Ener-Vate Consultancy Limited

Heat & Power ESCo Review for Tolgus Farm

A Techno-Economic Review of a Heat & Power ESCo option for Treveth Holdings

SMARTKLUB
Empowering Communities

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Contents

	Glossary
ASHP	Air Source Heat Pump
ESCo	Energy Services Company
LA	Local Authority
CC	Cornwall 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
SPV	Special Purpose Vehicle
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 LAs involved in the project are:

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

1.1.3 Treveth Holdings LLP is the funding and housing delivery vehicle for Cornwall Council.

1.1.4 This report looks in more detail at the possibility of developing a Heat and Power ESCo for the forthcoming Tolgus Farm Development for Treveth Holdings, 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 LAs 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.

1.2.4 It is anticipated that Treveth Holdings will set up an SPV for this scheme, and a separated SPV for each subsequent development.

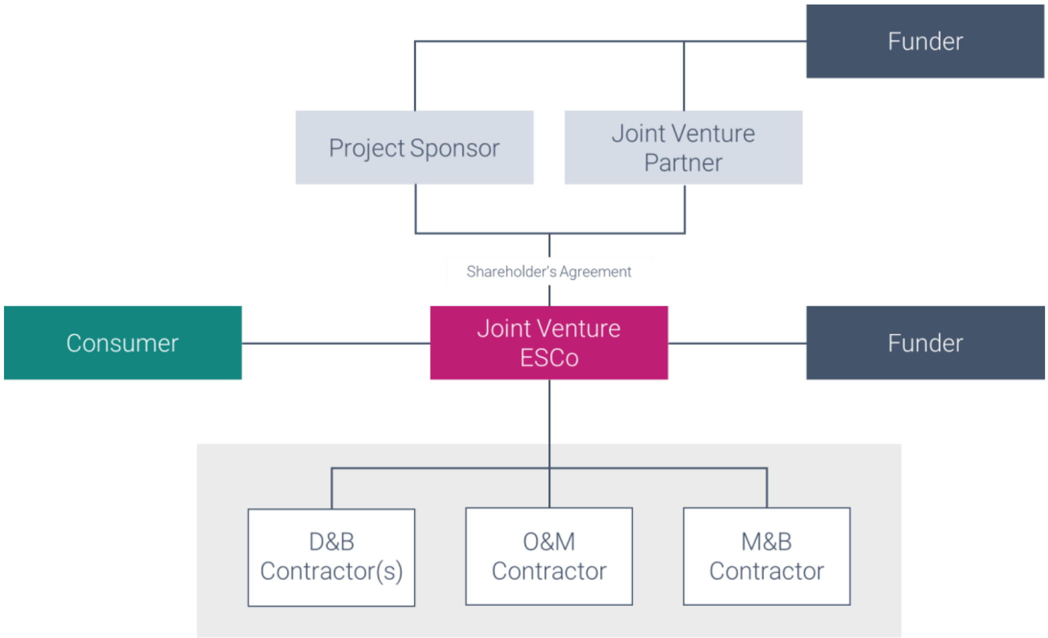
1.2.5 Treveth Holdings will act as Project Sponsor in the ESCo structure.

Following the recent "Common Scope ESCO Report" report published by Ener-Vate as part of this project the "Joint Venture ESCo" has been selected as the structure that underpins this report as Treveth Holdings has expressed interest in forming an ESCo with a partner.

As described in the 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 Joint Venture (JV) ESCo



2.1 Roles and Responsibilities

2.1.1 The Project Sponsor will jointly establish an ESCo entity with a Joint Venture Partner to deliver the low carbon energy scheme.

2.1.2 Both the Project Sponsor and Joint Venture Partner are responsible for securing funding for the project. The relationship between funding and equity distribution between the two parties does not necessarily have to be split equally and will be stated within a Shareholder's Agreement prior to the creation of the Joint Venture ESCo.

