Ener-Vate Consultancy Limited

Heat & Power ESCo Review for Horton Heath

A Techno-Economic Review of a Heat & Power ESCo option for Eastleigh Borough Council

SMARTKLUB
Empowering Communities

26 March 2021 | Ref: 2075-EBC-003

Contents

	Glossary
ASHP	Air Source Heat Pump
ESCo	Energy Services Company
LA	Local Authority
EBC	Eastleigh Borough Council
D&B	Design & Build
O&M	Operations and Maintenance
M&B	Metering & Billing
CWC	Crookes Walker Consulting
EVCP	Electric Vehicle Charge Point
kWh	Kilowatt Hours
MWh	Megawatt Hours
GWh	Gigawatt Hours
NIA	Nett Internal Area
BESS	Battery Energy Storage System
HV	High Voltage
OPEX	Operating Expenditure
CAPEX	Capital Expenditure
REPEX	Replacement Expenditure
COP	Co-efficient Of Performance
IRR	Internal Rate of Return
NPV	Net Present Value
CM	Capacity Market
FFR	Firm Frequency Response
DNO	District Network Operator
DUoS	Distribution Use of Service
iDNO	Independent District Network Operator
PPA	Power Purchase Agreement

1 Introduction

1.1 The Project

1.1.1 Ener-Vate Consultancy Ltd and SmartKlub Ltd have undertaken a research project to examine the options for establishing an Energy Services Company (ESCo) at new developments in each of four Local Authority (LA) areas.

1.1.2 The LA's involved in the project are:

- Eastleigh Borough Council,
- Isle of Wight Council,
- Bath and North East Somerset Council, and
- Cornwall Council.

1.1.3 This report looks in more detail at the possibility of developing a Heat and Power ESCo for the forthcoming Horton Heath Development for Eastleigh Borough Council, minimising the use of fossil fuels as an energy source.

1.2 ESCo Commercial Structure

1.2.1 A business that sells an energy service adds value to the provision of energy as a commodity by meeting some additional aspect of the customer's needs.

1.2.2 In its most developed form, an ESCo provides a commitment to deliver the benefits of energy to a specified level of performance and reliability whilst providing the ESCo entity itself with long-term revenue streams.

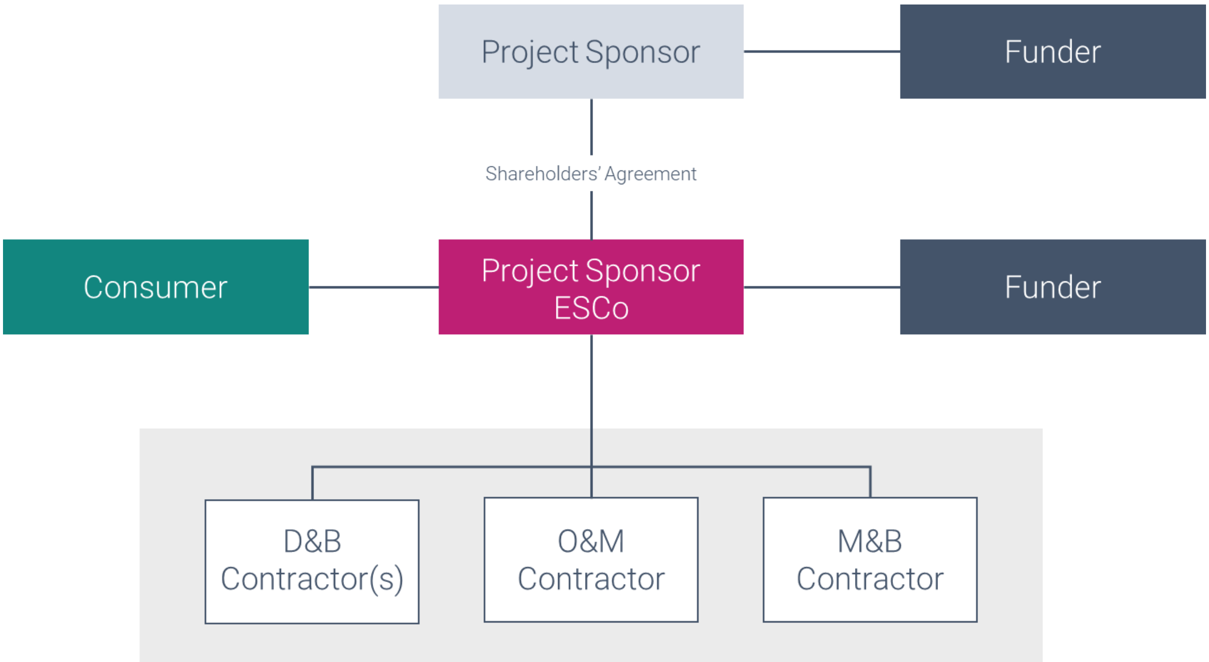
1.2.3 This business model is of particular interest to LA's because an ESCo with a performance contract has a strong incentive to increase the energy efficiency with which it meets its contract, and thereby drive down carbon emissions.

Following the recent "Common Scope ESCO Report", published by Ener-Vate as part of this project, the "Project Sponsor ESCo" has been selected as the structure that underpins this report as EBC has expressed interest in forming an ESCo.

As described in above separate report on supplying residential customers, all the options described in this study are designed to use class exemptions from the electricity regulations. This means that ESCos making supplies are not bound by the onerous obligations of licensed suppliers that are so costly and partly explain the patchy track record of challenger suppliers like Robin Hood Energy.

