BISEPS

Business clusters Integrated Sustainable Energy PackageS

RENEWABLE ENERGY FINANCING AND GOVERNANCE

OPTIONS APPRAISAL AND FEASIBILITY STUDY

Final report dated 8 March 2019

Contents

Report

1 BACKGROUND

1.1 BISEPS is the abbreviation for **Business clusters Integrated Sustainable Energy PackageS**. The BISEPS Project (www.biseps.eu) is an Interreg 2 Seas project that aims to reduce CO_2 emissions at business cluster level by creating energy synergies among businesses. This includes the generation, use and exchange of renewable energy (electricity and heat) on site.

1.2 The BISEPS model is being tested through 'Living Labs' – demonstration sites in each region where BISEPS partners are based. Manor Royal Business District (MRBD) is the Living Lab for West Sussex and the UK. West Sussex County Council (Your Energy Sussex, YES) (WSCC) is the sole UK partner in the 4-year project with partners in Belgium, the Netherlands and France. At MRBD, the Manor Royal BID, Crawley Borough Council (CBC) and YES are working together to develop the living lab as part of the longer-term transition to a low carbon, sustainable energy system for the area.

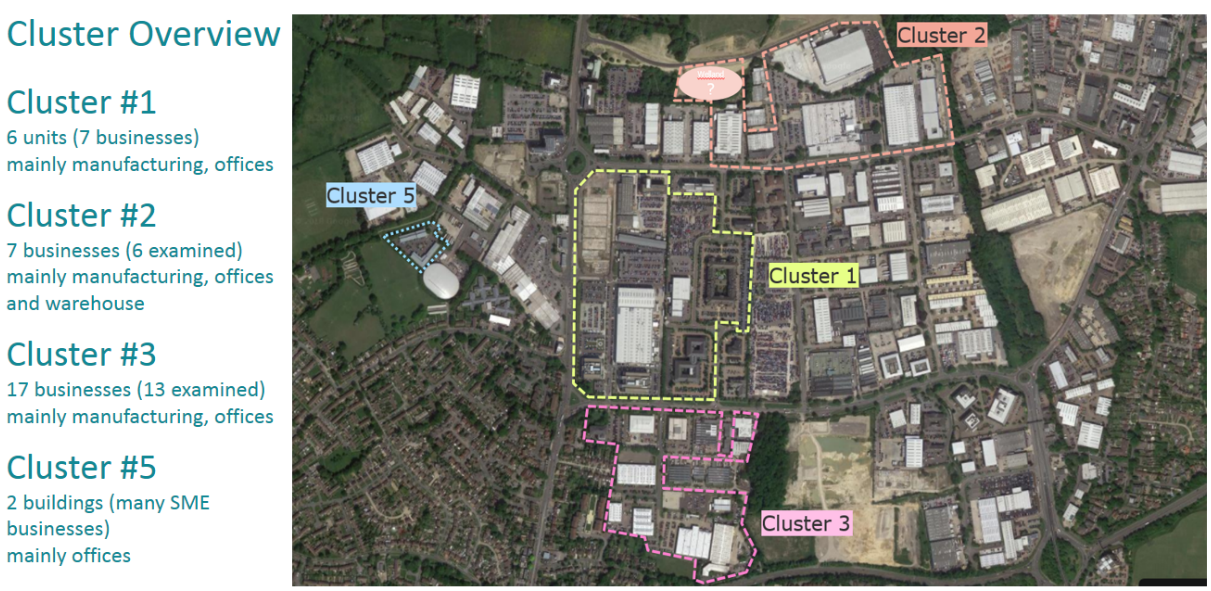
1.3 Background studies

1.3.1 A strategic study was completed in May 2018 which analysed the potential for a range of different low carbon technologies across the MRBD (*the BISEPS Re- Energise: Strategic Energy Opportunities study)*[1].

1.3.2 Four clusters within MRBD were identified, comprising groupings of businesses and available neighbouring land. The type and daily use of energy of the individual businesses were analysed, together with existing energy costs and tariffs to provide a benchmark for identified opportunities.

A range of potentially suitable technologies were then identified: Solar PV with/without Battery Energy Storage Systems (BESS), small CHP power plants with a small thermal storage and Ground Sourced Heat Pump (GSHP), dependent on the clusters' and specific business characteristics.

Diagram 1: the Four MRBD Clusters



1.3.3 Multiple energy system variants were modelled for each building within each cluster. The energy demand data on an individually time series basis, the results of the PV potential assessment and the other available technology options, were taken into consideration.

[1] http://www.manorroyal.org/assets/BISEPS%20Report%20May18.pdf

1.3.4 The variants were designed building by building, regardless of whether the buildings were owned and occupied by one company or if there were several companies within one building. For the latter, the energy demands for electricity and heat of all companies were aggregated, representing the total potential within the business cases for the owner of the building (on the assumption that the technologies would be installed by the owner, rather than individual occupants).

1.3.5 The potential (capacity, expected annual yield, self-supply), CAPEX, Lifetime, OPEX, CO_2 savings and a basic finance modelling were taken into consideration for the different technologies and combinations of technologies.

1.3.6 The results were then separated into individual "Business Variants" ("BVs") presenting the IRR and simple payback period (amortised) for the different buildings and the whole cluster area. The results are illustrated in Diagram 2 (Outcomes from the technology options analysis). The results were classified on a colour scale ranging from light green over dark green to cyan (best values) and indicate the suitability of the sustainable energy supply system. "Red colour" indicates no business case[2].

Diagram 2: Outcomes from the technology options analysis

CLASSES	IRR	ROI	Self Supply	CO2 Savings
+	0-6%	<= 15y	>45%	>25%
++	6-12%	<= 10y	>60%	>50%
+++	>=12%	<= 5y	>75%	>75%

CLUSTER #1, #2, #3, #5 Business Variants (BV)	FINANCIAL FIGURES			SUSTAINABILITY		
	CAPEX [GBP]	IRR [%]	Amortisation [a]	Generation [MWh/a]	Self Supply [%]	CO_2 Savings [%]
BV 1.1 - Solar PV, Rooftop	2,377,700	18.5%	5.2	2,238.1	8.8%	13.9%
BV 1.2 - Solar PV + CHP	3,232,200	43.7%	2.2	6,538.1	25.6%	32.3%
BV 2.1 - Solar PV, Rooftop	4,170,600	17.3%	5.5	3,926.2	27.7%	43.8%
BV 2.2 - Solar PV + BESS	4,973,800	-7.3%	25.1	3,140.0	52.6%	64.9%
BV 2.3 - Solar PV + CHP	4,668,500	23.9%	4.0	5,604.2	42.3%	60.6%
BV 3.1 - Solar PV, Rooftop	1,938,600	17.8%	5.3	1,835.7	21.9%	39.4%
BV 3.2 - Solar PV + BESS	3,076,000	-14.6%	25.1	1,632.3	45.4%	63.3%
BV 3.3 - Solar PV + CHP	1,824,500	21.2%	4.6	2,285.4	45.1%	58.4%
BV 5.1 - Solar PV, Block A	75,600	17.7%	5.4	77,400	36.3%	47.7%
BV 5.2 - Solar PV, Blocks B+C	92,700	16.2%	5.6	92,400	45.8%	60.5%
BV 5.3 - Solar PV, ABC+Carpark	264,900	9.9%	8.9	207,600	44.3%	82.9%
BV 5.4 - Solar PV (ABC) + BESS	190,800	8.9%	9.9	169,800	55.1%	79.4%
BV 5.5 - CHP, Blocks ABC	39,200	5.0%	15.0	47,100	17.5%	16.9%
BV 5.6 - Solar PV (ABC) + CHP	207,500	14.5%	6.5	169,800	56.2%	86.5%
BV 5.7 - Solar PV (ABC) + GSHP	298,500	28.3%	3.2	169,800	42.6%	95.0%

1.4 Conclusions from background studies

[2] Note that the initial project took no account of the potential for aggregation and the provision of grid services from behind the meter batteries.

1.4.1 The use of roof-top Solar PV was the most feasible technology and fastest way of saving CO_2 within each cluster (based on an electricity only solution). The IRR is very good with a quick payback time ("amortisation") of below 6 years, realised due to savings on energy bills from high levels of self-consumption. The combination with multifunctional solar PV carpark applications (which represent higher investment costs) as part of a microgrid behind the meter also outputted a reasonable investment return. Note however that any potential synergies (e.g. trading of electricity) amongst companies within the cluster were not considered.

1.4.2 The most comprehensive and efficient solution was found to be from coupling of heat & power, with roof-top Solar PV and CHP within the clusters (eg BV 1.2 or BV 2.3). Given the proximity of open land, Cluster 5 allowed the integration of a GSHP (see BV 5.7). The combination of PV plus GSHP constituted one of the best solutions from a sustainability and financial perspective (particularly due to the subsidy available from the RHI Scheme).

1.4.3 BESS as well as Fuel Cell solution was found to potentially work in combination with Solar PV (rooftop) where the real time electricity demand fitted with the generation and should become more attractive once the CAPEX drops (as is predicted) and if electrical vehicles (EV's) are introduced to the business case.

1.4.4 For further details on each BV (including input parameters and options with respect to the individual cluster, see: *BISEPS Ramboll : BISEPS Manor Royal Re-Energised – Renewable Energy Feasibilities Studies*[3]*.*

1.4.5 Note that a separate study for a potential district heating network on the MRBD is being undertaken in parallel. An energy mapping study within MRBD commissioned by CBC, was completed in 2018. The objective was to identify potentially useful heat supply opportunities for the purposes of district heating network (DHN) development. Following an assessment of energy demand and supply, district heating network opportunities onto two main clusters (1 - west side of London Road covering area around County Oak Way and Metcalf Way and 2 - between Fleming way and Manor Royal Road) were identified to take forward to techno-economic modelling. Gas engine Combined Heat & Power (CHP), Ground source heat pump (GSHP), fuel cell (FC) were identified as the preferred prime mover technologies for the study. The two gas engine CHP options show the best financial results. The GSHP and fuel cell solutions were found to be not economically viable at this stage primarily due to the high initial investment required in each case. Based on the results of the energy mapping exercise and the techno-economic analysis it has been concluded that, whilst a wholly private sector backed scheme is not viable, there is potential for a public sector led or joint venture approach. Therefore it was recommended to take forward the project to feasibility study.

1.5 Aim of this Options Appraisal Report

Building on the work completed in the *BISEPS Ramboll : BISEPS Manor Royal Re-Energised – Renewable Energy Feasibilities Studies*, this Options Appraisal analyses optimised technical solutions for MRBD, exploring at a high level the potential to maximise on-site energy consumption (and therefore the value of the energy generated) via private wire, local electricity networks, peer to peer trading and other related options. It also provides details on suitable funding mechanisms and business models to support businesses on the MRBD to develop such potential for localised low carbon energy solutions.

1.6 Structure of this Options Appraisal Report

1.6.1 In order to provide an analysis of the options available for business on the MRBD, we have developed three models of increasingly complexity from a technical, commercial, financial and legal perspective. Each of these models is based on variants of the Clusters analysed under the *BISEPS Ramboll: BISEPS Manor Royal Re-Energised – Renewable Energy Feasibilities Studies* and are described in Section 2 of this Report:

- **Model 1:** Cluster 1, building specific technologies and consumption, no trading of energy between businesses
- **Model 2:** Cluster 5, multi-building, "intelligent" technologies with trading of energy between businesses

[3] http://www.manorroyal.org/energy

- **Model 3:** Site wide energy business across all Clusters with site wide business engagement and site wide trading of energy

1.6.2 **Sections 3 – 6** of this report set out our analysis of each of these models from a financing, trading, technical and commercial and legal perspective.

1.6.3 **Section 7** of this report looks at the constraints to implementation of each Model.

1.6.4 **Section 8** of this report sets out in detail our key recommendations and next steps.

1.7 Executive Summary

1.7.1 Progress to date shows that a majority of businesses on MRBD are interested in renewables and/or some form of centralised management which could reduce power import prices and increase the value of locally generated power, but a lack of understanding of options available, priority and cost of capital (including perceived cost of capital/ lack of understanding of potential returns and/or savings) inhibit investment.

1.7.2 If businesses on MRBD wish to pursue a collaborative approach to energy generation and consumption in order to realise the benefits of economies of scale and intelligent collective management of power, such inertia must be exorcised, and interest exercised in a collaborative manner. This collaborative model is represented in our Model 2 and, building on Model 2 with added forms of peer to peer trading, Models 3a and 3b.

1.7.3 We have analysed the advantages and disadvantages of each Model that could develop on the MRBD and summarised our findings here:

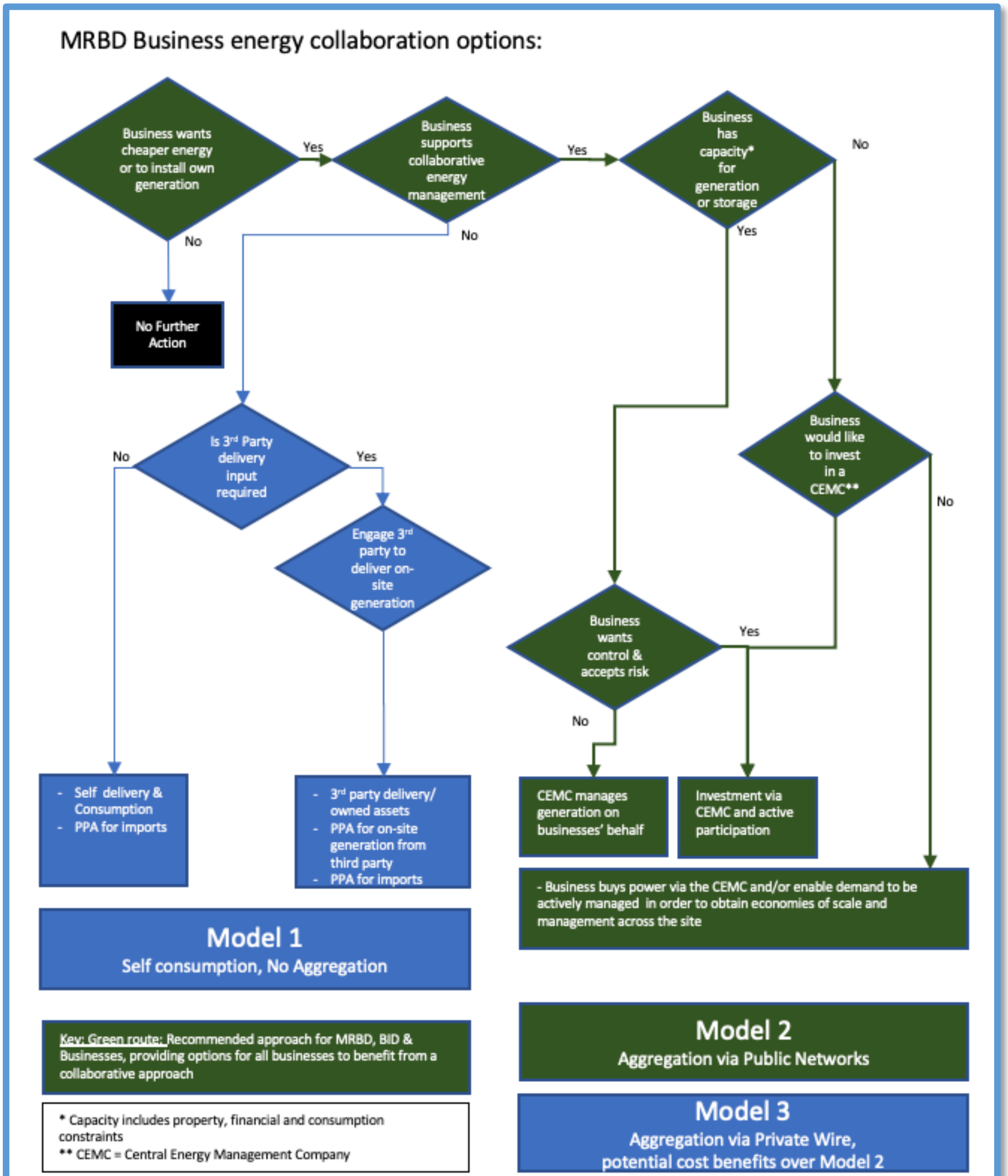
Model	Key advantages	Key disadvantages
Model 1	**Commercial/ Financial** • Is the status quo: simple and requires no co-operation between businesses • Requires no investment of time/ effort in a centralised function • Individual businesses retain returns from investment in own projects • No additional "ancillary" infrastructure costs	**Commercial/ Financial** • No ability to access advantages of co-operation (see Model 2) • Some of the technologies proposed (for example, BESS or EVs) are still at a high cost point and therefore investment by individual businesses on the MRBD may not seem economically justified. • Access to capital may be more limited/ harder to secure, particularly if the business does not have good covenant strength
	Legal • Projects can be set up and governed in a traditional manner which companies will be familiar with • No complexities of regulation in relation to on-site trading (as none being undertaken) • Relatively simple PPAs can be entered into for power off-take (i.e. the licensed supplier's standard terms) • No requirement to change status quo in relation to power purchase for businesses	**Legal** • If projects set up without a view to future collaboration, businesses may not be in a position to collaborate in relation to power generation/ consumption in the future • If long term PPAs entered into, penalties may be incurred for early termination (if businesses then wish to collaborate in bulk PPAs/ corporate PPAs) • More limited ability to negotiate PPA given small output of each individual business
	Technical • No complex arrangements required to be established for behind the meter balancing / co-ordination of technologies • Unlikely to be a requirement for additional infrastructure, ancillary to the generating asset and connection itself	**Technical** • If Model 1 is progressed without a view to moving to a Model 2 or Model 3, there may be more costly retrofitting of smart meters/ ancillary infrastructure which is capable of centralised management if Model 2 is subsequently progressed

Model 2	**Commercial/ Financial** • Potential for cheaper power if CEMC able to negotiate a bulk power supply agreement for businesses across the MRBD • Potential for a better power off-take price if CEMC is able to negotiate a bulk off-take agreement for power generated on the MRBD • Potential to develop low carbon on-site projects with more accessible and/or competitive debt due to aggregated portfolios of projects and potential for higher investor returns • Ability to reinvest centralised surpluses into "riskier" projects/ projects which may have a longer payback • Potential for businesses to have a share in CEMC, allowing businesses without generation capacity to benefit from investment returns	**Commercial/ Financial** • Requires businesses to be pro-active and actively co-operate with others on the MRBD to progress the project (and such engagement may be required at board level) • Requires acceptance of a certain level of risk (trialling relatively new technologies/ new configurations of technologies) • Requires patient capital • Requires businesses to have a long-term view of energy generation and consumption on MRBD • Requires on-going engagement and management • Projects with many 'moving parts' with their own set of constraints increases uncertainty and thus affects investment appetite and/or cost.
	Legal • Given economies of scale, better scope for negotiating terms of PPAs and bulk electricity supply agreements to the MRBD • If CEMC established, simplified contracting structures with suppliers/ contractors	**Legal** • Increased levels of due diligence required given complexities of projects • Potentially complex governance structures required/ complex interfaces to be navigated • Increased complexity may require additional negotiation/ bespoke contracts and specialist legal advice
	Technical • Potential to centrally manage and optimise power demand and generation across the MRBD (including via thermal or battery storage and/or EVs) and therefore take advantage of periods of cheaper electricity and to smooth generation profile to enable a better off-take price for power and/or to use assets within the capacity market	**Technical** • Management and optimisation of multiple projects may be complex and require detailed technical feasibility studies before being progressed and specialist technical advice • Additional technology required to manage increasingly complex projects, particularly in relation to metering and centralised management
Model 3a	**Commercial/ Financial** • As for Model 2 • In addition, use of Corporate PPAs give potential for increased benefits to generators and customers on MBRD	**Commercial/ Financial** • As for Model 2
	Legal • As for Model 2	**Legal** • As for Model 2 • In addition, increased complexity in relation to PPAs requires additional negotiation/ bespoke contracts and specialist legal advice
	Technical • As for Model 2	**Technical** • As for Model 2
Model 3b	**Commercial/ Financial** • As for Model 2 • In addition, if private wire deemed to be feasible (technically and commercially), commercial benefits from direct trading between generators and customers on the MRBD should be realised	**Commercial/ Financial** • As for Model 2 • Detailed commercial feasibility studies are required (based upon detailed technical studies) to determine whether either (a) privatisation of the existing grid is

	due to enhanced savings (deriving from realisation of Embedded Benefits) and cost avoidance associated with the private wire micro grid (i.e. avoidance of supplier obligations and supplier costs)	viable; or (b) laying of a new private wire micro-grid is viable
	Legal • As for Model 2 • In addition, simplified regulatory burden given supplies across a private network	**Legal** • As for Model 2
	Technical • If feasible, a private wire network/ microgrid will enable a range of opportunities for trading/ balancing of power/ reducing on-site consumption from the grid (etc).	**Technical** • As for Model 2 • Detailed technical feasibility studies and grid studies required, to determine whether either (a) privatisation of the existing grid is feasible; or (b) laying of a new private wire micro-grid is feasible

1.7.4 Based on a detailed understanding of these factors and knowledge of their own energy management drivers, the Businesses within MRBD are encouraged to undertake their own appraisal as to which, if any, of the models are attractive to them. For guidance, the following flowchart sets out the headline questions that the Business needs to ask itself in relation to its own intentions and relative merits of the delivery models set out in this report.

Diagram 2A: MRBD Business energy collaboration options



1.7.5 In addition to the key advantages and disadvantages of the three models, once the business(es) have determined a preferred model, the funding availability for the three models can be summarised as follows:

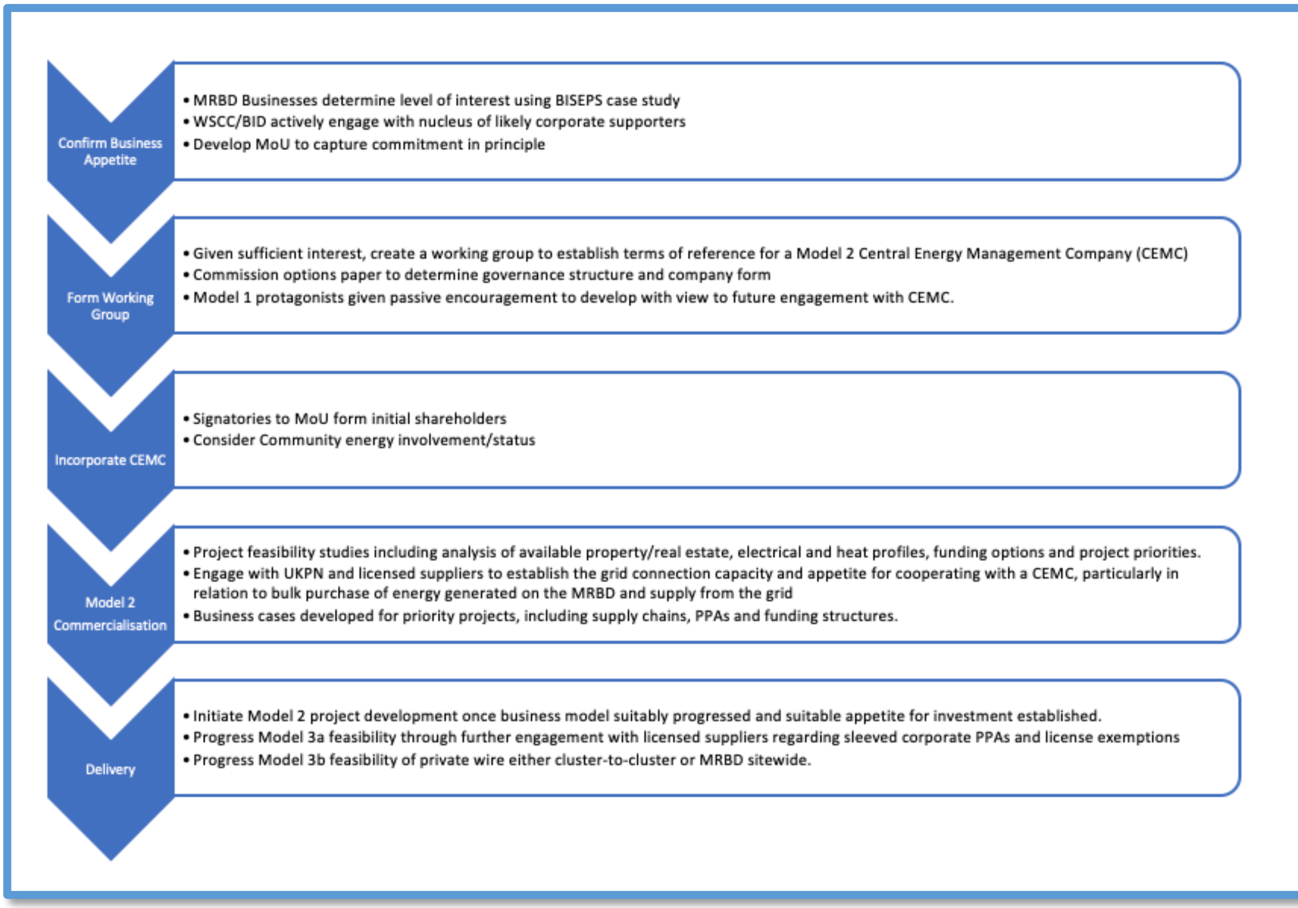
Diagram 2B: Funding Sources for Consideration

Funding Sources for Project Sponsor to Consider	Model 1 Self consumption, No Aggregation Up to 35% Energy Cost savings	Model 2 Aggregation via Public Networks, Up to 50% energy cost savings	Model 3 Aggregation via Private Wire, potential benefits over Model 2
Sponsor Internal Reserves	**Yes** – where available	**Yes** – where appropriate	**Yes** – where invested in CEMC
Government Support	**Yes** – where available	**Yes** – where available	**Yes** – where available
Project Finance	**Yes** – in ring-fenced SPV	**Yes** – with credit strength of sponsor and/or CEMC	**Yes** – with credit strength of sponsor and/or CEMC
Asset Lease Finance	**Yes** – in part where assets have residual value	**Yes** – in part where assets have residual value	**Yes** – in part where assets have residual value
Specialised Energy Funds	**Maybe** – likely public funds to SMEs	**Yes** – likely public funds to SMEs	**Yes** – Equity or debt from tax efficient VC funds
Crowd Funding	**Maybe** – from local 'ethos' or 'impact' investors	**Maybe** – for element of funding structure	**Maybe** – for element of funding structure
Secondary Markets	**No** – not at anticipated scale	**Maybe** – for aggregated cluster models	**Maybe** – for exit strategies once operational

1.7.6 In order to gain momentum for collaboration on energy generation and consumption on the MRBD, we would recommend the initial focus of further work in Q1/ Q2 2019 be directed at Model 2, as emphasised in the green path illustrated on the above flowchart, Diagram 2A. Model 2 could be established at relatively low cost and complexity as, in its initial basic formulation, Model 2 is simply the creation of a collaborative vehicle for co-operation, which can create proof of concepts by progressing low carbon projects on the MRBD in stages and encouraging collaboration between businesses in order to achieve best value for power purchase and sale.

1.7.7 We set out in further detail the steps that should be taken to progress Model 2 (and if there is appetite, Model 3a and if technically and commercially feasible, Model 3b) in Diagram 2C below, and in further detail under Section 8 of this Report.

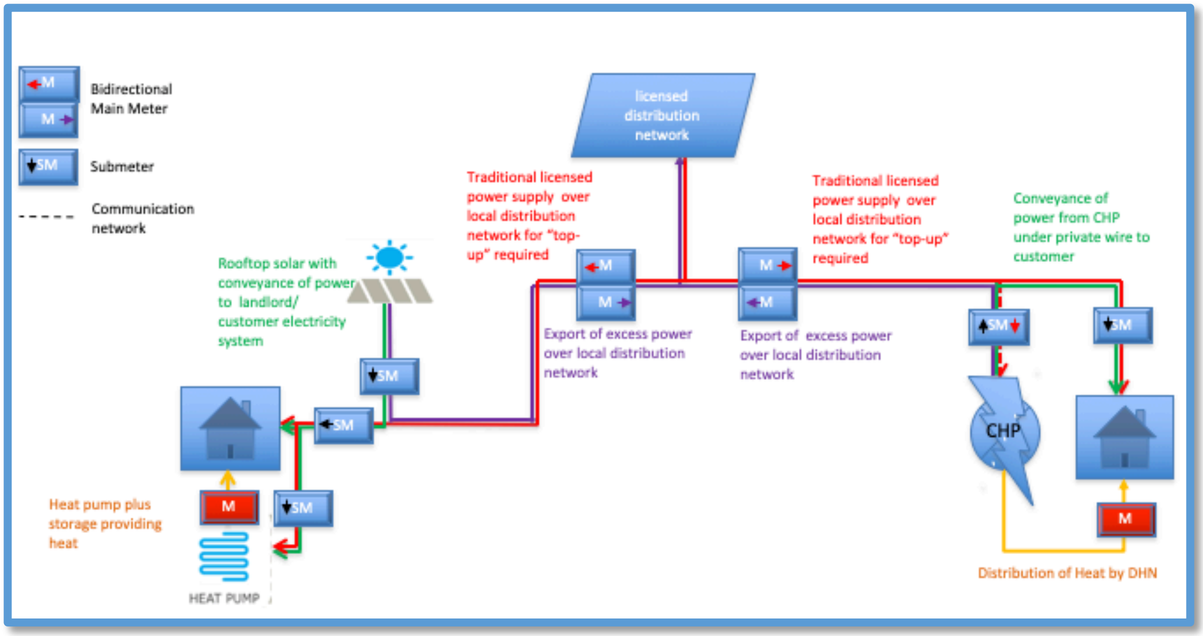
Diagram 2C: Next Steps Action Plan



2 MODEL OVERVIEWS

2.1 Model 1: Simple building-specific technologies

Diagram 3: Model 1: Physical structure



This model illustrates the simplest solution that could be implemented on the MRBD. The Ramboll Renewable Energy Feasibilities Studies referred to above illustrated examples of this model, e.g. BV1.1/ BV 1.2.

The key features of this model are:

Technology: rooftop solar/ GSHP/ CHP, serving individual businesses with heat or electricity.

Trading/ off-take:

- Heat is supplied directly to the individual business via a heat distribution network.
- Electricity is supplied via private wire behind the grid supply point meter to the on-site consumer business.
- Where the generator of the heat or electricity is not the same entity as the consumer, a power purchase agreement will be entered into governing the terms on which the electricity or heat is supplied to the consumer by the generator and the price of such power.
- Excess electricity which is not consumed on-site by the relevant business can be sold via the public distribution network to a licensed electricity supplier under a Power Purchase Agreement[4].

Funding:

- If individual businesses are undertaking their own projects, these may be self-funded (via on-balance sheet funds or a corporate loan).

[4] Note that from 1st April 2019, no subsidies will be available under the Feed-in Tariff Scheme for the export of power from new renewable energy schemes. A new scheme to guarantee the purchase of power is now being consulted upon (the "Smart Export Guarantee").

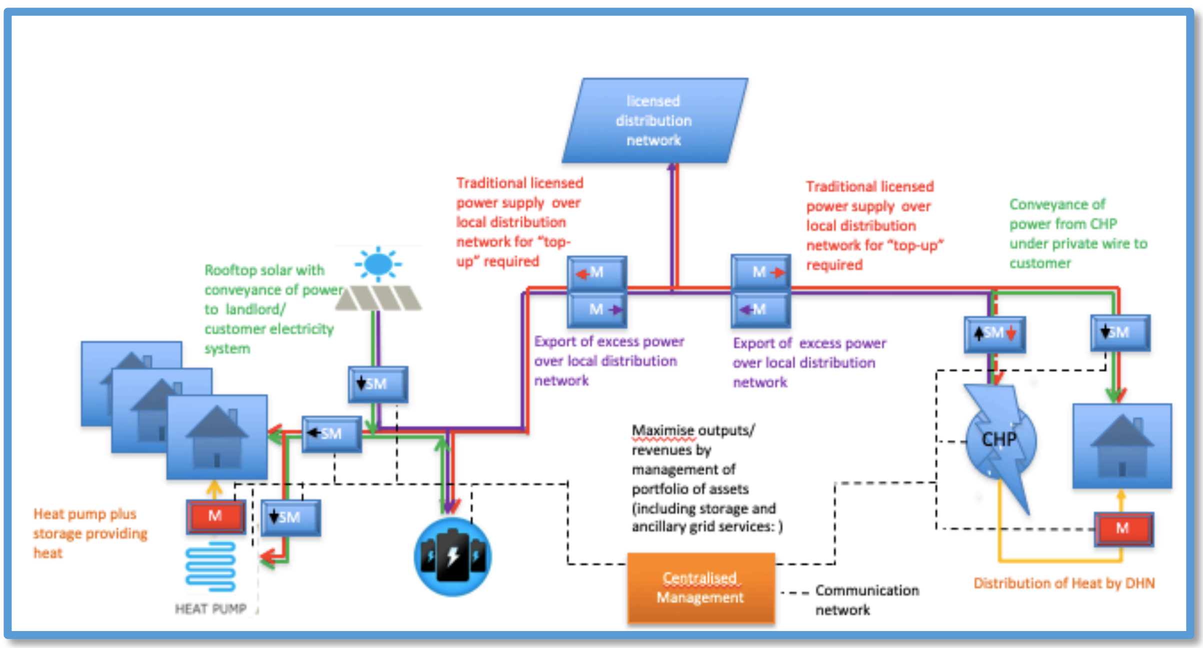
- If a third party developer undertakes a number of (for example) roof-top solar project across the MRBD, there may be opportunities for project finance.

Governance structure:

- If individual businesses are undertaking their own projects, there may be no specific governance structures in place.
- Where there is a desire to limit risk of a capital project, the renewable assets could be ringfenced within a simple Special Purpose Vehicle (SPV) structure.
- Where a third-party developer undertakes projects, again, a SPV structure may be established to hold multiple assets across the MRBD, or if there are multiple investors, a Joint Venture (JV) structure may be relevant.

2.2 Model 2: "Intelligent" multi-building, multi-technology models:

Diagram 4: Model 2: Physical structure



This model illustrates a more integrated and "intelligent" solution that could be implemented on the MRBD. The *BISEPS Ramboll: BISEPS Manor Royal Re-Energised – Renewable Energy Feasibilities Studies* provided the base for examples of this model, e.g. BV5.4/ BV5.6/ BV 5.7

The key features of this model are:

Technology: rooftop solar/ GSHP/ CHP plus battery storage and electrical vehicle charging, serving individual businesses with heat or electricity, but managed centrally to maximise outputs/ revenues.

Trading/ off-take:

- Heat is supplied directly to the individual business via a heat distribution network.
- Electricity is supplied via private wire behind the grid supply point meter to the on-site consumer business.
- Where there is centralised management of power generation, power purchase agreements may be entered into between the on-site generators/ businesses and the

centralised energy management company (CEMC), governing the terms on which the electricity or heat is supplied to the consumer (including, for example, the optimisation of such electricity generation using storage facilities/ electrical vehicle charging and/or ancillary services to the grid, including entry into the capacity market) and the price of such power and/or services supplied.

- Excess electricity which is not consumed on-site by the relevant business can be sold via the public distribution network to a licensed electricity supplier under a Power Purchase Agreement. Where there is centralised management of such sale of power, a better price may be able to be obtained by the CEMC given volume advantages/ potential ability to smooth dispatch.
- The CEMC may also arrange for site-wide electricity supplies from a licensed supplier to provide the electricity needs not met by on-site generation. Aggregated demand may enable a better price for such supplies and/ or enable a deal to be struck with a supplier in relation to the sale of excess power.

Funding:

- If individual businesses are undertaking their own projects, these may be self-funded (via on-balance sheet funds or a corporate loan).
- If the CEMC facilitates projects, with a view to aggregating power generation for the purposes of optimisation (to obtain best value for businesses on the MRBD in relation to on-site electricity consumption and export/ ancillary services), project finance may be a suitable source of funding. Debt providers may be able to lend at more competitive rates due to the guaranteed off-take arrangements with the CEMC. Businesses across the MRBD may also invest into the CEMC.

Governance structure:

- Where the CEMC manages energy generation and on-site supply across the MRBD, a SPV will need to be established. The SPV will be comprised of those businesses which wish to invest into/ take an active management role in the project and/or (depending on the model adopted), purchase energy from the SPV. Manor Royal BID and WSCC may also be key investors/ shareholders in the project.
- The CEMC SPV will need a robust governance structure, with key stakeholders forming the board of directors. Representatives from, for example, the Manor Royal BID, WSCC and those investing substantial equity or other forms of contributions should be included.
- The CEMC SPV may be established as a form of socially responsible/ not for profit organisation which could then reinvest in the locality/ undertake further projects in the locality which are environmentally and socially beneficial.