2.1.3 The Joint Venture ESCo will be responsible for procuring D&B, O&M and M&B contractors to deliver and operate the low carbon energy scheme, as well as retailing the energy provisions generated/required.

2.1.4 Therefore, the Project Sponsor and Joint Venture Partner will share control over the Joint Venture ESCo which will be both the asset owner and operator.

2.1.5 This option provides the best opportunity for community involvement in that they can jointly or severally play a role as JV ESCO part owner and Financier. This can be seen as a great advantage to Third Parties especially the Financier as the Consumers have 'skin in the game'. In addition, as localism rises, non-consumer local residents increasingly want to invest in their locality even if they are not energy participants. This for many is a preferable use of their savings than some anonymous unit trust.

2.2 Control, Risk and Reward

2.2.1 Both the Project Sponsor and Joint Venture Partner will share control over the Joint Venture ESCo's contractors, future expansion of the low carbon energy scheme and heat and power tariffs offered to consumers.

2.2.2 The Shareholder's Agreement will regulate the decision making in the Joint Venture ESCo. A key element of the agreement would be in relation to how cost overruns are handled.

2.2.3 Using a Joint Venture ESCo, depending on the distribution of equity between the shareholders, both the Project Sponsor and Joint Venture Partner will share the risk of funding, constructing and operating the project. In return, the Project Sponsor will share a direct financial reward from the success of the project.

2.3 Exit Strategies

2.3.1 Both the Project Sponsor and Joint Venture Partner have the ability to sell their shares in the Joint Venture ESCo.

2.3.2 Common exit strategies for Joint Venture ESCo are as below:

- One partner can but the other partner outright,
- One partner can progressively buy out the other partner over a period of time, or
- A partner can sell their shares to a 3rd party.

2.3.3 It is advised that the Project Sponsor not sell their shares until all design and construction risks have passed and the Joint Venture ESCo is operational. After a track record of secured revenues, the Joint Venture ESCo may be attractive enough to a secondary market.

2.3.4 If the Project Sponsor has a pre-determined aim to sell their shares at some point during the concession period, it is advised that these be written into the Shareholder's Agreement at the start.

2.4 Advantages and Disadvantages of a Joint Venture ESCo

2.4.1 Advantages	• Project Sponsor has some strategic control of the project. • Project risks are spread between the partners. • The Joint Venture Partner may bring expertise, skills and a source of funding. • There are opportunities to exit the project through the sale of shares. • Best opportunity for community involvement. This need not happen at start up, but after a few years of proven operation and viability.
2.4.2 Disadvantages	• There are legal complexities in setting up and negotiating the risks for each partner.

	• The partners will need to agree the direction of the project and how this will be managed. • The project must meet the Joint Venture Partners' return on investment criteria, which could result in higher heat and power tariffs.

3 Assumptions

3.1 Energy Strategy

3.1.1 This report is a combined heat and power model, assuming heating supplied by individual Ground Source Heat Pumps per property with shared boreholes.

3.1.2 The capex for the heat pump system has been taken from the Kensa data within the "Smart Energy Assessment 13th December 2019" by Hydrock.

3.1.3 It is assumed that all electrical energy required to power the heat pumps in each property will be supplied from a private wire network with power blended between solar pv, battery and grid supplies.

3.1.4 To test an OFGEM compliant unlicensed supply we have assumed power supply to all of the properties. Our calculations are shown below and this is expected to fall outside 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

The above assumes a diversified load per property of 4.2kW, given that the maximum that can be supplied unlicensed to residential properties is 1MW up to 238 units can be supplied from the solar energy system.

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

The development could be started on a private wire network, should the class exemption rules not change in the 3-4 years that will take to reach 238 properties the network could be adopted by a DNO/iDNO and become a licensed supply.

In this report we have assumed that the class exemption parameters will be increased to allow more residential units to be supplied via this method, so all 370 units are included on the private wire network.