Using class exemptions is acceptable because there are strict compliance thresholds that means that each ESCo remains small in its scale and geographical scope.

2 Project Sponsor ESCo



2.1 Roles and Responsibilities

2.1.1 The Project Sponsor (EBC) establishes a wholly owned ESCo to deliver the low carbon energy scheme without a 3rd party. The needs and considerations of establishing an ESCo are included in the Common Scope report.

2.1.2 The Project Sponsor will be the low carbon energy scheme asset owner and operator.

2.1.3 The Project Sponsor will be responsible for funding the low carbon energy scheme as well as the procurement of D&B, O&M and M&B contractors.

2.1.4 In this case funding could be provided from EBC finances or via prudent Government borrowing methods.

2.2 Control, Risk and Reward

2.2.1 The Project Sponsor will have control of the ESCo's contractors, future expansion and tariffs for the low carbon energy scheme therefore giving a lot of flexibility.

2.2.2 The Shareholders' Agreement will regulate the decision making in the ESCo, for example which decisions can be made by the ESCo itself, and which decisions can be made by the Project Sponsor as shareholder.

2.2.3 In return, the Project Sponsor will take on all funding, construction and operation risk. It will also benefit from all of the financial rewards from the success of the project.

2.3 Exit Strategies

2.3.1 The Project Sponsor has the ability to sell its shares in the ESCo or refinance any debt extended to the ESCo.

2.3.2 Should the Project Sponsor wish to sell its shares, the low carbon energy scheme should be fully built and operational over a period of a few years to be attractive to a secondary market.

2.4 Advantages and Disadvantages of a Project Sponsor ESCo

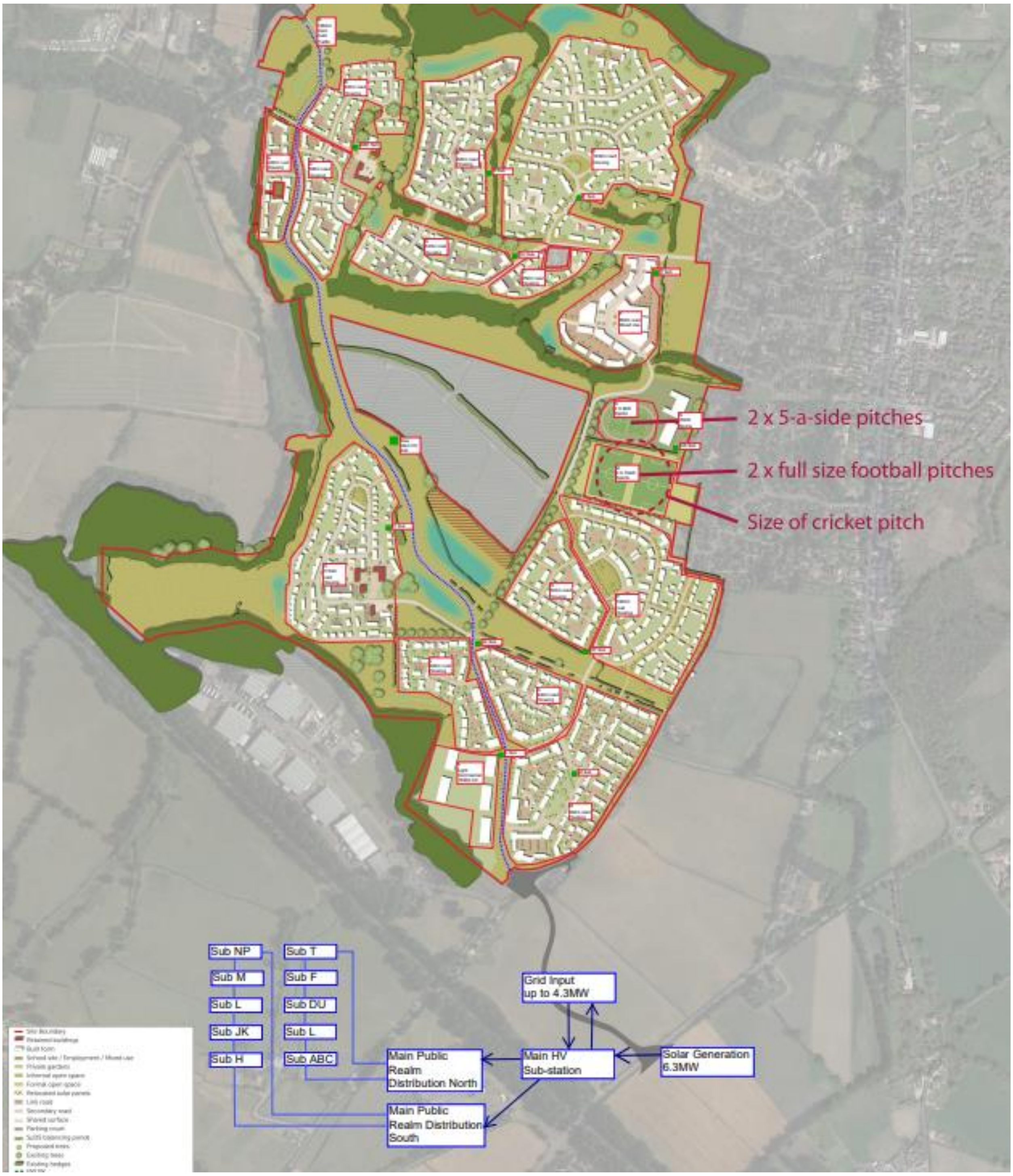
We recommend the Project Sponsor ESCo model as appropriate, due to its ability and control and to deliver the needs of the development and achieve climate change targets. Once the ESCo is established and proven for a period, it could be sold or part sold in order to reduce responsibilities and generate revenue. This could be part of a council strategy to "pump prime" ESCos in the local authority, with a finite amount of capital that is refreshed each time a proven ESCo is sold on. This will make Eastleigh more renewable, while limiting risk to the LA and showing leadership to the private sector.

