Ener-Vate Consultancy Limited

# ESCo Review for Ryde Business Park

A Techno-Economic Review of a Power ESCo option for Isle of Wight Council

SMARTKLUB
Empowering Communities

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# Contents

| | Glossary |
|---|---|
| ASHP | Air Source Heat Pump |
| ESCo | Energy Services Company |
| LA | Local Authority |
| D&B | Design & Build |
| O&M | Operations and Maintenance |
| M&B | Metering & Billing |
| 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 | Distribution 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 alternative approaches to decarbonising the supply of heat and power to the Ryde Business Park Extension.

## 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.

# 2 Assumptions

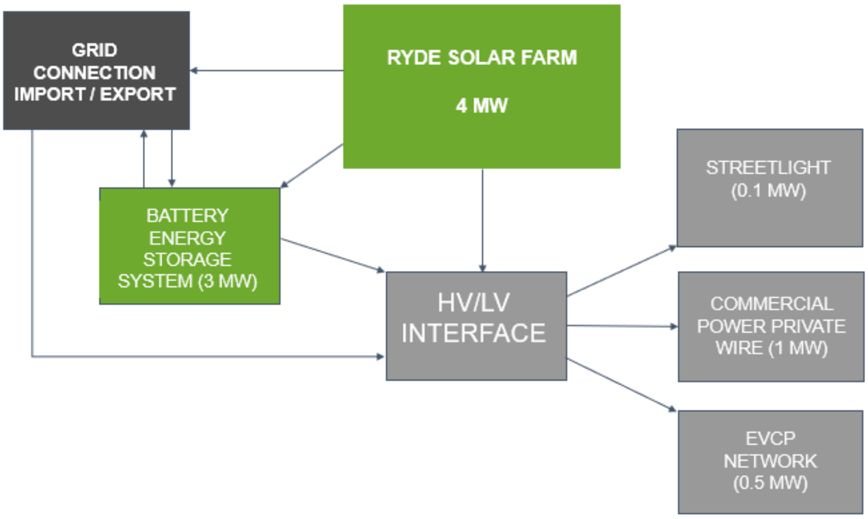
## 2.1 Masterplan

### 2.1.1 Ryde Business Park Masterplan c 27,000m2 development


2.1.2 This report is a stand-alone power model.

This report only considers electricity supply to common infrastructure and non-domestic consumers.

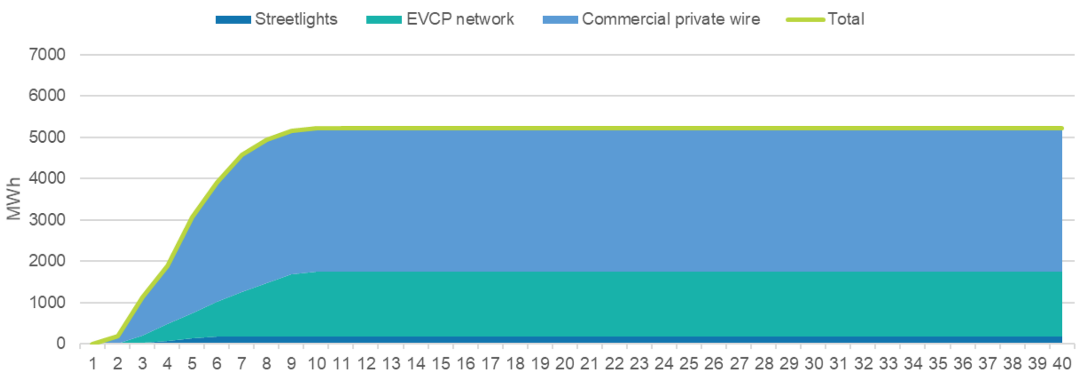
### 2.1.3 Power Schematic




## 2.2 Power demand assumptions

2.2.1 The following assumptions have been made to calculate overall electricity demand:

| Power consumption at build out | Qty | Annual demand (kWh) | Total annual demand (kWh) |
|---|---|---|---|
| Street & Traffic Lighting | 1 | 72,000 | 72,000 |
| EVCP (7.2kW twin) | 56 | 10,500 | 588,000 |
| Commercial (m2 NIA) | 9,818 | 910,129 | 910,129 |
| Light Industrial (m2 NIA) | 11,850 | 1,098,495 | 1,098,495 |
| Mixed use, local centre, retail | 6,500 | 1,462,500 | 1,462,500 |
| Losses (5% | | | 206,556 |
| TOTAL | | | 4,337,680 |



2.2.2 Non-domestic building demand is calculated by taking the peak demand assumptions (by property type) and assuming 30% peak load for 4,100 hours per annum.