2.3 **Model 3: Full sitewide Energy Company with business engagement and inter-trading**

Diagram 5: Model 3(a): Physical structure (with sleeved electricity supplies)

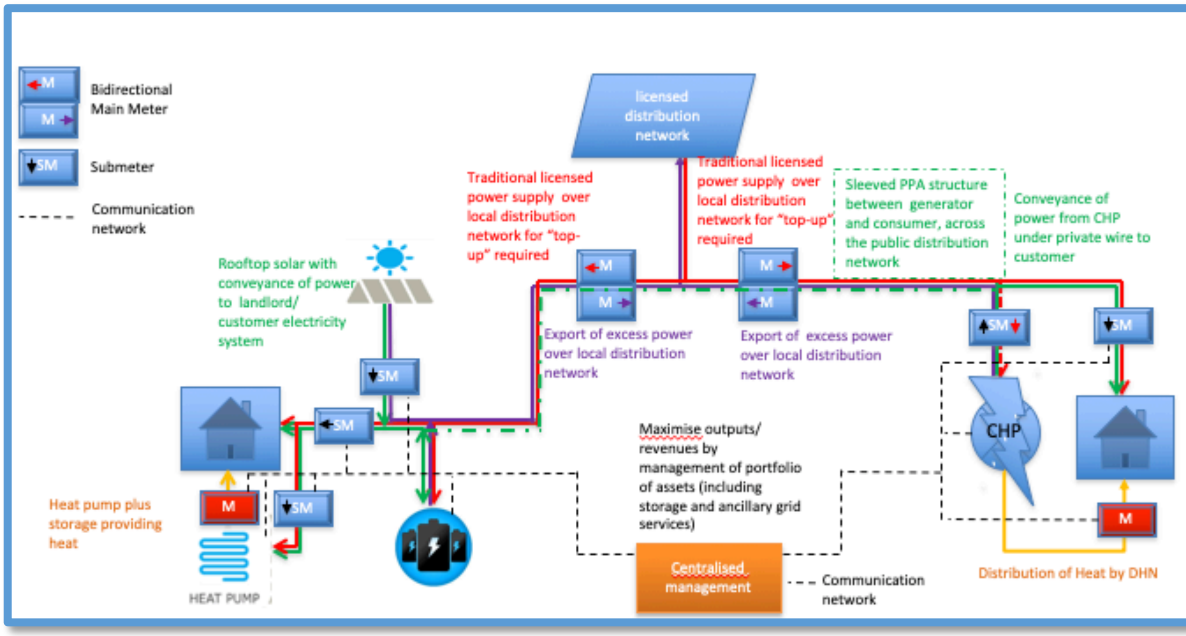
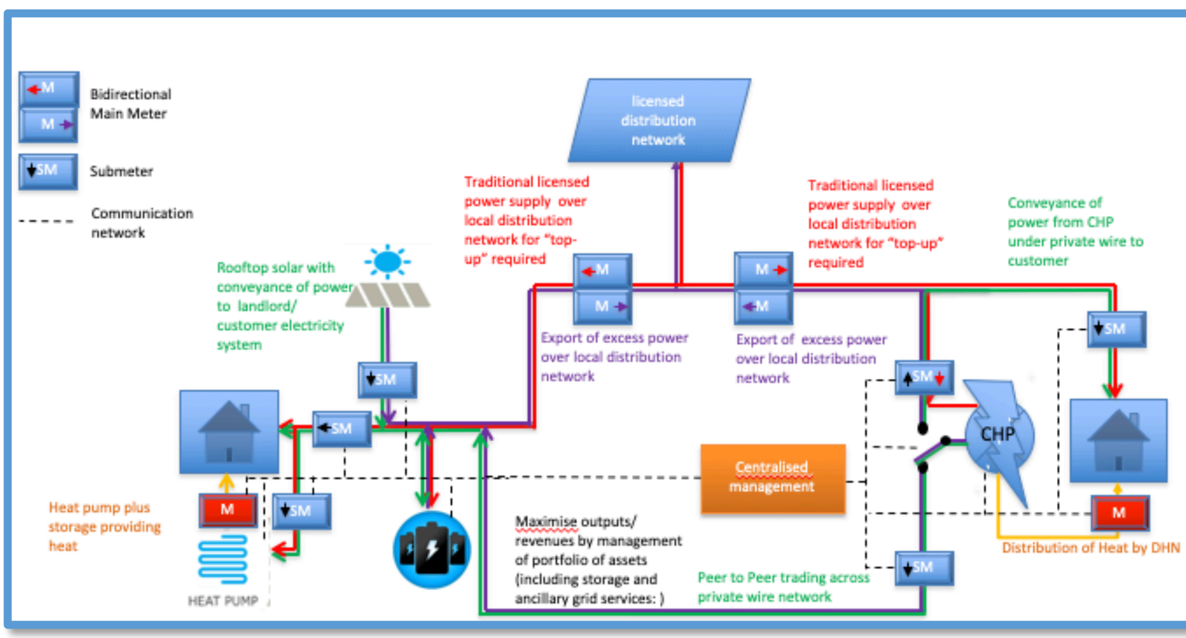


Diagram 6: Model 3(b): Physical structure (with additional private wire connection)



This model represents a fully integrated on-site energy solution, providing heat via heat networks and electricity either under **Model 3a** via sleeved PPA arrangements, or under **Model 3b,** utilising microgrid networks across the MRBD site, managed centrally to optimise pricing for businesses on the MRBD in relation to energy generated, consumed on-site and in relation to electricity, exported for sale to the grid.

Technology: rooftop solar/ GSHP/ CHP plus battery storage and electrical vehicle charging, serving multiple businesses with heat and/or electricity through site wide infrastructure (private wire micro grids/ estate wide heat distribution networks), managed centrally to maximise outputs/ revenues.

Trading/ off-take:

- Heat is supplied to business via an estate wide heat distribution network.
- Electricity is supplied via private wire microgrids across the MRBD (**Model 3b**), **or** where such arrangement is not initially feasibility (technologically or commercially), supplied via the local distribution network using a sleeved PPA contract structure (**Model 3a**).
- Power purchase agreements may be entered into between the on-site generators/ businesses and the CEMC, governing the terms on which the electricity or heat is supplied to the consumer (including, for example, the optimisation of such electricity generation using storage facilities/ electrical vehicle charging and/or ancillary services to the grid, including entry into the capacity market) and the price of such power and/or services supplied.
- Peer to peer trading across a microgrid may be established, enabled via smart/ real time meter data (**Model 3b**).
- Excess electricity which is not consumed on-site by the relevant business can be sold via the public distribution network to a licensed electricity supplier under a Power Purchase Agreement. Where there is centralised management of such sale of power, a better price may be able to be obtained given volume advantages/ potential ability to smooth dispatch (through management of generation, storage and demand).
- The CEMC may also arrange for site-wide electricity supplies from a licensed supplier to provide the electricity needs not met by on-site generation. Aggregated demand may enable a better price for such supplies and/ or enable a deal to be struck with a supplier in relation to the sale of excess power.

Funding:

- Where the CEMC undertakes the development of projects, with a view to aggregating power generation for the purposes of optimisation (to obtain best value for businesses on the MRBD in relation to on-site electricity consumption and export/ ancillary services), project finance may be a suitable source of funding. Debt providers may be able to lend at more competitive rates due to portfolio size and spread (including potentially strong balance sheets) of off-takers across the MRBD. Businesses across the MRBD may also invest into the CEMC, providing equity/ existing renewable assets/ land as contributions.
- The CEMC may also be the entity which owns and operates (through appropriate sub-contractors) the micro-grid across the site (**Model 3b**). It will be essential to determine the commercial viability and the availability of funding for such infrastructure.

Governance structure:

- As for Model 2, where the CEMC owns (and manages) energy generation and on-site supply across the MRBD, a SPV will need to be established. The SPV will be comprised of those businesses which wish to invest into the projects and/or (depending on the model adopted), purchase energy from the SPV. Manor Royal BID and West Sussex Country Council (WSCC) may also be key investors/ shareholders in the project.
- The CEMC SPV will need a robust governance structure, with key stakeholders forming the board of directors. Representatives from, for example, the Manor Royal BID, WSCC and those investing substantial equity or other forms of contributions should be included.

- The CEMC SPV may be established as a form of socially responsible/ not for profit organisation which could then reinvest in the locality/ undertake further projects in the locality which are environmentally and socially beneficial.
- Where grid infrastructure is also owned and managed by the CEMC (**Model 3b**), a separate SPV ("GridCo") may be desirable, to ring fence the risks of such an asset/ enable a different investment class which may be eligible for e.g. some grant/ innovation funding.

3 FINANCING

3.1 Background

3.1.1 The shifting low carbon and renewable energy landscape has meant a continuous evolution of financing structures; from early stage venture capital (seeking high-risk growth in fast-growing businesses), through construction bridge finance, to a secondary market with institutional players investing into lower-risk renewable energy portfolios offering demonstrable returns from underwritten revenues.

3.1.2 There has also been a shift towards the district heating market given the reduction in new renewable developments and the prospective leveraging effect of the HNIP fund. European concessionary funding (e.g. from EIB, or domestic initiatives such as LEEF and JESSICA) has also contributed significantly to the market. Naturally, where funding comes from the public sector into an economic undertaking, it needs to be provided on a 'commercial' basis or be within a State Aid exemption and be notified.

3.1.3 Within this context, this section looks to set out the options for financing low-carbon renewable energy investments by and for businesses located on Manor Royal; exploring both sources of funding and contractual structures for financing.

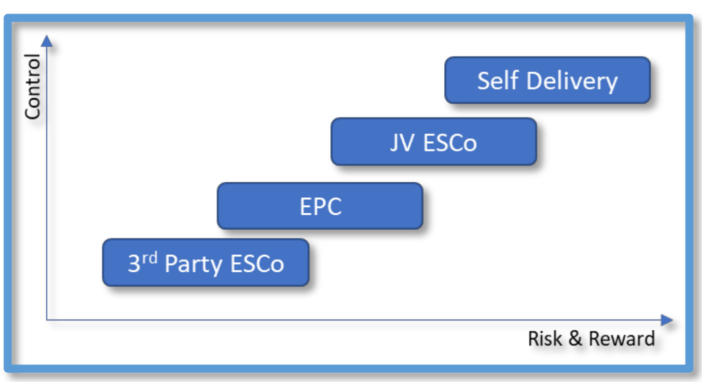
3.1.4 This is premised on the assumption that the individual business does not have the internal reserves itself to provide 100% of the capital so therefore is looking for external sources of capital; this may be simply for cash constraints, because the business's cost of capital exceeds the potential returns or for other business-related reasons. For models 1 and 2, where individual businesses may be undertaking their own projects, it is unlikely that 100% debt funding will be available and thus some element of reserves (share capital, accumulated profits, corporate borrowing) will be required.

3.2 Executive Summary

3.2.1 Funding options for localised low carbon energy within MBRD depend largely on the scale of the investment and the perceived ability of the liable parties to meet the required equity returns and/or debt service obligations. This in turn is a function of the stakeholder interest, including external business and service providers (ESCOs, etc) and the way in which they choose to contract for products and services.

3.2.2 This section explores the availability of funding for renewable energy and low carbon projects on MRBD and the different contracting structures that might be utilised to unlock funding for each of the 3 models. The choice of structure largely depends on the project sponsor's (host business) appetite for control and risk & reward for its involvement.

Diagram No. 7

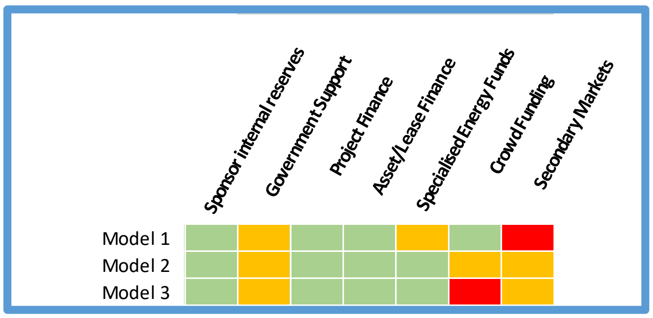


In each case, the key risk factors that funders will consider include:

- Deliverability
- Technology risk
- Savings and Revenue certainty
- Appropriate risk allocation
- Strong security against default or termination by either party (assets, guarantees etc)
- Defined costs with collateralised guarantees/warranties from contractors
- Clean title to land/property

As such, available funding for each of the 3 MRBD models can be summarised as:

Diagram No. 8



Although the subject of a separate paper, the potential role of the Local Authority as a cornerstone investor and/or guarantor is a significant factor in the realisation of viable funding for the more ambitious ESCO structures in Models 2 and 3.

3.3 Overview of the low carbon and renewable energy financing market

3.3.1 The marketplace is complex, with a wide range of technologies, financial structures, incentives and risks. While there is capital available and investor interest in low-carbon investment, there are market failures that need to be corrected. Some are related to the underlying investments, where the negative drivers associated with high-carbon activities (e.g. air pollution, climate change) and the positive drivers of low-carbon technology (e.g., how wider deployment of renewables allows for economies of scale) are not priced in. As a result, new technologies face disadvantages in displacing high-carbon incumbents.

3.3.2 The UK's public policy framework has helped address some of these externalities by increasing the cost for high-carbon technologies (as introduced by the EU Emissions Trading Scheme) and by supporting new technologies (for example, with price support for renewables).

3.3.3 Other market failures are related to the financial sector itself, where investors are discouraged by higher risk (real or perceived) associated with low-carbon investment. These can be characterised as:

(a) Low Capital Costs

One of the most significant challenges in the low carbon sector is the relatively low capital value of Projects - to the extent that the Projects are too small to attract low-cost funding from investors while due diligence costs are high relative to the investment size - and which therefore impacts the financial viability of the Projects.

(b) Credit Risk

The low carbon sector remains at the nascent stage and the credit risk associated with some technologies and/or counterparties is relatively high, especially for more traditional investors. Counterparties lacking either the collateral or revenue streams to secure their funding and/or skills in evaluating and processing low carbon finance are poor credit. It can also be difficult to value savings rather than revenues from low carbon interventions, making it harder to secure cashflows compared to energy supply projects.

(c) Long Paybacks

Projects require access to liquidity that fits the time horizons of low carbon investments which can be limited. In particular, private wire, district heating, and some renewables, can have paybacks of longer than 15 years. Also, uncertain consumer demand-based returns lead to a perception of performance risk.

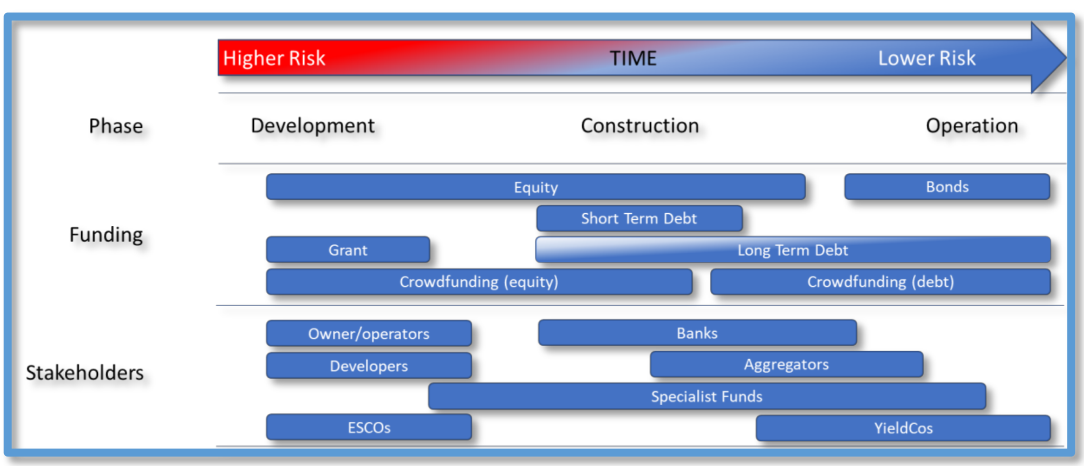
3.3.4 It can be difficult to create an alignment of interest between landlord and tenant in commercial property: the landlord is unlikely to invest in a scheme whereby the tenant takes the majority of the benefits, and a tenant is unlikely to wish to invest in the fabric of a building in which it only has a relatively short-term interest.

3.3.5 Simplicity, aggregation, standardisation and access to specialist technical assistance can mitigate these factors. Additionally, Public sector intervention and coordination can help by de-risking projects through taking a cornerstone investment stake or credit enhancement, or by providing the requisite expertise.

3.4 Overview of sources for low carbon and renewable energy funding

The funding of low carbon and renewable projects can be achieved in many ways, depending on the phase, nature and scale of the investment, the risk appetite of sponsors and investors, and market acceptability. For buildings in particular, funding of low carbon projects needs to consider interactions with existing funding (e.g. mortgages), leases where the freehold is not owned, and balance sheet issues.

Diagram No.9: The Funding Landscape



In addition to simply self-funding from balance sheet, options may include:

3.4.1 Government Support

Depending on the specific form and terms of government support, both the public and private sector entities (including ESCOs) have access to various forms of public intervention. Such interventions are aimed at improving the economic viability of a project (reducing the overall funding costs), however, this benefit should be considered against the 'cost' associated with conditions, restrictions and administrative requirements.

Government support available to MRBD will vary over time according to policy changes and budget constraints. Currently, the following support may be available to businesses:

(a) Grant funding is non-interest bearing and non-repayable and can be in the form of revenue or capital contributions. It is usually extended by a government body to support the development of projects meeting certain social or environmental objectives. The availability of grants varies considerably over time and depending on the business (typically SME) and technology envisaged, however key resources for MRBD businesses seeking funding may be:

- Coast to Capital LEP http://www.c2cbusiness.org.uk/member/coast-to-capital-lep-region-growth-grant-programme-2018-19.html
- Innovate UK - https://www.gov.uk/government/organisations/innovate-uk
- British Business Bank https://www.british-business-bank.co.uk/
- Funding Options http://www.c2cbusiness.org.uk/

(b) Operating subsidies

Electricity

The Renewables Obligation closed for all new renewable energy generation on 31 March 2017. The RO has been partially replaced by the CfD "Contracts for Difference" regime which was not applicable to solar PV in the last allocation round and unlikely (given BEIS' announcement in July 2018) to apply to solar PV in the May 2019 round.

The FIT Scheme is currently still open for renewable technologies of a capacity below 5MW, however will close on 31 March 2019 for all new applicants, to be replaced by a "Smart Export Guarantee". The parameters of this support mechanism are still to be developed and it is understood that rather than any guaranteed price for exported power, it will instead require suppliers to participate in a market for renewable power exported to the grid.

Heat

The RHI tariff depends on which renewable heat systems are used and the scale of generation. The annual subsidy lasts for 20 years for non-domestic buildings.

Once obtained, government operating subsidies have the benefit of being highly reliable revenue streams, credit enhancing project funding considerations and even being capable of securitisation; whereby debt is raised and serviced against the operating subsidies alone.

(For further detail, please see BISEPS Glossary and Guide).

(c) Concessionary Funding at less than market rates and/or on more beneficial terms (lower fees, longer availability period and loan life, repayment holidays, etc) can come from a number of sources; publicly or privately managed on behalf of government.

Such loans can be to the sponsor/owner or to the project. (see 3.4.4 below on specialised energy funds).

When investing public money into commercial undertakings, a grant of unlawful state aid must be avoided and this may serve to limit the amount of public support that can be accepted. This requires careful consideration by the project sponsor and its advisors, but a number of exemptions exist which may be available to MRBD, including:

- ***De minimis***: which allows small amounts of aid i.e. less than €200,000 over 3 consecutive fiscal years, to a single undertaking for a wide range of purposes.
- **General Block Exemption Regulation (GBER)** which sets out exemption categories for investment aid to support energy efficiency and/or environmental projects.

3.4.2 Loans / mortgages

Most low carbon financing is simply through normal lending. It is not specifically identified as low carbon lending as the detailed purpose of the loan is not usually known in sufficient detail, whether low carbon is the main purpose, or it is embedded into a larger project.

Low carbon loans should improve customer cash flow and a few banks have begun to take the improved cash flow into effect when considering credit risk. Although this is a positive development as energy saving clearly does improve cash flow, lenders taking into account this improved cash flow are also conscious that they are implicitly taking some performance risk - if the savings are not delivered the consumer risk is higher than anticipated.

Most consumer and commercial loans are recovered from the borrower in the normal way but there are specialised means of loan recovery in the global low carbon financing markets which have potential, particularly in a bespoke, private wire environment:

(a) On-Bill Recovery ("OBR") allows customers to repay loans made for low carbon improvements on their electricity bills. The UK's Green Deal was one such attempt at OBR and, although perceived as a failure, the basic premise is viable providing the lessons are learnt.

(b) Property Assessed Clean Energy ("PACE") is a financing mechanism used in the USA to enable low-cost, long-term funding for low carbon projects to be repaid as an additional payment on the local property tax.

(c) Green Mortgages are loans used to fund purchase of an energy efficient building or refurbish a building to a higher standard of energy efficiency. Although commonplace in the USA since the 1990s, in the UK these remain a work-in-progress with the UK Green Building Council

3.4.3 Project Finance

Project finance is the long-term financing of renewable projects based upon the projected cash flows of the project. This debt is secured against the assets of the project, including any performance guarantees and contracted revenues. In most cases these are non-recourse loans ring-fenced through SPV structures and so the liability of the shareholders is limited to their shareholdings in the SPV. In some cases, these may be limited recourse loans where certain of the shareholders' assets (as listed in the loan agreement) are provided as security or generic security is provided through a level of parent company guarantee.

3.4.4 Asset Finance

Leasing is a well-established method of financing low carbon projects. The contracts typically cover all materials, labour and soft costs associated with a low carbon project, however a critical distinguishing feature of equipment leasing is that the equipment is the collateral for the financing. The possibility that an equipment finance lender would repossess the equipment for non-payment puts the lender in a strong position but in practice it may be difficult to remove energy efficiency equipment that is embedded into a building or process. The assessed residual value of the asset against which the lender will fund can thus be a relatively low percentage of the project costs and thus require project funders to complete the rest of the funding structure from balance sheet.

3.4.5 Specialised Energy Funds

Over the last 10 years, many specialised infrastructure or low carbon and renewable funds have been established using private sector and public-private funding, including crowd-funding. These funds offer a range of equity and debt funding products.

The main sources of public funding available to the Manor Royal BID are:

(a) Coast to Capital, the regional Local Enterprise Partnership, has a number of funding, grant and loan opportunities available to private sector and public sector organisations to support business growth in Croydon, East Surrey, Gatwick Diamond, Brighton & Hove, Lewes and West Sussex. This funding comes from its allocation from the Government's Growth Deal and the European Structural & Investment Fund which both support business growth.

(b) Heat Network Investment Programme (HNIP) – a £320mn capital investment programme procured by BEIS and privately managed, which is expected to support up to 200 district heating projects by 2021 through grants, loans and other mechanisms, and to leverage in up to £2bn of wider investment. HNIP is expected to start investing in early 2019.

3.4.6 Crowd Funding

Crowd Funding is the practice of funding a project or venture by raising small amounts of money from a large number of people, typically via the Internet, reversing traditional funding concepts of seeking large amounts of money from a few institutions.

(a) Debt crowdfunding, often in the form of bonds, provides for the lending of money while bypassing traditional banks. Returns are financial, but investors also have the benefit of having contributed to the success of an idea they believe in.

(b) Equity Crowdfunding provides an opportunity in exchange for shares in the business, project or venture. As with other types of shares, apart from community shares, the risk/reward profiles are generally higher than debt. Community Shares in Co-operatives or Community Benefit Schemes are higher risk and lower return, so really for those with a social not a financial goal.

3.4.7 Secondary Markets

(a) Bonds, particularly green bonds, have a large potential role in energy efficiency as low carbon projects have a clear environmental benefit. Most specific low carbon projects are too small for the issuance of a bond on a single-project or single-owner basis, a stand-alone low carbon project of £10 million is unusual and still too small for a debt capital market bond. Even if several such projects were identified, the development and execution of those projects and the uncertainty associated with the pace of draws on capital over time would make the use of bonds unwieldy. Green bonds have, however, been used successfully to finance energy efficient buildings

(b) YieldCos. The emergence of the YieldCo for renewable energy portfolios, while it has had mixed success, represents the maturation of renewable finance and could have future application in energy efficiency. A YieldCo is a company that bundles together a series of renewable transactions such as the sale lease-back shown above. This aggregation blends risk and allows for steady, relatively predictable returns. It also allows parent companies to raise cheaper capital for established projects and to recycle the capital thus unlocked for new project development. Renewable energy YieldCos have been quoted on public stock markets such as the London Stock Exchange.

(c) Aggregation models. As with bonds low carbon financings have to date been too small to consider YieldCos but the emergence of aggregators could make them viable. An aggregator is an entity that purchases investments with the same or similar credit risk or 'asset class' and then collectively refinances them more efficiently utilising economies of scale and a portfolio risk approach. Aggregators can be the issuing banks or subsidiaries within the financial institutions themselves or brokers, dealers, correspondents or another type of financial corporation. Aggregators earn profit by purchasing individual assets at lower prices and then selling the portfolio at a higher premium, typically to institutional investors with a lower cost of capital for large scale investments.

3.5 Overview of contracting structures for low carbon and renewable energy financing

Beyond the simplest option for a consumer to fund and operate the low carbon and renewable project themselves, utilising the funding options above, a number of contracting structures exist that allow greater flexibility for scale, multiple consumers and/or multiple providers to participate in schemes as well as managing risks appropriately between commercial consumers, suppliers, landlords and service providers.

The models are structured to address the key characteristics that any funder will look for in a project, including:

- Deliverability
- Proven technologies
- Revenue certainty
- Appropriate risk allocation
- Strong security against default or termination by either party (assets, guarantees etc)
- Defined costs with collateralised guarantees/warranties from contractors
- Clean title to land/property

The key contracting structures relevant to the MRBD models are set out below with some more complex structures that may have application in certain bespoke situations set out in Annex 5.

3.5.1 Energy Performance Contracting

Energy Performance Contracting (EPC) is a form of 'creative financing' for capital investment which allows funding energy upgrades from anticipated cost reductions. Under an EPC arrangement an external organisation (ESCO) implements a project to deliver energy efficiency, or a renewable energy project, and the stream of income from the cost savings, or the renewable energy produced, is used to repay the costs of the project, including the costs of the investment. Essentially the ESCO will not receive its payment unless the project delivers as expected.

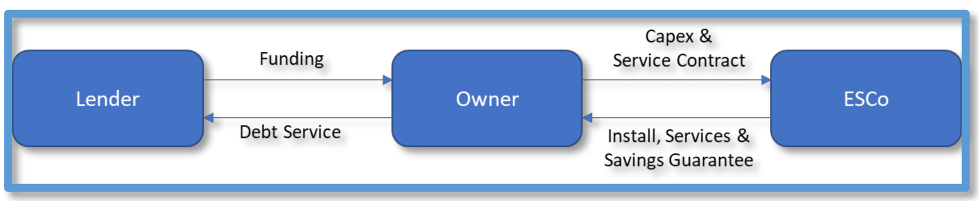
The ESCO does not generally provide the required capital but usually works with established lenders to facilitate provision of finance, although the customer can also decide to directly finance the project with its own reserves. Lenders require ESCOs with good track records and strong balance sheets that can ensure construction is completed on time and on budget and can support the performance guarantee.

The approach is based on the transfer of technical risks from the client to the ESCO based on performance guarantees given by the ESCO. In EPC, ESCO remuneration is based on demonstrated performance; a measure of performance is the level of energy savings or energy service. EPC is a means to deliver infrastructure improvements to businesses that lack energy engineering skills, manpower or management time, capital funding, understanding of risk, or technology information. Cash-poor, yet creditworthy customers are therefore good potential clients for EPC.

There are many variants of such contracts, the most straightforward ones are:

(a) Guaranteed Savings contracts provide that the ESCO guarantees a certain level of energy savings and in this way shields the client from any performance risk. Under a guaranteed savings contract the ESCO takes over the entire performance and design risk; for this reason, it is unlikely to be willing to further assume credit risk. Consequently, guaranteed savings contracts are rarely financed by or through the ESCO. The customers are financed directly by third party funders with the advantage that finance institutions are better equipped to assess and handle customer's credit risk than ESCOs. However, the involvement of the ESCO's technical skills and savings guarantee serve to enhance the creditworthiness of the project and thus improve the availability of funding and lower the interest rates.

Diagram No. 10(a): Energy Performance Contract



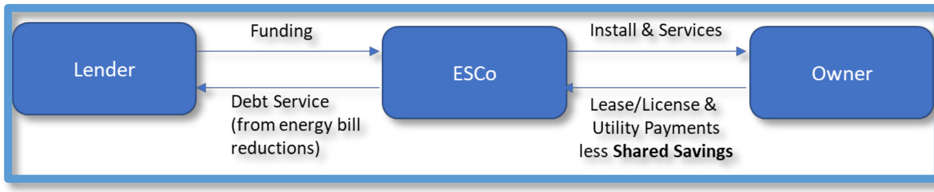
Application to MRBD:

Within MRBD, Guaranteed Savings contracts are suited to businesses with access to finance, internal or external, who wish to outsource the technical and performance risk to third parties.

Model 1	Yes	for isolated projects
Model 2	Yes	for businesses wishing to develop revenue generating assets of its own for peer-to-peer supply purposes.
Model 3	No	

(b) Shared Savings contracts split the cost savings for a pre-determined length of time in accordance with a pre-arranged percentage: there is no 'standard' split as this depends on the cost of the project, the length of the contract and the risks taken by the ESCO and the consumer. With shared savings the business takes over some performance risk, hence it will try to avoid assuming any credit risk. Therefore, a shared savings contract is more likely to be linked with external funding. While shared guarantees may well be suited to businesses with limited access to finance, the ESCO therefore assumes both performance and the underlying customer credit risk – if the customer goes out of business, the revenue stream from the project will stop, putting the ESCO at risk. In addition, such contractual arrangement may give raise to leveraging problems for ESCOs, because ESCOs become too indebted and at some point financial institutions may refuse lending to an ESCO.

Diagram No. 10(a): Energy Performance Contract



In order to assume credit risk, the shared savings model favours projects with short paybacks or large ESCOs with big balance sheets.

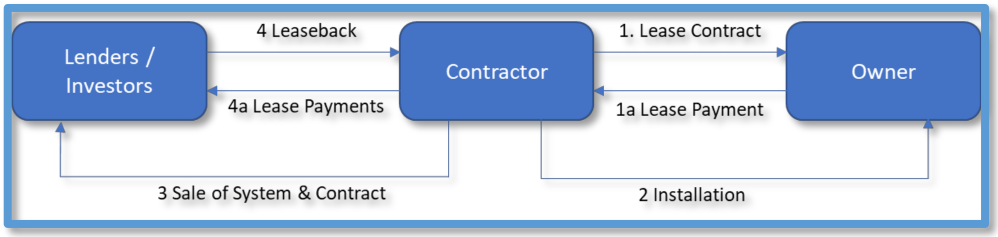
Application to MRBD:

Model 1	Yes	particularly SMEs seeking off balance sheet solutions to energy cost mitigation, but may lead to a proliferation of one-off deals. This in turn could produce a disparate structure that precludes the entrance of a larger ESCO with the ability to deliver Model 2 and Model 3 integrated services.
Model 2	Yes	For larger ESCOs with a balance sheet appetite to create a portfolio risk of larger and smaller companies, may have the capacity to aggregate those individual projects towards the Model 3 structure.
Model 3	Yes	As model 2 above

3.5.2 Sale-leaseback

The sale-leaseback structure has become an important piece of transaction architecture for solar installations in some jurisdictions. It grew out of the need for investment vehicles that would allow investors to own the tax attributes of a solar investment in order to receive tax benefits and motivate investment of equity that could benefit from beneficial tax rates. However, the structure also allowed solar contractors to originate projects efficiently by providing surety of financing for the solar projects they install. It also allows for aggregation of power by capital providers and the efficient sale of power to an off-taker.

Diagram No. 11: Sale - leaseback



Rather than signing a PPA with a host, the host signs a lease for the equipment and installation. The contractor then sells the solar installation and the contract for receivables from the host to the capital provider, who promptly leases the equipment back to the contractor. Lease payments flow from host to contractor and thence to capital provider.

Application to MRBD:

Model 1	No	
Model 2	Yes	The nuances of such transactions are more applicable to investors and ESCOs/contractors than the host businesses themselves but may apply for leasing contracts utilised by MRBD businesses under Models 2 or 3.
Model 3	Yes	

3.5.3 Rent-a-Roof

A simpler version of the sale-leaseback structure is the rent-a-roof model, popularised by the FIT scheme for PV installations. While successive derogations in the FIT have made such schemes more challenging, reductions in the cost of PV panels are redressing the imbalance. The model exists whereby an organisation may rent roof space from a property owner, install and maintain solar PV panels and take the FIT income for generation and export.

These schemes work in many different ways, for example, as part of the deal the generator may offer the occupier electricity at a discounted price. Alternatively, in return for lower rent the generator may provide electricity to the building for free.

These sorts of schemes can be very attractive to those with managed and tenanted estates. The prospect of reduced energy bills is likely to be a benefit when marketing the premises to future tenants as is the increased rental income when valuing the property on a rental yield. However, conversely, the presence of a title restriction associated with the roof lease may be perceived as a fetter to value and/or liquidity issue should an owner wish to sell the property; discouraging owners from agreeing to such transactions.

Application to MRBD:

Model 1	Yes	
Model 2	Yes	particularly where the owners of industrial properties with large uncluttered roof areas may wish to exploit the asset without capital investment of their own.
Model 3	Yes	

3.5.4 Power Purchase Agreements (PPAs)

The variety of PPAs are considered more fully in Section 4.4 below but in this context the role of PPAs are not a source of funding per se, rather a contracted revenue stream that provides assurance of debt service by the asset owner.

Many low carbon projects include elements of energy supply, particularly from distributed sources such as Combined Heat and Power or local renewables such as solar. This is likely to become increasingly common with the growth of distributed energy, demand response, energy efficiency and energy storage.

PPAs are a vital component of renewables finance. A PPA is generally a long-term contract for the purchase of electricity, gas, or some other utility such as heat or cooling by an off-taker. Thus a PPA allows a lender to underwrite the financing of the renewable or energy saving project. Just as the credit quality of the tenant is fundamental to the mortgage for commercial property, the credit quality of the off-taker has a significant impact on finance for renewable and cogeneration projects. A PPA may cover a single site or a portfolio of sites. Although PPAs are concerned with the purchase of generated power they can have a role to play in integrated low carbon and supply projects.

Application to MRBD:

Model 1	Yes	Businesses sponsoring their own projects under Model 1 or Model 2 will wish to sell excess production; the higher the unit price and the better the credit quality of the off-taker, the better the credit enhancement. The default price for this may be the 'spill to grid' price associated with the FiT regime, typically to a national supplier. This is superior credit but likely a low price.
Model 2	Yes	As above or below
Model 3	Yes	With a centralised ESCO under Models 2 and 3, it is envisaged that a higher price will be paid for the energy, without overly compromising the creditworthiness of the PPA, and overall improving the viability of the underlying generation project. Similarly, funding the ESCO envisaged in Models 2 or 3 will require revenue certainty by its investors, which will be improved by (ideally long-term) PPAs with the businesses it serves.

3.6 Joint Venture Structures

3.6.1 Joint venture structures have been commonly used to unlock investment in low carbon infrastructure. These can take a range of different forms but generally share the following characteristics:

- A clear vision for a shared end goal
- Shared leadership and resources to drive the vision and bring in other partners and expertise as appropriate
- Shared benefits
- Risk sharing

3.6.2 The potential role of WSCC in MRBD is the subject of a separate paper but having a public sector led SPV and where the local authority is directly invested in the SPV can reduce risk perceptions of external debt providers and optimise the funding potential and overall acceleration of investment.

3.6.3 Where the public sector is able to partner and directly invest alongside the private sector this can help de-risk the development and leverage a higher level of private sector finance and returns, ultimately making a development more commercially viable. It can also ensure that the public sector partner(s) has (have) more transparency over costs and benefits.

3.6.4 Generally speaking, debt capital costs less than equity capital and the joint venture partners will look to maximise the gearing (debt financing proportion) of the capital structure. The lending appetite from traditional debt providers will be influenced by a number of factors, including:

- maturity of the technologies
- track record and expertise of the joint venture partners
- credit strength of the joint venture partners
- certainty of the scheme cash flows and forecasting time periods

3.6.5 Pension funds offer a potentially significant source of low-cost investment in local low carbon infrastructure. The challenge to accessing this source of capital is one of making small to medium local "on-site" low carbon and renewable generation and infrastructure investments, attractive to institutional investors in terms of scale, risk and process. These investors do not typically invest on a project by project basis, nor do they generally take on direct construction risk and naturally tend to prefer long-dated index-linked secure returns. For this reason they have tended to back larger generation projects backed by a form of Government subsidy (e.g. ROCS), and are less comfortable with the higher risks associated with 'merchant' generation.

Application to MRBD:

Model 1	Yes	should multiple investors undertake to deliver the project, a form of JV may be relevant in order to define the risk/reward structure for investor and provide a vehicle through which to raise third party funds.
Model 2	Yes	as Model 1 although the potential for two or more MRBD businesses to come together to form a JV to provide the centralised energy management function across a range of projects provides greater scope for economies of scale and collective bargaining; including for the sourcing of funds. Project finance may be a suitable source of funding and debt providers may be able to lend at more competitive rates due to portfolio size, credit strength and sector spread of off-takers across the MRBD. Businesses across the MRBD may also invest into the centralised energy company, providing capital and/or existing assets (renewables, property, land etc) as contributions.
Model 3[5]	Yes	the same applies as Model 2 although the conceptual scale and opportunity for optimisation provides further credit enhancement and incentive for the JV or its developer to invest. Additionally, the introduction of distribution assets such as private wire or district heating provides another asset class that may, in isolation be attractive to institutional investors such as pension funds. These high upfront capital, longer term (up to 50 years vs 10-15 for generating assets), low maintenance assets lend themselves to the form of long term, indexed linked, secure revenues available through use-of-system charging.

[5] The Corporate Renewable Energy Aggregation Group may be a relevant example here

3.7 3rd Party ESCOs

Alternatively, it may be that in any of the centrally managed ESCO scenarios above, the MRBD prefers to outsource the management function, performance and credit risk, procuring an over-arching concession with a 3rd Party ESCO. In such circumstances, the businesses would seek to benefit from lower prices for energy consumption and higher prices for exporting energy surplus (should they invest in generation assets) but cede both control and value to the shareholders of the ESCO.

Application to MRBD:

Model 1	No	
Model 2	Yes	Unless businesses invest independently in the ESCO if option exists
Model 3	Yes	Unless businesses invest independently in the ESCO if option exists

3.8 Implications of public/ private JVs

3.8.1 The Localism Act (2011) confers on Local Authorities the ability to undertake commercial activities as part of its general power of competence.

3.8.2 Local authorities have a duty to achieve best value and demonstrate that they have fulfilled their other public law duties.

3.8.3 Where a local authority is exercising its general power for a commercial purpose then it must do so using a company. Accordingly, where the local authority proposes to undertake a joint venture a special purpose vehicle (SPV) will be incorporated as a clean legal structure for the joint venture enterprise. This SPV may be used as the actual development delivery vehicle or to procure the appointment of a single private sector delivery partner (with supporting supply chain) for the entire construction and operation of the scheme or simply to procure discrete packages of works and services from different contractors (possibly from a procured framework of suppliers) with the SPV potentially being the primary operational company in the SPV/ delivery structure.

3.8.4 The choice of joint venture structure, contracting arrangements and investment strategy will be influenced by governance and leadership, procurement, the relevant powers of stakeholders to engage in the project, state aid (where public bodies, such as WSCC are involved), and accounting treatment considerations as well as each partner's desired exit strategy, project returns, tax position, separation of risk and limits on liability and any energy-specific regulatory requirements. Please see further Section 5.11.5 which discusses some of the advantages and disadvantages of choices of structure.

3.9 Partnerships with Community Energy groups

3.9.1 Community energy has played a growing role in recent years in the development of smaller scale renewable energy projects, energy efficiency schemes and other demand-side activities. The sector is now at a crossroads following the cuts made to the Feed-in-Tariff Scheme and other policy changes. A number of the larger and/or more established community energy organisations have been exploring a range of new partnerships and business models, including private wire arrangements, local supply and trading models, corporate PPA structures, and community owned heat networks.