Advantages	• Project Sponsor retains all strategic control over the project such as future expansion and setting power tariffs. • Opportunities to exit the project through the sale of shares and/or refinancing of project debt. • Maximises opportunities to use the clean solar energy from Chalcroft solar farm to supply businesses and common infrastructure.
Disadvantages	• Project Sponsor is exposed to all project risks (if not passed down to contractors). Examples of these are included in Annexe B of this report. • Responsibility for funding/securing funding lies with the Project Sponsor. • The Project Sponsor will need to procure external expertise and skills. • While this structure can include community energy involvement, it comes with much higher risks as the LA will be seen as accountable for any adverse outcomes. However, this scheme could incorporate community involvement without direct financial involvement. For instance a LA sponsored Housing Association scheme.

3 Assumptions

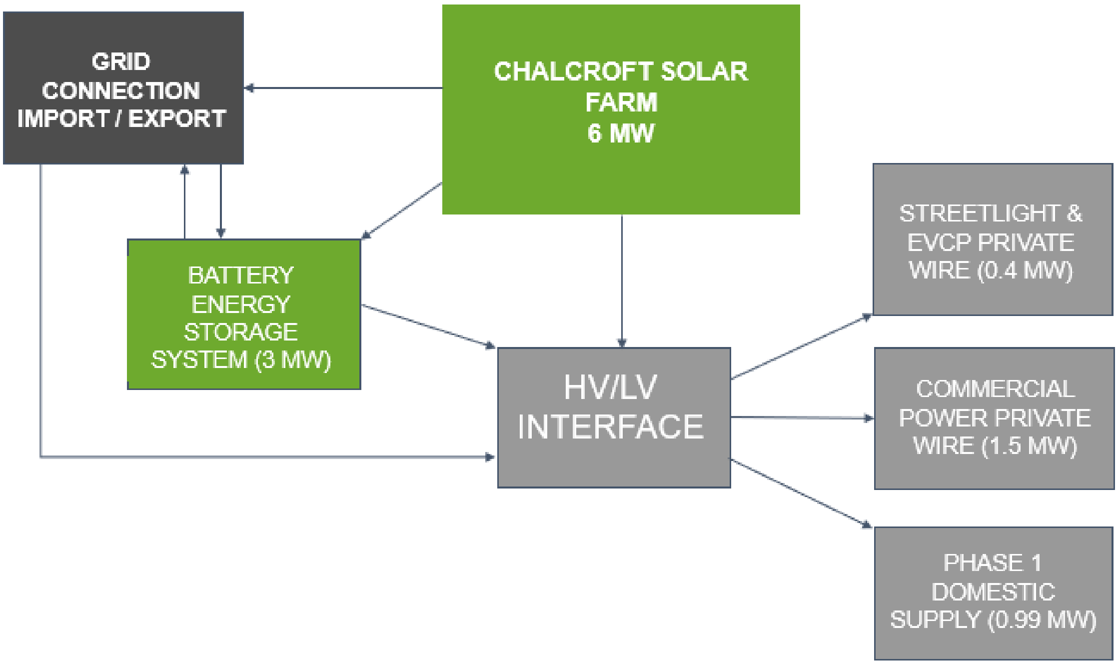
3.1 Power Strategy

3.1.1 High level Power schematic derived from Illustrative Masterplan DWG NO. 01



Excerpt from Crookes Walker Consulting paper attached as Appendix A

3.1.2 Power schematic



3.1.3 This report is a combined heat and power model, assuming heating supplied by individual Ground Source Heat Pumps per property with individual or shared boreholes. Current model assumes all houses have individual boreholes however it is likely that shared boreholes will be possible reducing overall capex.

3.1.4 It is assumed that all electrical energy required to power the heat pumps in each property will be supplied from a grid connection as normal, with the exception of phase 1 of 238 x properties which will be supplied via a private wire network.

3.1.5 To test an OFGEM compliant unlicensed supply we have assumed power supply to the first phase of properties of 238 x units. Our calculations are shown below and this is expected to fall within the published class exemptions:

Regulatory Parameters	Value (kW)
Standard Home Diversification Factor (DF)	2
Individual heat pumps DF	1.7
Individual EV charger DF	0.5
Max site generation	10,000
Max onsite residential supply	1,000
Max onsite residential distribution	1,000
Max offsite residential supply	2,500
Max offsite residential distribution	2,500
Max commercial supply	5,000
Max commercial distribution	10,000

Number of residential homes that can be supplied	
Standard homes	500
Standard homes + heat pumps	270
Standard homes + EV charger	400
Standard homes + heat pumps + EV charger	238

3.2 Power demand assumptions

3.2.1 Without a detailed schedule the following assumptions have been made in order to calculate overall electricity demand:

3.2.2 Non-domestic building demand is calculated by taking the peak demand assumptions from the CWC report (appendix A section 6.0) and assuming 30% peak load for 4,100 hours per annum which in turn provides a kWh/m2 per annum by property type:

Power consumption assumptions	kWh/m2/year	m2	Annual demand (kWh)
Commercial (m2 NIA)	95	7,274	691,217
Industrial	92	8,415	776,284
Education	74	2,260	166,788
Retail	185	1,672	308,484
Food & Drink	327	543	177,305
Supermarket	185	1,003	185,054

N.B. Property classifications and size have been taken from masterplan documents

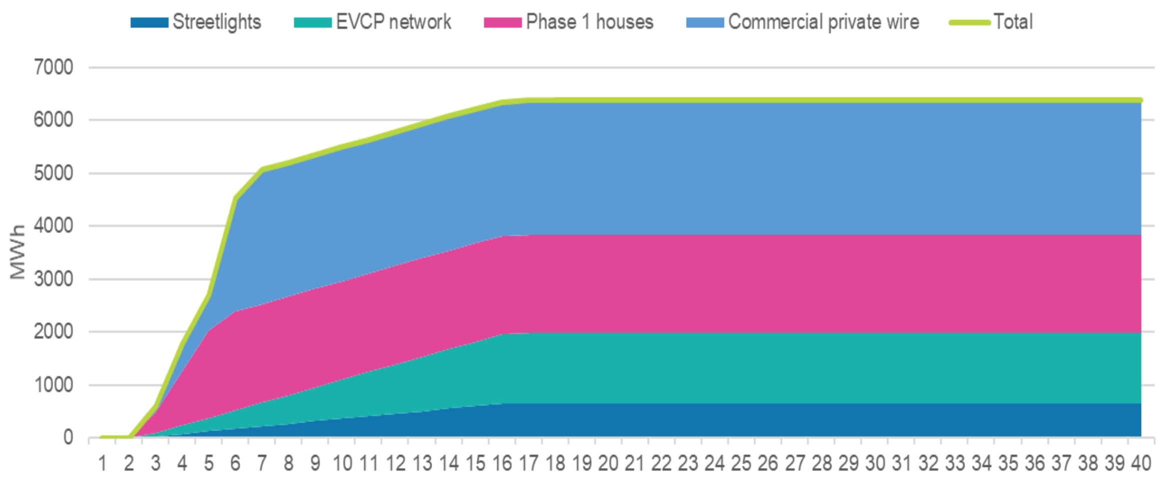
For the supply of power to the first 238 properties the demand assumptions are as follows:

Item	kWh/annum	Assumptions
Domestic power	4,000	Industry average for 90m2 property
4kW EVCP	2,400	600 hours per annum
GSHP	1,500	based on COP of 3
TOTAL	7,900	

Each additional property will be supplied from the grid as normal

This feeds into the total annual consumption forecast including lighting & EVCP demand:

Power consumption at build out	Qty	Annual demand (kWh)	Total annual demand (kWh)
Street & Traffic Lighting	1	660,000	660,000
EVCP (4kW streetlight)	330	4,000	1,320,000
Sports Pitch Lighting	1	109,766	109,766
Phase 1 domestic supply	238	7,900	1,864,400
Commercial (m2 NIA)	7,274	691,217	691,217
Industrial (m2 NIA)	8,415	776,284	776,284
Education (m2 NIA)	2,260	166,788	166,788
Retail (m2 NIA)	1,672	308,484	308,484
Food & Drink (m2 NIA)	543	177,305	177,305
Supermarket (m2 NIA)	1,003	185,054	185,054
Losses (5%			312,965
TOTAL			6,572,263



Peak demand estimated at 3.3MW.

3.2.3 EVCP in operation for 1,000 hrs per annum.

3.2.4 Commercial ESCo models are sensitive to the speed of construction whereby the earlier the demand comes on the better the financial performance of the scheme. However, from experience it is prudent to be conservative when forecasting in order to provide a more realistic picture and minimise the financial risks of possible delays, clearly as developer EBC can exert some influence over this to minimise risk.

3.2.5 Demand profile yr1 = 2022.

3.2.6 Build out profile

Property	Qty	Construction assumptions
Flats	550	10 per quarter Jan-21 to Sep-35
Houses	1,950	35 per quarter Jan-21 to Sep-35
Commercial		Jul-23 to Sep-25
Industrial		Jun-25
Education		Jan-22 to Dec-22
Retail		Dec-22
Food & Drink		Dec-23
Supermarket		Sep-25

3.2.7 Other assumptions

- A discount factor of 3.5% has been applied to calculate return on investment for the ESCo option presented.
- The ESCo concession term assumed in the financial model is 40 years.
- Demand profile below yr1 =2021