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 for the building classification 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	2,000	190,000
Community	145	400	58,000

For the supply of power to the residential 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	1,125	based on COP of 4*
TOTAL	7,525	

*Assumes ground floor underfloor heating throughout development.

This feeds into the total annual consumption forecast:

Power consumption at build out	Qty	Annual demand (kWh)	Total annual demand (kWh)
Commercial	2	248,000	248,000
370 x residential properties	370	7,525	2,784,250
Losses (5%)			387,213
TOTAL			3,419,463

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 Demand profile yr1 = 2023.

3.2.5 Build out profile

Property	Qty	Construction assumptions
Residential	370	60 per annum from Jan 23
Commercial (m2)	2,400	Jul-23 to Sep-25

3.2.6 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.

4 Heat & Power ESCo

4.1 ESCo structure

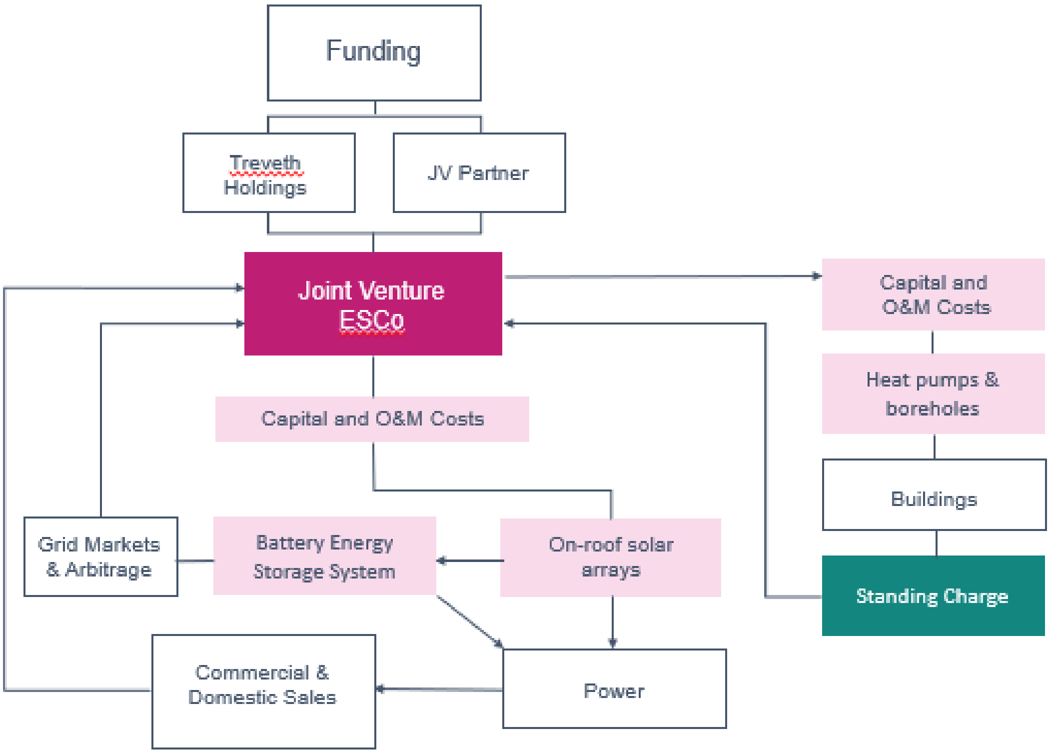


Image illustrates ESCo asset ownership and the flow of the heat standing charge and various power revenues back to the ESCo.

4.1.1 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
- Ground Source Heat Pumps and boreholes for residential and commercial property
- 1.1MW on-roof solar PV array on residential and commercial properties

4.1.2 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

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 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.

4.2.3 A 1-200m borehole between 2 properties has been allowed for and will provide 6kWp of heat energy per property.

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

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

4.2.6 Assumed an average of 3kWp on-roof solar PV per residential and commercial property, 370 x residential and 2 x commercial.