3.9.2 Community energy projects have been defined to date by the manner in which the project is either owned and/or controlled by a community group that involves a significant degree of direct and democratic citizen participation (on a one share, one vote basis) to achieve clearly defined local social and environmental outcomes/ community benefits. Whilst it is not correct to categorise them as non-profit companies, they do not have the same short-term profit motives and their purpose lies in achieving long-term community-outcome impacts.

3.9.3 A community energy organisation could make a complimentary investment partner in a shared ownership model given:

- their grassroots networks and collaborative processes
- their delivery expertise with a range of renewable technologies
- their ability to raise additional sources of finance through a community share or bond offer to the public as well as to access competitive loans from alternative ethical lenders such as Triodos, Leapfrog, Thrive, SASC
- their value proposition – project returns are directed towards local initiatives (often aimed at fuel or poverty alleviation) not maximising individual shareholder returns
- they demand lower returns, allowing a higher rate of return to be earned by commercially motivated investors so that the scheme is investable

3.10 District Heating financing

3.10.1 District heating projects have their own unique challenges where undertaken as a self-contained development project and this is the subject of the separate "Manor Royal Heat Network Study" undertaken in parallel with this BISEPS study.

3.10.2 Funding can be challenging for stand-alone schemes for several reasons, including:

- High capital costs associated with the energy centre and distribution network (oversized to accommodate a growth in demand/ future expansion with minimal disruption) in relation to annual revenues
- Long construction lead times, especially where a scheme is undertaken in phases
- Marginal returns and long payback period
- Revenue uncertainty from sales of power and exposure to customer credit risk and market price risks (wholesale gas prices)
- High transaction costs
- Lack of a pipeline of projects

3.10.3 These challenges are increased if conceived as part of a MRBD Model 3 wider area generation / solution mix including solar energy installations, heat pumps, storage and batteries to create a whole system, whole place approach.

3.10.4 There is currently no private sector incentive for whole system integration, to maximise collective generation optimisation and demand reduction. Given the range of stakeholders that would be involved in any scheme, local authorities can play a key role here as an enabler and are well positioned to lead the early stage development of a technically and financially feasible scheme that can realise economies of scale, maximise carbon savings and generate a sufficient rate of return to attract private investment/funding.

3.11 Application of funding to the three MRBD models

The following tables illustrate for each of the three MRBD model scenarios which funding sources can be explored depending on the contracting structure preferred (or required) by the sponsoring businesses and stakeholders.

Diagram No. 12: Model 1 Application of Funding

	CAPEX: Up to £1 million	Self Perform	Energy Performance Contracting		3rd Party ESCO	Joint Venture
Funding Responsibility		Sponsoring Business	Sponsoring Business eg Guaranteed Savings	3rd Party ESCO eg Shared Savings	3rd Party ESCO	JV Partners
Potential Funding Sources	**Sponsor internal reserves**	Shareholder Capital, retained profits, mortgages, corporate loans	Shareholder Capital, retained profits, mortgages, corporate loans	N/A	N/A	Yes, invested in ESCO via debt &/or equity
	Government Support	Subject to prevailing conditions at time of application	Subject to prevailing conditions at time of application	Subject to prevailing conditions at time of application	N/A	N/A
	Project Finance	Possibly if ring-fenced within separate SPV & with limited recourse to sponsor for demand guarantee	Where credit strength of ESCO is sufficient to support guarantees & longevity of sponsor is assured	Where credit strength of host is sufficient to secure revenues & longevity of ESCO is assured	N/A	N/A
	Asset/Lease Finance	where assets have residual value and combined with internal reserves	where assets have residual value and combined with internal reserves	where assets have residual value combined with ESCO capital	N/A	N/A
	Specialised Energy Funds	Subject to conditions, most likely public funds to SMEs	Subject to conditions, most likely public funds to SMEs	Subject to conditions, most likely public funds to SMEs	N/A	N/A
	Crowd Funding	For smaller projects, from 'sympathetic' investors, often in local area	For smaller projects, from 'sympathetic' investors, often in local area	For smaller projects, from 'sympathetic' investors, often in local area	N/A	N/A
	Secondary Markets	N/A	N/A	N/A	N/A	N/A

Diagram No. 13: Model 2 Application of funding

CAPEX: Up to £5 million		Self Perform	Energy Performance Contracting		3rd Party ESCO	Joint Venture
Funding Responsibility		Sponsoring Business	Sponsoring Business eg Guaranteed Savings	3rd Party ESCO eg Shared Savings	3rd Party ESCO	JV Partners
Potential Funding Sources	**Sponsor internal reserves**	Shareholder Capital, etc as part of funding structure	Shareholder Capital, etc as part of funding structure	N/A	N/A	Yes, invested in ESCO via debt &/or equity
	Government Support	Subject to prevailing conditions at time of application	Subject to prevailing conditions at time of application	Subject to prevailing conditions at time of application	Subject to prevailing conditions at time of application	Subject to prevailing conditions at time of application
	Project Finance	If ring-fenced within separate SPV & with limited recourse to sponsor for demand guarantee	Where credit strength of ESCO is sufficient to support guarantees & longevity of sponsor is assured	Where credit strength of host is sufficient to secure revenues & longevity of ESCO is assured	Where credit strength of ESCO is sufficient to support guarantees & longevity of sponsor is assured	Where credit strength of ESCO is sufficient to support guarantees & longevity of supply/demand is assured
	Asset/Lease Finance	where assets have residual value and combined with internal reserves	where assets have residual value and combined with internal reserves	where assets have residual value combined with ESCO capital	where assets have residual value combined with ESCO capital	where assets have residual value combined with JV capital
	Specialised Energy Funds	Subject to conditions, most likely public funds to SMEs	Subject to conditions, most likely public funds to SMEs	Subject to conditions, most likely public funds to SMEs	Equity &/or debt from tax efficient VC funds	Equity &/or debt from tax efficient VC funds
	Crowd Funding	For smaller projects, from 'sympathetic' investors, often in local area	For smaller projects, from 'sympathetic' investors, often in local area	For smaller projects, from 'sympathetic' investors, often in local area	N/A	N/A
	Secondary Markets	N/A	N/A	N/A	For exit strategies once operational with proven revenue	For exit strategies once operational with proven revenue

Diagram No.14: Model 3 application of funding

CAPEX: Up to £5 million		Self Perform	Energy Performance Contracting		3rd Party ESCo	Joint Venture
Funding Responsibility		Sponsoring Business	Sponsoring Business eg Guaranteed Savings	3rd Party ESCO eg Shared Savings	3rd Party ESCO	JV Partners
Potential Funding Sources	**Sponsor internal reserves**	Shareholder Capital, etc as part of funding structure	Shareholder Capital, etc as part of funding structure	N/A	N/A	Yes, invested in ESCO via debt &/or equity
	Government Support	Subject to prevailing conditions at time of application	Subject to prevailing conditions at time of application	Subject to prevailing conditions at time of application	Subject to prevailing conditions at time of application	Subject to prevailing conditions at time of application
	Project Finance	If ring-fenced within separate SPV & with limited recourse to sponsor for demand guarantee	Where credit strength of ESCO is sufficient to support guarantees & longevity of sponsor is assured	Where credit strength of host is sufficient to secure revenues & longevity of ESCO is assured	Where credit strength of ESCO is sufficient to support guarantees & longevity of sponsor is assured	Where credit strength of ESCO is sufficient to support guarantees & longevity of supply/demand is assured
	Asset/Lease Finance	where assets have residual value and combined with internal reserves	where assets have residual value and combined with internal reserves	where assets have residual value combined with ESCO capital	where assets have residual value combined with ESCO capital	where assets have residual value combined with JV capital
	Specialised Energy Funds	Subject to conditions, most likely public funds to SMEs	Subject to conditions, most likely public funds to SMEs	Subject to conditions, most likely public funds to SMEs	Equity &/or debt from tax efficient VC funds	Equity &/or debt from tax efficient VC funds
	Crowd Funding	For smaller projects, from 'sympathetic' investors, often in local area	For smaller projects, from 'sympathetic' investors, often in local area	For smaller projects, from 'sympathetic' investors, often in local area	N/A	N/A
	Secondary Markets	N/A	N/A	N/A	For exit strategies once operational with proven revenue	For exit strategies once operational with proven revenue

* See Model 1 for options where individual businesses may seek to develop their own capacity but trade with Model 3 ESCO

4 TRADING

4.1 Background

4.1.1 As part of the increasing focus on extracting value in a post subsidy market and the realisation of the benefits of a decentralised energy market, there has been an increasing exploration of innovative trading models, including a variety of PPA structures, private wire models, local balancing, microgrids, "virtual power plant" models (i.e. models which see nominal balancing of generation and consumption via smart metering technology and intelligent management of assets) and smart grid opportunities. Real time data transfers, taking learnings from block-chain technology, also provide the potential to open private and virtual networks to a wide range of players, reducing the burden on constrained grids and increasing the potential benefits to a range of players.

4.1.2 However, sustainable energy investments are often disregarded because they face a competition for scarce capital, a lack of trustworthy information or doubts/confusion over the possible benefits. Many project developers still face obstacles in raising the necessary up-front costs for their projects and lack access to attractive and adequate financing products from the market, particularly where projects have scalability issues.

4.1.3 Establishing a clear trading route, with, where possible, guaranteed revenue streams, is therefore essential for the "bankability" of projects and the access to capital and debt described under Section 3 above.

4.1.4 The MRBD provides an ideal model to explore many of these opportunities, with on-site electricity and heat demands, private wire and micro-grid opportunities and the potential to engage businesses to become more than simply energy consumers.

4.2 Executive Summary

4.2.1 There are a range of trading options for power generated on the MRBD open to businesses on the site. These are examined in detail below at Sections 4.3 – 4.8 and described individually in more detail in Annex 2 (Electricity Trading: Details and Heads of Terms).

4.2.2 To summarise, the types of trading of electricity that could be undertaken on the MRBD depending on the Models developed are as follows:

- **Model 1:** in the simplest model, which sees building specific technologies developed by individual businesses, the most common types of trading will be:
    - Self-supply: the power generated from on-site renewables (or electricity from CHP), is consumed by the same business as generates the power, ("behind the meter" for electricity); or
    - Private wire PPA: electricity is generated from roof-top or on-site renewables owned by a separate business to the business occupant, with consumption by the building occupant metered and paid for, commonly under a solar-roof top lease arrangement;
    - Standard PPA: electricity generated but not consumed on-site is exported to the grid and sold by the generator to a licensed supplier.
- **Model 2:** in this more "intelligent" model, the above trading options can be pursued, however there are likely to be advantages in the CEMC taking an active role in managing the Private Wire PPA and the Standard PPA. By aggregating portfolios of generation and demand, the CEMC may be able to better manage the assets, particularly by utilising storage facilities placed behind the grid supply point meter and EV charging points, smoothing consumption across the site. In addition, the price obtained under the Standard PPA for electricity exported to the grid may be improved if the aggregated power output from each generation plant is substantial.
- **Model 3:** in the fully integrated model, if micro grid infrastructure across the MRBD is developed, Private wire PPAs/ Peer to Peer could be established between businesses across the MRBD site/ between businesses and the CEMC, taking full advantages of the benefits of

Private wire PPAs without the constraints of the assets being roof-top directly adjacent to the consumer. Where a microgrid infrastructure is not developed, a site wide trading arrangement could still be developed, but under a contractual "Corporate PPA" structure. The CEMC could facilitate these arrangements, by liaising with a fully licensed supplier which would discharge the necessary obligations to distribute power across the MRBD.

4.2.3 The options available for trading power under each Model are partly constrained due to the possible physical arrangements of assets on the site, but also legislative constraints. The electricity trading activities set out above (bar in most circumstances self-supply) are regulated by the Electricity Act 1989, which requires a licence to be obtained for generation, distribution and supply activities, unless exempt under a class exemption (set out under the Class Exemption Order 2001). We discuss the detailed application of the regulation of electricity below at Section 4.9 and under Annex 2.

4.2.4 The trading routes for direct heating (and cooling) are generally limited due to the physical constraints on distribution. Common arrangements for heat trading are:

- Direct Supply**:** heat supply agreements entered into between generator and end consumer;
- Bulk Supply**:** bulk heat supply agreements entered into between generator and normally a landlord, with heat delivered by the landlord to end consumer tenants as part of the services delivered pursuant to lease or tenancy arrangements.

The source of heat for DHN is commonly on-site CHP, however there is increasing pressure from carbon, efficiency and in some cases, planning, drivers to source waste heat. This may be from, for example, energy from waste plants or industrial processing plants.

4.3 Routes to market/ trading options for electricity

4.3.1 The trading opportunities, or "routes to market" for electricity can be based on two primary categories, which are directly shaped by the legislative constraints placed on the sale and distribution of power (examined in more detail at Section 4.9 below):

- **Direct trading**: power is sold directly to customers or used on the same site as it is generated. The power never enters the public network.
- **Indirect trading**: power is sold onto the public network. This means that the units are allocated to an electricity supplier.

4.3.2 These two routes are not necessarily mutually exclusive. It is common for power to be sold directly to a customer via a private wire, with the excess "spilled" onto the public network.

4.3.3 **Direct trading:** this type of trading can be further split into two categories:

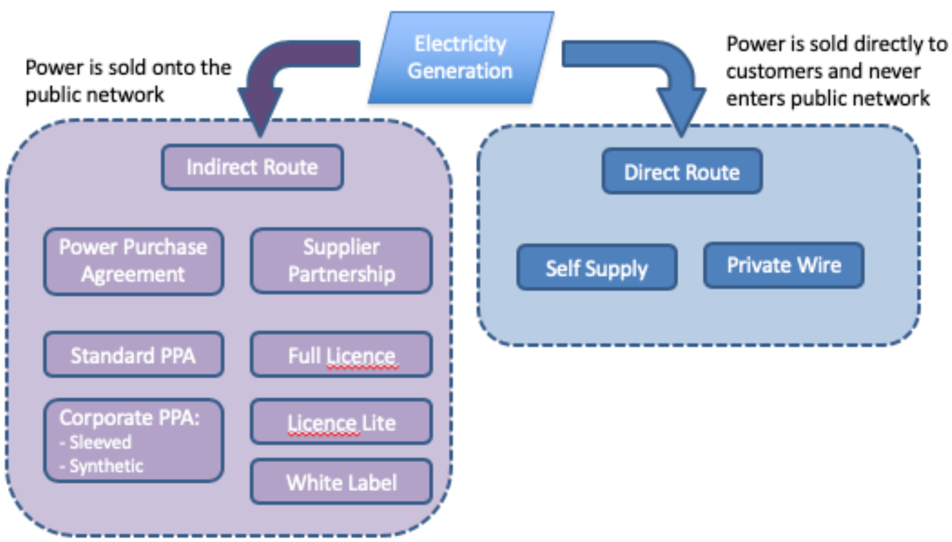
- Self-Supply**:** the power generated from on-site renewables (or electricity from CHP), is consumed by the same entity as generates the power, "behind the meter";
- Private Wire PPAs: the power generated from on-site renewables (or electricity from CHP), is consumed by a third party (or, consumed by the same entity as generates the power, but via a metered private wire/ microgrids) under a PPA arrangement. This can also be classified as a type of Peer-to-Peer electricity trading.

4.3.4 **Indirect trading:** There are broadly 6 options for trading power indirectly. The first three of these involve forms of PPA the fourth, fifth and sixth involve a generator becoming or partnering with a licensed electricity supplier:

- Standard PPA**:** the power generated from on-site renewables (or electricity from CHP), is exported to the grid and sold to a licensed supplier;

- Corporate PPA: direct agreements are made between generator and consumer, but the electricity is still exported to the grid and sold via a licensed supplier. Corporate PPA's can be split in two further categories:
    - Sleeving/ Peer to Peer: a generator supplies a customer utilising a licensed supplied. A bilateral deal is entered into between generator and end customer, with the licensed supplier implementing the deal. Peer to Peer is similar, but a platform facilitates the arrangement.
    - Synthetic PPA: a direct agreement between a generator and end customer that hedges the wholesale price element of the electricity bill using a Contract for Difference[6] approach
- Full licence: the generator (or entit(ies) wishing to undertake supply activities) becomes a fully licensed supplier and the export units are allocated to that generator/ supplier.
- Licence Lite: the generator (or entit(ies) wishing to undertake supply activities) becomes a licensed supplier, but the licence excludes the requirements to accede to industry codes.
- White Label: the generator (or entit(ies) wishing to undertake supply activities) partners with a licensed supplier to offer electricity tariffs, typically on a commission based agreement.

4.4 Summary of routes to market



4.5 Direct Routes to Market: Self Supply and Private Wire PPAs

4.5.1 Under a direct route to market, electrical output from either an on-site renewable energy generator (for example rooftop or ground mounted solar) or a CHP producer, is sold directly to customers (via private wire) or used on the same site as it is generated and consumed by the same entity as generated it (self-supply). The power never enters the public distribution network and is made under a licence exemption or does not fall under the Electricity Act (in the case of self-

[6] CfD is a financial instrument that fixes a price (labelled the strike price) for a commodity or service in the future between two parties. Where the outturn price differs from the agreed price, one party will make a payment to the other to ensure that both parties remain in the same financial position as if there had been no change to the underlying market price.

supply) (see further Section 4.9.4) and so avoids the charges associated with the national settlement system.

4.5.2 In most cases where power is supplied via private wire or where self-supplies are made, the customer/ self-supplier will maintain a grid connection to the public network to enable security of supply for when the generator is unavailable. This will always be the case where the generator is an intermittent renewable energy generator. The generator may also maintain a connection point with the public network either through the demand customer or independently to enable them to export excess power. In some cases, either the generator or customer will own a private network and one party may rely on the other for access to the public network.

4.5.3 Self-Supply

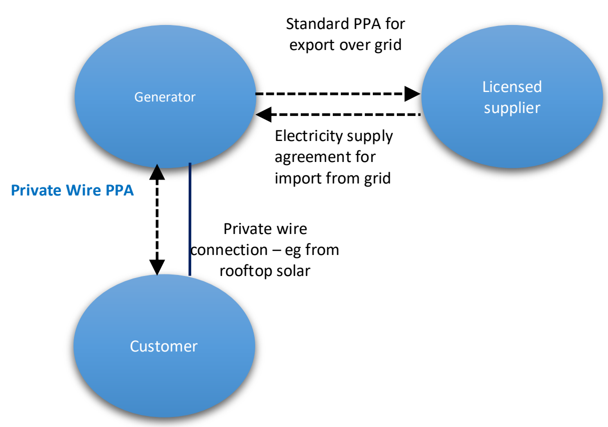
This form of supply has a number of advantages over indirect trading, as it allows for the full costs of importing power to be offset. This means that available Embedded Benefits can be fully realised by the generator/ consumer[7], whilst avoiding costs associated with licensed supplies (i.e. supplier obligations (recovery of costs of renewables obligation, feed-in-tariffs, CfDs and capacity market) and supplier costs (recovery of costs associated with supply, including metering costs and a margin for providing the service)).

There may also be advantages from an accounting perspective where costs of installation of generation can be offset against the generator's corporation tax and as the output does not have to travel long distances, system losses are minimised.

However, in some cases there may be additional network asset costs (i.e. private wire from generation to consumption), where the source of the supply is not directly located at the site of consumption (for example, where a ground mounted solar plant is located near, but not directly adjacent to the energy consuming part of the business).

4.5.4 Private Wire PPA

Diagram no. 15:



A direct supply over a private wire is where the power generated from on-site renewables (or electricity from CHP), is supplied to a third party (or, to the same entity as generates the power, but via a metered private wire) through a private wire and not over the distribution network. This can also be classified as a type of Peer-to-Peer electricity trading. Supply may be to one or many premises and there will be a contractual relationship between the generator and the third party

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[7] Note however, with the move towards distribution connected assets and behind-the-meter business models, many market participants have become concerned around the current network charging structure and whether it is fit for purpose. Consequently, Ofgem has undertaken a review of Embedded Benefits: the Targeted Charging Review (TCR) and Significant Code Review (SCR). See further Annex 1.

that specifies the price paid for the metered power. Legally, the concept of "private wires" derives from the Electricity Act (see further Section 4.9.4).

A common form of Private Wire PPA structure is a roof-top solar lease which sees a solar company generating power from roof-top assets, placed on rented roof-space. Electricity is consumed by the occupant of the building when available and paid for under a PPA arrangement under the roof-top lease, with excess power exported to the grid by the generator or the occupant under a Standard PPA.

This type of arrangement is becoming increasingly common for types of generation other than roof-top solar, as import costs of power increase and benefits of on-site generation can be realised (Embedded Benefits as above for self-supply, noting again the caveats on future availability following Ofgem reviews, together with savings related to supplier costs (as set out at Section 4.5.3 on Self-Supply).

Note however, where substantial additional network is required to connect the relevant assets, there may be substantial additional infrastructure costs. Where existing public infrastructure exists for electricity distribution, installing private wire from generation to consumption is simply duplicating assets (see further Section 5.4.2 in relation to Micro-grids). There may also be an impact on pre-existing import supply arrangements if import profiles differ as a result of the arrangement. Note also that although the Generator's supplies will be licence exempt (namely Class A or C – see further Section 4.9.2), the owner of the private wire will always have the obligation to enable third party access to their private wire[8] potentially negating the benefits of the private wire to a generator, if they are unable to secure consumption of their electricity across such private wire.

For further details and an example Heads of Terms of a Private Wire PPA, please see Annex 2, HOT No. 2.

4.5.5 Micro-grids

Micro-grids are an extension of a Private Wire model, but involve multiple consumers and potentially multiple generators. They can also be referred to as "Network Replicating Private Wires" (NRPW), where they are installed alongside existing public distribution networks, as would be the case for the Manor Royal Business District.

Research undertaken for Western Power Distribution[9] found that few NRPW models of any significant size (i.e. those that generate and import above 100kW) exist. This appears to be due to the contractual complexities in setting up such arrangements, including arranging supply and distribution licence exemptions, up-front infrastructure costs and barriers to laying a private wire and, crucially, the credit or investment risk profile of the demand customer(s). The case studies exampled by the research undertaken found that NPRW models tend to involve (a) supplying high investment grade counterparties with an interest in green credentials; and (b) the customer(s) are high energy users with a long-term commitment to the arrangement and with an appropriate demand profile for the generation.

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[8] This situation has arisen following the "Citiworks" case. See further Section 4.9.5 below.

[9] Lux Nova Partners, together with Open Utility, Reckon and Regen undertook research ("Next Generation Networks: Comparison of price incentive models for locally matched electricity networks") which included an examination of Network Replicating Private Wires. The research is available here: https://www.westernpower.co.uk/downloads/1907

However, like standard private wire models between single generator and customer, the benefits can be substantial if infrastructure costs can be off-set by realisation of Embedded Benefits, together with savings related to supplier costs. It also enables the generator to benefit from a better PPA price from the NRPW connected customer than a low wholesale electricity purchase price and the customer to benefit from lower electricity prices than can be obtained from the grid.

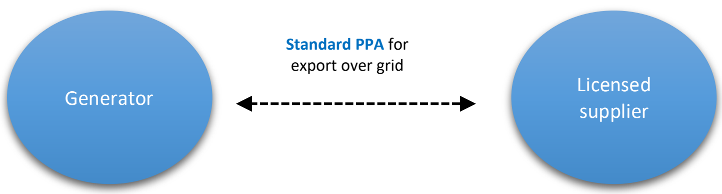
At a smaller scale, true micro-grids are more common (and are in fact present in most multiple occupancy blocks, where supplies are made to a landlord who on-supplies to tenants).

4.6 Indirect routes to market for electricity: PPA Models

Under an indirect route to market, electricity is exported onto the distribution network and enters the national settlement system. This arrangement currently requires units that enter or exit the public network are allocated to a licensed supplier (a limited number of large generators deal directly with the national settlement system rather than through a supplier, however this would not be relevant to the scale of generation on the MRBD). The two options that are therefore available to a distributed connected generator that uses an indirect route to market is to agree a PPA with an electricity supplier or to become a supplier in their own right. This section 4.6 looks at the options available for agreeing a PPA. Section 4.7 looks at the possibilities available to become fully licensed, or to enter into a form of partnership arrangement with a licensed supplier.

4.6.1 Standard PPA

Diagram no. 16: Standard PPA



A “Standard PPA” is the most basic form of PPA, entered into between a generator of power and a licensed supplier. These agreements are relatively standardised and can be procured easily and quickly directly from suppliers or through an online auction platform. Consequently, this route to market is selected by many generators, particularly new entrants and it can be considered as the baseline or counterfactual against which other options are measured.

The PPA will enable electrical output from the generator to be exported and allocated to the supplier under the national settlement process and the supplier become responsible for all cashflows (in the electricity market context) attributable to the generator. These cashflows range from income from the wholesale market, Embedded Benefits and imbalance charges.

The PPA specifies how the supplier pays the generator for cashflows that result from the units exported by the generator. The PPA may also cover issues such as any generator responsibility for unplanned outages, any minimum generation requirements or any “take-or-pay” arrangement. For non-intermittent generation (such as CHP), the PPA may also cover details relating to the notification of the planned running regime to assist the supplier in minimising their imbalance position.

As a competitive market exists for PPAs, a generator would be able to access one easily through the e-power monthly auction. However, where non-standard arrangements need to be agreed, PPAs should be negotiated directly between the supplier and generator. This will be the case where, for example, a renewable generator is wishing to export power and requires a longer term PPA in order to obtain finance, or where a hybrid generation source, such as solar and storage, wishes to offer a more blended power output and/or the potential for additional services to the supplier (relating to the utilisation of the storage capacity). The price that can be obtained in a negotiated PPA will depend on a number of factors, including intermittency. The generator can expect to achieve a greater share of income where the generation is reliable and does not place the imbalance position of the supplier at risk.

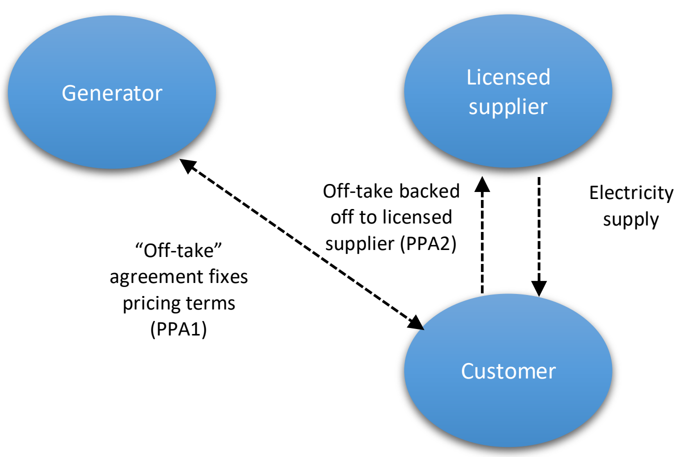
For an example Heads of Terms of a Standard PPA, please see Annex 2, HOT No. 1.

4.6.2 Corporate PPAs

For generators looking to enhance their earnings or looking for longer term agreements, there are several variations to the Standard PPA that may be used which are collectively referred to as Corporate PPAs. Corporate PPAs is the terminology used to describe agreements between generators and end customers where the electricity still flows via the public network, but with a supplier that is required to sit between the generator and end customer to implement the agreement. Corporate PPAs can be further split into two sub-categories: Sleeved PPAs and Synthetic PPAs.

4.6.3 Corporate PPAs: Sleeved PPA

Diagram no. 17: Sleeved PPA



A “sleeved” supply is where a generator forms an agreement with a customer to supply them with electricity over the distribution network. To enable this agreement, a supplier is used as a facilitator by arranging and paying for the transport of that energy across the public grid and managing the risk of a supply and demand mismatch or ‘imbalance’.

Sleeving allows a generator to agree pricing terms with the customer which suits both parties (PPA1 above). This type of agreement can be between a generator and either one or several demand customers and allows for longer-term offtakes to be agreed, which creates certainty for both parties. This type of arrangement could be established across the public distribution network of the MRBD.

A licensed electricity supplier will register all meters in the arrangement and will typically flow through to the parties involved: network charges (including transmission, distribution, system operator costs and losses); together with costs of supplier obligations (i.e. recovery of costs of renewables obligation, feed-in-tariffs, CfDs and capacity market) and supplier costs (i.e. recovery of costs associated with supply, including metering costs and a margin for providing the service) and charge these costs through to the Customer (PPA2 above).

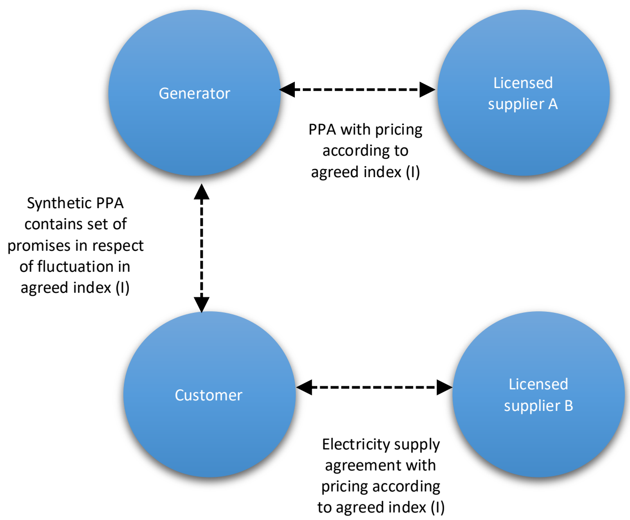
Recent developments in the market have seen platforms established for the trading of sleeved power, enabling some form of Peer to Peer trading (see for example, the Good Energy "Selectricity"[10] platform provided by Piclo.)

For further details and an example Heads of Terms of a Sleeved PPA, please see Annex 2, HOT No. 3.

For further details and an example Heads of Terms of a Peer to Peer Platform based PPA, please see Annex 2, HOT No. 5.

4.6.4 Corporate PPAs: Synthetic PPA

Diagram no. 18: Synthetic PPA



A synthetic PPA is where a generator and a specific customer enter into a bilateral agreement for the price of power sold by the generator and bought by the consumer. This arrangement is however purely financial, that sits separate from the generator's PPA under which it sells actual exported power to a licensed supplier and the customer's supply agreement under which it buys actual power.

The synthetic PPA is typically a contract for difference, where payment adjustments can be made in either direction (between generator and customer), as the actual commodity price of power fluctuates. This structure can deliver greater price certainty to the generator and customer and can be particularly attractive where a longer-term arrangement is being put in place.

For an example Heads of Terms of a Synthetic PPA, please see Annex 2, HOT No. 4.

4.6.5 Bundled PPAs with grid off-take

In order to obtain a better price for exported power generated on MRBD a bundled arrangement could be established which would see multiple generators on the site export power under one PPA, with the electricity generated aggregated across the estate. Individual meters would need to be installed to apportion the revenue received, whilst an aggregator may need to be appointed to manage and optimise the aggregated output, particularly by utilising complementary generation sources, such as solar plus storage plus thermal storage from CHP and/or EVs. If the CEMC were established, this arrangement would likely fall under their management.

[10] https://www.goodenergy.co.uk/selectricity/

From the technical view additional to the main export meter the different generation units need their own meter to calculate the different part for self-supply and export. For the export and self-supply of the energy from the generation units, the order of the connection of the different generation units in the private wire network has a relevant influence. The unit with the highest Feed-in-Tariff should be nearest connected to the export meter and the units with the lowest FiT should be installed closest to the consumer to generate the best benefit.

4.7 Indirect routes to market for electricity: partnership arrangements with licensed suppliers

As described above, indirect routes to market involve a generator trading through a licensed supplier (via a PPA arrangement) or becoming a licensed supplier themselves. This is because all electricity exported onto the public distribution network must be entered on the national settlement system and allocated to a licensed supplier (unless the generator deals directly with the national settlement system (i.e becomes a party to the Balancing and Settlement Code, BSC), however there are only a small number of large generators that choose this route, given the administrative burden of becoming a party to the BSC).

This is a much bigger undertaking for a generator (or group of generators) wanting to maximize the ability to sell power on a local (or consumer specific), but not private wire, basis and brings with it both new risks that need to be managed, but also additional opportunities by allowing the generator direct access to end consumers across the public network and the ability to participate directly in the wholesale market. Where such a supplier route to market is adopted, it is a licenced activity and three options exist[11]: Full Licence, White Label and Licence Lite.

4.7.1 Full licence

Obtaining an electricity supply licence as a route to market (i.e. to obtain direct access to customers across the public network), involves undertaking all activities associated with gaining a full supply licence. This includes becoming a party to all relevant Industry Codes and establishing data flows with the national settlement systems in order to facilitate real time system balancing, including the registration of generator and customer meters, in order to allocate the relevant units to the supplier. It also involves complying with all standard licence conditions ("SLCs"), establishing a brand, setting up tariffs and the infrastructure required to interact with customers.

Obtaining a supply licence and setting up an electricity supply business is a large undertaking, although it is possible to outsource various parts of the business as long as the supplier ensures it remains compliant with the SLCs. Generally, a supply business is a low margin business that requires a large number of customers to cover the fixed costs of running the business.

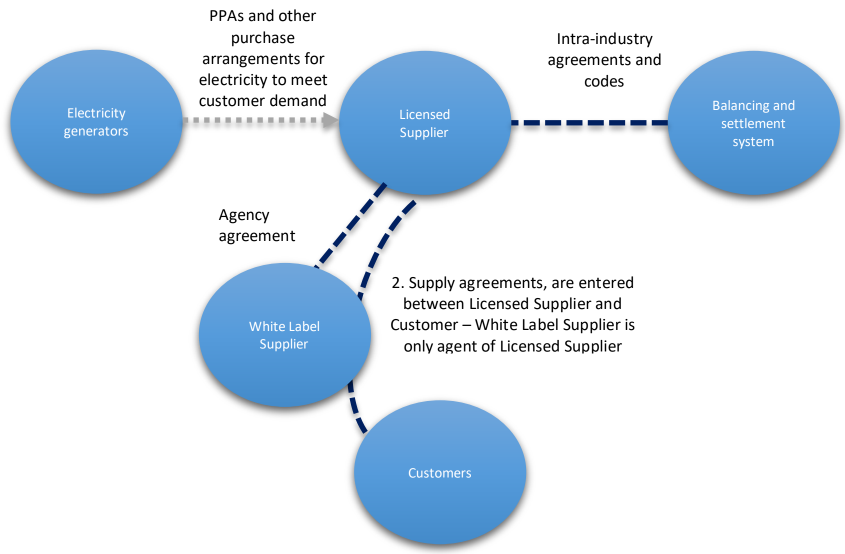
We do not consider that this is an option that would be pursued on the MRBD, given the administrative and cost burdens, although have discussed such an opportunity specifically with WSCC.[12]

4.7.2 White Label

Diagram no. 19: White Label

[11] Some supply activities are licence exempt (e.g. the options for a direct route to market will typically rely on a supply licence class exemption), however, the existing class exemptions do not allow electricity supply across the public network without the involvement of a supplier. Technically a "ninth" route to Market exists which would require a change to existing licence exemptions, application for a new supply licence exemption and/ or changed to various regulations and codes, so is deemed to be outside the scope of this report.

[12] See WSCC Addendum Report



Under a "white label" arrangement, the "white label supplier" is able to promote sales of electricity (which it may or may not generate itself) to consumers under its own branding. However, the actual supply of electricity (in licensing terms) is made by a licensed electricity supplier. To enable this to happen, the white label supplier enters into a form of agreement with a licensed supplier under which the white label supplier is appointed to act as "agent" of the licensed supplier. This enables all the regulatory interaction with industry codes, billing of customers and customer service functions, to be provided by the licensed electricity supplier, saving the white label supplier all the associated costs and risks of setting up a business to perform these functions. Instead, it can focus on sales.

Through negotiation with the licensed supplier, the white label electricity supply business can provide a range of customised tariffs sold under a unique brand while the licensed supplier uses their existing systems and infrastructure to manage the electricity supply to the end customer. The split of supply functions between the fully licensed supplier and the white label supplier will depend on the contract between the two. Most licensed suppliers will want to undertake the majority of business functions to ensure the white label activity does not result in licence breaches.

The licensed supplier will flow through to the parties involved: network charges (including transmission, distribution, system operator costs and losses); together with costs of supplier obligations (i.e. recovery of costs of renewables obligation, feed-in-tariffs, CfDs and capacity market) and supplier costs (i.e. recovery of costs associated with supply, including metering costs and a margin for providing the service).

There could be possible benefits to the CEMC in branding an electricity supply for the MRBD as part of its centralised energy management activities, particularly where bulk purchase of electricity is undertaken to obtain a better purchase price for multiple businesses.

For an example Heads of Terms of a White Label Supplier Agreement, please see Annex 2 HOT No. 6.

4.7.3 Licence Lite

The SLCs referred to above, oblige suppliers to comply with Industry Codes which facilitate wholesale market trading, real time system balancing and retail competition and provide for various consumer protections. The costs incurred from directly complying with the high competency aspects of the Industry Codes are not scalable for small-scale electricity suppliers and therefore add significant overheads to smaller scale supply business models.

Consequently, Ofgem took the decision to introduce a modification to the licensing regime in 2009. New SLC 11.3, provides an option for a derogation from the requirement to be a direct party to the Industry Codes, provided that an appropriate outsourcing arrangement is put in place with a fully licensed, third party supplier ("TPLS") who is a party to the Industry Codes. The derogation therefore enables a route to market for smaller-scale companies and distributed energy generation who intend to supply direct to customers (rather than rely on the sale of their output wholesale to licensed suppliers), but exceed the relevant thresholds for an exemption from the requirement to hold a licence. Note that the Licence Lite regime is distinct from "white label" supply, where the "white label" party is not independently licensed.

A Licence Lite arrangement could be established for MRBD, where the CEMC takes on the Licence Lite role, acting as supplier for the Customers on the estate, whilst engaging the services of a fully licensed supplier to ensure that generation and supply are balanced (and providing the top-up and spill services described above).

However, we do not consider at this stage that such an arrangement would be of significant advantage to the businesses on MRBD unless there was specific appetite to develop an electricity supply business (distinct from maximising the benefit of on-site renewable energy generation). We have therefore not considered this arrangement in further detail (or provided example HOTs). Separately, this may be an opportunity for WSCC to undertake on a broader (beyond MRBD) basis[13].

4.8 "Alternative" peer-to-peer models

There are a number of models developing which attempt to create a peer-to-peer structure within the current regulatory regime. The success of these are limited, without legislative change. They are discussed here for completeness.

4.8.1 Virtual Micro-grids

This describes an arrangement where a generator sells to demand customers who are connected to the public network in a similar locality to the generator. The parties attempt to replicate a private wire arrangement but use the public network instead of installing their own private network. This business model has been discussed as a solution to realising the true benefits of localised generation and consumption.