4 Heat & Power ESCo

4.1 ESCo structure

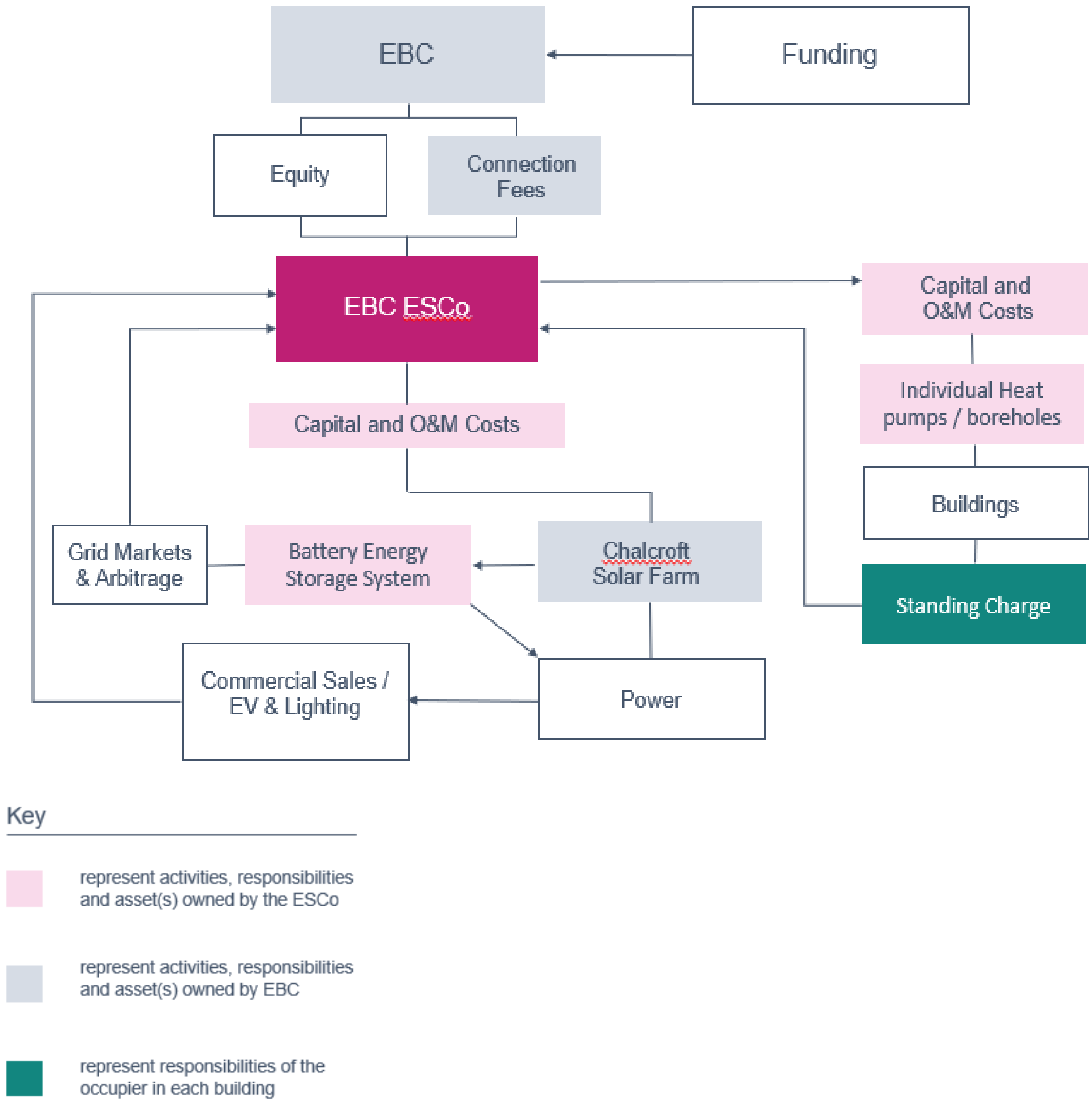


Image illustrates EBC & EBC ESCo asset ownership and the flow of the heat standing charge and various power revenues back to the ESCo.

4.1.1 EBC ESCo is responsible for the funding, design, construction and operation of the energy system:

- Battery Energy Storage System (BESS)
- Private Wire network and connections to commercial properties
- Streetlight Electric Vehicle Charge Points (EVCP)
- Ground Source Heat Pump and borehole per residential and commercial property

4.1.2 EBC ESCo will receive all revenues associated with the energy system, including but not limited to:

- Heat pump/borehole standing charge
- Electricity sales
- Arbitrage and ancillary market services
- Clean Heat Grant of £4k per property (assuming fund is launched successfully)

4.2 Energy Concept

4.2.1 The design concept for this option is individual heat pumps for each residential and commercial property on the development, it is envisaged apartment blocks will use a shared geothermal array.

4.2.2 2,500 homes is part of the heat ESCO, 238 homes of phase 1 also receive power from the ESCO.

4.2.3 EBC ESCo will receive O&M revenues via a simple fixed tariff, each building owner/occupier will purchase power to supply heat pump that will deliver heating and hot water.

4.2.4 A single 100m borehole in the property curtilage has been allowed for and will provide 6kWp of heat energy.

4.2.5 No central heat energy centre or heat network will be required.

4.2.6 A compound will be required for HV infrastructure and BESS, this would be c. 1,000m2

4.2.7 Modelling assumes first power on Jan-22.

4.2.8 As EBC is both ESCo and developer it has a unique opportunity to maximise the overall efficiency of the heat pumps by ensuring the secondary heating and hot water systems within each house type and building are designed to make the most efficient use of the lower water temperature parameters.

4.2.9 It is recommended to install the residential phase private wire network compliant with DNO standards. Should the class exemption limits not change by the time phase 2 construction is commenced the phase 1 network could easily be adopted by a DNO/iDNO for ongoing maintenance.