4.2.7 On roof solar PV is connected directly to a private wire ring main with no interface to the properties.

4.2.8 Power is supplied to the properties via a separate ring main with a blend of solar pv, battery and grid supplies.

4.2.9 Modelling assumes first power on Jan-23.

4.2.10 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 later phase 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 Revenue

First year revenue following build out (in model = 2029) inflated:

ITEM	£ annual at build out	% Total
Variable Electricity Tariff	486,030	55%
Fixed Electricity Tariff	65,600	7%
Fixed heat Tariff	153,472	17%
Grid export	23,999	3%
Grid Services	153,153	17%
TOTAL	882,253	100%

4.3.2 Capital Expenditure (CAPEX) breakdown and assumptions made:

ITEM	£	Notes
GSHP + boreholes	2,729,870	All residential and commercial properties
1.17MW on-roof Solar PV	1,170,000	£1,000 per kWp
BESS	650,000	2MWh energy / 2MW inverter
Private Wire Network	250,000	LV ring main to all properties
Prelims	210,001	Design & Project Management
TOTAL	**5,009,871**	

- 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 when 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.

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

ITEM	£ lifetime (uninflated)	Notes
GSHP	1,296,500	£100/yr resi £1k/yr commercial
BESS	282,500	£8k/yr
On roof solar	87,165	1.3% capex/yr inc land rental
Electricity	21,016,855	
Metering & Billing	1,567,566	£60 per connection
Bad debt	254,749	1% residential / 1% commercial
Staffing	297,777	
Business rates	220,268	Solar & BESS assets
TOTAL	25,023,381	

4.3.4 Annual operations expenditure (OPEX) breakdown at build out (inflated by RPI) and assumptions made:

ITEM	£ annual at build out	Notes
GSHP	48,639	£100/yr resi £1k/yr commercial
BESS	10,516	£8k/yr
On roof solar	3,076	1% capex/yr
Electricity	373,607	
Metering & Billing	29,183	£60 per connection
Bad debt	4,456	1% residential / 1% commercial
Staffing	5,258	
Business rates	4,082	Solar & BESS assets
TOTAL	478,817	

4.3.5 Replacement expenditure (REPEX) breakdown and assumptions made:

ITEM (inflated)	£ lifetime	Notes
GSHP	1,422,000	65% 15yr lifecycle
BESS	282,500	20yr
TOTAL	1,704,500	20yr

4.3.6 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		14p/kWh	

- 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)

4.3.7 Electricity Cost & Revenue assumptions

Full build out Electricity supply to ESCo	Volume (kWh)	% supply	Price (2020) £	Annual Cost (uninflated)
Grid import electricity	2,055,637	74.0%	0.1400	£287,789
Import from on-roof solar	721,500	26.0%	0.0000	£0
TOTAL	2,777,137			£287,789

- The Solar array will be connected to the HV infrastructure and BESS via a Private Wire Network.
- Model assumes ESCo pays nothing for power from on-roof solar arrays, balance of solar generation would be sold to grid by ESCo or possible PPA to council.

4.3.8 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 3) - opex & repex by resident

Elec Volume	1500	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 p
EDF	18.71	29.10	£280.65	£106.22	£386.87	£200.00	£291.67	£878.53	0.20
SSE	18.71	29.10	£280.65	£106.22	£386.87	£200.00	£291.67	£878.53	0.20
Scottish Power	18.71	29.10	£280.65	£106.22	£386.87	£200.00	£291.67	£878.53	0.20
								Average	0.20

GSHP (COP 4) - opex & repex by ESCo

Elec Volume	1125	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	Heat Price Tariff
EDF	18.71	29.10	£210.49	£106.22	£316.70	£325.00	£0.00	£641.70	0.14
SSE	18.71	29.10	£210.49	£106.22	£316.70	£325.00	£0.00	£641.70	0.14
Scottish Power	18.71	29.10	£210.49	£106.22	£316.70	£325.00	£0.00	£641.70	0.14
								Average	0.14
								SAVING	**27%**