However, under the current electricity market in the UK, which requires that all electricity supplies that use the public network become part of the national settlement processes, there is no recognition of localised collections of generation and demand meters or any trading between them. Consequently, a licensed supplier must always be involved in this arrangement (in order to account for the electricity units in the national settlement system), so resulting in a sleeved/ synthetic PPA structure.

Further, even though there are true benefits of power generated and consumed locally due to the avoidance of use of the transmission network, all meters connected to the local distribution network are still charged under current arrangements on the assumption that all electricity flows from the transmission system interface (the Grid Supply Point), rather than making allowance for power flows happening within the virtual microgrid (i.e. flowing locally on the local distribution network). This means that currently there is limited additional commercial benefit from this type of arrangement, unlike a private wire arrangement. The reviews being undertaken by Ofgem currently of charging methodologies for the use of grid infrastructure (the Targeted Charging Review and the Significant Code Review[14]) are examining how charges for infrastructure should be made in the future. In general it does not currently appear that the benefits of localised trading of power will be recognised.

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[13] See further WSCC Addendum Report

[14] https://www.ofgem.gov.uk/electricity/distribution-networks/charging-arrangements

4.8.2 Blockchain enabled trading

"Blockchain" is a term used to describe a decentralised method of ledger for validating and recording direct transactions between peers. All transactions are recorded in a single source of "truth" that is auditable, immutable and visible to all participants. The technology broadly works by coding a transaction which is verified and written into a "block" with its own "hash value". This is a random number generated by an algorithm, based on the contents of the block. When the block is full a new block is created with the hash value written as the first entry into the new block, therefore "chaining" together the blocks (hence "blockchain"). If anyone ever attempts to change an entry in a prior block, the hash value would no longer match what was written in the new block and the attempt would be deemed invalid (therefore, in part, how an immutable record can be created).

The technology is being adopted by industries and businesses that had previously relied on trusted central parties for trading and verifying data (for example financial services). One of its important features is its ability to enable "smart contracts" (not necessarily legally binding), which are essentially self-executing code which implements the operational terms of an agreement between two or more parties. A smart contract can include logic-based programs that run on top of a blockchain, receiving data from various sources and implementing a series of rules. The technology is therefore, in theory, suitable to be applied to the electricity industry, by allowing for an automated system of selling and purchasing electricity between parties. There are a number of experiments in the low carbon electricity space utilising blockchain technology, notably the Brooklyn Project in New York[15] and Power Ledger in Australia.[16]

However, as applied currently to the UK electricity market, the technology can only be layered on top of existing market rules. This means that it could create a method of recording real time energy production and consumption data for generators and consumers across a network, which *in theory* could enable direct trading of electricity units between such parties for such power. However, this would only be permissible to the extent this falls within current Regulation. Therefore, if such trading were across a private microgrid (with all the associated licence exemptions for supply and distribution), this could prove an effective method of enabling real time trading of power.

However, if such trading were across the public distribution network, the restrictions currently applicable to such trading would occur, therefore requiring a licensed supplier to act as an intermediary. There could still be benefits if, for example, a synthetic PPA model were being pursued and the parties wished to record between themselves the real time benefit of consumption occurring at times when relevant renewable energy generation occurred. However, currently this technology would not assist in participation in the centralised UK electricity market.

4.8.3 Licence exempt supply over public networks

Another potential route for direct generator to customer trading is for the generator to exploit the supply licence exemptions and become a licence exempt supplier using the public network rather than a private wire. This route is available to licence exempt suppliers wishing to supply less than 5MW of power (but limited to a maximum of 2.5MW to the domestic sector) over the public network or where a specific exemption is applied for and granted by the Secretary of State. This is effectively a subset of the above virtual microgrid route to market.

Although this route to market is theoretically feasible, as for the virtual micro-grid structure, in the current electricity market, it relies on the involvement of a third-party licensed supplier, as all units of electricity that flow across the public network must be accounted for by allocating them to a licensed supplier. Consequently, for a party to make use of this exemption and avoid the need for a licence they must contract with a licensed supplier. This effectively places another organisation between the supplier and the end customer which is likely to add an additional layer of cost with

[15] https://www.brooklyn.energy
[16] https://www.powerledger.io

little benefit. Again, an equivalent position can be achieved through a corporate PPA type of agreement.

ADDENDUM: on 3rd January 2019, a proposal was made to Elexon to modify the market rules[17], expanding on the BSC Modification P344 "project TERRE" (see further Section 5.5.2 below), to allow individual consumers to be supplied by multiple suppliers through one settlement meter. The proposal involved the creation of a new role, the Customer Notification Agent, who will reconcile power flows through the meter, enabling accurate allocation of volumes and costs, which in turn will allow trading parties to reflect these volumes in their bills and payments to consumers. If Elexon approve the modification, it could in theory enable real time trading of local power (utilising smart meter data) and a realisation in some cases of exempt supplier benefits.

4.9 Legislative constraints on trading: Electricity

4.9.1 Background

The Electricity Act 1989 (the "Act") prohibits the generation, distribution or supply of electricity without a licence, unless the person carrying out that activity benefits from a specific exemption granted by the Secretary of State or falls within a class exemption under the Class Exemptions Order. These class exemptions cover, amongst other things:

- generation, distribution or supply below certain thresholds;
- distribution or supply involving only limited or no domestic supplies;
- generators making on-site supplies or supplies over private wires; and
- re-sellers of electricity.

Some of these exemptions are subject to convoluted definitions and complexity. Nonetheless, carrying on a prohibited activity (without a licence or exemption) is a criminal offence:

- even though it can sometimes be difficult to determine with a high degree of certainty whether a particular activity is compliant or non-compliant;
- regardless of the intentions of any person committing an offence, technical non-compliance identified by a professional advisor in a transactional context can trigger an obligation on the advisor to notify potential 'proceeds of crime' or face potential personal criminal liability themselves.

The Direct Trading activities described above rely on one of several supply licence class exemptions, with private wire likely involving distribution activities and therefore relying on distribution licence class exemptions. The Indirect Trading activities rely on a licensed supplier involvement to discharge relevant licence obligations.

4.9.2 Generation licence exemptions

The generation exemptions are generous, (although obtaining a generation licence in any event is not as administratively burdensome as a distribution or supply licence). There are four class exemptions relevant to electricity generation (set out in more detail under Annex 3) which set out the key boundaries of what electricity generation activity can be undertaken without needing to hold a generation licence: Class A (Small Generators); Class B (Offshore Generators); Class C (Generators not exceeding 100MW); and Class D (Generators never subject to central dispatch). The detailed analysis of the generation licence exemptions are set out under Annex 3: Electricity Regulation.

It is expected that all generation on the MRBD will fall under the Class A exemption.

[17] https://www.elexon.co.uk/mod-proposal/p379/

4.9.3 Distribution licence exemptions

There are three class exemptions relevant to electricity distribution (set out in more detail under Annex 3) which set out the key boundaries of what electricity distribution activity can be undertaken without needing to hold an electricity distribution licence: Class A: (Small distributors); Class B (On-site Distribution); and Class C: (Distribution to non-domestic consumers). The detailed analysis of the distribution licence exemptions are set out under Annex 3: Electricity Regulation.

All three exemptions could be relevant to a generator wishing to distribute power to a customer on MRBD, however this would depend on the specific configuration of the grid supplying customers. If there were no domestic customers connected to the grid (which we assume would be the case if there were a private wire micro-grid arrangement established for MRBD), Class C (and potentially Class A) would be applicable. If the public network serving MRBD were bought (i.e. became under private ownership) careful analysis would need to be undertaken to determine whether any domestic customers were indirectly served, otherwise potentially class B or C would be applicable.

4.9.4 Supply licence exemptions

There are three class exemptions relevant to electricity supply (set out in more detail under Annex 3) which set out the key boundaries for what electricity supply activity can be undertaken without needing to hold an electricity supply licence: Class A (Small supplier licence exemption); Class B: (Resale supply licence exemption); Class C: (On-site supply licence exemption). The detailed analysis of the supply licence exemptions are set out under Annex 3: Electricity Regulation.

Broadly, supplies made by a generator on MRBD directly to a consumer across the current public distribution network may fall under the Class A Small Supplier licence exemption even if across the existing public network, however, in order to avoid the need for a licensed supplier involvement, there must also be a valid distribution licence exemption (see further below). It is very unlikely that the supplies would fall under both supply licence and distribution licence exemptions, therefore notwithstanding the Class A Supply Exemption, involvement of a licensed supplier will be needed in the arrangement.

However, private wire supplies will fall under the Class C On-site Supplier exemption. This enables, for example, roof top solar generation to be supplied directly via private wire to the occupant of the relevant building. (See Annex 1 for the legislative definition of "private wire").

If a private wire network/ micro grid is established on MRBD as illustrated under Model 3, the supplies would also likely fall under the Class C On-site Supplier exemption and would not require any third party licensed supplier involvement, as there is no public distribution network (however note the concern regarding the indirect service of domestic customers above).

The key attraction to private wire or same site supply is commercial – it does not attract various charges normally due on electricity supply. This is because:

- when a Class C-exempt supplier generates electricity and supplies it to consumers (or a Class B-exempt on-supplier) who are connected via private wires or who are on the same site and they are not using the licensed distribution and transmission networks - that supply of electricity does not attract various use of system charges; and
- the supply of electricity by a licence-exempt supplier does not attract various supplier levies.

However, it should be noted that electricity that the Class C-exempt supplier imports to top-up (where customer demand is higher than its generation output) or as back-up (when its generating plant is not operating) will be delivered to it over the licensed transmission and distribution networks and be supplied to it by a licensed supplier. Consequently, that top-up and back-up supply attracts all regular use of system charges and supplier levies. Similarly, all surplus power ("spill") above customer demand that the Class C-exempt supplier-generator exports will be carried over licensed networks and will also attract regular charges (although it may enjoy certain embedded benefits).

The advantage of the Model 2 arrangement which potentially sees such top-up and back-up managed centrally by the CEMC, would be the aggregation and management (through e.g. storage or EVs) of the site wide requirements, enabling a better price to be obtained for the "spill" under an aggregated off-take PPA and potentially a lower price for the top-up.

The Model 3 arrangement which sees a micro-grid established across the MRBD would still require PPAs for the top-up arrangements and for the spill, however not only will these requirements be aggregated and managed through storage or EV demand, but the CEMC will be able to match supply and demand across the site, minimising the requirements for top-up and maximising the price for spill by managing (as far as practicable) the timing of dispatch of the power.

4.9.5 **"Citi-works" restrictions**

Notwithstanding that a supplier or distributor of electricity on the MRBD may be exempt from the requirement to hold a licence, they will be subject to certain requirements relating to access to electricity distribution infrastructure, following the ruling in the "Citiworks" case[18]. This case clarified that the requirement placed on network owners to provide third party access to their network[19] applied in respect of all transmission and distribution systems *irrespective of size.* This therefore means that a customer on a private wire network can choose to be supplied by a third party supplier, not the incumbent providing electricity to the private wire network. The UK Government introduced the new obligations under the Electricity and Gas (Internal Markets) Regulations 2011. These regulations impose third party access obligations on distribution exempt licence holders in circumstances where a customer has expressed an interest in being supplied by an alternative supplier, or has signed a contract with a third party supplier.

For the MRBD, this would have implications to the extent that a private wire/ micro-grid were established and subsequently, customers on such grid wished to be supplied by a third party. Where such customers are vested in the success of any supplier/ energy company on the site (for example, where customers are shareholders or other forms of stakeholders) or where the customers benefit from cheaper on-site power, this should not cause a problem.

4.10 District Heating

4.10.1 **Overview of DHN schemes**

In the UK, Districting Heat Networks ("DHN") provide heating to multiple customers within a building (sometimes referred to as communal heating) or number of buildings (referred to as district heating) using a centralised generation system. The heat is provided in the form of hot water (or more rarely, steam), before being piped throughout a building (communal) or across the local area (district). Typically, where a DHN spans multiple buildings, heat exchangers are used to hydraulically separate the central system from local systems, allowing different pressures and rates of circulation and easier control of temperatures (and ownership) in local buildings.

DHN schemes can be delivered in a range of different ways and will be structured contractually according to the various stakeholder interests. Schemes may be local authority or private developer procured and/or delivered, set up as joint ventures, delivered as concession arrangements with all works and services outsourced to an ESCO provider or procured directly in packages.

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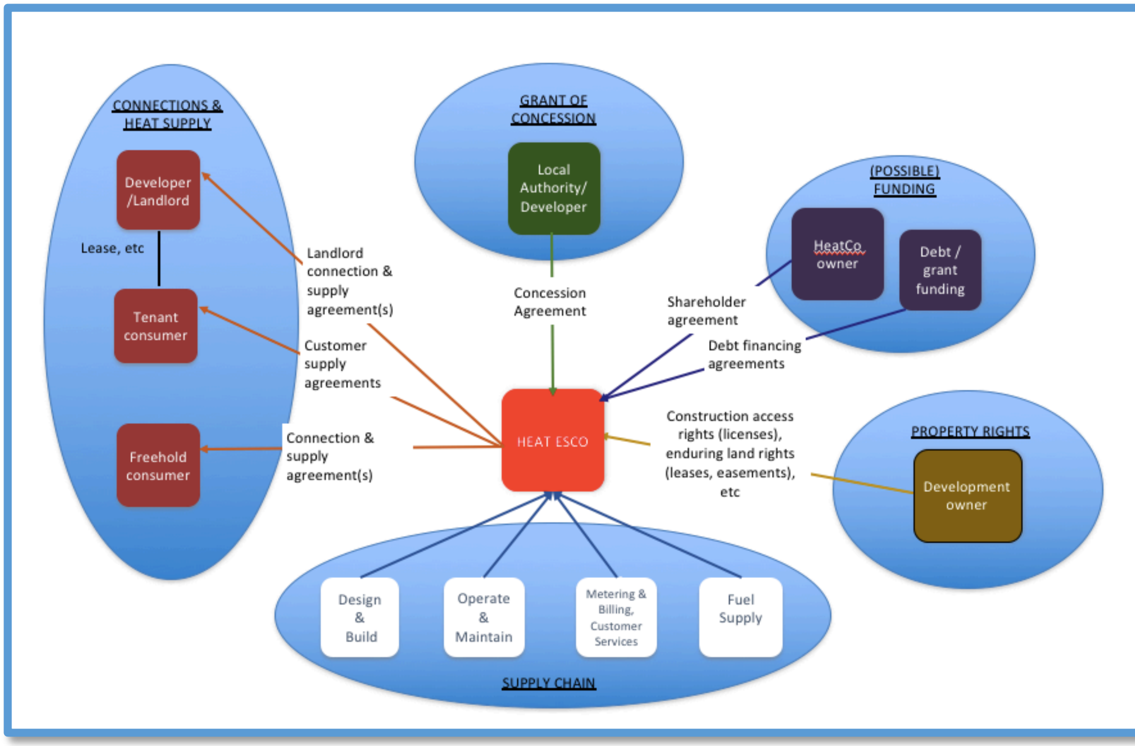
[18] Citiworks v Flughafen Leipzig/Halle GmbH (Case C-439/06) [2008] EUECJ

[19] This requirement is set out under Article 32 of the EU Directive concerning common rules of the internal market in electricity (the "Electricity Directive").

Were a DH structure to be established on MRBD, an arrangement could see an estate wide "Estate Management Company" managing the DHN (for example, the Manor Royal BID), with stakeholders across the site involved in some form of governance of such Estate Management Company. Alternatively, if the CEMC were established, the heat could be managed together with electricity.

A common structure for a concession delivered DHN would be as follows:

Diagram no. 20: DHN structure



4.10.2 **Supply of Heat**

Individual heat supply agreements between the ESCO and the customers will be entered into with customers on the development. These agreements will oblige the customers to pay for the supply of heating, and for the ESCO to compensate tenants for any failure to supply. For domestic customers, these agreements tend to have additional protections introduced by the voluntary Heat Trust scheme, however for commercial customers (as would be relevant on MRBD), supply agreements may be much more bespoke and dependent on the counterparty negotiating strengths. Key terms will include:

- Term of supply (the ESCO will want as long as possible, to ensure guaranteed off-take. Concession arrangements can see commercial supply agreements entered into for up to 35/ 40 years);
- Compensation regimes for failure to supply heat;
- Division of responsibility for equipment (for example, the ESCO may be liable to maintain heating networks up to a metered point at the customer's premises, with all maintenance of pipework within the Customer's unit being the Customer's responsibility).

A sample commercial supply heads of terms is included at Annex 2, HOTs No. 7.

An alternative supply chain may see the ESCO entering into a bulk supply agreement with a landlord or an Estate Management Company, who then on-supplies such heat to tenants, charging under lease or tenancy service charges. Normally in such circumstances the obligations on the

ESCO will cease at a metered heat exchanger at an entry point into a building (or block). All responsibility for sub-metering, maintaining secondary networks (etc), will then belong to the landlord or Estate Management Company.

It has also become more common for heat/ cooling to be provided as a service, rather than as a commodity. Where an Estate Management Company manages or off-takes heating and cooling for supply to customers, such an arrangement may be part of the broader services provided to the estate, where as part of the services provide “comfort” is a component. The cost of heating and cooling in this circumstance may be wrapped (like landlord supplies) in a general service charge.

4.10.3 **Waste heat off-take**

Where there is an opportunity to off-take waste heat from processing (for example, an energy from waste plant or an industrial process such as paper manufacture) benefits may be achieved both in respect of the commercial model for an ESCO and customers, due to the availability of potentially cheaper heat and in relation to carbon savings that can be made. Key considerations in such an arrangement will include:

- the reliability of the heat off-take (it is common to have back-up boilers/ CHP units);
- what commitment the waste heat supplier is willing to provide in relation to the delivery of heat, including quality (e.g. carbon content), quantity and term (note that the greater the commitment required, the likelihood that the heat will be priced accordingly);
- the additional infrastructure required to take the heat from the plant (any configurations to existing plant/ pipework etc).

4.10.4 **Supply of electricity from CHP**

Where the DHN scheme is supplied by a Combined Heat and Power plant (“CHP”) supply of electricity from the plant to Customers (who may also be receiving heat) will be treated exactly as discussed above for other forms of generation. The only difference will be the distinction that parasitic load (i.e. electricity generated by the plant that is subsequently consumed by the plant in the production of heat) falls outside of the licensing regime as it will not be caught be the definitions of supply or distribution.

4.11 Legislative constraints: District Heating

4.11.1 The regulatory regime applicable to the heat component of a DHN is currently limited, notwithstanding that DHN schemes tend to be monopolies in relation to the heat that they provide, with customers often having little or no choice in relation to their district heating provider. Gradually, various mechanisms for governance are being introduced, for example under EU regulation and through the voluntary Heat Trust scheme. The Competition Markets Authority (CMA) investigation (see further Annex 4) may pave the way to further regulation, as may the Scottish Government’s consultations on regulation of district heating.

4.11.2 The majority of exiting regulation and voluntary codes of practice relate to domestic customers (namely the Heat Network (Metering and Billing) Regulations 2014, the Landlord and Tenant Act 1985 and the Heat Trust Scheme), therefore are only briefly outlined in Annex 4 (on the understanding that no domestic customers would be supplied on MRBD). There is a more widely applicable voluntary standard, the CIBSE/ ADE Heat Networks Code of Practice, which is a largely technical document and is also summarised in Annex 4.

4.11.3 In general, development of a district heating network/ on-site heat generation on the MRBD is unlikely to be overly constrained by legislation other than relevant planning and building restrictions.

4.12 Application of the trading options:

4.12.1 **Application to the three Models**

The route to market for locally generated electricity chosen by businesses on MRBD and/or by WSCC will depend on the strategic objectives of each stakeholder involved in each project or collective projects and the legislative constraints on supply and distribution set out above. From a purely economic perspective, there is a general hierarchy between the route to market options is as follows:

1) **Self-supply**: Most economic route as offsets full demand cost.
2) **Private wire**: Offsets full demand costs of end users, but additional cost associated with physical infrastructure of private wire (other than in a roof-top solar model), plus some complexity on contractual arrangements.
3) **Supplier route**: Becoming a supplier, either White Label, Licence Lite or full licence, can enhance earnings when compared to a PPA route, but a minimum size portfolio needs to be acquired in each case to recover the fixed costs.
4) **Corporate PPA route**: Using a peer-to-peer, sleeving or synthetic PPA can result in improved margins compared to a standard PPA.
5) **Standard PPA**: A simple, low risk route to market, but revenue may be lower than the routes to market above. Bundling the output across the MRBD (a Bundled PPA) may increase revenue obtainable for power sold.

Considering our three Models:

- **Model 1:** the options available for a Model 1 arrangement, which sees a simple business by business solution for on-site renewables with no inter-trading, the options available will be:
    - self-supply: for those business who are able to install renewable assets on their own property assets and consume the power themselves. This type of arrangement is the most cost effective for power generated on-site which cannot be traded via private wire as it benefits from savings related to supplier cost (i.e. costs associated with supplies across a public distribution network);
    - Private Wire PPA (on-site): for those businesses who have property assets and are willing to let roof space/ land for third party installation of renewable energy assets and either consume the power themselves on-site via a Private-wire PPA, or enable their tenant to consume such power either via a Private-wire PPA direct from the generator or as part of the utilities supplied to their premises;
    - Standard PPA: for any excess electricity not consumed on-site by the relevant MRBD businesses and exported to the grid, a standard PPA will need to be entered into for the purchase of such power by a licensed supplier. Note that following 1st April 2019, there will be no Feed-in Tariffs available for exported power, however the Government is currently consulting on some form of replacement support, the "Smart Export Guarantee".
    - Heat Supply Agreement: for the sale of heat where a third party heat ESCO supplies heat across a heat distribution network.
- **Model 2:** the options available for trading even where there is a co-ordinated purchase and sale of energy, as proposed by the introduction of the CEMC, are largely as for Model 1. The legislative restrictions placed on supply and distribution mean that despite the potential physical ability of a centralised body to purchase and sell energy across the MRBD, due to the existence of electricity supplies across a public distribution network, direct supplies cannot made. (Note that Corporate PPAs are possible, but are analysed as part of the more comprehensive Model 3). One key additional benefit of centralised management is the introduction of:

    - Bundled PPA: the CEMC may be able to obtain a better price for exported power generated on MRBD by aggregating the export of each individual generator on the site under one PPA. The same may be applicable in relation to the import of power, given the aggregated demand.

- **Model 3:** the options available under Model 3, where there is centralised management of power **and** a private network are broadened to include those under Model 2 and 3 (if desired) **and**:
    - Private-wire PPA (microgrid): where a private micro-grid network has been installed, direct supplies of electricity between businesses on the MRBD can be established, without the involvement of a licensed supplier and the associated cost. If established CEMC may take a central role in generating/ purchasing and aggregating power across the site, selling power to businesses across the site under a Private-wire PPA and balancing generation and demand using real time data from smart meter technology and the management of flexible assets (such as storage, EVs and thermal storage from district heating).
    - Corporate PPA: where a private network is deemed too expensive or unfeasible (at least initially), Corporate PPAs (Sleeved PPAs or Synthetic PPAs) can be used to create direct relationships between the generator and customer (eg the CEMC where they manage generation across the MRBD and each business on the site), where the pricing of power can be unilaterally set, but involving a third party licensed supplier to discharge the electricity licence obligations in relation to the supply of power across a public distribution network.

4.12.2 Potential for scaling more widely

If there is appetite amongst businesses on the MRBD (including the CEMC if established) and WSCC to use MRBD as a hub for wider energy generation and trading, using one of the Indirect routes to market utilising a partnership arrangement with a licensed supplier may be a desirable option. We understand a full licence would not be considered at this stage.

A White Label option could be of benefit to the CEMC in branding an electricity supply for the MRBD as part of its centralised energy management activities, particularly where bulk purchase of electricity is undertaken to obtain a better purchase price for multiple businesses. Once a White Label arrangement is established, this could be rolled out to supply business outside of the MRBD. This might be of particular interest to WSCC who could leverage their reputation in order to obtain customers across West Sussex and could create a positive message regarding renewable generation across the County.

Alternatively, a Licence Lite arrangement could be established, which goes a step further to establishing an electricity supply business. As above, we do not consider at this stage that such an arrangement would be of significant advantage to the businesses on MRBD through the CEMC unless there was specific appetite to develop an electricity supply business (distinct from maximising the benefit of on-site renewable energy generation). However, separately, this may be an opportunity for WSCC to undertake on a broader (beyond MRBD) basis.

Finally, WSCC may consider the models developed on MRBD as good templates for other estates across West Sussex. If a common method of management, particularly for Models 2 and 3 could be established and proved feasible, the CEMC structure and the benefits of active power management (both generation and consumption) within a locality could provide a template for other similar hubs across the region (and potentially more widely).

5 TECHNICAL AND COMMERCIAL OPTIMISATION

5.1 Background

5.1.1 For the implementation of the three business models, various technical adjustments and the technical integration of the production units must be made. The integration requires advanced infrastructure with additional cables, protection units, switchgears and ICT solutions. Also, an additional private wire cable across the district could be required if Model 3b is progressed. To enable real time trading and balanced electricity generation and consumption across the district, additional electrical energy flows should be detected with additional meters to be able to bill accordingly. In addition, for optimised control of the systems to improve self-consumption, a communication network must be built. Depending on the complexity of the business model, decentralised energy management may be necessary. This automatically controls the plants based on the real-time measurement data collected by the meters. To increase the self-supply rate with a battery and the utilisation of additional ancillary services for grid support, the battery must be integrated according to technical guidelines including network monitoring to prevent an isolated operation. To enable increase of self-supply by integration and use of electrical vehicles intelligent charging stations should be built. All technical installations must be carried out by qualified personnel and must comply with up-to-date technical standards.

5.2 Executive Summary

5.2.1 The use of Solar PV plants is feasible, both commercially and technically, on rooftops and existing structures within the four clusters of the MRBD (including the consideration of shading effects). The levelised costs of producing energy based on local solar irradiation dropped below the market price due to the significant decrease of solar PV module prices, excellent performance and an expected lifetime of far beyond 25 years. Coupling the power with the heat generation with a CHP unit will improve the business case significantly. From a technical point of view the maximum potential for the use of decentralised generation units depends on the available sites for generation/ storage and the costs of infrastructure. Depending on the additional costs of installation (including in particular the cost of private wire installation under Model 3b), operation and maintenance costs and conditions of power purchase and sale, all three models could be commercially viable. All three Models are technically feasible.

Model 1:

- From a technical point of view the equipment and connection are similar to Model 2.
- All generation units will be connected directly to the distribution system.
- System design and complexity depends on the selected business model(s) (100% self-consumption, export, peak shaving, balancing market) and selected components (PV, CHP, Battery). For more complex systems additional cables, meters, switchgear, electrical protection, energy management, communication network may be needed. Complex installations require a central energy management system.
- Depending on the capacity of the generation plant and the grid capabilities, the voltage level is low voltage or medium voltage.
- Depending on the capacity of the generation unit a request to the grid operator for connection has to be made.

Model 2

- The equipment required is the same as for Model 1.

- All generation units will be connected directly to the private wire network behind the meter.
- Model 2 tends to be more complicated than Model 1 and an CEMC is needed. Where there are a number of sites using a CEMC may add value.
- Depending on the capacity of the generation plant and the grid capabilities, the voltage level is low voltage or medium voltage.
- Depending on the capacity of the generation unit a request to the grid operator for connection has to be made.

Model 3a:

- A connection is only needed to the public grid (the installation of individual sub-meters would depend on the commercial model).
- One bidirectional meter for import and export is needed.
- From a technical point of view only the technical standards have to be met

Model 3b:

- Model 3 with the additional private wire connection is more complex.
- The connection has to be designed by experts.
- The public grid connection includes different protection equipment, switchgear, and meters.

5.3 Technical optimisation of on-site low carbon and renewable generation

5.3.1 Without a clear subsidy route for new, solar PV in the GB market, many developers are looking at ways to develop solar PV with battery storage. This has the potential benefit to unlock new revenue streams and allow solar PV to load shift to capture higher market prices. Additionally, many owners of existing assets are looking at this option to boost revenues.

5.3.2 The key focus for the technical optimisation is to minimise energy costs for companies on the MRBD, maximise the value of renewable power produced and reduce CO2 emissions. The main incentive is to avoid non-commodity costs, principally, grid usage charges and Government energy policy costs. In total the non-commodity costs account for about 50% of energy bills, expected to rise to 60% by 2020. Additional to the optimisation of the share of on-site consumption the optimal sale of the excess energy to different markets will be relevant.

5.3.3 Technical optimisation includes finding the optimal capacity for generation units to reduce the energy cost and receive additional revenues in excess of the operation costs and debt service. In cases where battery units are combined with generation units, energy production and battery capacity have to be designed depending on the load, with capital expenditure and operating costs of all related units needing to be considered. The additional income from the provision of grid services needs to be considered as well once a need is identified by the system operator.

5.4 Maximising the share of on-site consumption:

Where it is not possible to directly trade between businesses (i.e. where businesses are operating under a Model 1 or Model 2 scenario as Model 2 has to have an energy supplier as intermediary), one key economic benefit of on-site energy production is to off-set the more expensive grid supply by own generation. The most feasible technologies for this are PV and CHP units. The optimal design for generation plant including the capacity and location, depends on the electrical load profile of the on-site consumer, the available areas for installation (e.g. sloped and flat rooftop, facade, parking areas, noise protection walls and unused open areas), and also on the economic conditions for the energy purchase and excess energy sale.

Where it is considered commercially and technically feasible to progress Model 3b (i.e. the private wire model), various technical integration options for the generation units are possible.

The connection of the generation units could be anywhere in the private wire, if the connection capacity (cable and transformer) is high enough. Installations above 30-100kW mainly have to be connected to the grid connection point and above about 250kW close to the transformer or before the transformer at a medium voltage level.

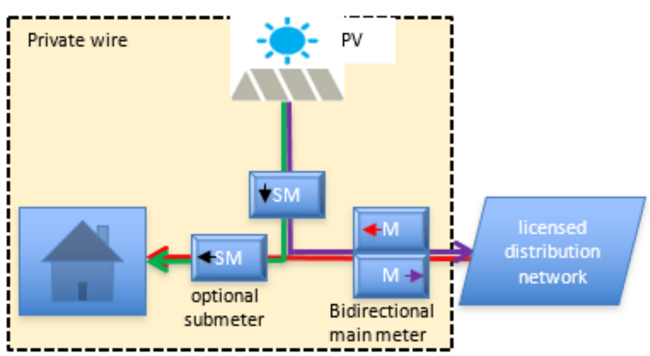
The best business cases for integration of PV, CHP and batteries are based on private wire connections behind the meter (i.e. Model 3).

The easiest and standard connection of the generation unit is made on the low voltage level with a direct cable at the main fuse box with an additional submeter in or beside the existing cabinet to measure the generation and consumption of the unit. The installation also includes the protection of the additional cables and generation unit. Standard PV systems do not have consumption in periods without solar radiation (night time) and the meter for the measurement of the demand could be in skipped with an agreement of the grid operator (ignoring the insignificant demand). The manufacturer of the inverters issues a certificate of non-demand in these cases. Additionally, the existing main meter to the public network would need to be upgraded to a meter with bidirectional measurement for the exported energy. It must be proved if the existing capacity of the grid connection is sufficient. This will be coordinated with the local grid operator during the connection request.

If the distance from the generation unit to the main connection point is long and implementation of connection to the grid is likely to cause high costs the connection could also be made to the existing wire network behind the meter. In this case the existing cable and protection must be able to accommodate the additional load. This will need approval from a technical expert.

For installations of generation units with a power higher than 200-1,000kW (depending on the grid capacity), the connection must be made on medium voltage level on an existing or additional transformer. In these cases, a professional expert has to design the grid connection. The connection to medium voltage causes higher costs for cables, additional transformers and switch gear.

Diagram 21: Typical connection of PV in a private wire network with main meter (M) and submeter (SM)

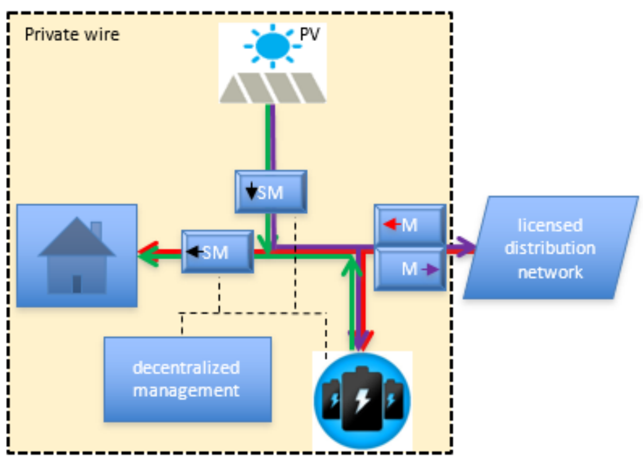


For designing CHP units, the electrical profile and heat demand are relevant. In order to decouple heat demand from electrical production of the CHP (e.g. to cover electrical demand and operate in times of electrical demand) thermal stores will be needed. This will also enable the CHP to trade in the electricity market as balancing services and participate in the capacity market. It must be taken into consideration that the public grid conditions could be in opposition to the local grid network conditions at peak times (with high energy costs). Centralised energy management through the CEMC (Models 2 and 3) will enable balancing of these opportunities and requirements in the most economical way.

Due to the high share of non-commodity costs embedded in imported electricity, increasing the share of private wire/ own consumption has a beneficial economic effect. In order to reduce the import of electrical energy to a minimum, real time and online (i.e. accessible) measurement of the electrical demand is necessary. Depending on the capability of the generation and the battery units the reactive power of the consumption could be covered from the generation units (essential to ensure that the private wire grid can be "balanced" from an electrical flow perspective), and would need to be managed by the CEMC.

Depending on the detailed economic and technical conditions the installation of battery storage improves the feasibility of the energy system and should provide all the functionality of peak shaving, ancillary services and intelligent energy management. For a long lifetime of the battery a detailed battery cell management system should be included. Optimised management of the battery (as part of wider energy management across the MRBD) could also be a function undertaken by the CEMC.

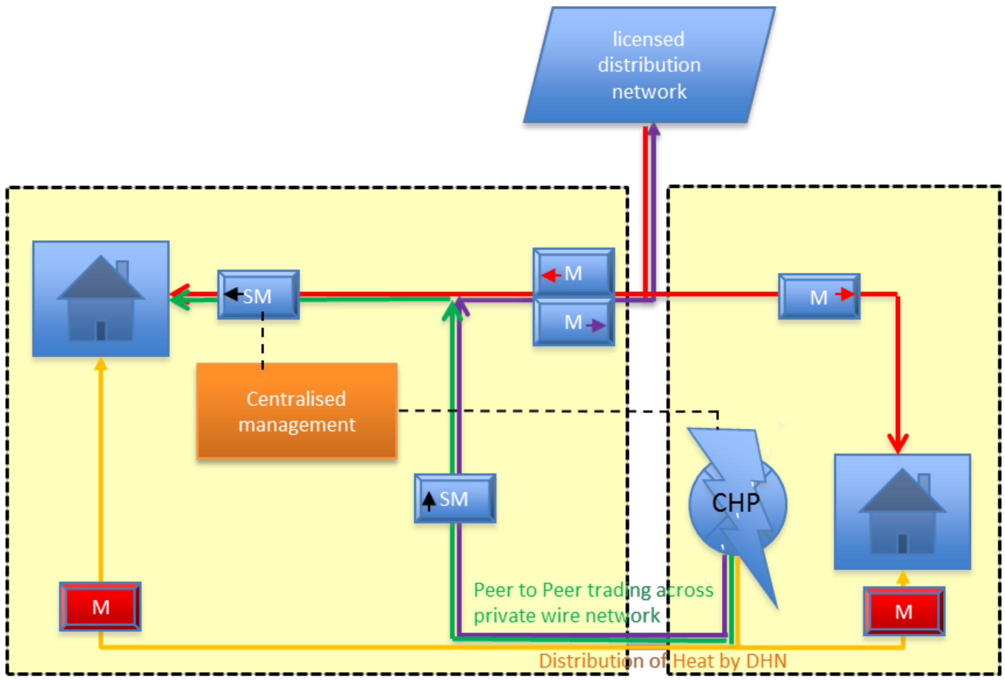
Diagram 22: Typical installation of PV with battery system with all meters



To identify the optimal combination of technologies detailed assessments with simulations based on time series should be made. A techno-economic simulation including all technical and economic parameters of the chosen combinations of technologies, (which will have an influence on operation parameters) is usually part of this assessment. With variations to the combination of technologies, designs relating to capacity, technical parameters and orientation, the optimized size and type of generation will be identified. The optimisation goal will depend on the overall goal of the CEMC (eg, maximising generation/ smoothing demand profiles/ reducing power prices etc). This techno-economic assessment could be very complex and can be provided by experts. Often provider and manufacturer of the components provide a simpler analysis which would be sufficient for smaller and simple installations (i.e. Model 1) which would mainly serve only to reduce the requirements for energy imports without any centralised energy management.

As an example, diagram 23 shows a private wire connection of a CHP unit (Model 3b). The heat is delivered to one building while the electricity is used in another building.

Diagram 23: Example for additional private wire connection from a CHP to a neighbour



5.4.1 Microgrids

A microgrid is an electrical network for a limited supply area within close proximity of generation sources and user loads. Microgrids could be designed as autonomous island systems or connected to other microgrids to be part of a larger supply system and power grid. Typically, they integrate multiple sources such as solar PV, wind power, biomass, small hydro, geothermal, waste-to-energy and CHP systems.

In order to manage the generation and demand side of a microgrid additional components have to be considered in the design, including energy storage and a microgrid control system. These two components mark the significant difference to conventional power grids. The combination of mainly renewable generation sources with energy storage and intelligent load management allow microgrids to provide reliable, economic and environmentally friendly power supply based on a high efficiency. Microgrids can also be used and designed as black start power or to bolster the grid during periods of heavy demand, especially in providing vital ancillary services such as frequency support. This kind of ancillary service will be compensated by the grid operator and will support the economy of the new system.

The easiest and least regulated form of microgrid is an installation of electrical production units directly in the private wire network of the consumer, behind the meter. The consumer will install their own power generation application(s) or/and a whole system (e.g. various smaller Solar PV plants and battery storage). Normally the operator and the consumer are the same legal entity.

5.4.2 Behind the meter PPA

A “behind the meter PPA” is also a form of private wire connection of electrical generation units, with the same benefits. However unlike “self-supply”, a third party operates the power plant behind the meter in the private wire network and supplies power to a customer. A common example of this type of structure is where a third party installs a PV system on a rooftop and supplies the tenant of the building with power.