4.3 Financial model

4.3.1 Capital Expenditure (CAPEX) breakdown and assumptions made:

ITEM	£m	Notes
GSHP + boreholes	24,110,000	All residential and commercial properties
EVCP	247,500	330 x 4kWp streetlight model
Battery Energy Storage System	856,000	3MWh energy / 3MW inverter
Private Wire Network	215,000	Inc LV Connections to Commercial Buildings
Prelims	480,000	Design & Project Management
TOTAL	**25,908,500**	

- Battery sized and specified to maximise revenue generating opportunities

Battery sizes need to be optimised in order to get satisfactory returns. This depends on their energy capacity (MWh) required to serve the private wire network load and their power capacity (MW) to provide grid services.

The grid connection costs need to be understood here. The larger the connection the more valuable the battery is to the grid, but also the more likely connection costs will be high. This can only be decided connections are being discussed with the DNO when investment ready business plans are being written.

- Capex phased in line with construction & electricity demand.
- No allowance made for any additional import capacity required.

4.3.2 Operations expenditure (OPEX) breakdown for project life and assumptions made:

ITEM	£m lifetime (uninflated)	Notes
GSHP	8,664,000	£100/yr resi £1k/yr commercial
BESS	420,500	£12k/yr
EVCP	132,536	1% capex/yr
Electricity	46,859,610	
Metering & Billing	413,605	£20 per connection
Bad debt	539,175	0.2% residential / 1% commercial
Staffing	1,488,885	50% FTE
Business rates	60,126	BESS asset

TOTAL	58,578,438	

4.3.3 Annual operations expenditure (OPEX) breakdown at build out and assumptions made:

ITEM	£m annual (uninflated) 2035	Notes
GSHP	32,000	£100/yr resi £1k/yr commercial
BESS	12,000	£12k/yr
EVCP	2,544	1% capex/yr
Electricity	1,016,079	
Metering & Billing	7,700	£20 per connection
Bad debt	11,370	0.2% residential / 1% commercial
Staffing	20,000	50% FTE
Business rates	11,999	BESS asset
TOTAL	1,113,692	

4.3.4 Replacement expenditure (REPEX) breakdown and assumptions made:

ITEM	£m lifetime	Notes
GSHP	11,850,000	65% 15yr lifecycle
BESS	827,156	20yr
TOTAL	12,677,156	20yr

4.3.5 Pricing assumptions

ITEM	Residential	Commercial	Assumptions
Connection fee	£6,000	£32/m2	Commercial is for GSHP and power connection
Standing Charge (per annum)	£325	£6/m2	Commercial is for GSHP and power availability
All power sales (kWh)		13.55p	

- Residential connection fee is considered a reasonable developer contribution for a Low Carbon GSHP solution.
- Residential Standing Charge is an annual payment to the ESCo for the maintenance and replacement of the GSHP/borehole system for the duration of the concession.
- Commercial Standing Charge includes both GSHP/borehole maintenance/replacement (£5/m2/annum) and a power availability charge (£1/m2/annum)

4.3.6 Electricity Cost & Revenue assumptions

Full build out Electricity supply to ESCo	Volume (kWh)	% supply	Price (2020) £	Annual Cost
Grid import electricity	3,529,407	53.6%	0.1275	£449,999
Import from Solar Farm	3,050,000	46.4%	0.0475	£144,875
TOTAL	6,579,407			£594,874

- The Solar Farm will be connected to the HV infrastructure and BESS via a Private Wire Network.
- Model assumes EBC ESCo purchases power through a Power Purchase Agreement (PPA) from Solar Farm, balance of solar farm generation would likely be sold to grid by operator (assumed EBC) and that revenue is not included in this model.

4.3.7 Heat Pricing counterfactuals

For the purposes of heat pricing comparison individual Air Source Heat Pumps (ASHP) have been selected, the comparisons include all lifetime costs:

- Variable and fixed energy costs
- ASHP insurance & maintenance costs
- ASHP replacement amortised over lifecycle

ASHP (COP 2.5) - opex & repex by resident

Elec Volume	1800	kWh		Heat Volume	4500	kWh			
	Tariff p/kWh	Daily Standing Charge p	Total Tariff	Total Standing Charge	Total Elec Cost	Annual Maint.	Annual Repex Accrual	Total	Equivalent Heat Price Tariff
EDF	£16.55	£27.43	£297.90	£100.12	£398.02	£200.00	£291.67	£889.69	£0.20
SSE	£17.81	£27.50	£320.58	£100.38	£420.96	£200.00	£291.67	£912.62	£0.20
Scottish Power	£17.81	£27.50	£320.58	£100.38	£420.96	£200.00	£291.67	£912.62	£0.20
								Average	£0.20

GSHP (COP 3) - opex & repex by ESCo

Elec Volume	1500	kWh		Heat Volume	4500	kWh			
	Tariff p/kWh	Daily Standing Charge p	Total Tariff	Total Standing Charge	Total Elec Cost	GSHP Standing Charge	Annual Repex Accrual	Total	Equivalent Heat Price Tariff
EDF	16.55	27.43	£248.25	£100.12	£348.37	£325.00	£0.00	£673.37	£0.15
SSE	17.81	27.5	£267.15	£100.38	£367.53	£325.00	£0.00	£692.53	£0.15
Scottish Power	17.81	27.5	£267.15	£100.38	£367.53	£325.00	£0.00	£692.53	£0.15
								Average	£0.15
								SAVING	**24%**

- Heat volume 90m2 property x 50kWh/m2/annum
- Electricity tariffs from Go-Compare 2/10/20 SO50 postcode
- No benefit from on-roof solar has been included with ASHP analysis as expected to be negligible
- ASHP REPEX accrual based on £3,500 cost with 12 year plant life

4.3.8 CO2 comparison

HEAT GENERATOR	Heat Demand kWh/p.a.	COP/eff	electricity used kWh/pa	kgco2/kWh	TOTAL CO2 t/pa
Individual ASHP	11,712,992	2.5	4,685,197	0.233	1,092
Individual GSHP	11,712,992	3	3,904,331	0.233	910
Difference					-182
Difference %					-20%

4.3.9 Financials & Sensitivity

- For the base case scenario the power supplied to the ESCo from the solar farm is set at 3GWh per annum, this is 49% of published annual output.
- This is considered a balanced assumption however it may be possible to capture more of the solar generation to sell via private wire at higher prices, detailed HH modelling will provide these answers and this sensitivity is shown in the table below.