- Heat volume 90m2 property x 50kWh/m2/annum
- Electricity tariffs from Go-Compare 8/12/20 TR16 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

4.3.9 CO2 analysis

Assumed 3kWp solar PV is installed on each property:

CO2	Volume (kWh)	40y tCO2
On roof solar pv generation	39,937,500	-2,192
GSHP power consumed	15,153,750	843
CO2 saved		-1,348

- Table illustrates that more power is generated than consumed by GSHP so energy system is carbon negative.
- Figures are lifetime of ESCo (40 yrs)
- CO2 factors from BEIS Energy & Emissions Projection 2018

4.3.10 Financials & Sensitivity

- For the base case scenario the power supplied to the ESCo from the solar array is set at 65% of expected 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.
- N.B. All items inflated by RPI except electricity which uses the BEIS electricity index

BASE MODEL ASSUMPTIONS	
Residential properties	370
Commercial property	2,400m2
Discount Factor	3.50%
Concession Term	40 years
Connection Fee Income (inflated)	£2,575,100
Electricity income (inflated)	£32,856,038
GSHP Standing Charge Income	£8,627,365
Grid Services income (inflated)	£8,995,112
CAPEX (uninflated)	£5,009,871
OPEX (inflated)	£25,023,381
REPEX (uninflated)	£1,704,500
IRR	12.37%
NPV	£4,909,823

SENSITIVITY	IRR	NPV
Base Case 65% Solar Output to ESCo	12.37%	£4,909,823
40% Solar Output to ESCo	11.29%	£4,256,209
Grid Service revenue +50%	16.10%	£6,700,789
Grid Service revenue -50%	8.98%	£3,093,424
No Grid Service Revenue	5.70%	£1,249,402
Power Demand +10%	15.70%	£6,522,095
Power Demand -10%	9.31%	£3,276,417

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, it's 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 0%, 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 Cornwall Council. • Control over pricing regime and possible variations to support the affordable housing sector. • 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 CC. • GSHP is 27% cheaper for residents and saves 20% more CO2 than ASHP. • The price residents pay for power will be equivalent to or cheaper than the best available market tariff. • 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 *“Establish the commercial viability of a Joint Venture ESCO and identify a suitable structure”:*

Commercial viability established to “outline stage” as defined in Common Scope report.

5.1.2 Identify potential partners in the market

Refer to Common Scope report.

5.1.3 Set out the next steps

Refer to Common Scope report

5.2 Smaller schemes

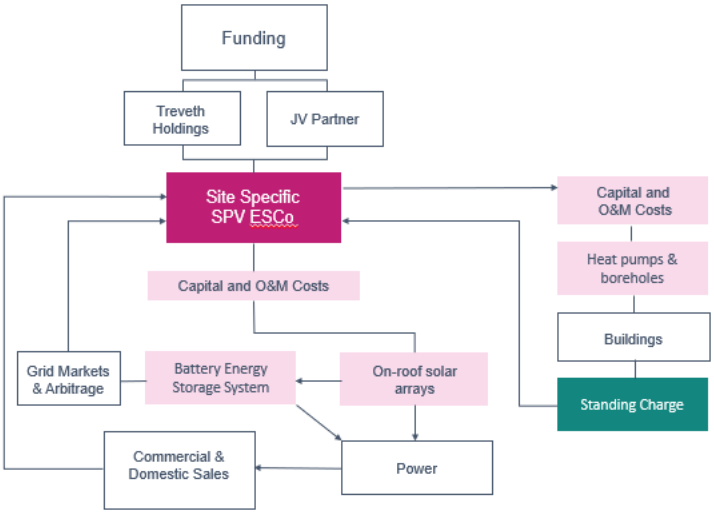
5.2.1 In line with an emerging Cornwall strategy on providing eco-lite developments on a strategic scale (may include a white label deal with Cornwall renewable generation PPA with a licensed supplier) there will be at least a medium term need for small but viable 50 home eco developments. Therefore, the question has been asked if 4 x 50 home developments are as viable as a single 200 home development? And if so, what is the optimum ESCO entity relationships to deliver and administer this?