Note that submeters must be installed to separate the flow for settlement and determination of charges under the PPA.

The payback period for this kind of investment is usually 10 to 15 years depending on the technology. However, most commercial consumers will look for investments with payback periods of 3 to 5 years, especially if they are not the owner of the building. Therefore, PPA behind the meter may only be an option for building owners and landlords or tenants with long term perspectives. Building owners and plant operators will accept longer payback times and could therefore be interested in these kinds of investments.

The operator of the plant will deliver the energy directly from its local plant to the consumer behind the meter. Excess energy will be delivered to the grid by a PPA. The operator could be the building owner or a generation plant provider with a lease of the land / roofspace. A direct private cable connection from neighbouring areas could be an option to extend the benefits of the private wire network and avoid the use of the public grid. Parallel simultaneous connections of the generation plants at several points in the grid are not allowed due to the need to protect the grid components and connected consumers.

This arrangement would not be feasible for small installations (up to 100-250kW), which are not on the same site as the consumer because the capital expenditure on private wire would higher than the benefit for both parties (operator and consumer). To install generation units over 100kW the connection will be done close to the grid supply point or the transformer due to limited cable capacities and the higher than appropriate voltages that manifest as a result . Depending on the maximum power it could also be necessary to infeed (or connect) in at a next higher voltage level, perhaps medium voltage (e.g. 11kV). A private installation on medium voltage level is only practicable if the transformer (and associated installation) is not part of the public network. Otherwise a sleeved PPA should be used.

5.4.3 **Use of storage**

Due to the high share of non-commodity costs embedded in imported electricity, increasing the share of private wire/ own consumption by an additional battery behind-the-meter and alongside generation units could have a beneficial economic effect, particularly where batteries are charged at off-peak times when electricity prices and network charges are low. Discharging at peak times, when electricity is expensive and network charges are high, reduces overall energy costs.

When used in combination with other generating units, the battery will also charge during times of excess energy generation on-site. A forecast algorithm can be used to predict the excess energy and manage the optimal discharge of the battery to provide enough free battery capacity for such excess energy. In combination, charging of electric vehicles (EVs) could be done during night time (for fleet vehicles) when power is generally cheap and when the EVs are not being utilised (see further section 5.4.4 below).

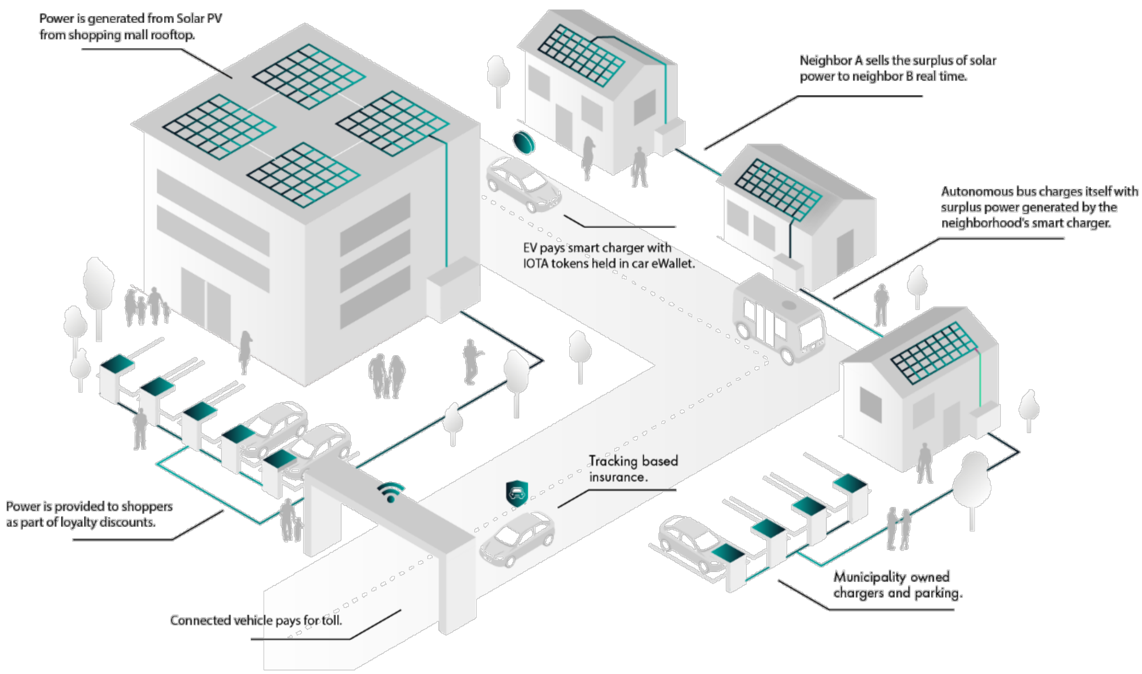
Additional advantages of battery use, besides the increase of the share for on-site consumption with discharge at peak times, are the reductions in the amount of imported electricity and the benefits from the provision of ancillary services (see further section 5.5.2 below). Also, the batteries offer significant potential cost savings during low demand.

The battery system consists of the battery itself including a battery management system to protect the battery cells and provide a long lifetime, inverters for charging and discharging the battery and a battery energy management system for optimal use in the energy system. Under Model 2 or 3, this would be managed by the CEMC. The management system should ensure optimal on-site consumption, peak shaving and ancillary services.

5.4.4 **Use of EV charging**

EVs are predicted to have significant growth within the private and public sector (approx. 1 million by 2020 and 9 million by 2030). To serve the need for re-charging the batteries of these vehicles, more and more charging infrastructure needs to be installed. Currently, the highly fragmented charging market leads to new challenges but also new opportunities. For example, location and ownership of charging stations (e.g. company fleets, community and public), complex IT and payment processes, organising purchase and trade (e.g. via platforms, blockchain, B2B, B2C) as well as supply and demand (e.g. peak, overload) within the distribution network.

Diagram No. 24 Examples for use of Solar PV in connection with private and public transport [Source: IOTA, Smart City]



One key focus will be the organisation of the interested groups on a Peer-to-Peer basis (P2P) via platforms supporting the idea of the shared community (i.e. via the CEMC).

In combination with Solar rooftop PV, multifunctional Solar Carparks and battery energy storage systems (BESS), the purchase and trade of energy might be a feasible solution for company fleets once the decision towards e-Mobility is taken.

In the industrial zone of the MRBD, most employees are likely to come to work with a vehicle. To make the workplace more attractive and to encourage the use of electric cars installation of EV charging stations is attractive. When combined with on-site generation units (Model 2) or a private wire network (Model 3), electrical energy on the MRBD should be cheap and could be sold to employees and visitors. Where combined with generation from PV systems, EVs will be charged with fossil free electricity.

However, when installing several EV charging stations the charging power could have a significant influence on the peak demand within the local network and grid capacity could be limited. To optimise the use of the local generation and to fulfil the limits of the capacity, the EV charging units should be controlled by the energy management system (i.e. the CEMC in Model 2 and Model 3). In these cases, the demands of vehicle use should be integrated. The system needs information on, when the cars will leave the MRBD and when the batteries should be charged.

5.4.5 The synergies of CHP/ district heating with electrical generation on-site

If a private wire model is chosen alongside a DH network (i.e. Model 3b), one potential cost saving is to lay the electricity cables in the same trenches alongside the heat network. The cables will need to be kept a minimum distance from the heat network pipes (distance will vary depending on the size of cable and pipes) and may require slightly more excavation. However, this small incremental cost should yield savings over laying a separate electricity network (although there may be legal implications to consider, e.g. if an organisation's powers to lay heat mains differs from its powers to lay cables).

The use of CHP thermal stores to store electric energy in the form of heat may also provide a useful power management tool for the CEMC to balance power generation and demand across the estate.

5.5 Increasing revenues from grid export

In addition to increasing on-site consumption, the benefits that can be derived from grid exported power and ancillary services should be taken into consideration.

5.5.1 Sale of excess energy

In April 2019 the Feed-in tariff subsidy scheme for small scale renewables will end for new generation, therefore it will be necessary either to find off-takers and negotiate a bespoke PPA for grid exported power, or enter into the proposed replacement scheme (the "Smart Export Guarantee") (see further Section 4.4).

5.5.2 Balancing/ ancillary markets

Storage and gas CHP assets could offer frequency response and reactive power service to the System Operator. The battery storage system will help to balance national demand by providing frequency response services to the national grid.

DSR assets have the ability to meet short-term frequency needs (normally the most lucrative contracts) and longer duration reserve requirements. Aggregation of DSR is normally required to meet the 1MW minimum capacity threshold set by National Grid, with aggregation companies usually taking a fee for the services to do this.

Although participation is rising in these balancing services from DSR and embedded generation assets, a number of National Grid's balancing tools and, therefore, revenue streams are not open to them. Two ongoing regulatory changes are likely to change this: P344 Project TERRE and P355 BM Lite.

P344 Project Terre

P344 Project TERRE is an advance implementation project that forms part of the implementation of the European Electricity Balancing Guidelines. Project TERRE aims to harmonise the System Operator dispatch of regulated reserve across several areas (including Great Britain, France, Switzerland, Spain, Portugal and Italy – Ireland is currently an observer). It will do this by introducing a common TERRE product, consisting of 15-minute blocks of upward and/or downward energy volumes, which will be similar to current GB products, such as BSC Bid-Offers or Short-Term Operating Reserve (STOR) submissions.

BSC modification proposal P344 will allow introduction of a new type of balancing mechanism party which will allow DSR and storage to participate in the mechanism. There are 12 criteria that products must meet, including a minimum quantity of 1MW and a minimum delivery period of 15 minutes or multiples thereof, and a maximum delivery period of 60 minutes. National Grid intends to have a solution in place to meet testing requirements in Q2 2019.

P355 BM Lite

This proposal seeks to introduce a “BM Lite” mechanism to allow smaller parties to offer balancing energy to the System Operator National Grid, in competition with the larger (typically 100MW+) BM Units already operating in the market. The change would allow direct BM access to parties without the need for a party to become a full BSC member, which opens a significantly larger pool of providers including storage and DSR/ behind-the-meter.

Although at the early stages of development (the modification was raised in July 2017), it proposes that meters can be aggregated for the provision of between 5MW and 200MW plant to be dispatched by the System Operator. The service providers would have the same operational requirement as other BM units, which means submission of dynamic data, bid/offer prices, and relatively onerous communication systems between the System Operator and providers. Proposed implementation is for mid-2019.

Future revenue streams

With the increasing penetration of renewables on the distribution network and the expected roll-out of further distribution connected assets, such as battery storage, there is an increasing need to actively manage the distribution networks that parallels what National Grid undertakes on the GB-wide transmission network.

The increasing prevalence of embedded assets are causing system management issues for voltage management, grid connections and export back onto the wider transmission system. As a result, DNOs are actively undertaking processes to transition to more active network management and become DSOs.

Although in its early stages, this programme is likely to see the roll-out of grid services on the distribution system to help manage local system imbalances. The Electricity Networks Association (ENA) published a roadmap in July 2017 outlining how a DSO model can be introduced with four key areas to address:

a) integration of DSO with TSO;

a) smart meter integration into new network pricing structures;

b) regional demand forecasting; and

c) DSO-level balancing service tenders.

For flexible assets, such as solar PV co-located with battery storage or a DSR-fitted end-user, the move to a DSO operational model should bring new revenue opportunities. The programme for the move is ongoing and being led by DNOs themselves rather than Government or Ofgem. Trials are currently underway in several regions and we expect ongoing development and progress of this to 2020.

5.5.3 Capacity market

The Capacity Market is only available for generation that is not receiving any other form of subsidy. However, given the current trajectory of regulation, unless there is existing generation on MRBD that is receiving subsidies, the capacity market is likely to be available to on-site generation.

A capacity provider that clears in an auction will receive an agreement which will entitle them to an availability payment equal to the cleared auction price multiplied by their de-rated capacity (i.e. a factor determined by National Grid, that reflects availability over peak periods), and allocated in monthly payments as weighted to reflect the profile of demand. In return, they must provide their de-rated generation capacity at times of system stress, as notified by National Grid, in the delivery years. (For further detail, please see BISEPS Glossary and Guide).

To date, no solar assets have ever applied for a capacity market agreement and moreover, the scheme, as yet, does not have a specific de-rating factor for the technology. However, this is being considered by Ofgem to be introduced ahead of the auctions in 2019.

5.6 Application to the three models

To establish an economic view of the technical solutions for the three Models, a baseline is needed. The baseline comprises both the costs of distribution and the costs of power.

The use of the public distribution network incurs Use of System (UoS) charges. There are two charges.

1) Based on the capacity of the connection, different cost for import and export
2) Based on the energy transported, different for import and export

Diagram No.25 shows the charges applied to a customer using the low voltage network for a point close to MRBD on the UK Power Networks network. The charges are calculated annually and are revised to recover a fixed amount of revenue each year. Although they will change, the volume of energy imported or exported at MRBD will not change the rate significantly and therefore act as a relevant benchmark price.

Diagram No. 25 cost parameter of use of the grid for examples

Condition	Parameter	unit	price
Import	LV UoS Capacity Charge	£ / kVA / day	£ 11
	LV UoS kWh charge	£ / kWh	£ 0.083
Export	LV UoS kWh charge	£ / kWh	£0.085

To give a high-level identification of cost savings for the three different Models, the differential costs of electricity is also important. Diagram No.26 shows the assumed cost of electricity imported and exported for this economic model. The costs in Diagram No. 27 are based on generic supplier costs for a large commercial (Company 2) and a small to medium industrial unit (Company 1).

Diagram No. 26: cost parameter for examples

Condition	Parameter	unit	price
Import	Unit cost of electricity – supplier	£ / kWh	£ 0.06
Export	Electricity revenue price	£ / kWh	£ 0.052

To set the benchmark, it is assumed that the customers set up a contract with a licensed electricity supplier for all their energy needs to be imported from the public distribution network (no generation is installed on-site). The energy purchase price is set at the supplier price.

Diagram No.27: Model 0: Benchmark – all energy imported from the distribution network

Company	*Demand*	*Imported electricity*	*Electricity generation*	*Electricity import cost*	*Electricity export cost*	*Electricity export revenue*	*Annual cost*	*Cost saving*
Unit	*(kWh / a)*	*(kWh / a)*	(kWh / a)	*(£ / a)*	(£ / a)	(£ / a)	(£ / a)	(£ / a)

Company 1	1,398,000	1,398,000	-	(204,050)	-	-	(204,050)	-
Company 2	3,569,000	3,569,000	-	(515,545)	-	-	(515,545)	-

In addition to the above costs the following assumptions are made.

- The cost of generation CAPEX is not captured in these three models
- Any profit from aggregators / sleeving contracts is accounted for in the price
- The cost of the Independent Distribution System Operator (IDNO) operations and maintenance (under the private wire Model 3b) is the same as the public distribution network. That is in Model 3b, no saving is made by operating as an IDNO.

5.6.1 Model 1: Business operating individually

Model 1 is based on the individual customer contracting with an energy supplier for imported electricity and having generation within their properties. From the energy modelling conducted earlier[20], the customer is not able to install enough generation to meet their demand. For the purposes of Model 1, the customer will not export any energy, but will reduce their import (it needs to be modelled on a project by project basis). The imported energy is transported across the public distribution network with the Point of Connection (PoC) between the customer and the public network operator at the customer's export meter.

Two examples are provided below for comparison: Model 1a where the customer does not export any energy and Model 1b where the customer is exporting the energy.

Diagram No.28: Model 1a: Individual business with net energy and no export

Company	*Demand*	*Imported electricity*	*Electricity generation*	*Electricity import cost*	*Electricity export cost*	*Electricity export revenue*	*Annual cost*	*Cost saving*
Unit	*(kWh / a)*	*(kWh / a)*	(kWh / a)	*(£ / a)*	(£ / a)	(£ / a)	(£ / a)	(£ / a)
Company 1	1,398,000	1,010,000	388,000	(148,380)	-	-	(148,380)	55,670
Company 2	3,569,000	3,177,000	392,000	(459,301)	-		(459,301)	56,244

For this option to export the UoS Capacity Charge is paid for the net energy import. However, there is no charge levied due to all the energy being used within the customer's business. In this example, there is no contract to allow exported energy, if the customer was to export, technically the facility would be automatically shut down (in keeping with the associated connection agreement), economically they would be exposed to the UoS export charges based on the maximum ½ hourly export volume. Case 1b shown in Diagram No.29 shows the cost if the customer was to export all the energy they generate (and import all the energy they consume)

Diagram No.29: Model 1b: Individual business with full import and full export

Company	*Demand*	*Imported electricity*	*Electricity generation*	*Electricity import cost*	*Electricity export cost*	*Electricity export revenue*	*Annual cost*	*Cost saving*
Unit	*(kWh / a)*	*(kWh / a)*	(kWh / a)	*(£ / a)*	(£ / a)	(£ / a)	(£ / a)	(£ / a)
Company 1	1,398,000	1,398,000	388,000	(204,050)	(44,555)	20,331	(228,274)	(24,224)
Company 2	3,569,00	3,569,000	392,000	(515,545)	(41,885)	20,541	(536,889)	(21,344)

[20] *BISEPS Ramboll : BISEPS Manor Royal Re-Energised – Renewable Energy Feasibilities Studies*

The above model 1b, shows that it is not economically viable to export the energy when compared to importing the energy only. This is dominated by the location of MRBD in a UK context that attracts high UoS charges due to the nature of the network.

5.6.2 Model 2: Businesses with net energy consumption and aggregator supplier

The second model assumes that the customers have combined their energy needs into a single portfolio and engaged an aggregator to negotiate a better energy price. It is assumed for this model that all energy is consumed on the individual sites, no individual export from any facility, and the net energy is procured. The PoC to the public distribution network is still classified as the individual meter with any generation behind the meter.

Diagram No. 30 shows a lower electricity price based on the assumption that an aggregated energy consumption can drive a lower price.

Diagram No. 30: cost parameter for aggregator

Condition	Parameter	unit	Price
Import	Unit cost of electricity - aggregator	£ / kWh	£ 0.05

The benefit of aggregator actions is shown in Diagram No. 31. This assumes that the public distribution network is still in use, and therefore the UoS charges for using the network are still applied.

Diagram No.31: Model 2: Independent customer with aggregator

Company	Demand require	Imported electricity	Electricity generation	Electricity import cost	Annual cost	Cost saving
Unit	(kWh / a)	(kWh / a)	(kWh / a)	(£ / a)	(£ / a)	(£ / a)
Company 1	1,398,000	1,010,000	388,000	(138,280)	(138,280)	65,770
Company 2	3,569,000	3,177,000	392,000	(427,531)	(427,531)	88,014

The savings are derived entirely from the lower power price No costs for administering the CEMC have been allowed.

5.6.3 Model 3a: Customer with net energy consumption and a third-party sleeving contract

In the third model (Model 3a) the technical requirements of the network are still manged over the public distribution network with a third-party sleeving contract in place.

The sleeving contract allows for a higher level of control over long term energy prices, but in terms of UoS charges, the network charges are still applicable as the energy is not procured locally and UoS charges will still be applied for imported energy.

An extension of this model would be for an independent generator to build within the confines of the LV network. Although a sleeving contract can be put in place, the independent generator would be liable to UoS charges for energy exported to the public distribution network.

In terms of cost, unless the energy price is lower, this has the same UoS impact as Model 2. As the PoC is still at the meter and any generation is behind the meter.

5.6.4 Model 3b: private wires network

A private wire network is better described as an IDNO. The key difference in this model is that the PoC is moved from the individual customer meter to a single meter at the interface with the public distribution network.

In this model, energy can be traded peer to peer – that is directly between generator and customer within the site, and due to the private wire arrangement, the supplies are able to be made as licence exempt supplies.

The most significant saving using a peer to peer and licence exemption is that a levy associated with environmental and social obligations would not be applied to the overall contract. This has the impact of reducing the energy price by 18%[21] from either a supplier or an aggregator.

The PoC will measure the difference between total generation and demand and based on the import and export figures. Diagram No.32 shows the benefits based on assuming the costs associated with operating and maintaining an IDNO network is the same as the public distribution network. Although they may be lower, this is representative of a worst case, in that if the costs were higher, you would stay with the public distribution network.

For this model the energy price used is the same as that in the Model 2 – aggregator with 18% reduction as it would not attract the environmental and social obligation levy.

Diagram No.32: Model 3b: IDNO with PoC at the interface

Company	***Demand require***	***Imported electricity***	***Electricity generation***	***Electricity import cost***	***Annual cost***	***Cost saving***
Unit	*(kWh / a)*	*(kWh / a)*	(kWh / a)	*(£ / a)*	(£ / a)	(£ / a)
Company 1	1,398,000	1,010,000	388,000-	(128,180)	(128,180)	75,870
Company 2	3,569,000	3,177,000	392,000	(395,761)	(395,761)	119784
	4,967,000	4,187,000	780,000	(523,941)	523,941)	195,654

The benefit of the IDNO connection may be found through savings through OPEX and a reduction in the price of energy from an on-site generator. In that if the IDNO can operate and maintain the assets at a lower cost than the public distribution network operator, then savings can be made. The IDNO will still incur UoS charges for any energy transported across the interface.

[21] https://www.ofgem.gov.uk/data-portal/breakdown-electricity-bill

6 LEGAL STRUCTURING AND GOVERNANCE

6.1 Executive Summary

6.1.1 The legal structuring and governance arrangements that may be established for businesses on MRBD supplying electricity, heat or providing storage or other ancillary power related services, will depend largely on the stakeholder interests and those external businesses and/or service providers (such as ESCO providers/ technology providers) (including WSCC) who may invest or provide services to relevant projects.

6.1.2 This section explores in more detail the different roles that the MRBD business could undertake and how key risks, opportunities, appetites and current property arrangements may influence the structuring of low carbon solutions on the site.

6.1.3 The key roles and responsibilities of parties on the MRBD are likely to fall into one or more of the following categories, depending on such experience, appetite for risk, investment appetite (etc):

- developer (who will procure equipment supply and design and build);
- asset owner;
- generator;
- operator (generation assets and non-generation assets);
- heat/ electricity supplier;
- funder;
- regulator/ governance
- landlord;
- customer/ tenant.

6.1.4 Many roles may be undertaken by the same entity (for example, it is common on a district heating scheme for the asset owner, generator, operator, supplier and funder to be the same party). When looking at our 3 Models, under Model 1, the simplified arrangements will see generator/ developer/ asset owner/ funder likely to be the same entity, with a possibility of the customer also being the same business. Model 2 and Model 3, with the introduction of the CEMC may see the roles of generator/ developer/ asset owner migrated to the CEMC (and sub-contracted as relevant), with separate customers served across the MRBD and third-party finance obtained. Under Model 3b (where a micro-grid is established), there may be a separate entity specifically established for the development and operation of this asset.

6.2 Shaping structuring

6.2.1 There are a number of key issues that stakeholders engaged in the project will need to consider, which will ultimately shape the contractual structuring of the Models developed on the MRBD:

- Scale of the opportunity: where there is a limited opportunity for development of on-site renewables (eg due to lack of suitable space or a lack of off-take opportunities (e.g. an unwillingness of businesses to purchase on-site renewable power of constraints on grid off-take)) there will be a corresponding limitation on the available funds and wider stakeholder engagement. Any project development will be undertaken on a more limited individual company by company basis where individual business initiative arises (following a Model 1 structure).
- Scale of cost: the scale of the potential capex investment required will depend on the scope of the projects being delivered. Where there is a larger capex and corresponding higher return (through power purchase payments of rental payments), the greater the potential appetite of investors (whether MRBD or third-party funders) to invest and become involved in project development. Where capex can be aggregated (for example

by the CEMC under a Model 2 or Model 3 structure, taking a development role for a number of solar installation projects) economies of scale may be developed and a more centralised management function and cost base may evolve. Similarly, operation and maintenance costs can benefit from economies of scale where projects can be aggregated under common ownership or management, lending weight again to centralised management function.

- Risks and responsibilities: the role of individual businesses will also be shaped by the appetite of such businesses to take risks and whether they are willing to take on responsibilities in relation to the management of energy projects. Where businesses have capital to invest, but little appetite for management, they may become equity investors in a shared project, but undertake little active management. Alternatively, those that do not have the capex, but wish to take a more active role in development could possibly take board roles within a CEMC to drive forward projects on the MRBD. Using sub-contracting structures to pass risks and responsibilities to third parties (in return for appropriate fees) will also add to structuring considerations.
- Rewards and benefits: the levels of rewards and benefits (for example from equity returns or from cheaper electricity prices), will depend on the allocation of initial risks and responsibilities, the investments made and the willingness of business across the MRBD to engage with the project.
- Appetite and potential for engagement: again, the greater the levels of engagement across the MRBD, the greater the potential for a more coherent, co-ordinated project with the added benefits that such co-ordination can bring in terms of power pricing, economies of scale and investment opportunities. The level of engagement may depend on the capital each business has to spend on on-site energy generation (if any), the scale of energy demand the businesses have and the potential assets in terms of suitable sites for the siting of relevant energy assets (eg. if the relevant business is a landlord with suitable roof space for the siting of solar PV) or existing assets (eg existing solar PV which they wish to "invest" into a CEMC). Some businesses may have limited available cash, limited assets (eg are a tenant without the necessary rights to use the roof space), however, they may have a large energy demand and wish to provide a valuable "anchor load" to a nascent CEMC.
- Proposed project delivery: the manner in which on-site renewable and low carbon projects are developed and delivered on the MRBD may be a function of many of the matters above. It can also be a function of how businesses on the MRBD choose as a collective to progress projects. Again, if a variant of Model 2 or Model 3 is developed, the CEMC may manage project delivery of assets in a co-ordinated manner, taking advantage of economies of scale and the ability to roll out common structures.
- Property/ asset ownership structures: the manner in which property rights are held across the MRBD estate will influence the structuring of projects in a very practical manner. Engagement of those with the requisite land right will be essential to take advantage of the best sites for project development. The manner in which those businesses engage will depend on their appetite for engagement. For example, a landowner could be passive, letting roof space for an agreed rent, but taking no further role in the wider project development. Conversely, a landowner may choose to invest themselves in assets and engage in the CEMC development. WSCC and/or the Manor Royal BID may have a role looking forwards to ensure that future businesses (tenants and landlords) are made aware of the energy aspirations of MRBD and potentially mandate that where appropriate, roof-space/ land-space is made available to projects (for example through planning conditions/ land transfer requirements) and leases (or other relevant

forms of property interest) are appropriately amended to encourage on-site renewable energy use[22].

6.3 Roles and responsibilities

Roles and responsibilities of businesses on MRBD will emerge following considerations of the key issues set out above and the appetite of each company to engage in the project. Note that many of the roles described may also be carried out under direction of any of the businesses or the CEMC (i.e. subcontracted to specialists).

The roles are likely to fall into one or more of the following categories:

Diagram No. 33: Roles and Responsibilities

<table>
<tr><th>Role</th><th>Which stakeholder?</th><th>Roles and Responsibilities (examples)</th></tr>
<tr><td>Developer</td><td>Either a third-party developer wishing to undertake low carbon development on the Business District or an individual or group of businesses on the District (ie CEMC) willing to undertake development risk with a view to returns.

Roles of developer normally cease in relation to a particular asset on “financial close”. However, where they are undertaken by a body with an ongoing interest (i.e. developing further projects/ undertaking O&M etc), they may well continue – as would be the case with

Same stakeholder(s) entity(ies) potentially also asset owner/ generator/ operator</td><td>Defining physical nature of the project
Commissioning studies to establish the viability of the potential electricity or heat networks.
Identifying funding options
Defining the scale and timing of demand for heat, electricity or ancillary services
Co-ordinating other stakeholders, including potentially sourcing funding
Co-ordinating advisors to enable project development
Arranging (and possibility procuring) supply chain for project delivery:
Equipment supply
Design & Build/ Installation</td></tr>
<tr><td>Asset owner</td><td>Either third party specialist company (such as an ESCO provider), or an individual or a group of businesses on the District (i.e. CEMC) who wish to make returns from owning energy generating infrastructure

Ownership could be split for different classes of assets (eg primary and secondary heating networks, CHP plant, solar plant) and returns could be made from renting assets (for example, from a use of system charge), or from generation revenue streams.

Normally ownership is a long-term function and survives completion of installation and repayment of finance, however beneficial ownership of assets may vary over lifetime of a project (e.g. equity may vary).

Same stakeholder(s) entity(ies) potentially also developer/ generator/ operator</td><td>Securing an income stream to match its responsibilities and to cover its risks
Insuring or procuring insurance for the assets
Ensuring the assets are maintained and components replaced when life expired
Contracting with installers, maintenance providers, and service companies (where the Asset Owner does not undertake such activities itself)</td></tr>
<tr><td>Generator / Operator (generation assets)</td><td>Either third party specialist company (such as an ESCO provider), or an individual or a group of businesses on the District (i.e. CEMC) who wish to make returns from operating assets to generate heat and/or electricity or providing</td><td>Undertakes specialist generation/ storage activities and/or management of asset to maximise output/ value of asset
For a CHP asset will also be responsible for purchasing gas and electricity for generation of heat/ electricity</td></tr>
</table>

[22] See for example Green Leases: http://www.betterbuildingspartnership.co.uk/sites/default/files/media/attachment/bbp-gltk-2013_0.pdf

	storage service **and/or** providing maintenance services. Same stakeholder(s) entity(ies) potentially also developer/ asset owner	• For a CHP asset will be required to meet minimum output / quality standards in relation to heat (and potentially cooling and electricity) for onward delivery to Customers • For all assets, ensuring minimum availability/ performance standards are met • Undertaking maintenance, repair and (in some cases) replacement works (NB some of these functions may be subcontracted)
Operator (non - generation assets)	Likely to be specialist company (although could be individual/ group of businesses on the District), responsible for ensuring operation of distribution infrastructure (i.e. private wire network/ district heating network pipework). Role may involve charging users of the infrastructure (eg a generator or a supplier) for use of the assets.	• Undertakes management of asset to ensure availability for power flows • May also be involved in management of real time data flows across the local distribution infrastructure in order to assist in the matching of demand and generation
Heat/ Electricity Supplier	Either third party specialist company (such as an ESCO provider), or an individual or a group of businesses on the District (i.e. CEMC) who wish to make returns from supplying customers with heat or electricity. Note, the sale of heat or electricity as a service is distinct from the physical delivery of the commodity. Same stakeholder(s) entity(ies) likely to also be the generator on a private wire/ heat network, however note where activities licensed under the Electricity Act take place, there is mandated separation of generation, distribution and supply roles.	• Procuring heat/ power/ cooling delivery to customers • Metering • Billing • Undertaking price reviews • Attracting and securing new customers • Collection of revenues • Managing customer debt and default • Communicating with customers
Customer	Any individual business on the Business District wishing to be supplied with locally generated heat/ electricity and entering into a relevant heat supply agreement/ power purchase agreement. The Customer may also be a landlord who is a bulk purchaser of heat/ electricity/cooling which is then supplied on to tenants **or** a tenant of a landlord undertaking such role.	• Agreeing terms of purchase agreement (e.g. price formula, service levels, carbon intensity) • Paying an agreed price for the service • In relation to heat, may operate a secondary and/or tertiary network within customers unit/ building/ block in accordance with the terms of the supply agreement (e.g. maximum return temperature)
Funder	A third-party funder (debt/ equity) or any business or group of businesses on the district, wishing to provide funding to a generation (or storage) project on the district. Role ceases once finance has been repaid (for example on an asset sale or following debt repayment).	• The role of the Funder will depend on the type of finance (debt or equity), the term of the finance and the manner in which the interest of the Funder are secured (for example through assignment of rights to shares, a direct agreement, a lien over assets or shareholder rights pursuant to a Shareholders Agreement). • The Funder will provide sources of financing and enter into relevant loan or shareholder agreements • Some Funders will have certain governance functions over a project to ensure that appropriate revenue streams are generated in order to pay interest/ dividends on debt/ equity.
Regulator/ Governance	A collective body of interested stakeholders on the Business District, which may include Manor Royal BID or WSCC, which have the relevant powers (eg through a governance	• Setting overall direction and objectives for the energy generation and supply across the Business District.

	agreement/ concession agreement) to enforce standards in relation to heat/ electricity/ cooling/ other related services. May be the same entity as the developer.	• Overseeing commercial behaviour and high-level performance • Taking high level commercial decisions • Monitoring performance standards • Resolving disputes between generators/ operators and customers • Enforcing fair pricing
Landlord	The role can relate to land on which the generation assets/ distribution assets are located or the building to which the heat/ electricity/ cooling is delivered. The relevant stakeholders will be de facto be the relevant businesses on the Business District who have title to relevant plots of land/ buildings.	• Granting leases for siting of generation assets • Granting easements for routing of buried assets • Providing rights of access for installation, operation maintenance and replacement of equipment • In relation to the Landlord of a building into which services are delivered, responsibilities may also include: • ensuring generator/ operator / supplier has sufficient rights of access to equipment located within the building/ tenants' demises (normally through appropriate provisions in tenant leases) • insuring network assets within the building • maintaining and replacing network assets within the building
Tenant	The relevant stakeholders will be de facto be the relevant businesses on the Business District who have rented relevant plots of land/ buildings. It is assumed such tenants will also be customers of heat/ electricity/ cooling services.	• As for customers • May also include obligations to permit access to service providers to ensure relevant assets can be operated/ maintained

6.4 Impact of Landlord and Tenant relationships

6.4.1 As briefly referenced above, the relationship between the businesses on the MRBD as landlord and tenant will have a direct impact on the type of engagement that such businesses are able to have with the project. These roles are examined in more detail as will apply to almost all businesses on MRBD. We would recommend that those requiring further details on solar roof top development, review the following REA BRE guide: *BRE (2016) Solar PV on commercial buildings: a guide for owners and developers*[23].

6.4.2 **The Landlord's perspective:** owners of buildings on the MRBD have a number of drivers which should encourage engagement in this project:

Property assets: firstly, having suitable land/ roof-space for the installation of renewable/ low carbon assets is in itself an asset which has value to be realised. The utilisation of the land/ roof-space could either be undertaken on an individual basis (Model 1) or in collaboration with others on the MRBD (Models 2 or 3). If the relevant landlord does not have the capex to invest themselves, under Model 2 or 3, the CEMC may be able to install the assets as part of the wider low carbon development across the site, paying relevant market rates (or providing electricity at relevant discounted rates) in return for the use of the areas.

[23] https://www.r-e-a.net/upload/123160-nsc-solar-roofs-good-practice-guide-web.pdf

Sustainability: with increasing drives for sustainability at a corporate level, landlords may find the installation of renewable/ low carbon assets a useful addition to their CSR objectives and may help to achieve necessary EPC ratings. In addition, buildings with a strong environmental performance will potentially be more attractive to occupiers wishing to meet their own sustainability targets.

Energy generation: the ability to generate on-site electricity (or heat) which can be sold directly to occupants (as part of general service charges or under a separate PPA) may be viewed as a useful additional revenue stream and may also be desirable from an occupier's perspective as above with regards to sustainability objectives. Note the need to install suitable meters (where not already present) in such circumstances, unless the electricity delivered is wrapped in an overall service charge.

Fund management: where buildings form part of property funds, investors and fund managers are increasingly interested in the sustainability performance of the property funds into which they invest. Drivers from environmental legislation and the anticipated growing demand from occupiers for environmentally sustainable buildings presents a clear risk and exercises increasing influence on investment decisions. Where funds can demonstrate that they have considered and addressed the sustainability aspects of the property portfolios, build positive occupier relationships and demonstrate plans to address environmental legislation, will likely be considered lower investment risk.

6.4.3 **The Tenant's perspective:** the tenants' drivers are similar to those of their Landlords':

Sustainability: again, with increasing drivers for sustainability at a corporate level, businesses looking to occupy premises may be looking specifically for buildings that are environmentally sustainable, addressing reputation risk and limiting risk exposure, customer interests and potentially providing financial savings.

Cost: occupiers are increasingly focused on their total property occupancy costs. This goes beyond rent and rates and includes service charges, utility costs and costs associated with environmental taxes. If a landlord can provide a building with cheaper clean energy due to on-site energy production, this may be very attractive to a tenant.

Energy generation: where the tenants' property rights enable (for example under a long leasehold which has the necessary rights to do works), tenants themselves with suitable roof-space/ land areas may wish to generate on-site electricity (or heat). Indeed, they could also sub-let such spaces (where the lease permits) to a developer such as the CEMC as part of a wider roll out of renewable developments across the MRBD.

6.4.4 Managing agents (which could include Manor Royal BID) can also have a key role to play by supporting landlords' efforts to put in place renewable energy assets/ liaising between tenants and landlords to support collaborative action in relation to the generation and supply of energy from such assets.

Ensuring collaboration: where there is a collective desire on the MRBD to ensure that landlords and tenants are suitability incentivised to engage in this project, Green Leases[24] should be encouraged, land areas/ roof-spaces not already let (i.e. on new build on the MRBD) should have relevant title reserved for the development of renewable energy, smart metering should be installed and where practicable, businesses encouraged to engage (for example through some nominal shareholding at the minimum), in a CEMC if established. The rights granted for a particular project must be sufficiently secure (i.e. contain restrictions on third party access and contain necessary rights for the generator to operate and maintain) and for a sufficiently long term (the payback period of some projects, for example, storage, is currently 20 years and therefore the term must equal such period).

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[24] http://www.betterbuildingspartnership.co.uk/sites/default/files/media/attachment/bbp-gltk-2013_0.pdf

6.5 Options for delivery structures

The types of delivery structures for low carbon/ renewable infrastructure on MRBD will flow from the MRBD businesses' appetite for engagement and adoption of relevant roles and responsibilities and the key structuring considerations set out above. The three models examined by this report provide a high-level suggestion as to what different delivery structures will look like from a contractual perspective, however there could of course be any number of variants.