BASE MODEL ASSUMPTIONS	
Residential properties	2,500
Commercial property	23,521m2
Discount Factor	3.50%
Concession Term	40 years
Connection Fee Income (inflated)	£19,579,912
Electricity income (inflated)	£63,859,092
GSHP Standing Charge Income	£53,917,530
Grid Services income (inflated)	£12,743,076
Clean Heat Grant (inflated)	£12,956,320
CAPEX (uninflated)	£25,908,500
OPEX (uninflated)	£58,578,438
REPEX (uninflated)	£12,677,156
IRR	17.63%
NPV	£13,580,792

SENSITIVITY	IRR	NPV
Base Case 50% Solar Output to ESCo	17.63%	£13,580,792
70% Solar Output to ESCo	20.77%	£16,789,979
30% Solar Output to ESCo	13.93%	£10,253,272
Grid Service revenue +50%	22.00%	£16,133,546
Grid Service revenue -50%	14.00%	£11,012,576
No Grid Service Revenue	10.97%	£8,427,143
Power Demand +10%	22.97%	£16,642,521
Power Demand -10%	13.35%	£10,497,758

No Clean Heat Grant	5.82%	£5,057,939

4.4 Grid Services

4.4.1 Grid Services

Where a battery and suitable grid connection are available the incremental cost of selling grid services via an aggregator allows additional revenues to be earned. The prices for these are highly volatile depending on market liquidity and needs of the National Grid. This in turn depends on climatic conditions and customer power demands. However, the expected trend is for values to increase as society transitions from gas and oil for heating and transport respectively.

- Grid services are calculated on a per MW availability basis and include:

- Capacity Market est £2k/MW/yr

  CM supports standby energy capacity to ensure demand can be met by supply. Rules on this are being transitioned currently and prices are very low, but participation does not carry risk or obligations.

- TRIAD est £15k/MW/yr

  This service helps large energy users to offset their peak demands during December, January and February and so avoid large charges from National Grid. An aggregator uses demand and weather forecasts to try and calculate when the winter peaks or Triads will occur and run a battery portfolio at this time to offset this. The actual Triads are declared by National Grid retrospectively so there is no guarantee of earnings if the battery was not run at that time.

- Firm Frequency Response est £42k/MW/yr

  This service supports grid frequency and can import or export energy at a stated power. This is usually bid for on a monthly basis and can be for 24 hours to a few hours. There is no guarantee of winning a contract every month and much depends on an aggregator's bidding strategy.

The detailed operation of the energy scheme, its half hourly solar generation and behind the meter demand will determine the availability of energy and power available for grid services and this cannot be determined in a pre-business case study of this type. For that reason, we provide some sensitivity analysis that assumes 50% and 150% availability to illustrate impact and risk.

4.5 Advantages and Disadvantages of a Heat & Power ESCo

Advantages	• Ability to provide a Return on Investment and secure long-term revenue stream for EBC.

	• Control over pricing regime and possible variations to support the affordable housing sector. • Ability to optimise the investment in Chalcroft Solar Farm. • Positioned well to exploit current and future revenue streams associated with decentralised & flexible power generation and storage. • Significant peace of mind for residential purchasers about the maintenance and replacement of the Heat Pump system in the properties on the development, particularly if backed by EBC. • GSHP is 24% cheaper for residents and saves 20% more CO_2 than ASHP. • No external visual or noise issues around the properties that have been associated with ASHP.
Disadvantages	• Power ESCo's carry more complexity than heat ESCo's and there will be a transition into smart optimisation services over the first 10 years. This could be considered an opportunity also. • Grid capacity constraints for the supply of power to the electric heating systems on the development. • ASHP has lower capex with no opex or repex costs for the ESCo.

5 Summary

5.1 Report Compliance with tender requirements

5.1.1 *"The ESCo model will look at how to best distribute the energy produced from the Solar Farm (currently negotiating acquisition of freehold land and business)."*

This report outlines the distribution of solar pv generated power to:

- Streetlights and furniture
- Phase 1 x 236 homes
- Commercial private wire
- Network of EVCPs

5.1.2 *"The study will address the regulatory, practical and commercial issues associated with combining power from the solar farm with onsite generation and battery."*

The solution we are recommending appears to be compliant with the exemptions under The Electricity Act (Class Exemptions from the Requirement for a Licence) Order 2001. However, Eastleigh should always ensure each project has an examination by legal experts in order to confirm its legality. There are many complex exemptions and conditions that render simple yes/no guidance as inappropriate. Considering the necessary guidance for Generation, Distribution and Supply, we believe the Horton Heath scheme we have elaborated is worthy of legal examination because:

a) Generation: comes under Class A: small generators - as the solar farm generates less than 10MW.

b) Distribution: comes under two possible parts of the act:

Class A: small distributors – less than 2.5MW of electrical power for the purpose of giving (or enabling) supply to domestic customers, for the part sold directly to EV domestic consumers, or

Class B: On-site distribution: Persons (other than licensed distributors) who do not at any time distribute from any distribution system more electrical power than one megawatt for the purpose of giving a supply to domestic consumers or enabling a supply to be so given with that electrical power provided that each domestic consumer receives the electrical power, disregarding stand-by electrical power, from a generating station embedded in the same distribution system as himself.