Based on the financial model of the energy system, it appears that 50 home developments can be viable (see table and sensitivities). In addition it is perfectly possible to have the administration of a number of such sized developments under one ESCO to minimise governance costs. This is achieved by ensuring that the two limiting factors are adhered to as follows:

a) the Class Exemptions thresholds for each small site - that are well within the regulations, and

b) the single transformer ownership rule per entity we believe can be observed by having a subsidiary SPV ESCO for each site that owns the transformer (needs checking by legal expert).

In which case a single group ESCO can own all the subsidiary site SPV ESCOs while it administers and supplies the energy and customer service to all homes. The following structure would work for this scenario:



5.2.2 A 50-unit scheme has been modelled using the same structure and energy solution outlined in this report. Using a 500kW/kWh battery the scheme achieves a positive IRR, Summary and sensitivities below:

BASE MODEL ASSUMPTIONS (INFLATED)	
Residential properties	50
Discount Factor	3.50%
Concession Term	40 years
Connection Fee Income	£318,353
Electricity income	£4,496,037
GSHP Standing Charge Income	£1,198,956
Grid Services income	£2,211,298
Clean Heat Grant	£212,236
CAPEX	£1,098,458
OPEX	£4,123,309
REPEX	£463,667
IRR	7.92%
NPV	£451,002

SENSITIVITY	IRR	NPV
Base Case 50% Solar Output to ESCo	7.92%	£451,002
70% Solar Output to ESCo	8.57%	£526,036
30% Solar Output to ESCo	7.25%	£375,712
Grid Service revenue +50%	11.95%	£898,281
Grid Service revenue -50%	3.51%	£604
No Grid Service Revenue	0.00%	-£465,660
Power Demand +10%	9.20%	£598,014
Power Demand -10%	6.58%	£303,512
Discount Factor 4%	7.92%	£370,202
Discount Factor 5%	7.92%	£237,946
No Clean Heat Grant	5.68%	£279,869

5.2.3 From the sensitivities of the 50 home scheme it can be seen that such a scheme is more sensitive to adverse sensitivities. In particular, the grid service revenues, of which there are a number of points to make:

- It is likely that the nature of a 50 home development is to be infill development and, therefore, have a higher dependency on the particular constraints situation on that part of the DNO's grid. This will impact the connection costs (both capital and operational) shared amongst a low number of homes. On the other hand, if this is a congested part of the grid, the DNO's need for flexibility will be higher as more legacy homes in the neighbourhood wish to transition to heat pumps and EVs. Thus, the grid service revenue available could be higher.

  This needed value will only be optimised regularly for location based grid services in a world where the DNO has transitioned to be a DSO and so is rewarding flexibility over and above the National Grid services modelled here. The emergence of schemes like https://www.flexiblepower.co.uk/ are a step in this direction.

- By having, say 4 x 50 homes, with a 500kW battery on each site provides some resilience to an aggregator bidding in the flexibility to National Grid services. The minimum unit size is 1MW, therefore, 4 x 500kW batteries working under a single ESCO having control of the 2MW unit will be attractive to an aggregator. This is much better than having a battery part of a mixed set of legal entities that the aggregator has to juggle with when bidding in units to National Grid.

Recommended next actions:

- Establish certainty on costs for all plant requirements
- Understand local grid availability and constraints
- Progress to Investment Grade Business Case following the guidelines within Common Scope report
- Talk to WPD DNO regarding their flexiblepower.co.uk scheme and see if there could be some strategic alignment between developer plans and grid constraints
- Once design complete talk to aggregators to understand their view of best sensitivities to use for the investment business case.