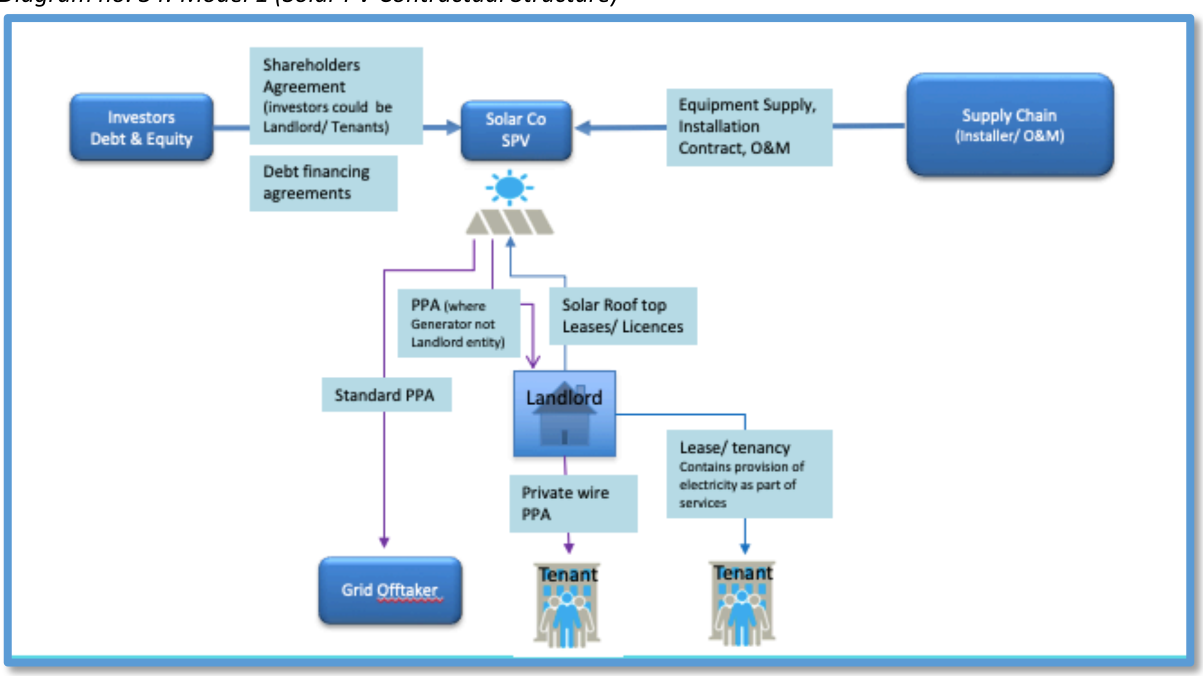
6.5.1 Model 1: Simple building-specific technologies

Roof-top solar PV projects: If individual businesses are undertaking their own solar PV projects, project structures will be relatively straight forward. Contracts with specialist contractors will be procured directly by the individual business for design, installation, operation and maintenance of the relevant asset, with a PPA put in place for power off-take (in relation to the excess power not consumed on-site). Funding may be on-balance sheet or possibly via a corporate loan. For larger projects, project financing may possibly be available (although unlikely unless the project is part of a wider portfolio). There are unlikely to be any specific governance structures in place, rather an investment decision will be made on a business by business basis.

If there is a desire to limit risk of a capital project, the renewable assets could be ringfenced within a simple SPV structure. This structure will likely be put in place where a third-party developer undertakes projects, particularly if multiple assets are held across the MRBD. If there are multiple investors, a Joint Venture (JV) structure may be relevant.

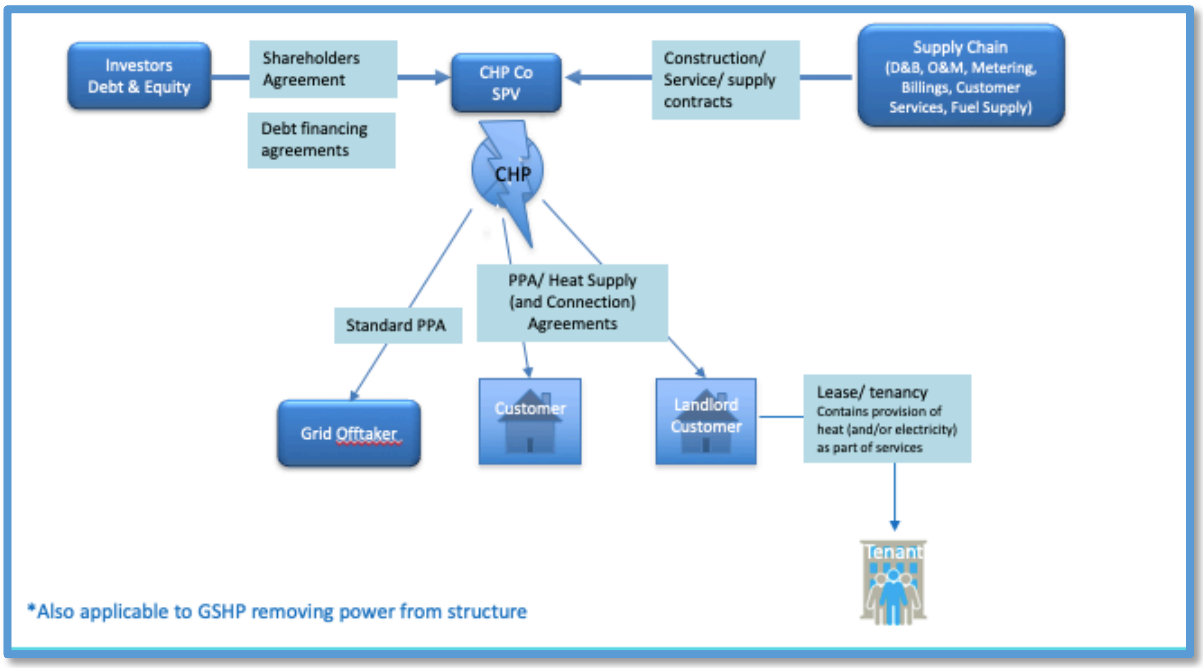
The following diagram no. 34 sets out an example Model 1 contractual structure for a roof-top solar PV, where the Landlord either establishes a SPV or enables a third party developer, to install solar PV on their rooftop. Equity and debt arrangements are put in place to fund the project, whilst third party contractors are procured to deliver the project. Power consumed on-site is sold either as part of a package of services to the Landlord's tenant, or via a Private Wire PPA. Power not consumed on-site is exported to the grid under a Standard PPA.

Diagram no. 34: Model 1 (Solar PV Contractual Structure)



Combined Heat and Power projects: a very similar structure may be established to deliver a building specific CHP solution. The following diagram No. 35 sets out an example Model 1 contractual structure, with an SPV company established to deliver a CHP project. Equity and debt arrangements are put in place to fund the project, whilst third party contractors are procured to deliver the project. Power (heat and electricity) consumed on-site, or in the case of heat, delivered via a heat distribution network, is sold either as part of a package of services to the Landlord's tenant, or via a Private Wire PPA/ Heat Supply Agreement. Electricity not consumed on-site is exported to the grid under a Standard PPA.

Diagram no. 35: Model 1 (CHP Contractual Structure)



6.5.2 **Model 2: "Intelligent" multi-building, multi-technology model**

Model 2 sees the introduction of ***centralised management*** of the low carbon/ renewable projects and infrastructure across the MRBD via the Centralised Energy Management Company (CEMC). Individual businesses (or third party developers) may install and own such projects, however the CEMC will operate such projects in order to achieve the benefits described above of a better PPA price for power exported to the grid, a potentially better price for power imported by businesses on the MRBD, and some element of matching and/ or smoothing of generation and demand across the site by use of smart meters and real time data and the utilisation of battery storage, EVs and thermal storage.

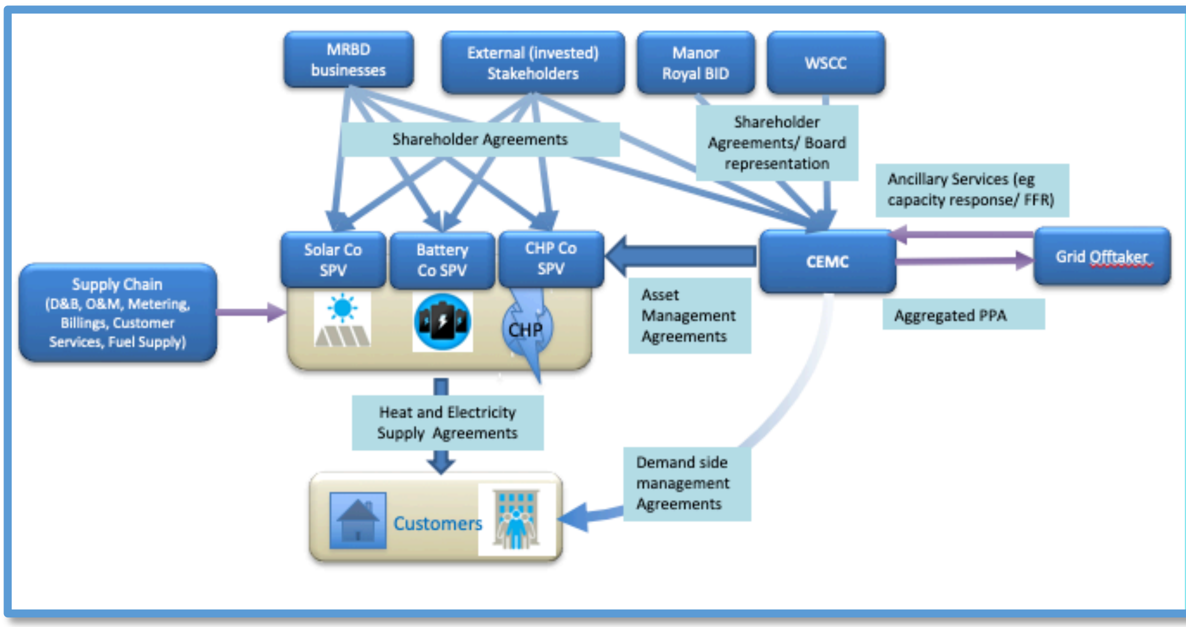
In such a scenario, a SPV will need to be established, the shareholders of which will be comprised of those businesses who wish to invest into/ take an active management role in the estate wide project and/or (depending on the role stakeholders wish the CEMC to take) sell power to the CEMC and/or purchase energy from the CEMC.

In order to ensure that the CEMC delivers the project in a manner which reflects interests across the MRBD (as far as practicable), the CEMC SPV will need a robust and accountable governance structure, with key stakeholders forming the board of directors. Representatives from, for example, the Manor Royal BID, WSCC and those investing substantial equity or other forms of contributions should be included. In addition, a requirement (captured in, for example, the Shareholders Agreement) to consult and engage non-Shareholder businesses across the MRBD should be incorporated to ensure accountability and develop good relationships with the CEMC (with a view to active participation of as many businesses as possible). It will be a critical workstream to ensure that the CEMC Shareholders Agreement is appropriately drafted, to represent interests, enable project progress and ensure accountability.

Further consideration of the form of the CEMC SPV is set out below at Section 6.5.5.

The following diagram No. 36 sets out an example structure where a CEMC manages assets on the MRBD estate. As for Model 1 above, MRBD businesses (and other relevant investors/ developers) install and own individual projects. However, in addition, the CEMC will enter into Asset Management Agreements with the MRBD businesses which own relevant assets (or the relevant SPVs) and may also enter into demand side management agreements with businesses who own flexible assets (such as storage or EVs) or have flexible demand profiles (i.e. have an electricity requirement which can be increased or decreased in response to a grid requirement without detriment to the business's core activities). In addition, the CEMC will enter into PPAs with the Grid Off-taker as discussed above, to obtain the benefits of aggregated demand/ generation and relevant ancillary services agreements.

Diagram No. 37: Model 2: Contractual Structure



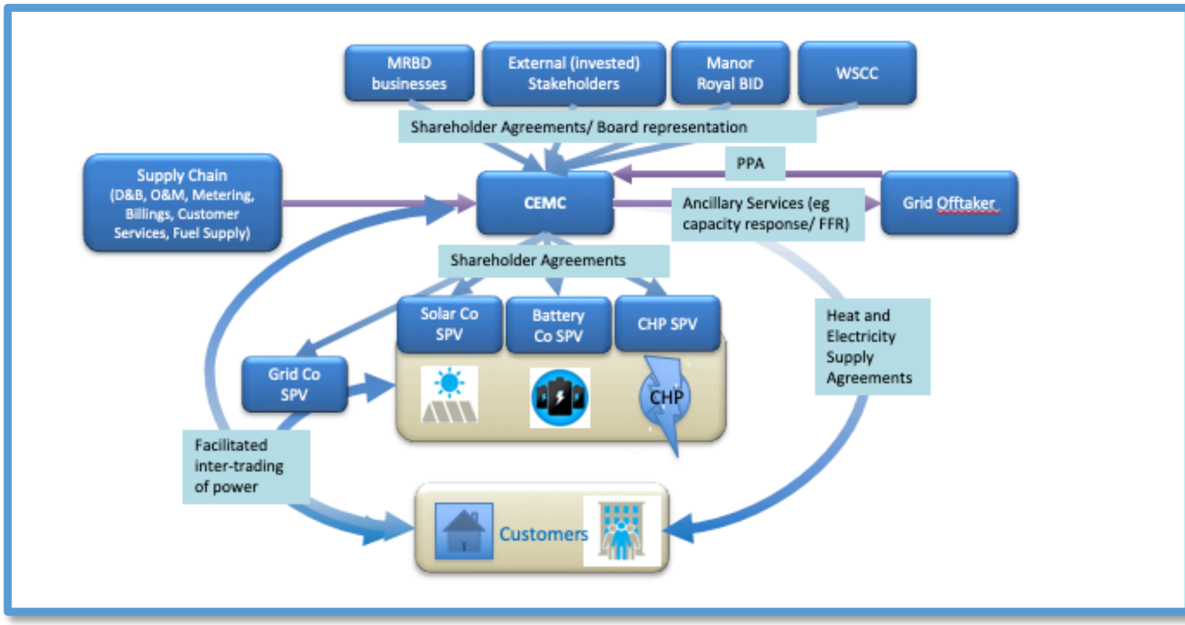
6.5.3 Model 3: Full sitewide Energy Company with business engagement and inter-trading

Building on Model 2, Model 3 sees the ***managing and owning*** energy generation and on-site supply across the MRBD. In this scenario, all the considerations set out above for Model 2 will be applicable, however rather than the individual MRBD businesses owning the assets, CEMC will establish specific SPVs ("Asset Co's) to own each class of asset (or each asset). Where grid infrastructure is also owned and managed by the CEMC, a separate SPV ("GridCo") may be desirable, to ring fence the risks of such an asset/ enable a different investment class which may be eligible for e.g. some grant/ innovation funding.

The same considerations are needed with regard to the governance of the CEMC, which will become even more critical given the fact assets will now be held directly by this entity.

The following diagram No. 38 sets out an example structure with the CEMC owning and managing the assets on the MRBD, including Grid Co which will facilitate inter-trading and real time active management of power on the estate.

Diagram No. 38 Model 3: Contractual Structure



6.5.4 Governance of the Central Energy Management Company

If Model 2 or Model 3 structures are developed, the basic governance structures will be set out above, which show how stakeholders across the MRBD, including the Manor Royal BID and WSCC will become shareholders in the CEMC SPV. The CEMC SPV will in turn set up subsidiary SPVs to hold different assets on the estate.

A variation on such a structure could see a Holding Company ("Hold Co") established as an intermediary entity into which Stakeholders (including debt funders) hold shares, with operations carried out by a CEMC Operation Company ("Op Co"). This separation of functions could be useful to enable day to day operations and decision making without high level agreement between stakeholders. The Hold Co would provide strategic direction for the business and ensure good governance; it would control the finances of the project and, for example, approve major investment decisions, approve annual plans for project development, including operational plans, business development strategies, annual budgets, and director salaries (etc). A panel of advisors to the Hold Co board (or non-exec directors) who are experienced in the type of projects proposed could be appointed to provide strategic direction.

The Op Co would be responsible for all operations, including business plan delivery, development of annual plans (setting objectives, policies and values for the business), producing budgets for agreement by Hold Co, accounting for the company's activities by reporting progress to the shareholders via the Hold Co board, project development, marketing, entering into contracts for the delivery of projects, sale of electricity (etc) and would be run by people with experience in developing and managing projects of this type. The board of the Op Co could include senior managers of businesses across the MRBD and would ensure that all activities are in the best interests of the company and its stakeholders. The Op Co could in turn hold the asset SPVs, or alternatively, these may be held by the Hold Co. There may be operational and/ or funding advantages in either option. Note that the tax implications of these structures are not considered in this report.

6.5.5 Form of the Central Energy Management Company

If Model 2 or Model 3 structures are developed, the basic governance structures will be as set out above, which show how stakeholders across the MRBD, including the Manor Royal BID and WSCC will become shareholders and manage the CEMC SPV. The CEMC SPV and or the CEMC Hold Co will in turn set up subsidiary SPVs to hold different assets on the estate.

The form of the CEMC (and its relevant Hold Co/ Op Co) (i.e. choice of vehicle) could be a standard company limited by shares. Alternatively, there could be benefit in establishing the company(ies) as socially responsible/ not for profit organisations which could then reinvest in delivery of low carbon projects/ undertake further projects in the locality which are environmentally and socially beneficial.

The advantages and disadvantages of the various options of form available for the CEMC established as a social enterprise are set out in the following table (green are advantages, orange disadvantages). Note a charity structure is not explored given the commercial focus of this enterprise and tax considerations (which can have a significant bearing on choice of company structure) are not examined. It is recommended that as a next step, detailed tax (and other relevant advice) is sought, together with a wide consultation of stakeholder aims, to determine which structure best suits requirement for the CEMC.

Diagram No. 39: CEMC Company structures

Vehicle	Key features	Funding options/ restrictions	Governance/ Stakeholder Engagement	Flexibility	Risk to stakeholders	Suitability as vehicle for CEMC
Company limited by shares ("CLS")	A CLS is an incorporated entity formed pursuant to the Companies Act 2006 for the purpose of operating a business, usually where such business is intended to be profit-making. As an independent legal entity, a CLS can own assets of the business itself, employ staff, enter into contracts and sue and be sued in a court of law. A CLS is responsible for the debts and liabilities of the business. Registration with Companies House is straight forward and quick.	CLSs can raise funds by way of **equity** investment (private investors) or **debt**. If the company was offering shares to the public it is likely that the CLS would need to register and be subject to the additional regulation of the Financial Conduct Authority (FCA). This will present the CLS with additional complexity and restrictions around activity. If the ESCO wishes at any point in the future to offer shares to the public, it would need to be publicly listed and FCA regulated, or convert to an IPS.	**Power structure:** two tier: Directors & Members **Directors** have the role of managing and running the day to day business of the company. **Members** own the CLS, contributing equity funds to the company by way of subscribing for shares and receiving income payments in the form of dividends. Their liability is limited to the amount unpaid on their shares. **Constitution:** Set out in memorandum and articles of association, covering internal management structure and procedures, such as roles and rights of members and directors. The objects of the CLS can be run on a not-for-profit basis or for a social purpose The shareholders Agreement will set out any agreement between individual members.	The key draw back to this structure is the requirement that the company must be publicly listed in order to make a public share offering. The structure does however have the flexibility re future options to transfer/ convert to a co-operative structure. In addition, the CLS will be able to trade in energy and operate on a not for profit basis if the constitution is so formed.	Directors benefit from limited liability except in exceptional circumstances (eg fraud or wrongful trading). Insurance can be taken out to cover the majority of liabilities (though not in the event of fraud or bad faith). Shareholders liability limited to extent of share subscription and any guarantees or contractual obligations. In the event of insolvency, shareholders have no further liability subject to certain exceptions where shareholders and directors have acted dishonestly.	A CLS is a commonly recognised structure. Contractors/ power off-takers may however request parent company guarantees/ bonds if the covenant strength of the CLS is weak. The CLS has a number of benefits: - simple route to company establishment - potential to convert a CLS to a Co-operative if wanted to raise funds by way of a community share offer in the future - ability to run a CLS on a not-for-profit basis The major drawback is the inability to raise equity through a community share offer unless publicly listed.

Company limited by guarantee ("CLG")	A CLG is a limited company that has members who, rather than purchase shares, provide a nominal guarantee in the eventuality that the company is wound up. It is established under and subject to company law in the same way as companies limited by shares with the exception of law relating to shares. A CLG may only pursue activities that are within or reasonably incidental to its stated objects.	**Generally only debt** Although not a legal requirement of the form, a company limited by guarantee typically has a prohibition within its memorandum of association on the distribution of profits. The material difference between a company limited by guarantee rather than shares is that a guarantee company is not designed for a company that will hold private capital and that will provide returns to investors on investment.	**Power Structure: two tier:** Directors & Members **Directors** have the role of managing and running the day to day business of the company. **Members** own the CLS. However, they do not own the company in the same way that shareholders do in respect of a CLS, as there is no notion of equity. Rather than having a shareholding, the members guarantee to provide a sum (usually a nominal £1) in the eventuality that the company is wound up. The members of a company limited by guarantee do however otherwise have the role given to shareholders. **Constitution:** as per CLS, but with guarantee rather than shareholding.	Not particularly flexible: a guarantee company is not a normal vehicle for businesses that envisage distributing profit to third party investors or owners. In addition, like a CLS the company must be publicly listed in order to make a public share offering (which given a CLG structure is unlikely to be possible in any event.)	Directors benefit from limited liability except in exceptional circumstances (eg fraud or wrongful trading). Insurance can be taken out to cover the majority of liabilities (though not in the event of fraud or bad faith). Members liability limited to extent of guarantees and any contractual obligations. Risk is minimal given nominal guarantee granted.	If distribution of profits is envisaged as a long term aim, and given that a share company can be run on a not-for-profit basis, a CLS recommended as being more suitable and flexible for purpose compared to a CLG.
Limited Liability Partnership ("LLP")	A LLP is a body corporate with a legal personality separate from that of its members that can be used where two or more parties want to come together to undertake a business with a view to profit. Combines organisation flexibility and tax status of a partnership with limited liability for its members. Registration with Companies House can be relatively straight forward and quick.	**Only debt** An LLP can raise finance in its own name and can give security by way of fixed and floating charges. A LLP has no share capital and is not subject to the company law rules governing the maintenance of capital. A wider (eg community) share offer would not be possible for a Limited Liability Partnership.	**Power Structure: Single tier:** The members of a LLP normally share in the responsibilities of running the business. Designated members have some extra responsibilities on top of those of ordinary members (such as signing accounts on behalf of the members). **Constitution:** Rights and responsibilities are defined and divided in the members' LLP Agreement. It is possible for LLPs to have protections for a not-for-profit/ social purpose set out in the LLP Agreement.	A LLP itself has unlimited capacity, which means that third parties need not be concerned about any restrictions on its activities. A LLP can do anything that a natural person can do, including holding property, entering into contracts, employing people, suing and being sued. LLP combines the organisational flexibility (it has the complete flexibility to organise its internal structure as it wishes) and tax status of a partnership with limited liability for its members. However, it will not possible to undertake a wider (community) share offer.	Members have limited liability, however members of the LLP must contribute to the LLPs assets on its winding up. Anyone lending money to the LLP, such as a bank, may still require personal guarantees from the partners.	A LLP is a commonly recognized structure. Contractors/ power off-takers may however request parent company guarantees/ bonds if the covenant strength of the LLP is weak If the stakeholders in the CEMC wishes to ensure flexibility to raise equity or in the future to offer shares to the wider Community on a public share offer basis, this vehicle may not be the best option. In addition the "flat" governance structure may not suit the broad range of potential stakeholders.
Community Interest Company ("CIC")	Limited company structure for social enterprise with a statutory "asset	**Debt and Equity** Equity: As for other limited companies, but subject to	**Power Structure:** Two tier: As for a CLS or CLG (depending on whether the CIC is	As a separate legal entity, a CIC can enter into contracts, employ	Incorporation limits the personal liability of the individuals involved.	If in the form of a CLS, a CIC is a legally recognised form. However

	lock[25]", dividend cap and focus on community benefit. Regulated by company law and a statutory appointed CIC regulator. A CIC has to carry out activities which fulfil a "community purpose". Regulation is relatively "light touch" in comparison with regulation of charities. Registration with Companies House is as per normal companies, with the completion of an additional form setting out the community interest and how it will be pursued.	additional regulation to ensure community benefits (not more than 35% profits can be paid out to shareholders). Not permitted to run public share offer unless publicly listed CIC.	established as a CLS or a CLG).	staff, lease property etc and will have the burden of those obligations and liabilities. Relatively flexible, however note restriction on profits that can be paid out and the asset lock. The asset lock may however provide an added benefit if funding is sought from certain donors/ investors who wish to see their funds put to certain social purposes.	As per CLG or CLS depending on incorporation of CIC.	contractors/ power off-takers may however request parent company guarantees/ bonds if the covenant strength of the CLS is weak. The CIC has the benefits and drawbacks of a straightforward CLS, however, it has the benefit of the asset lock which may provide the needed security for a potential funder with social aims. The major drawback is the restriction on dividends payable and inability to raise equity through a community share offer unless publicly listed.
IPS Co-operative ("Co-op")	A co-op is a type of industrial and provident society with prescribed rules around open membership and equality of voting. It is set up to benefit its members. A co-op is regulated by the Financial Conduct Authority ("FCA") as well as Companies House and does not receive any particular tax advantages over a normal company (although note community share offers). It is intended to be used for organisations wanting to establish a 'mutual' model with the organisation owned by stakeholders of the organisation and with surpluses principally reserved for reinvestment into the organisation rather than distribution to owners. Must be a "bona-fide co-operative society"	**Debt and Equity** Equity: Can pay dividends. Can run a community share offer. However: Where part of the business capital is the common property of the cooperative, members should receive only limited compensation (if any) on any share or loan capital that they subscribe. Interest on share and loan capital must not be more than a rate necessary to obtain and retain enough capital to run the business.	**Power Structure:** Two tier broadly analogous to a company. It comprises of members (one member one vote) in the society who appoint committee members/ officers who have responsibility for the day to day operation of the society. The members of the co-operative are analogous to shareholders with capital payable in order to become a member and dividends payable from profits of the cooperative. However, whilst dividends can be paid, the purpose of a co-operative cannot be to provide dividend payments to members and in practice it may be more typical for the membership to decide to reinvest all profits into the business of the cooperative. **Constitution:**	As a separate legal entity, a co-op can enter into contracts, employ staff, lease property etc and will have the burden of those obligations and liabilities. A wider community share offer can be undertaken. Interest and dividends are limited. Limited flexibility for the governance arrangements where there are members with different levels of interest in management (with all members required to have one vote).	Members benefit from limited liability. Can only be sued when they have acted in breach of their duties.	Contractors/ off-takers (and potentially funders) may be less familiar with this form of company. Given potential weak covenant of the Co-op guarantees or bonds may be required. The major benefit of the Co-op is the ability to raise equity through a wider community share offer. The drawback to a co-op is the limitations on dividends and interest payable and the limited flexibility for governance structures.

25 A statutory asset lock is one imposed by statute, requiring the governing documents of the CIC to ensure that on dissolution and payment of creditors (including shareholders) any remaining assets shall be transferred to another asset-lock organisation with similar objectives.

	(which is not defined by statute, however criteria is laid down by the FCA). Registration with the FCA can be a lengthy process.		A co-op has a set of model rules as its constitution.			
IPS Community Benefit Society ("Bencom")	A Bencom is a type of industrial and provident society with prescribed rules around open membership and equality of voting. It is set up to benefit the community other than just own members. FCA regulated. Registration with the FCA can be a lengthy process.	**Debt and Equity** As per co-op, including one member one vote, but new legislation provides option of more secure form of asset lock. No dividends, but can pay (limited) interest on share capital	**Power Structure:** As per co-op	**As per Co-op** however note additional restriction on dividends.	Members benefit from limited liability. Can only be sued when they have acted in breach of their duties.	As above, contractors/ off-takers may be less familiar with the structure, therefore guarantees or bonds may be required. The major benefit of the Bencom is the ability to raise equity through a wider community share offer. The drawback to a Bencom is the limitations on dividends and interest payable and the limited flexibility for governance structures.

7 CONSTRAINTS TO IMPLEMENTATION

7.1 Executive Summary

There are a range of issues that will need to be overcome in order to deliver the ambition of this project, particularly Models 2 or 3 and a sample of these are set out below. However, the greatest constraint to progress on MRBD is garnering sufficient business support.

Progress to date shows that a majority of businesses are interested in renewables and/or some form of centralised management which could reduce power import prices and increase the value of locally generated power, but a lack of priority and cost of capital (including perceived cost of capital/ lack of understanding of potential returns and/or savings) inhibit investment. Such inertia must be exorcised, and interest exercised in a consistent manner to enable centralised management and economies of scale.

One of the key areas of feedback we received was the need to understand in more detail what the capital requirements of projects would be, coupled with an understanding of the expected return and how centralised management of power on-site and deployment of intelligent management of demand and supply (including cost of micro-grids) might enhance such returns. Without a more detailed understanding of the financial modelling of the proposed projects, stakeholders felt that board engagement within their businesses would be difficult.

Once such modelling is developed further and committed stakeholder engagement is obtained, we consider that next key to mobilisation of businesses across MRBD is the development of a resourced and resourceful co-ordinating body (i.e. CEMC) to manage the internal stakeholder requirements and overcome external constraints in a cohesive manner.

7.2 Commercial, financial and legal

There are a range of commercial/ financial and legal constraints that will need to be explored and managed to enable projects to progress.

7.2.1 Title

Those wishing to develop renewable/ low carbon projects on the MRBD must have (or the ability to obtain) adequate title to undertake viable projects (both in relation to rights to maintain assets in situ and in relation to term to enable a sufficiently long payback period). Existing restrictions to this may include freehold title restrictions imposed by the seller, leasehold restrictions in landlord-tenant relationships and mortgage restrictions where a third-party investor (bank) has an interest in the property. Future restrictions imposed by eg a third party (including tenant) rent-a-roof model may deter owners as this can still be perceived as a fetter to liquidity and value if selling the property.

7.2.2 Legislative

Electricity trading activities (bar in most circumstances self-supply) are regulated by the Electricity Act 1989, which requires a licence to be obtained for generation, distribution and supply activities, unless exempt under a class exemption (set out under the Class Exemption Order 2001). This means that unless a private wire microgrid is established across the estate (Model 3), the full advantages of generating renewable energy on-site cannot be realised by supplying directly to businesses on the MRBD and instead, where businesses wish to trade between each other, Corporate PPA models (for example a Sleeved PPA) will need to be established with the assistance of a licensed electricity supplier (Model 2).

7.2.3 Capital

One fundamental premise of sustainability is that renewable interventions are economically viable. However, depending on the nature of the technology, renewables can require significant up-front funding capital that is repaid, and thus an economic benefit realised, over a long period of time (up to 20 years). This in turn requires confidence on the part of the investor(s) that the predicted returns will be met (or exceeded) throughout this period. Some of the technologies proposed (for example, BESS or EVs) are still at a high cost point and therefore investment by individual businesses on the MRBD may not seem economically justified. The development of a CEMC which could invest surpluses from energy trading and management into projects which have a longer payback period may be one way in which the issue of capital availability could be addressed.

7.2.4 Security

If external debt funding is sought, then sufficient security is required to provide recourse to the lender should the project fail. Inter alia, this can be through recourse to guarantees from creditworthy entities (eg parent company or, possibly, public body), the physical assets of the project, lease/license rights of the project and/or contractual rights, particularly contracted revenue. If established, the CEMC may therefore need to secure additional forms of support, for example from WSCC/ the Manor Royal BID in early years before its covenant strength improves.

7.2.5 Revenue uncertainty

Any investor, sponsor or third party, equity or debt, will require assurance that the project revenues will be realised. Constraints to this include: market risk where there is an assumption of market demand but no contract on which to rely; revenue contracts shorter than economic viability periods and contracts with poor creditworthy counterparties. In particular, this relates to the supply price of energy to customers. If Model 2 is established, a suitable (long term) Corporate PPA model whereby businesses on the MRBD purchase power from on-site renewables (utilising a licensed supplier to “sleeve” the power) can help mitigate this risk. Model 3 would largely negate these risks as the private wire network arrangement would require that all power generated is sold across such network: i.e. there is a captive market.

7.2.6 Cost uncertainty

Similar to revenue uncertainty, cost uncertainty undermines investment appetite. From a generic project perspective, development/construction contract risks, operation and maintenance costs, and funding interest rates (if not hedged) are major factors. In relation to power specifically on MRBD, this relates to the purchase price of energy to the business. The power price that can be obtained by businesses for the *sale* of power on the MRBD must not be prohibitively high such that the price for *purchase* under Corporate PPAs (Model 2) or Private wire PPAs (Model 3) to other businesses on site creates a disincentive to the development of the models. The price for power sold and purchased will be a function of many factors, including generation costs (capex, opex etc) and distribution costs (whether passed on by a licensed supplier under a Corporate PPA or due to a use of system charge for use of the MRBD private wire).

7.2.7 Complexity

Complexity in an investment can be a positive where there is a portfolio effect on financing (i.e. higher ratios/ quantum of debt can be leveraged due to the spread of risk and size of portfolio). However, often, many ‘moving parts’ with their own set of constraints increases uncertainty and thus investment appetite and/or cost. This includes both required predicted returns / interest rates and also the cost of due diligence, which in itself can deter project sponsors and undermine affordability.

7.2.8 State Aid

In order to overcome inertia and tap into the lowest cost of capital, the involvement of public bodies is beneficial. However, state aid considerations can limit the extent to which a public body can contribute in terms of percentage ownership, amount of capital and/or cost of capital. The issues of State Aid are dealt with further in the WSCC Addendum Report.

7.3 Technical, planning and environmental

7.3.1 Grid Connectivity

All installations should be coordinated with the network operators and/or meet the requirements of the grid operator.

The installed main and submeters should meet the requirements and if necessary be operated by a licenced meter operator.

7.3.2 Design Integrity

Basic design constraints will affect the viability of a project, for example whether roof structures (for solar PV) or ground conditions, (for CHP/ GSHP/ private wire etc) support the imposed loadings and spatial requirements of the equipment. This would also be a consideration for GSHP in respect of the underlying geology and spatial requirements.

The components, their installation and operation should fulfil all required technical standards. For health and safety, the designs and installations must be reviewed by technical experts.

Geography

The physical arrangement of assets can be a constraint if the cost of linking and/or distributing energy from the assets far outweighs the benefits. This is particularly relevant in the case of the microgrid considerations for MRBD.

If relevant, the requirements of environmental regulations must be fulfilled. If some parts are not clear the permission authority has to be contacted.

7.3.3 Planning and environmental

Planning restrictions may apply to limit the technologies that can be deployed; visual, noise, environmental (including CHP emissions and groundwater for GSHP), although in relation to roof-top solar PV, restrictions will be limited, and the projects should fall under permitted development rights[26]. The Building Regulations[27] will need to be considered in relation to projects sited within/ on buildings on the estate. Considerations will also need to be made in relation to waste from projects (any Hazardous waste in relation to CHP projects or the disposal of batteries relating to a storage project). The CDM Regulations[28] will apply to all projects carried out on the MRDB.

7.4 Local appetite, business approach to risk

Stakeholder engagement was undertaken during December 2018 in the form of workshops at which Ramboll, Lux Nova Partners and WSCC presented the three Models and at which MRBD businesses were given the opportunity to discuss the proposals and provide their own views as to appetite to pursue projects. In addition, a survey was sent to all MRBD businesses which had expressed interest in the project to garner their more detailed feedback.

The key findings from the workshops and survey feedback was as follows[29]:

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[26] Permitted development rights are set out in the Town and Country Planning Act (General Permitted Development)(England) Order 2015, Schedule 2, Part 14, Class J. In general, installations below 1MWp on non-domestic premises are considered permitted development, provided they adhere to certain design stipulations.

[27] Building Regulations 2010 (SI2010/2214) (as amended)

[28] http://www.hse.gov.uk/construction/cdm/2015/index.htm

[29] Note that it should be born in mind that the workshop attendees and survey respondents were a self-selecting group: those with an existing interest were those that attended and responded

Appetite: there was a definite appetite amongst respondents in engaging with other businesses on the MRBD to maximise the potential of on-site renewable energy generation.

Key drivers: respondents felt there were a number of key drivers for their businesses to engage in the project:

- make buildings more attractive for tenants (green building credentials);
- opportunities for generating own electricity and heat;
- cheaper power (this comprised the majority of responses);
- ability to use locally generated electricity in hydrogen generation for fleet of buses.

Key constraints: respondents raised the following issues as key constraints on their business engaging in the project:

- Title issues:
  - collective agreement with other resident companies/ landlords;
  - obtaining permission from freeholders;
- Cost/ revenue uncertainty:
  - obtaining the necessary ROI and incentivising boards to proceed;
  - understanding the cost vs return analysis and identified savings of the project;
- Planning permissions

Next steps: respondents felt the following issues needed to be addressed in order to move forwards with the project:

- understanding the options available;
- developing a strong business case;
- cost vs return analysis;
- identified savings of local power trading;
- understanding of costs of private wire infrastructure.

8 RECOMMENDATIONS

Following completion of this report, we would recommend that a number of next steps are undertaken, firstly to determine whether there is sufficient appetite within businesses on the MRBD to progress the project (and what Model is preferred) and secondly, to address key issues of viability in order to develop more detailed business plans.

8.1 Establish critical mass of stakeholders

8.1.1 Recommend that MRBD business are mapped to determine appetite for engagement on a cluster by cluster basis to establish the initial business case for progressing the project and determine which of those businesses might take a more central role (for example in establishing the CEMC if there is appetite to pursue Model 2).

8.1.2 In order to establish critical mass to make Models 2 or 3 viable, recommend that the CEMC working group selectively engage with a core group of the largest prospective generators and consumers within MRBD. It is likely that these same businesses would be some of the investors in the CEMC.

8.1.3 Once these businesses are identified, the technical, commercial and financial advice can be tailored to the specific circumstances.

8.2 Encourage businesses progressing Model 1 to consider Model 2

8.2.1 Where businesses are only interested in a Model 1 approach, encourage progression of unilateral low carbon on-site projects (given general environmental benefit), but without substantial further assistance from the BISEPS project/ WSCC, as a business by business development of projects is not conducive to the creation of the trading synergies that the BISEPS project is seeking. The benefits that should arise from collaboration (see Model 2 and 3 below), will not be realised if businesses progress unilaterally.

8.2.2 Recommend that businesses are encouraged to participate in Model 2 (with a view to Model 3a or Model 3b if proved economic in the future) and made aware of the benefits that should be realised under Model 2, including:

- the potential for cheaper power where the CEMC is able to negotiate a bulk power supply agreement for businesses across the MRBD;
- the potential for a better power off-take price where the CEMC is able to negotiate a bulk off-take agreement for power generated on the MRBD;
- the potential to develop low carbon on-site projects with more accessible and/or competitive debt due to aggregated portfolios of projects and therefore the potential for higher investor returns;
- the potential to centrally manage and optimise power demand and generation across the MRBD (including via thermal or battery storage and/or EVs) and therefore take advantage of periods of cheaper electricity and to smooth generation profile to enable a better off-take price for power and/or to use assets within the capacity market.