Class C: distribution to non-domestic consumers – for any amount of distribution to commercial customers only. This covers all the non-domestic power sold, plus could include the sale of the part for the EV charging if via a commercial entity like a car club.

c) Supply: Class A: small suppliers – for those who supply electricity they generate themselves providing the amount is less than 5MW and no more than 2.5MW is to domestic consumers

This study only considers commercial power supply to avoid the risks associated with current residential regulation. While private wires can be used to supply residential addresses, the resident still has the right to a change of supplier. If they do leave the ESCo supplier this detracts from the business case and makes the ESCo less viable, or it makes the ESCo increase prices to other residents to cover the loss and provoke further residents to switch away. Furthermore, there is yet to be an established Ofgem approved method for an iDNO (Independent Distribution Network Operator) agreeing DUoS (Distribution Use of System) charges with the switching resident. The resident also has the right to pay for their own regulated DNO connection but at considerable cost that is unaffordable in normal circumstances.

Instead, we will present several alternative business models that innovative companies are trialling at the moment that may receive Ofgem approval at some point, these are featured in the Common Scope document.

5.1.3 *"The study will need to touch on how PV energy can be used to supply EV charging points and how these can be optimised on both a domestic level (SMART EV chargers on plots) and community level (centralised battery storage with community car club). The scale of a community EV charging scheme cannot be determined at this time, but we feel there is merit in proposing even a small scheme to beginning with the ability to expand depending on uptake."*

We recommend further dialogue with Hilson Moran on optimising the cost/value equation here. We have for now costed the most pragmatic solution by utilising the streetlamp wiring that can carry 4kW per lamp post, with cost effective chargers. This allows trickle charging sufficient to recharge c40kWh per night to each vehicle per lamp post. This shows we can consume significant power to reward the ESCo sufficiently. If a completed and costed charging and wiring strategy is concluded by Hilson Moran in time, we can integrate that into the model also.

5.1.4 *"The consultant should take account of the work being developed in parallel both on a site Energy Strategy and an EV Charging Strategy."*

See 5.1.3 above.

5.2 Financial model

5.2.1 A case can be made for the development of a Heat & Power ESCo for Horton Heath, however the model's power demand and generation assumptions are linear in nature i.e. total annual assumptions with no HH or seasonal variations.

5.2.2 To proceed towards an investable business case further detailed design and modelling will need to be performed with a range of profile data:

- Half Hourly (HH) solar farm generation from Chalcroft Farm
- Full understanding of the power connection capacities to the national grid for import and export.

- Location, quantum and operating regime for EVCP's.
- HH demand assumptions for Commercial unit types.

5.2.3 With this data calculations can be performed to maximise revenue streams from the BESS:

- Arbitrage / time-shifting
- Frequency Response
- Reserve

6 Appendix A

CWC
crookes walker consulting

One Horton Heath, Eastleigh

Solar Generation Connections

Feasibility Report

Ref: 2160 R001 Rev P1 Date: 14/10/20

Crookes Walker Consulting
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6.1 Appendix B – Preliminary Risk Matrix

Appx%20B%20HH%20Risk%20Register%2(

6.2 Appendix C – Phase 1 Residential Power Supply

6.2.1 We have considered options for supplying power to Horton Heath in a way that appears to be compliant with the exemptions under The Electricity Act (Class Exemptions from the Requirement for a Licence) Order 2001.

We believe the Distribution Exemption "Class B" from item 5.1.2 is the favoured route, by limiting the amount of power being supplied to residential consumers to 1MW at any given time. This can be achieved by introducing a simple control system that:

- Limits power to residents from the solar array to 1MW.
- Limits power to residents from the BESS to 1MW when no solar generation is available.
- Imports from grid when required for top-up or when there is no solar/BESS power available.

This approach has been informally discussed with a class exemption specialist and the advice we have is that on a "general principles basis" the approach complies with the "at any time" description mentioned in the exemption wording. This would need to be explored further by EBC to get sufficient comfort to support an investable business case.

6.2.2 Using the HH solar generation data provided a simple model has been created to analyse solar generation vs power demand on a daily basis for the year combined with BESS utilisation to support evening peaks in particular. Summary findings are:

- 65% of annual power consumption for Phase 1 residential (393 homes) (3.1GWh) can be supplied by a combination of Solar and BESS.
- BESS is configured as mentioned elsewhere in this report, charging during the day from solar pv and discharging for the first night-time hours.

To provide a clearer picture on the commercial opportunity that power represents to the ESCo further work is required as per 5.2.2. In addition a HH pricing model needs to be built that can be overlaid into the ESCo heat model to include:

- HH power pricing index (e.g. Nordpool)
- HH grid charges (Use of System charges etc)
- HH BESS utilisation

Options could also be included to model the impact of additional solar pv/BESS assets as there is sufficient extra residential demand that can be satisfied in addition to the power demands outlined in 3.2.2.