8.2.3 Recommend that any projects that do progress under Model 1 are encouraged to do so with a view to wider future engagement, such that the structure adopted does not though preclude them from joining a collaborative project in due course. This would include:

- the setting up of SPV structures to own assets that could be transferred to the CEMC in the future;
- installing smart meters and relevant ancillary infrastructure to enable future centralised management and/or integration;
- ensuring that PPAs entered into for electricity sales with a licensed supplier are either on a rolling basis or capable of being terminated without prohibitive penalty in order to switch to a bulk off-take model.

8.3 Progress Model 2

8.3.1 Recommend that, in order to gain momentum, the initial focus of further work in Q1/ Q2 2019 be directed at Model 2, which could be established at relatively low cost and complexity as in its initial basic formulation, Model 2 is simply the creation of a collaborative vehicle for co-operation, which can create proof of concepts by progressing low carbon projects on the MRBD in stages and encouraging collaboration between businesses in order to achieve best value for power purchase and sale. Note:

- Model 3a (which introduces direct trading between customers and generators on MRBD via sleeved PPA structures) should be viewed as a "next stage" project, once sufficient generation capacity has been installed, business demand has been established across the MRBD and a third party licensed supplier relationship established which makes a sleeved PPA model sufficiently beneficial to generator and customer.
- Model 3(b) (which would introduce a private wire microgrid across the MRBD) should only be progressed once the detailed analysis of costs and benefits has been undertaken to prove that it is technically and economically feasible.

8.3.2 Recommend that in order to progress Model 2, WSCC and Manor Royal BID formulate a working group to progress the establishment of the CEMC, which should enable businesses to benefit from the economies of scale offered by collaboration (see examples at section 8.2.2 above). This will include developing the governance structure that will enable and encourage all of the businesses, from micro to corporate enterprises, to benefit from participation in an equitable way; recognising that the corporations will be the ones that enable the CEMC model to work at scale. An options paper should be commissioned to establish the form of company most suitable for the CEMC, including routes for procurement compliance where the WSCC (and any other public bodies) are a member.

8.3.3 Recommend that following establishment of a critical mass for engagement in Model 2 and the establishment of the CEMC, the CEMC progress project feasibility studies during the course of 2019, including an analysis of:

- available land (including roof-space) for chosen low carbon projects (including solar PV, CHP, storage and EV charging), including analysis of ownership/ access etc;
- detailed electrical and heat profiles (grid capacity, demand, connectivity etc) across MRBD in order to establish:
    - best combination of technologies given locational parameters;
    - optimal use of storage / EVs/ thermal stores and behind the meter balancing of power demand and generation;

  bearing in mind potential for future trading between generators and consumers;
- available funding for projects (from MRBD businesses, grant funding, loans, external equity, etc);
- which projects are the "low hanging fruit" and should be targeted first in order to establish proof of concept.

8.3.4 Recommend that the CEMC actively engage with UKPN and licensed electricity suppliers operating in the distribution area to establish the grid connection capacity and appetite for cooperating with a CEMC, particularly in relation to bulk purchase of energy generated on the MRBD and supply from the grid.

8.3.5 Recommend that again, in order to maintain momentum for this project, before end 2019, CEMC:

- fully developed business cases, supply chain and funding (including appropriate PPAs[30]) are established for the projects identified for first development, with a view to commencement of construction during 2020;
- the business case for bulk purchase of power (from a licensed supplier) is established and if economically advantageous, those businesses wishing to engage, prepare to switch and appropriate contractual relationships are established between the CEMC (as broker, if appropriate), the supplier and the business customers.

8.4 Explore feasibility of Model 3a

Following establishment of CEMC and progression of Model 2, recommend determining the appetite for businesses to trade their power locally, utilising corporate PPA structures. If there is appetite to explore this option, recommend:

- engaging relevant licensed suppliers to determine which corporate PPAs options would be available to generators and consumers across the MRBD, noting in particular whether options for multiple suppliers for the same meter point are available following the proposed BSC modification (see ADDENDUM at Section 4.8.3 above) and whether that opens up opportunities for cost savings between the businesses;
- exploring what advantages such sleeved corporate PPAs could afford generators and customers (e.g. a long term guaranteed power price), particularly where intelligent use of technology combinations (storage, EVs, thermal storage) plus CHP and solar PVs can smooth power generation and demand.

Note that there is nothing to prevent the CEMC exploring Model 3a alongside projects under Model 2, we simply propose that the Model development is undertaken in stages, to enable stage by stage engagement by businesses and a period of time to establish proof of concept.

8.5 Explore feasibility of Model 3b

8.5.1 Recommend that further desktop studies are undertaken to establish the technical feasibility of a private wire structure across the MRBD (either privatising the existing infrastructure of laying a new microgrid). Establishing feasibility on a cluster by cluster and then on a whole MRBD estate basis may be a useful exercise if it is likely that some clusters may be more technically feasible than others.

8.5.2 If proven technically feasible (either on a cluster by cluster basis or across the whole MRBD site), quantify the additional costs (of the grid infrastructure/ privatisation of the existing infrastructure and operation and maintenance of such infrastructure) and the enhanced savings (deriving from realisation of Embedded Benefits) and cost avoidance associated with the private wire micro grid (i.e. avoidance of supplier obligations and supplier costs). Following the analysis, it should be possible to identify if there are sufficient benefits to warrant progression from Model 3a to Model 3b.

8.5.3 Recommend exploring opportunities for grant funding of the private wire network(s).

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[30] Bear in mind that if there is a business case to move to corporate PPAs as per Model 3a, any PPAs entered into with a licensed supplier at this stage should be either on a rolling basis or capable of being terminated without prohibitive penalty in order to switch to a sleeved model.

ANNEX 1: BISEPS MARKET AND REGULATION GLOSSARY AND GUIDE

ACT: advanced conversion technology

AD: anaerobic digestion

ADE: the Association of Distributed Energy

Balancing and Settlement Code/ BSC:

Behind the Meter: Behind the meter generation refers to the practice of connecting generation to users without using the public network (either transmission or distribution).

BEIS the Department for Business, Energy and Industrial Strategy

Capacity Market: the Government's flagship program to ensure the long-term security of supply in GB. Auctions for capacity are held four years ahead of a delivery year ('T-4'), with further 'top-up' auctions held to account for any interim changes one year in advance of a delivery year ('T-1'). The Capacity Market is a technology neutral mechanism and most types of capacity can participate in the auctions including new and existing generation plant, storage, DSR and interconnector capacity.

CIBSE: the Chartered Institute of Building Services Engineers

Contracts for Difference/ CfD: The CfD regime was established under the Energy Act 2013, as amended. A CfD is a long term contract between a low carbon electricity generator and the UK Government (via the Low Carbon Contracts Company Limited ("LCCC")). The price paid for electricity generated is set at a fixed price (the "strike price"). The generator sells the electricity in the wholesale market and when the market price is below the strike price, the generator receives a top up payment from LCCC. Above the strike price, the generator must pay back the difference to LCCC. The first round of CfDs were awarded in September 2015 and the second round in September 2017. The September 2017 round was only allocated to "emerging technologies" including offshore wind. Ground mounted solar was *not* included. The next round is due to be held in May 2019 (following BEIS' announcement on 23 July 2018). The current indication is that the renewable energy generation eligible for support will continue to be the "less established technologies": i.e. offshore wind, on-shore wind on remote islands, dedicated biomass with CHP, ACT, AD, geothermal, wave and tidal stream. Further allocation rounds will be held every further two years starting from 2021.

CHP: combined heat and power is the name given to a variety of technologies that simultaneously generate useable heat and electricity. This process is also known as cogeneration, or trigeneration where cooling is provided. Typically, technologies are powered by a reciprocating engine or gas turbine connected to an electrical generator, with combustion heat from this process captured to provide hot water or even cooling. This heat can be transferred and sold to customers via a heat network rather than simply venting it into the environment.

Demand Side Response/ DSR: customers are incentivised financially to lower or shift their electricity use (demand) at peak times to help manage load and voltage profiles on the electricity network.

District Heating Scheme/ DHS: the provision of heating to multiple customers within a building (also referred to as communal heating) or a number of buildings (also referred to as district heating), using a centralised generation system. The water is heated (or in some rare cases, converted to steam), before being piped throughout a building (communal) or across the local area (district). Typically, where a heat network spans multiple buildings, heat exchangers are used to hydraulically separate the central system from local systems, allowing different pressures and rates of circulation and easier control of temperatures (and ownership) in local buildings.

Distributed Generation: generation which is located within the lower voltage distribution network (i.e. 132kV and below), which avoids costs associated with moving power longer distances across the transmission system.

DNO: Distribution Network Operator

DSO: Distribution System Operator

Embedded Benefits Distributed Generation can receive benefits by virtue of being embedded within the distribution system commonly referred to as "Embedded Benefits". Embedded Benefits arise from the avoidance of charges associated with the transmission network and the receipt of credits from the distribution network. The categories of Embedded Benefits include:

- Avoidance of transmission network use of system (TNUoS) charges, which is a charge incurred by transmission connected generators;
- The offset costs of suppliers who are charged on a net basis and passed on to the generator in the form of a credit (where the generator supplies under a PPA), including:
    - TNUoS charges that are levied on supplies (known as the Triad benefit)
    - Balancing Services Use of System (BSUoS) charges;
    - Capacity Market Supplier Charge
    - Assistance for Areas with High Distribution Costs
    - Residual Cashflow Reallocation Cashflow
- Reduced network losses;
- Distribution Use of System Charges (DUoS): DNOs provide DUoS credits to most embedded generation to reflect the reduction in their costs that result from the presence of embedded generation.

However, note that as the value of embedded benefits can be substantial to a distributed generator, Ofgem is concerned that they may no longer align with the costs savings that accrue from these generators being connected at distribution level rather than transmission. Ofgem is therefore reviewing this area, which is likely to result in a reduction in the level of Embedded Benefits in the future.

Feed in Tariff/ FIT Scheme: the FIT scheme was established under the Energy Act 2008, came into force on 1 April 2010 and is administered by Ofgem, which accredits new installations, maintains a central FITs register and oversees FITs payments made by electricity suppliers to generators. The scheme applies to installations with a total installed (generating) capacity TIC of 5 megawatts (MW) or less and guarantees a generation tariff and where applicable, an export tariff, per kilowatt hour of electricity generated and exported. Once a project has been allocated tariff, it will remain on that tariff for the life of the installation, or the life of the tariff (whichever is the shorter). Current tariffs run for 20 years. The Export FIT is payable where generators opt in to the export FIT regime (which can be done on an annual basis), where a flat rate payment will be guaranteed. Otherwise, generators can opt to sell the electricity under a PPA on the open market (to a supplier). The scheme closes to all new applicants from 31 March 2019.

Grid Supply Point: means the point at which a network is connected to the public distribution network.

Industry Codes: The Master Registration Agreement ("**MRA**"), the Balancing and Settlement Code ("**BSC"**), the Distribution Connection and use of System Agreement ("**DCUSA**"); and the Connection and Use of System Code ("**CUSC**").

PPA: power purchase agreement

Private Wire: Electricity Act definition of Private Wire is as follows: "private wires" means electric lines owned by—
a) the supplier in question;
b) consumer who receives a supply from the supplier in question from the generating station;
c) the owner, lessor or lessee of the generating station or of one of the premises to which a supply is made by the supplier in question; or
d) any of the persons described above jointly with any other of the persons described above,
provided that the owner of those wires is not a licensed distributor.

Renewable Heat Incentive/ RHI: The RHI pays participants of the scheme that generate and use renewable energy to heat their buildings. The RHI is intended to cover the additional capital and running costs of renewable heat installations (compared to traditional installations) through quarterly RHI payments. The government initially set the level of tariffs to achieve a 12% rate of return on additional capital invested (except for solar thermal).

There are two parts to the RHI:

- Domestic RHI – launched 9 April 2014 and open to homeowners, private landlords, social landlords and self-builders (see further; https://www.ofgem.gov.uk/environmental-programmes/domestic-renewable-heat-incentive)
- Non-domestic RHI – launched in November 2011 to provide payments to industry, businesses and public sector organisations (see further: https://www.ofgem.gov.uk/environmental-programmes/non-domestic-renewable-heat-incentive-rhi)

Note that the RHI is due to close to new applicants on 31 March 2021

Renewables Obligation/ RO: the Renewables Obligation was established under the Utilities Act 2000, as amended, and associated delegated legislation, including the Renewables Obligation Order 2015 (SI 2015/1947), which revoked the Renewable Obligation Order 2009 (SI 2009/785) (previously the main RO instrument).

Significant Code Review/ SCR and Targeted Charging Review/ TCR: On 4 August 2017, Ofgem launched its Targeted Charging Review (TCR) and Significant Code Review (SCR), to examine the possibilities for reform of residual charging for the transmission and distribution networks and to keep other embedded benefits under review. It expressed concerns that the current arrangements for residual charging may be resulting in inefficient use of the networks. Ofgem argued this may drive actions from some network users that result in adverse impacts on other network users and, hence, consumers in general.

Ofgem published two working papers on network charging at the start of November 2017. The first set out the regulator's latest thinking on how it will progress work under its TCR, as it relates to residual network charging. Ofgem believes there is a strong argument for recovering residual charges from demand only, rather than from generators or a combination of demand and generators (as is currently the case). It is proposing to take forward four in-depth assessments of mechanisms for residual recovery for detailed quantitative assessment: fixed charges; capacity demand charges; gross consumption charges; and, the current baseline charges. This work will feed into a consultation on Ofgem's "minded-to" decision in summer 2018[31].

The second paper was more broad ranging and examined reforming network access arrangements and forward-looking charges. The options for these two areas are to be developed through Ofgem analysis and input from industry through two task forces established under the CFF. If the process finds that reform is

[31] *[Update needed]*

needed, potential changes will be consulted on in summer 2018, with the potential for an SCR to be launched afterwards. Industry would then be expected to take forwards any code changes necessary, with final decisions on modifications in early 2019 and implementation of the changes in April 2020, ready for the 2020-2021 charging year.

A summary of the charging options being considered by Ofgem is detailed below:

- Option A: a charge linked to net (kWh) consumption.
- Option B: a fixed price charge. This would reduce potential distortions to network users by separating the residual cost recovery from network users' consumption or generation charges.
- Option C: fixed charges set by connected capacity. One option would be for it to be based on fuse size.
- Option D: gross kWh consumption.
- Option E: a hybrid approach. Ofgem suggest this could allow low usage domestic consumers to pay on net consumption, while larger users pay fixed charges based on capacity.

The market view is that residual charges are likely to be based on connection capacity and, therefore, be an unavoidable fixed cost. If the outcome is a move towards a greater fraction of user charges being based on connection capacity, this could result in a dampening of locational or time-of-use signals to incentivise generation and demand to change their import/ export. This could reduce the incentives and payments/cost savings for behind-the-meter solar PV to respond to network charges as peak payments and time-of-use network charges would be less of the overall charge.

Spill: surplus electrical generation where output of a generator is greater than the on-site (and behind the meter) consumption, which "spills" onto the public distribution network.

ANNEX 2

ELECTRICITY TRADING:

DETAILS AND HEADS OF TERMS

WARNING: these documents are intended only to serve as a prompt to discussion of some of the key issues likely to arise in the context of the subject matter of this document. Substantive commercial and legal consideration will need to be given to an electricity generation/ distribution/ supply arrangement or a district heating scheme in order to flesh out the principles flagged below and others relevant to that particular scheme and before the parties commit, in principle, to a set of "heads of terms" or develop and enter into a fully binding legal agreement.

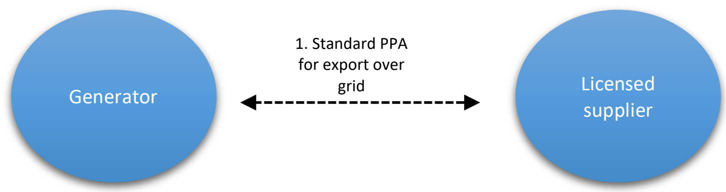
This document is no substitute for taking proper legal advice from lawyers experienced in electricity supply and district heating.

HOT 1 – Standard Electricity PPA

<table>
<tr><td colspan="2">Standard Power Purchase Agreement

Parties: [Generator] (1) and [Licensed Supplier] (2)</td></tr>
<tr><td>Description and Assumptions</td><td>

• Example structure



• The generator is exporting electrical output onto the ‘grid’ (usually onto the local, licensed distribution network operator’s network).

• The generator will seek a number of offerings from potential licensed supplier off-takers.

• Off-takers will pitch different offers, varying by:

  ○ the price they pay for electricity exported;
  ○ the proportion of any ‘embedded benefits’ they offer;
  ○ the extent of forecasting and imbalance risk they take as opposed to the generator;
  ○ their own credit rating;
  ○ their own terms and conditions.

• In nearly all cases, the generator will NOT produce the power purchase agreement and will only negotiate the terms of the off-takers standard form power purchase agreement. Therefore, these “HoT”s can only serve to flag a few key points to look for in the Buyer’s PPA drafting. This typically comes either in the form of: (a) consolidated PPA or (b) as a separate commercial ‘proposal’ plus general terms and conditions (and, potentially, special terms and conditions).
</td></tr>
<tr><td>Parties</td><td>(1) [Generator]

(2) [Licensed Supplier (as off-taker)]</td></tr>
<tr><td></td><td></td></tr>
</table>

Conditions precedent	*[Relevant conditions to commencement]*[32] *[Obligations usually on the Generator to have satisfied the Conditions by [ ]]* *[If Conditions are not met, agreement to cease, except [ ]*[33]*]*
Description and operation of the generating facility	*[The Supplier will want full details of the generating station]* *[Obligation usually imposed on the Generator to operate in accordance with law, good industry practice, etc.]* *[The Generator will usually be under obligation to obtain and maintain its generation connection]*
Sale of electricity	*[Provisions govern passage to Supplier of title to export electricity for all purposes, including for the purposes of the BSC]* *[If the generating facility is earning ROCs, a restriction should be imposed on the Supplier's onward sale of electricity to GB consumers only]*
Metering	*[Provisions govern installation, ownership and registration of meters, including appointment of Meter Operator and giving access to Supplier's Data Collector and Data Aggregator]* *[Provisions will also deal with meter accuracy and how to deal with meter errors]*
Forecasting, output data, volume tolerances and imbalance risk	*[The Supplier will want forecasts of expected export output. Depending on the nature of the technology used, it will be possible to give forecasting that is:* • *more or less detailed;* • *more or less reliable.]* *[From the Generator's perspective, it is important not to be under obligation to provide unrealistic forecasting information. However, the more information that is given to the Supplier, the better they should be able to mitigate their own imbalance risk. Where the Supplier is taking imbalance risk, better output predictability should allow them to charge less for taking this risk. On the other hand, if the Generator is able to tightly control their electrical output, it may be in their interests to retain imbalance risk. They would then face a bigger risk of incurring imbalance costs if their output is not as expected, but, if they operate as expected, they should receive a better price for their export electricity.]*

[32] These could relate, for example, to third party consents having been obtained, the generating plant being commissioned, etc.
[33] Insert relevant provisions which shall survive expiry (such as confidentiality).

	[Some Suppliers will allow tolerance bands. This permits some deviation from projected output before imbalance costs are passed to the Generator. This allows some sharing of imbalance risk]
Other benefits	*[The Supplier may agree to buy additional products generated along with electrical output (such as ROCs).]* *[Suppliers will usually agree to share the value of embedded benefits. The share agreed will vary from Supplier to Supplier and depends upon the particular project and other factors.]*
Price and payment	*[Price may be determined in a number of different ways. This may include – for example:* • *for half-hourly metered export output, a price applicable for any given settlement period, aggregated into a payment due for export output over a given contract period;* • *the price may be determined by reference to an agreed index;* • *a flat price may be applied to any export output achieved over a given contract period;* • *price fixing may be for the duration of the agreement or for shorter periods – under some PPAs, the Generator can serve a price fix notice to switch from a fully variable market price to a fixed price offered by the Supplier]* *[Payments will usually be adjusted to reflect:* • *additional payments for additional products bought – e.g. ROCs* • *additional payments for additional benefits realised – e.g. embedded benefits* • *deductions for imbalance charges passed through to the Generator, where output was not as predicted* • *other 'pass through' charges (these are charges incurred by the Supplier associated with dealing with the Generator's export output)* • *VAT and any other applicable taxes]* *[Provisions should include time for payment and when interest starts to run on late payments.]* *[Generator's may be concerned to make sure that their Buyer has sufficient financial standing always to meet its payment obligations to them. This may be particularly relevant to larger CHP installations. Risk of non-payment can be reduced by shortening contract, billing and payment periods and/or by seeking additional financial security.[34]]*
Change in law	*[Change in law provisions will generally pass most change in law risk to the Generator. However, it is important to distinguish between changes that the Supplier can/will simply pass on to its customers, at one end (and which are reasonable for the Supplier to assume responsibility for) and changes that*

[34] Although many of the biggest suppliers will not give any additional financial guarantee.

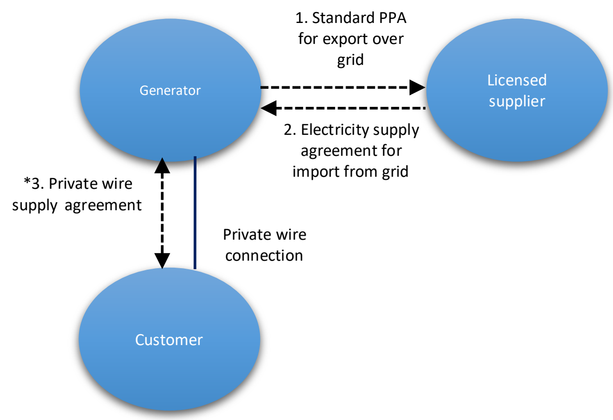
	purely go to the cost of running a generating plant, at the other (and which it would be unreasonable to expect the Supplier to assume). The interaction between some costs and the wholesale price of electricity can make the commercial dynamic and negotiation more complex.]
Force Majeure	*[Force Majeure provisions are seen in most PPAs, with familiar suspension wording and termination for extended Force Majeure. The more technically complex the generating facility, the more carefully the Force Majeure wording will need to be studied.]*
Termination	*[Termination will normally be possible for material breach of contract by either party (including non-payment), insolvency and extended for Force Majeure]* *[On termination, in addition to settling pre-termination liabilities, the parties will want to address closing out their market exposures (if any) according to the pricing structure they have agreed. Where market exposure arises, the termination position could be adverse or favourable to the Generator or Supplier, depending on market conditions. So it is important to make sure that wording captures potential 'upside' and not just 'downside' for the Generator.]*
Disputes	*[Various approaches to dispute resolution are common amongst PPA providers. These generally escalate through management perhaps to an appointed 'expert', under an agreed set of procedures, or to an external body, such as the Electricity Supply Industry Arbitration Association of England and Wales]*
Boilerplate:	○ Status of the Agreement ○ No partnership or agency ○ Confidentiality ○ Third Party Rights ○ Notices ○ Variation and Waiver ○ Invalidity and Severability ○ Entire Agreement ○ Governing Law

HOT 2 – Private Wire PPA

<table>
<tr><td colspan="2">Private Wire PPA

Parties: [Generator/Supplier] (1) and [Customer] (2)</td></tr>
<tr><td>Description and Assumptions</td><td>

Example structure:



The Generator may be ‘spilling’ or ‘exporting’ some electrical output onto the ‘grid’ (usually onto the local, licensed distribution network operator’s network) and may do so under a number of models. Most commonly this will be under a standard PPA (contract 1 in the above example structure).
The Generator supplies on-site Customers under the Class C supply exemption. This permits the Generator/supplier to supply electricity:

it has generated itself; and
any supplied to the Generator/supplier by a licensed supplier.

The Generator/supplier will have in place an agreement for the supply of electricity to the site from the grid (contract 2 again above). This may be a fairly standard supply agreement.
The Generator/supplier will also have in place a Private Wire Supply Agreement(s) with its Customer(s) (contract 3 again above and summarised here).
In accordance with the requirements of the Class C supply exemption, the Customer(s) will be on the “same site” or connected by “private wire” to the Generator’s generation facility.

</td></tr>
<tr><td>Parties</td><td>(1) [Generator] (as generator and supplier)</td></tr>
</table>

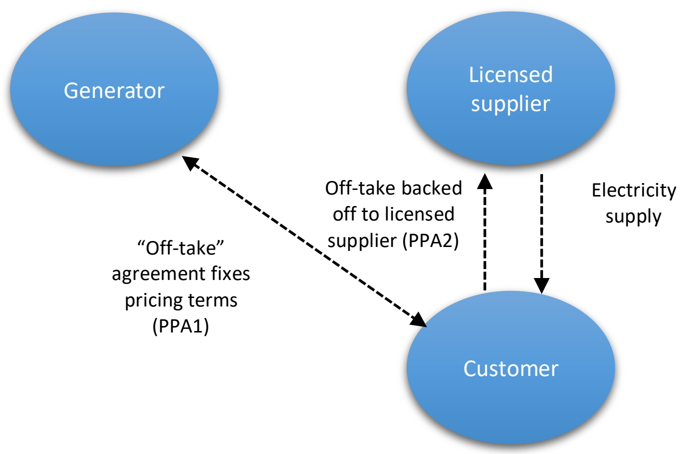
	(2) *[Customer]*
Conditions precedent	*[Relevant conditions to commencement]*[35] *[Obligations usually on the Generator to have satisfied the Conditions by [ ]]* *[If Conditions are not met, agreement to cease, except [ ]*[36]*]*
Description and operation of the generating facility	*[The Buyer will want full details of the generating station]* *[The Generator usually accepts an obligation to operate in accordance with law, good industry practice, etc.]*
Connection capacity and installing the private wire connection	*[The Generator will usually be under obligation to obtain and maintain its connection to the gird and to deal with any permitting required for operation of the generating station.]* *[Because the Generator's grid connection will be subject to limits, and due to the aggregation of demand across the site and between Customers, the Generator will usually want to impose a maximum load that the Customer can draw.]* *[If the private wire connection is not already in place, additional provisions (and/or an additional set of contracts) will be needed to address construction of the private wire itself]*
Sale of electricity	*[The Generator will sell and the Customer will buy electricity]*
Metering	*[Provisions govern installation, ownership and registration of meters, including appointment of Meter Operator and giving access to Buyer's Data Collector and Data Aggregator]* *[Provisions will also deal with meter accuracy and how to deal with meter errors]*
Forecasting, output data, volume tolerances and imbalance risk	*[The Generator may want forecasts of the Customer's expected demand. Depending on the nature of the Customer's operations, it will be possible to give forecasting that is:* • *more or less detailed;* • *more or less reliable.]*

[35] These could relate, for example, to third party consents having been obtained, the generating plant being commissioned, etc.
[36] Insert relevant provisions which shall survive expiry (such as confidentiality).

	[From the Customer's perspective, it is important not to be under obligation to provide unrealistic forecasting information. However, the more information that is given to the Generator, the better they should be able to mitigate their own imbalance risk. This should allow them to charge less for taking this risk.] *[Some Generators will allow tolerance bands. This permits some deviation from projected output before imbalance costs are passed to the Customer. This allows some sharing of imbalance risk]*
Other benefits	*[Generators and Customers may agree to share the value of any embedded benefits received. The share agreed will vary from project to project and depends upon a variety of factors.]*
Price and payment	*[The Generator may charge at different rates for:* • *electricity it generates itself; and* • *electricity it imports from the grid.]* *[Typically, the Generator will seek to recover all costs it incurs when it is importing for (and paying for) electricity from the grid. This will include all commodity and all system costs. On the other hand, electricity generated by the Generator should enjoy various embedded benefits and, so, may be cheaper. As a result, Customers will normally want to see that the Generator maximises the amount of electricity it supplies from its own generation output and minimises the amount of grid import relied on.]* *[Payments will usually be adjusted to reflect:* • *the cost of any electricity import needed (including associated system costs) and imbalance charges, where demand was higher than generation output – this is usually restricted to situations the Generator is not in default of generation output commitments, maintenance commitments, etc.* • *VAT and any other applicable taxes]* *[Provisions should include time for payment and when interest starts to run on late payments.]* *[Generator's may be concerned to make sure that their Customer has sufficient financial standing always to meet its payment obligations to them. Risk of non-payment may be mitigated by the fact the private wire Customers are often also tenants of the Generator]*
Change in law	*[Change in law provisions will generally pass most change in law risk to the Customer. However, it is important to distinguish between changes that the Generator can/will simply pass on to its customers, at one end and which are reasonable for the Customer to assume responsibility for (e.g. because it would under any normal electricity supply contract) and changes that purely go to the cost of running a generating station, at the other (and which it may be unreasonable to expect Customers to assume.]*

Force Majeure	*[Force Majeure provisions are seen in most Private Wire Supply Agreements, with familiar suspension wording and termination for extended Force Majeure. The more technically complex the generating station, the more carefully the Force Majeure wording will need to be studied.]*
Termination	*[Termination will normally be possible for material breach of contract by either party (including non-payment), insolvency and extended for Force Majeure]* *[On termination, in addition to settling pre-termination liabilities and any market exposures, the parties will want to address compensation for any stranded investments. What is reasonable will depend very much on the specifics of the project.]*
Disputes	*[Various approaches to dispute resolution are common amongst PPA providers. These generally escalate through management perhaps to an appointed 'expert', under an agreed set of procedures, or to an external body, such as the Electricity Supply Industry Arbitration Association of England and Wales]*
Boilerplate:	○ Status of the Agreement ○ No partnership or agency ○ Confidentiality ○ Third Party Rights ○ Notices ○ Variation and Waiver ○ Invalidity and Severability ○ Entire Agreement ○ Governing Law

HOT 3 –Sleeved PPA

Sleeved Electricity PPA **Parties: *[Generator]* (1) and [Customer] (2) and *[Licensed Supplier/Offtaker]* (3)**	
Description and Assumptions	• A sleeved supply is where a Generator forms an agreement with a demand Customer to supply them with electricity over the distribution network. To enable this agreement, a Supplier is used as a facilitator by arranging for the transport of that electricity across the public grid and managing the risk of a supply and demand mismatch or 'imbalance'. • Sleeving allows a Generator to approach demand Customers and agree terms that suit both parties. This type of agreement can be between a Generator and either one or several demand Customers and allows for longer term offtakes to be agreed which creates certainty for both parties. • There are various approaches that can be taken to structuring this arrangement. The most common one is illustrated below:  • This approach involves the Customer buying legal title to the Generator's output directly from the Generator (under PPA1) but then immediately on-selling title to that electricity to the Supplier (under PPA2). The Supplier then sells the electricity back to the Customer under a supply agreement that wraps in the Generator's electricity. • The Supplier's involvement allows the electricity to be conveyed from the Generator to the Customer over the licensed transmission and distribution systems and for the Supplier to provide additional back-up and top-up supplies to the Customer.

	• Because of the involvement of the Customer in the middle of a back-to-back PPA chain, each of the Generator, Customer and Licensed Supplier will be very sensitive to the credit-worthiness of the others in the chain. • Other approaches are possible but are not summarised here.
PPA 1	
Parties	(1) *[**Generator**] (as generator of power)* (2) *[**Customer**] (as initial off-taker)*
PPA terms	*[The simplest approach is for the Generator and Customer to have identified an amenable Supplier and to use the appropriate form of the Supplier's PPA as the basis for this PPA. The Supplier may have been selected following a competition or, for example, because it is the Customer's preferred Supplier. This approach helps avoid the Generator and Customer negotiating PPA terms that no Supplier will back off]* *[The Supplier's standard PPA terms are modified to recognise that:* • *the Customer is not a licensed supplier;* • *the Customer is on-selling to the Supplier, who is a licensed supplier;* • *title to generated electricity passes to the Customer at the export meter point;* • *any Special Conditions required by the Customer]*
Special Conditions	*[Price/Term: the Generator and Customer most likely want to agree a longer term, fixed price for electricity than is otherwise available in the regular PPA market – this can give the Generator greater revenue certainty and the Customer greater cost certainty than either is otherwise likely to be able to achieve]* *[Fuel source/Sustainability: the Customer may have special requirements over and above those required by statutory schemes]* *[Any other factors important to the Customer:]*
Other benefits	*[The Generator may agree to sell and the Customer to buy additional products generated along with electrical output (such as ROCs).]* *[Note: the Generator and the Customer may agree to share the value of any embedded benefits available, associated with the generation facility.]*
PPA 2	
Parties	(1) *[**Customer**] (as seller of power)*

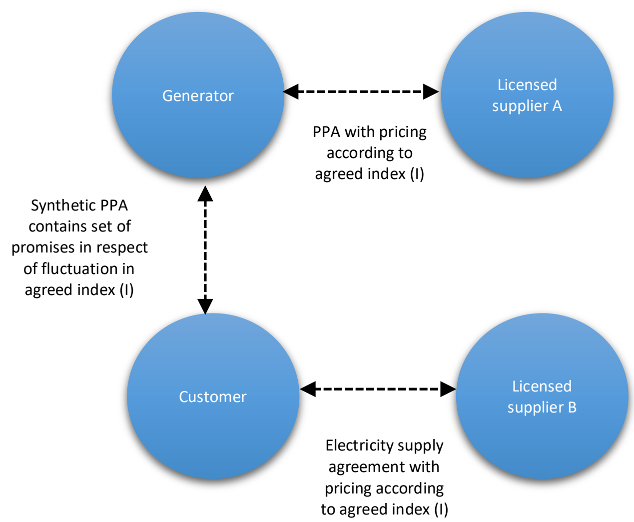
	(2) *[**Supplier**] (as off-taker)*
PPA terms	*[Per above, this will be the appropriate form of the Supplier's PPA.]* *[The Supplier's standard PPA terms are modified to recognise that:* • *the Customer is not, itself, the generator but procures compliance by the Generator with all relevant terms;* • *the Customer is on-selling to the Supplier, who is a licensed supplier;* • *title to generated electricity passes to the Supplier at the export meter point;* • *the Customer's Special Conditions would not flow through to the Supplier (unless having a bearing on discharge of obligations relevant to the Supplier]*
Supply Agreement	
Parties	(1) *[**Supplier**] (as seller/supplier)* (2) *[**Customer**] (as customer and consumer of electricity)*
Supplier's terms of supply	*[Per above, this will be the Supplier's terms of supply.]* *[The Supplier's standard terms of supply are modified to recognise that:* • *the Customer's electricity demand is to be met by the Supplier but this will involve:* ○ *notionally utilising electricity sourced from the Generator's export output over the grid (via the back-to-back PPA structure); plus* ○ *other electricity (sourced by the Supplier) as may be needed to meet the Customer's electricity demand where this is different from the Generator's export output (i.e. top-up, back-up and short-term balancing);* • *title to delivered electricity passes to the Customer at the demand meter point.]* *[The price paid for supplied electricity will depend upon:* • *the nature of the Generator's generation source;* • *whether and how much the Supplier has paid for the Generator's export output under PPA2;* • *any margin agreed between the Supplier and the Customer that the Supplier can charge for administering the sleeving arrangement;* • *system costs incurred (including imbalance charges and how it has been agreed that imbalance risk should be apportioned) but with a default assumption that the Supplier will pass through all system costs at their full value.]*

HOT 4 – Synthetic PPA

<table>
<tr><td colspan="2">Synthetic Power Purchase Agreement

Parties: [Generator] (1) and [Customer] (2) and [Licensed Supplier/Offtaker] (3)</td></tr>
<tr><td>Description and Assumptions</td><td>

- A synthetic PPA allows a Generator and a Customer to negotiate only the components of an offtake agreement that matters to them and to leave the complex regulatory matters to others.
- A regular PPA will exist between the Generator and a Supplier and a regular Supply Agreement will exist between a Supplier and the Customer.
- Consequently, a synthetic PPA might only cover price and a guarantee of origin.
- There are various approaches that can be taken to structuring this arrangement. The most common one is illustrated below:



</td></tr>
<tr><td colspan="2">PPA</td></tr>
<tr><td>Parties</td><td>(1) [Generator] (as generator of electricity)

(2) [Supplier] (as off-taker)</td></tr>
<tr><td></td><td></td></tr>
</table>

PPA terms	*[This uses the appropriate form of the Supplier's PPA as the basis for this PPA (See HoTs1)]*
Supply Agreement	
Parties	(1) *[**Supplier**] (as seller/supplier)* (2) *[**Customer**] (as customer and consumer of electricity)*
Supplier's terms of supply	*[Per above, this will be the Supplier's terms of supply.]*
Synthetic PPA	
Parties	(1) *[**Generator**]* (2) *[**Customer**]*
Terms of guarantee or contract for difference	*[This approach allows the Generator and the Customer to focus only on what happens when the value of the chosen index rises above or falls below a certain level.]* *[The index is used to determine the price paid for the Generator's output and used to determine the Customer's supply price. Most monetary flows will, therefore, be under the PPA (from Supplier to Generator) and under the Supply Agreement (from Customer to Supplier).]* *[They synthetic PPA approach allows the Generator and the Customer to agree to payment adjustments between them only to 'correct' for deviation from the agreed level or index. The effect is to stabilise the price for each of them and involves smaller money flows. The value of the contract and, therefore, sensitivity to counterparty creditworthiness is, therefore, lower than with the sleeved supply agreement.]* *The synthetic PPA is also likely to include a requirement for guarantees of origin but may also include other bespoke requirements important to Customer and/or to Generator].*

HOT 5 – Peer to Peer PPA

Peer to Peer Supply Agreement

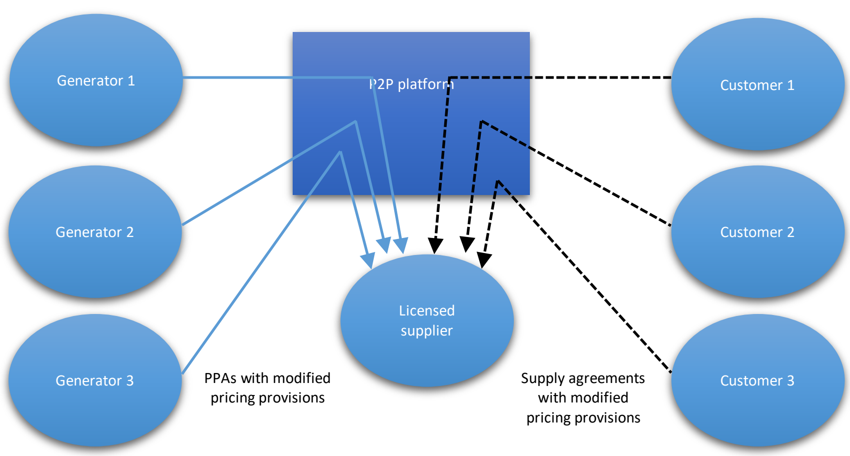
Parties: *[Generators],* [Customers], and *[Licensed Supplier]*

Description and Assumptions

- Various different approaches may be possible to implement a peer-to-peer supply. The only model currently operating adopts an approach that can be compared to a sleeved supply. Generators and demand Customers (who are not on the 'same site' or connected via 'private wire' but who are all half-hourly metered) agree a pricing structure through a peer-to-peer platform and a notional supply of that power is effected over the grid through a licensed Supplier. The Supplier also manages all risk of a supply and demand mismatch or 'imbalance'.

- Peer-to-peer matching allows demand Customers to build a portfolio of preferred generation assets/types and reach agreement on pricing with Generators.

- A structure for implementing peer-to-peer supply is illustrated below:



- This approach involves each Customer and each Generator entering into terms of use of the peer-to-peer platform. These terms govern use of the platform and rules on setting price amongst other things.

- Each Generator also enters into a power purchase agreement. The principal purchaser is the Licensed Supplier.

- Each Customer also enters into a supply agreement. The principal seller is the Licensed Supplier.

Peer-to-peer terms	
Parties	(1)^n *[**Generators**] (as potential sellers of electricity)* (2)^n *[**Customers**] (as potential buyers of electricity)* (3) *[**Licensed Supplier or other**] (as peer-to-peer host)*
Peer-to-peer terms	*[These will allow potential Generators and potential Customers to be introduced]* *[They are the 'rules of the club' so will be specific to the USP of the particular peer-to-peer platform. However, they are likely to address things such as:* • *how Generators describe their generating projects, the stage they are at in their development before they can come onto the platform, the amount of export electricity they expect to be able to sell;* • *how Customers describe their demand profile;* • *how Generators and Customers are expected to behave in terms of price setting]*
PPA	
Parties	(1) *[**Generator**] (as generator of electricity)* (2) *[**Licensed Supplier**] (as off-taker)*
PPA terms	*[These are likely to be the Licensed Supplier's standard PPA terms (see HoTs 1).]* *[The Licensed Supplier's standard PPA terms are modified to recognise that:* • *the Generator and a Customer or Customers will agree the price for the Generator's export output through the peer-to-peer platform;* • *when the Generator is generating as expected and the Customers are consuming as expected, the price agreed between them applies;* • *when there is surplus export output, the Licensed Supplier's pricing prevails and sets the price paid for the surplus export output]*
Supply Agreement	
Parties	(1) *[**Licensed Supplier**] (as seller/supplier)* (2) *[**Customer**] (as customer and consumer of electricity)*

<table>
<tr>
<td>Supplier’s terms of supply</td>
<td>
[Per above, this will be the Supplier’s terms of supply.]
[The Supplier’s standard terms of supply are modified to recognise that:

the Customer’s electricity demand is to be met by the Supplier but this will involve:

notionally utilising electricity sourced from the Generator’s or Generators’ export output over the grid; plus
other electricity (sourced by the Supplier) as may be needed to meet the Customer’s electricity demand where this is more than the Generator’s export output (i.e. top-up, back-up and short-term balancing);

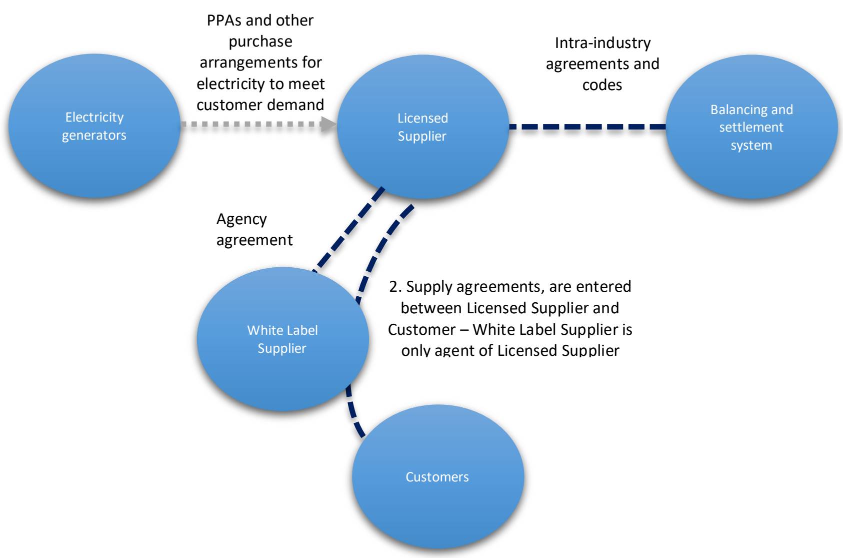
title to delivered electricity passes to the Customer at the demand meter point.]

[The price paid for supplied electricity will be:

when export output from selected Generators is sufficient to meet the Customer’s demand, the price agreed between Generator(s) and Customer(s) using the peer-to-peer platform prevails;
when there is a shortfall in the amount of export output from selected Generators relative to Customer demand, the Licensed Supplier’s pricing prevails]

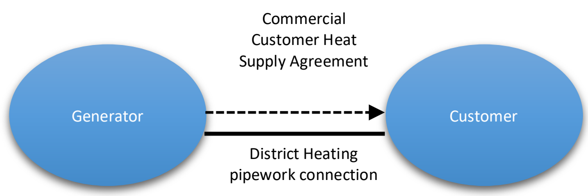
</td>
</tr>
</table>

HOT 6 – White Label Electricity Supplier Agreement

White Label Supplier Agreement **Parties: *[White Label Supplier], [Licensed Supplier]* and *[Customers]***	
Description and Assumptions	• A White Label Supplier is an unlicensed company that has a contractual agreement with a Licensed Supplier to sell electricity to consumers using the White Label Supplier's brand. The White Label Supplier might be an existing and well-known brand, such as a supermarket chain or a local authority or it may have been set up specifically (e.g. to service a particular part of the community). • The White Label supplier will need an agency agreement with a fully licensed supplier to sign-up Customers on behalf of the Licensed Supplier. • This allows the White Label Supplier to rely on the Licensed Supplier for all the regulatory interaction with industry codes, billing of customers and customer service functions, using their existing systems and infrastructure to manage the electricity supply to the end customer. • The split of supply functions between the Licensed Supplier and the White Label Supplier will depend on their commercial objectives. Some White Label Suppliers will want the Licensed Supplier to undertake as many business functions as possible, whereas others may provide some functions themselves, particularly if they already have the infrastructure in place (for example, they may already have a call centre and prefer to use their own service in this regard). Example structure: 

1. White Label Supplier Agreement (or Agency Agreement)	
Parties	(1) *[**White Label Supplier**] (as agent)* (2) *[**Licensed Supplier**] (as principal)*
White label terms	*[The White Label Supplier will be appointed as the Licensed Supplier's agent for the specified purpose. This will cover signing up Customers that the Licensed Supplier will supply with electricity. It may be restricted to certain categories of Customer.]* *[The appointment will also address any split of functions, particularly where the White Label Supplier has its own infrastructure – e.g. to service customer enquiries, etc. However, under this model, all regulatory functions will only ever be performed by the Licensed Supplier.]* *[The White Label Supplier may be paid a fee for attracting new Customers to the Licensed Supplier]*
2. Supply Agreement	
Parties	(1) *[**Licensed Supplier**] (signing directly as supplier) or [**White Label Supplier**] (signing as disclosed agent of Licensed Supplier)* (2) *[**Customer**] (as customer and consumer of electricity)*
Supplier's terms of supply	*[Per above, these will be the Licensed Supplier's terms of supply.]* *[They may contain a tariff structure specific to the White Label arrangement]*

HOT 7 – Commercial Heat Supply Agreement

Commercial Heat Supply Agreement: *[Supplier]* (1) and *[Customer]* (2)	
Description and Assumptions	• A heat generator (expected to be a CHP generator) supplies heat directly to a commercial customer via a district heating network. • Example structure: 
Parties	(1) Heat Supplier (2) Commercial Customer
Heat Supply and Ancillary Services	*[To include:* ○ *provision of heat to be made available 24 hours per day for the duration of the supply agreement (subject to emergency disconnection, requirements of Law, planned maintenance and disconnection due to non-payment);* ○ *provision of customer query management facilities for end users to query energy invoices, service interruptions, maintenance/ repairs (etc);]* ○ *[maintenance and/or replacement of meters, customer interface units and heat interface units]*[37].
Billing/ Pricing	*[To include:* ○ *invoicing for energy use based on meter readings*[38]*, pricing comprising:*

[37] Commercial Customers may undertake this role, rather than the Heat Supplier, however where these units are owned by the Heat Supplier, maintenance obligations will usually lie with the Heat Supplier.
[38] Metering and Billing Regulations will apply, which will normally require the meters to be "smart" and therefore capable of remote reading.

	▪ *Heat Price* ▪ *Maintenance and Replacement Service Charge* ▪ *Fixed Standing Charge* o *providing pricing protection (in respect of heat/hot water/total energy costs), with regular price comparator review;* o *pricing to be clearly explained and statements to set out breakdown of costs;* o *[offer of dual fuel discounts to customers]*[39]*;* o *provision of customer query management facilities for end users to query energy invoices]*
Customer Protection	*[To include:* o *access to customer premises only by prior arrangement or in an emergency and the obligation not to cause any damage (and any damage caused to be satisfactorily rectified);* o *ability to challenge meter readings and request testing of meters;* o *data protection and confidentiality;* o *appropriate dispute resolution procedures]*
Fault Rectification/ Performance Regime	*[To include:* o *provision of emergency call out services/response regime for fault rectification of plant and networks*[40]*;* o *appropriate standards of performance and compensation regime for breach. Guaranteed minimum standards of Heat supply will be dependent on the type of Commercial Customer and their bargaining power*[41]*]*

[39] This will only be relevant where the Heat Supplier is either a licensed supplier and able to also offer electricity, or where the Heat Supplier is able to provide electricity from a CHP within licence exemptions (pursuant to the Electricity Order 2001 and the Electricity Act 1989).

[40] Note that depending on the contractual framework, the Heat Supplier may or may not be the operator of the DHS. If they are a separate entity, a coherent customer facing offering must still be provided, with a help desk provided by eg O&M Contractor, Metering and Billings Contractor, Concessionaire, DBOM Contractor (etc), from which complaints are appropriately dealt with and the relevant parties notified in order to rectify any problems.

[41] For example, a hotel may have a greater costs exposure for failure to provide heat, therefore they would request a higher compensation.

Customer responsibilities	*[To include:* ○ *payment;* ○ *[operation and maintenance of, and] preventing damage to / not tampering with the heating system within the Commercial Unit;* ○ *not obtaining heat from another supplier during term of the Agreement (unless during a period of heat suspension that does not result from non-payment).]*
Non- Payment	*[To include clear procedure following non-payment, with disconnection only after a minimum of non-payment for [x] days, followed by a minimum of [x] reminders and continued non-payment for a further [x] days after the last reminder[42].]*
Disconnection	*[Disconnection only following non-payment, in an emergency (including emergency repairs to the network), for planned notified maintenance or where required to do so by Law.]*
Limitation on Liability	*[The Heat Supplier will likely choose to limit their liability to the Customer. The limitation should be reasonable in the circumstances.* *Limitations on Customer liability may also be included.]*
Termination by Customer	*[Right for Customer to terminate should be clearly set out.]*
Boiler Plate	○ Subcontracting/ assignment ○ Notices ○ Third Party Rights ○ Change in Law ○ Waiver ○ Invalidity and Severability ○ Entire Agreement ○ Governing Law

[42] Depending on the split of contractual responsibilities and the share in risk and reward that the Heat Supplier is taking (for example, if they are also Concessionaire), they may also take the credit risk for non-payment of consumers.

ANNEX 3:

ELECTRICITY REGULATION

1 GENERATION LICENCE EXEMPTIONS

1.1 Class A: Small generators - those who do not provide more than either 10MW or 50MW (where the generating station has a declared net capacity of less than 100MW) from any one generating station, disregarding power supplied to a single or qualifying group of consumers on the same site as the generating station, who consume all the power supplied to them by the generating station (unless they resale in accordance with the Class B electricity supply exemption).

1.2 Class B: Offshore generators- those who do not generate electricity except at a generating station which is situated on an offshore installation; and do not supply such electricity except to premises which constitute or are comprised in an offshore installation.

1.3 Class C: Generators not exceeding 100 megawatts - those who do not provide any electrical power except from generating stations which were connected to the transmission system on 30th September 2000 and which are not normally capable of exporting more than 100MW to the transmission system.

1.4 Class D: Generators never subject to central despatch- those who do not provide electrical power except from generating stations which were connected to the transmission system on 30th September 2000 provided that under the terms and conditions of their licences granted under section 6(1)(a) of the Electricity Act 1989 they were not on that date required to submit those stations to central despatch by the licensed transmitter (central despatch being the process by which the licensed transmitter scheduled and issued direct instructions to licensed generators for the despatch of electrical power prior to 27th March 2001).

2 SUPPLY LICENCE EXEMPTIONS

2.1 What constitutes electricity "supply" and, therefore, requires activities to be carried on under a licence or under one of the class exemptions applicable to supply, turns on the definition of "supply" given in the Act. The Act defines electricity "supply" as follows:

"supply" in relation to electricity, means its supply to premises in cases where—
(a) it is conveyed to the premises wholly or partly by means of a distribution system, or
(b) (without being so conveyed) it is supplied to the premises from a substation to which it has been conveyed by means of a transmission system,
but does not include its supply to premises occupied by a licence holder for the purpose of carrying on activities which he is authorised by his licence to carry on"

2.2 Consequently, to constitute 'supply', there must be physical delivery of electricity to premises and it must be:

- conveyed over a low voltage distribution system; or
- delivered from a sub-station connected to the high voltage transmission system; and
- it must not be delivered to a person holding a generation, distribution or supply licence for purposes ancillary to their licensed activity.

2.3 Once the activity of "supply" is established, in order to avoid the need to be licensed, the supply activity must fall under one of the three licence exemptions.

2.4 The Class A: small supplier licence exemption - this exempts:

- those who only supply electricity which they generate themselves; and
- the amount of electricity they supply is less than 5MW and not more than 2.5MW of that is to domestic customers.

This 5MW/2.5MW supply limit is applied on an aggregate basis across sites and across a corporate group. Therefore, it is only available to permit relatively limited supply activity. Also, it does not explicitly permit back-up or top-up supply, therefore is not a solution for an intermittent renewable generator wishing to supply a customer with a complete energy solution. However, for a generator wishing to supply their own electricity directly to commercial customers, provided that the distribution exemptions are met, this licensing exemption

2.5 The Class B: resale supply licence exemption – this exempts those who on-supply electricity:

- which has been supplied to their premises by a licensed supplier or a Class C exempt supplier (except that there is no requirement that the categories of consumer under Class C consume all the electricity supplied to them); or
- which they generate themselves or which is supplied by an exempt supplier which makes supplies when either their normal supply (from a licensed supplier or Class C supplier) is temporarily interrupted or the plant used to generate electricity is being tested.

The Class C electricity supplied in category (i) must only be made to premises which are on the same site from which the supply is made and is subject to additional restrictions in respect of quantities of Class C electricity made over previous years and in respect of supply to domestic customers (no more than 250MW hours in any year).

This exemption may be of some limited value to an entity on the Business District wishing to supply customers with its own generation, plus back-up power, *however*, it relies on the supplies being made to *"their premises".* Careful consideration of property arrangements and corporate structuring will therefore be very important.

2.6 The Class C: on-site supply licence exemption - this exempts those who only supply electricity which:

- they generate themselves or which they generate themselves together with electricity which they receive from a licensed supplier; and
- is consumed by eligible consumers.

The exemption sets out a list of eligible consumer types by reference to consumption scenarios. Many of these are overlapping and complex. However, they can be loosely summarised as follows:

- a "single consumer" or an "onsite qualifying group" (this is a single consumer or consumers in the same corporate group) that, in either case:
  - occupies the **same site** as the generating station; and
  - consumes all the electricity at that premises (other than where they make Class B exempt on-supplies);
- "additional group consumers" each of whom:
  - occupies the **same site** as the generating station or receives the electricity over "**private wires**"; and
  - consumes all the electricity at those premises (other than where they make Class B exempt on-supplies); and
  - total power supplied is less than 100MW, of which not more than 1MW is for domestic supply;
- a "remote consumer" or "remote qualifying group" [this is a single consumer or consumers in the same corporate group] that, in either case:
  - receives at least one third of the output of the generating station at premises they occupy on the **same site** as the generating station or which is connected by **private wire**;

  - consumes all the electricity at those premises (other than where that they make Class B exempt on-supplies);

- additional group consumers consuming less than 100MW (by which, it is assumed, at peak load) together with any of a single consumer, an on-site qualifying group, a remote consumer or a remote qualifying group (or any combination of them);
- any other person where the provision of the output of the generating station does not amount to the supply of electricity.

To understand the above, the following definitions are also important.

"private wires" means electric lines owned by—

- the supplier in question;
- consumer who receives a supply from the supplier in question from the generating station;
- the owner, lessor or lessee of the generating station or of one of the premises to which a supply is made by the supplier in question; or
- any of the persons described above jointly with any other of the persons described above,
- provided that the owner of those wires is not a licensed distributor.

"site" is not defined nor are *"premises"* or *"same site"* (in the context of consumers) but some guidance may be drawn from the treatment of generating sets being on the *"same site"* as each other if they are—

- on the same premises;
- on premises immediately adjoining each other; or
- on premises separated from each other only by a road, railway or watercourse or by other premises occupied by the consumer in question, by any other person who together with that consumer forms a qualifying group, or by the person seeking to take advantage of the relevant generation or supply exemption.

3 DISTRIBUTION LICENCE EXEMPTIONS

3.1 Like supply, what constitutes electricity 'distribution' and, therefore, requires activities to be carried on under a licence or under one of the class exemption applicable to distribution all turns on the definition of 'distribution' given in the Act. The Act defines electricity 'distribution' as follows:

"*distribute by means of a distribution system, that is to say, a system which consists (wholly or mainly) of low voltage lines and electrical plant and is used for conveying electricity to any premises or to any other distribution system*"

3.2 The definition of 'distribution' is, therefore, somewhat circular but the use of the word 'distribute' (without further explanation) within the definition of 'distribution' suggests an ordinary meaning should be given to the word. 'Distribute' may, therefore, imply some sharing of electricity between consumers or, perhaps, premises.

3.3 This suggests that a single-wire, point-to-point connection between a generating plant and a point of consumption all owned by the same person on the same premises is not, of itself, capable of being regarded as a distribution system if no-one else is also connected. This is important when considering 'self-supply'.

3.4 Once the activity of "distribution" is established, in order to avoid the need to be licensed, the supply activity must fall under one of the three licence exemptions:

3.5 Class A: small distributors – this exempts those who distribute less than 2.5MW of electrical power for the purpose of giving (or enabling) supply to domestic customers. This 2.5MW domestic supply limit is applied on an aggregate basis across sites operated by a person or operated by any member of the same corporate group. However, it would exclude distribution in another part of a corporate group, if that falls under the Class B distribution class exemption, described below.

3.6 Class B: on-site distribution – this exempts those who distribute:

- any amount of electricity for commercial purposes; and
- not more than 1MW of electrical power for the purpose of giving (or enabling) a supply to domestic consumers from a generating station embedded in the same distribution system.

This class exemption allows for electricity to come from other 'standby' sources on a temporary basis when the generator is not actually producing the power itself or is producing less than normal due to generating plant outages, etc. However, it does not allow 'top-up' above the normal level of output of the generating station. So, for example, for a 500kW generating plant, it only allows up to 500kW of distribution for domestic supply.

3.7 Class C: distribution to non-domestic consumers – this exempts those who undertake any amount of distribution to commercial customers only. This exemption is not available if the distribution network is used at any time to distribute any electrical power at all for the purpose of giving (or enabling) a supply to domestic consumers.

4 SPECIFIC CONSIDERATION OF THE LICENSING REGIME AND PRIVATE WIRE/ MICRO-GRID SUPPLY

4.1 The legal definition of 'private wires' is found in the Class Exemption Order (as set out under Annex 3) and sits within and has relevance to the electricity "supply" class exemptions. Ownership of the wires is the first defining requirement. Yet, the proviso that the owner of the wires is not a licensed distributor necessarily means that, to be lawful, the activity carried on over the relevant private wires is either 'distribution' which falls within an electricity distribution class exemption; or some other conveyance of electricity which does not constitute 'distribution'. Consequently, in order to understand the legal significance of 'private wires', it is also necessary to understand:

- the exemptions under which electricity distribution can be carried on without a licence, as a key component of the definition of 'private wires';
- what other conveyance of electricity, which does not constitute 'distribution' might be relevant; and
- the use made of the term 'private wires' within the relevant electricity supply exemptions.

4.2 Note that for the purposes of this analysis, a micro-grid is assumed to be a private wire system, that falls within the definition of private wire (i.e. is either owned by the supplier of electricity or the consumer).

4.3 Licence-exempt electricity distribution in the context of private wires: Please see the analysis above. Any of these exemptions may be used in the context of private wires.

4.4 Licence-exempt electricity supply in the context of private wires: There is only one supply exemption that is directly relevant to private wires – that is the Class C exemption, which has been summarised above.

It is important to understand that a privately-owned electrical connection between generator and consumer may fail the ownership test for the purposes of the definition of *'private wires'* but that failure may not be fatal to the exemption because generator and consumer may still be considered to be on the *'same site'* as one another. Equally, the *'private wires'* definition may rescue a situation where the *'same site'* test is not quite met.

From the above, it should be apparent that:

- the Class C supply exemption is potentially very useful for operators of generating plant which they wish to use to meet some of the electricity demand of customers on the 'same site' or connected by 'private wires';

- what constitutes a 'private wires' connection or being on the 'same site' has a very particular legal definition which turns largely on property ownership and boundary issues so it may be tempting to jump to a favourable conclusion that proves to be incorrect on closer enquiry;

- what is and what is not therefore exempted under Class C supply exemption is far from straightforward and requires a good understanding of property ownership, corporate group structures, commercial supply arrangements and the point or points at which 'supply' actually takes place.

4.5 Supplies over private connections that are not 'same site' or over 'private wires'

Electricity supplies which are made over a distribution system not belonging to a licensed Distribution Network Operator and which are not made by generator-supplier to a consumer on the same site or connected by private wires are not necessarily unlawful. They may still be permitted without a licence provided:

- the distribution activity still meets one of the distribution licence exemptions described above; and

- the supply activity falls within one of the other limbs of the Class C exemption or under the Class A (small supplier) or Class B (re-sale) exemptions.

4.6 How is 'self-supply' different?

Self-supply has different meanings in different contexts. In terms of the Electricity Act and the requirement to hold a licence or fall within an exemption, it is important first to determine whether any given self-supply scenario actually involves an Electricity Act *'supply'* or if *'distribution'* even arises. Each scenario needs to be assessed on its facts. Two example scenarios are:

Scenario A: a generator generates electricity on one premises and consumes that electricity itself on the same premises. It may be neither distributing that electricity nor supplying that electricity within the definitions given by the Act. Where that is the case, neither a licence nor an exemption is needed in respect of the carriage or delivery of that electricity.

Scenario B: a generator generates electricity on one premises and conveys it at 11kV to multiple consumers on an industrial site. There is low voltage *'distribution'* and physical delivery. Consequently, there is also *'supply'* for the purposes of the Act. Both the distribution and the supply must either be licensed or fall within an exemption. However, parasitic load of the generating station (that is, electricity consumed within the process of generating) would not be delivered to premises nor distributed so neither a *'supply'* nor *'distribution'* arises in respect of that parasitic load and it requires neither a licence nor an exemption.

Certain other legislation uses the term *'self-supply'* (or uses similar terms) but may or may not define this by reference to the Electricity Act definitions. Therefore, it does not have a consistent meaning or capture across legislation and care should always be taken when assessing the treatment of self-supply.

ANNEX 4:

HEAT REGULATION

1 The Metering and Billing Regulations

1.1 The Metering and Billing Regulations[43], are derived from the EU Energy Efficiency Directive[44]), with the primary purpose of encouraging heat suppliers to increase their uptake of final customer energy metering and provide more accurate and informative billing methods. The intention is to bring communal and district heating more in line with gas and electricity sectors where such matters are governed in detail, in order to make consumers more aware of what they are being charged and encourage economical use of heat, empower consumer to challenge their heat supplier on the performance of the heating system and to minimise inefficiencies.

1.2 The Regulations apply to:

- district heat networks;[45]
- communal heating;[46]

and require heat suppliers[47] in relation to each district heat network or communal heating system operated by them to:

- notify the details of the network or system to the National Measurement and Regulation Office;
- install heat meters and temperature control devices or heat cost allocators and thermostatic radiator valves; and
- issue compliant bills (i.e. are accurate, based on actual consumption and contain certain billing information).

1.3 For new build district heating schemes, these requirements are unlikely to be onerous, as they generally reflect what has become good industry practice and what will certainly be adhered to by any district heating scheme which is registered with the Heat Trust (see further below).

1.4 However, for older district heating schemes which have not been upgraded and for those smaller communal schemes operated by landlords on a building scale, these requirements could require costly improvements to the heating infrastructure, changes to the way in which landlords divide up the costs of heating (and cooling) through service charges and additional administrative burdens relating to the regular filing of information with the National Measurement and Regulation Office.

1.5 With relation to communal heating schemes with landlord supplied heat, there is a degree of uncertainty in the market as to whether the Metering and Billing Regulations will override the terms of existing leases with regards to service charges (for example, based on fixed percentages or floor areas). Arguments as to technical feasibility of billing could then be run on the basis that the

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[43] SI 2014/3120

[44] Directive 2012/27/EU (in particular Articles 9, 10 and 11)

[45] Defined as *"the distribution of thermal energy in the form of steam, hot water or chilled liquids from a central source of production through a network to multiple buildings or sites for the use of space or process heating, cooling or hot water"*

[46] Defined as "*the distribution of thermal energy in the form of steam, hot water, or chilled liquids from a central source in a building which is occupied by more than one final customer, for the use of space or process heating, cooling or hot water"*

[47] Defined as *"a person who supplies and charges for the supply of heating, cooling or hot water to a final customer"*

lease requires a different allocation of charges than one based on actual consumption. Further complications could arise where a landlord is required to bill entirely separately for heat from other service charges as the lease provisions prevent the change that the Metering and Billing Regulations require.

1.6 A pragmatic approach to take would be to assume that the legislation will prevail, because breach of the regulations is a criminal offence, to which contractual obligation is no defence. Landlords should therefore make appropriate arrangements to adhere to the regulations and make tenants aware of the changes.

1 The Landlord and Tenant Act 1985

1.1 Contrary to common misconception, there is no general, statutory obligation imposed on landlords to provide heat. However, in certain circumstances, landlords do have specific statutory obligations directly relevant to district heating. Essentially, these can be characterised either as obligations:

- to provide or maintain certain infrastructure or services; or
- not to pass through to tenants unreasonable costs incurred.

1.2 Under the LTA 1985, s 11, landlords must keep in repair and in proper working order the installations in a dwelling-house for space heating and for heating water. This obligation only applies to domestic lettings, under a short lease. A short lease is a lease of a dwelling house for less than 7 years.

1.3 Under the LTA 1985, ss 18 and 19, landlords can only pass through to tenants reasonable costs of maintenance (for example, of networks and apparatus within the building) if they are charging in advance of incurring the costs. And, under the LTA 1985, s 20, landlords' rights to pass through to tenants costs they incur under Qualifying Long Term Agreements are severely limited unless they have undertaken a statutory consultation.

2 Voluntary Standards

2.1 CIBSE/ ADE Heat Networks: Code of Practice

2.1.1 The Code of Practice was produced as a joint project between the CIBSE and the ADE and was launched on 8 July 2015. It is intended to raise standards across the DHN supply chain, setting minimum and best practice standards to provide greater confidence for developers and local authorities. Its stated purpose is to:

- improve the quality of feasibility studies, design, construction, commissioning and operation by setting minimum requirements and identifying Best Practice options;
- deliver energy efficiency and environmental benefits;
- meet good customer service levels; and
- promote long-lasting heat networks in which customers and investors can have confidence.

2.1.2 The Code of Practice is intended to apply to heat networks designed to supply new developments and networks that are retrofitted to supply existing buildings. The Code of Practice is widely referred to and often incorporated into local authority/developer concession agreements by reference and, arguably, is now considered to be general good industry practice and therefore incorporated by inference.

2.2 Heat Trust Scheme

2.2.1 The Heat Trust Scheme is a voluntary standard that was launched in November 2015 which sets out a minimum quality and level of customer service that heat suppliers supplying heat through DHN should provide to domestic and micro-business customers. The Scheme applies to metered and unmetered heat customer properties where the heat customer pays for the heat energy supply directly to the heat supplier. The Scheme does not apply to district cooling.

2.2.2 Although voluntary, the Scheme is supported by government as a self-regulation initiative that recognises best practice. It does fill a particular gap in the governing framework with regard to consumer protection and is increasingly seen as a minimum requirement in tenders for DHN ESCO providers, however it does not provide wider standards for DHN and it is of course voluntary, therefore it does not assist customers where schemes have not signed up for participation.

2.2.3 For customers supplied by DHN schemes which participate in the Scheme, there is access to an independent process with the Energy Ombudsman for settling complaints between customers and the heat supplier. This service is free for customers to access.

2.2.4 The Scheme Rules set our rules in relation to customer service standards and customer protection requirements, including (in relation to micro-businesses):

- heat supplier obligations (relating to minimum design parameters and flow and return temperatures);
- continuity of supply;
- guaranteed service payments for failure to meet performance standards;
- an obligation to fulfil all legal requirements under the Heat Network (Metering and Billing) Regulations 2014 in relation to the installation of heat meters/ heat cost allocators (see above);
- an obligation to provide each customer with a heat bill that complies with all legal requirements under the Heat Network (Metering and Billing) Regulations 2014.

2.2.5 Note that the Scheme does not cover three key areas (as the Heat Trust does not have the legal authority to comment or prescribe standards):

- provide comment or arbitration on pricing;
- provide guidance on contract length; or
- provide a supplier of last resort.

These issues are being addressed in the Competition Markets Authority's (CMA) heat networks market study discussed below.

2.3 CMA heat networks market study

2.3.1 The CMA launched the CMA Market Study to examine three broad themes:

- transparency of information, both prior to customers moving into a property and during residency;
- concerns regarding the monopoly supply of heat, the inability of customers to switch and the potential misalignment of the incentives of the builders, operators and customers of heat networks; and
- outcomes for heat network customers, including prices, service quality and reliability.

2.3.2 The outcomes of the Study were published on 23 July 2018 and their recommendations were put to Government.

2.3.3 They suggest that a statutory regime governing the regulation of heat networks is required, which would require “design of suitable duties for the regulator in relation to prices, quality of service, transparency of information and minimum technical standards. It would also require a mechanism to identify, monitor and enforce the regulation. This could be through a licensing regime, as is currently under consideration in Scotland”.

2.3.4 They also recommend that explicit recognition of heat networks should be developed in relation to:

- Planning and Building Regulations, where the CMA have identified that rules regarding heat networks are not clear enough.
- Leaseholder arrangements and tenancy agreements, where it should be clearer how heat networks are treated in terms of ownership and responsibility for operation and maintenance.
- Property sales disclosure rules including Energy Performance Certificates, which are not currently designed to reflect the performance of heat networks.

2.3.5 The next steps will be to see if the Government take on board the recommendations and move to regulating the sector. It seems likely that the Scottish Government may take the lead in this regard.

ANNEX 5:

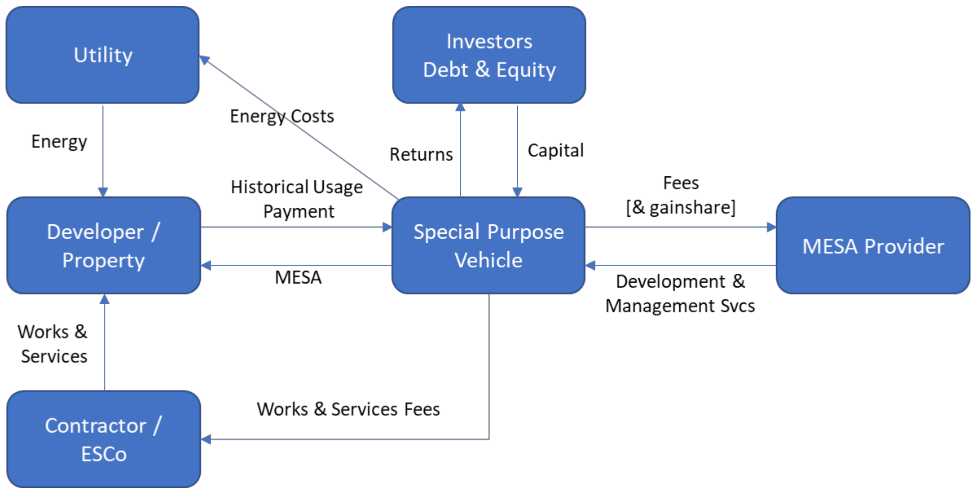
VARIANTS OF ENERGY PERFORMANCE CONTRACTING

(a) Energy Performance Contracts (EPC): are the most common form of services agreement and are a contractual arrangement between the beneficiary and the provider of an energy service in which the provider, an Energy Service Company (ESCO), provides a guarantee of performance for the installed measures . The ESCO does not generally provide the required capital but usually works with established lenders to facilitate provision of finance, although the customer can also decide to directly finance the project with its own equity. The ESCO's guarantee is meant to ensure that the savings are sufficient to pay debt service. If there is a shortfall, the host, but not the lender, has recourse to the ESCO. Lenders require ESCOs with good track records and strong balance sheets that can ensure construction is completed on time and on budget and can support the performance guarantee.

In addition to the responsibilities above, the ESCO usually maintains an ongoing service contract, tied to the new equipment installed as part of the works. Because of the performance guarantee some form of performance measurement and verification (M&V) is required for the life of the contract and the methodology should be specified in the contract in the form of an M&V Plan. The M&V responsibility should be executed in a way that avoids conflict of interest, i.e. the ESCO effectively measuring its own success and independent third party M&V specialists, expert in the application of recognised standard techniques such as those of the International Performance Measurement & Verification Protocol (IPMVP), can be engaged to ensure independence.

The complexity of EPCs has led to the emergence of EPC facilitators in some market, as well as procurement frameworks to assist public sector agencies to develop and implement contracts and link projects to financing.

(b) Managed Energy Services Agreements (MESA), provide for the developer to assume responsibility for payment of utility bills on behalf of the host asset. Rather than a bill based on savings, the host asset pays the developer an amount equal to the historical energy usage adjusted for current energy rates, weather, and occupancy of the building. This approach typically requires a fully calibrated model reflecting 365 days of energy usage and capable of replicating historical usage with a high degree of accuracy. The formulae for calculating MESA bills based upon future rates, weather and occupancy are provided in the MESA contract.

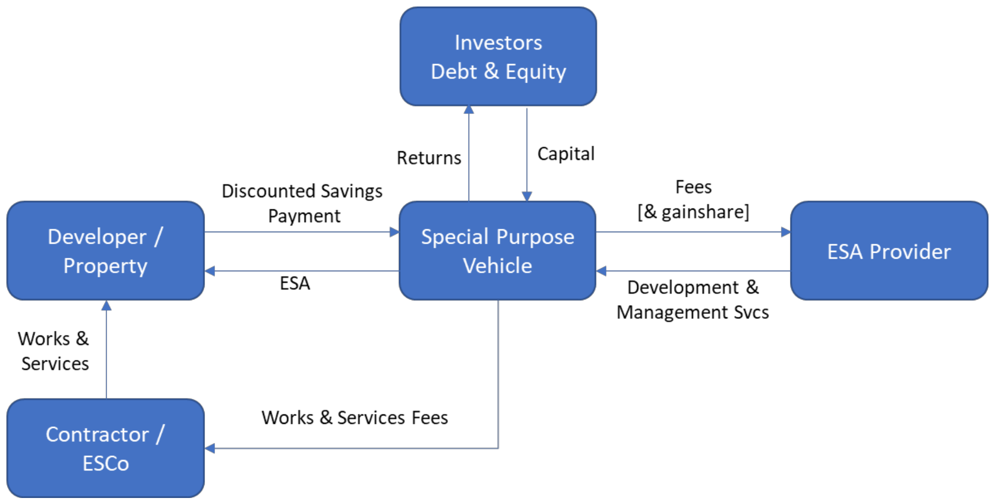


The MESA developer does not typically assume responsibility for procuring energy, which otherwise could represent a conflict of interest; since the asset pays the developer based on historical usage multiplied by current rates, the developer would have a natural disincentive to source lower-cost energy. Typically the MESA makes payment of the energy bill a contractual obligation and an administrative function of the MESA developer, but it does not generally require that energy bills appear in the name of the developer. These bills typically remain in the name of the host asset.

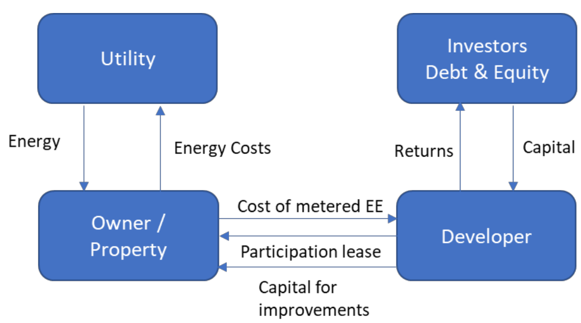
The developer may or may not engage a full-service ESCO to implement the project. MESA presents a higher degree of performance risk for the developer, who may wish to manage that risk directly rather than outsourcing project design and construction.

(c) Efficiency Services Agreements (ESA), provide for a developer to retrofit the host property, and the host property pays the developer the savings, typically with a negotiated discount to the facility's historical costs. In contrast to a MESA, the ESA provider does not take responsibility for utility payments, which remain in the hands of the host property.

The ESA developer may act as designer and installer of the project, engaging contractors directly, or outsource the function to an ESCO



(d) Measured Energy Efficiency Transaction Structures are an emerging option in the USA whereby energy efficiency is metered. Metering is achieved by combining smart meter consumption data and building modelling to produce a dynamic baseline, against which savings are measured. Units of energy saved are then paid for on a per unit basis.



A utility company can fill the role of developer, or the equity provider, or this can be undertaken by an experienced project developer working in partnership with capital providers. A number of advantages are claimed for the MEETS structure including:

- the deal structure resembles a Power Purchase Agreement, a well understood instrument that can be financed
- it provides an incentive for the utility to sell efficiency
- the energy tenant agreement looks like standard real estate leases and therefore is easy to understand for real estate professionals
- energy efficiency could become a tradable resource.