2.2.3 EVCP are 7kW twin operating for 2,000 hrs per annum.

2.2.4 Other assumptions

- A discount factor of 3.5% has been applied to calculate return on investment for ESCo option presented.
- The ESCo concession term is 40 years, typically ESCo concession terms range from 25 to 50 years and up to 80 in some examples.

# 3 Power ESCo

## 3.1 ESCo structure

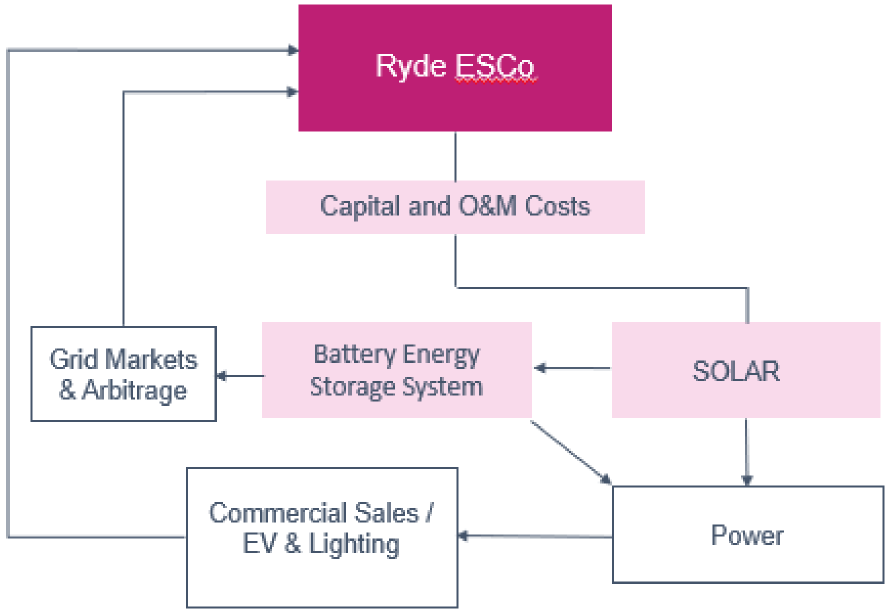



Image illustrates ESCo asset ownership and the flow of the various power revenues back to the ESCo.

3.1.1 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
- 4MW solar PV array

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

- Private Wire Electricity sales
- Arbitrage and ancillary market services
- Grid Export sales

## 3.2 Energy Concept

3.2.1 The design concept for this option is power only, heating assumed by Heat Pumps as a development cost for each property on the development.

3.2.2 ESCo will receive fixed standing and variable electricity charges.

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

3.2.4 Approx. 12 acres of land will be required for 4MW ground solar PV array.

3.2.5 Modelling assumes first power on Jan-23.

## 3.3 Financial model

3.3.1 Capital Expenditure (CAPEX) breakdown and assumptions made:

| ITEM | £m | Notes |
|---|---|---|
| Solar Farm | 3,600,000 | 4MW 12 Acres £900 per kW |
| EVCP | 105,000 | 56 x 7.2kW |
| BESS | 865,000 | 3MWh energy / 3MW inverter |
| Prelims & set up | 380,000 | Design & Project Management |
| **TOTAL** | **4,950,000** | |

- 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.

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

| ITEM | £m lifetime (uninflated) | Notes |
|---|---|---|
| Solar Farm | 1,520,000 | £10 / MWh / annum |
| BESS | 420,500 | £12k/yr |
| EVCP | 37,538 | 1% capex/yr |
| Insurance & Legals | 375,000 | £10k per annum |
| Metering & Billing | 33,345 | £20 per connection / annum |
| System monitoring & CCTV | 1,912,500 | £60k per annum |
| Land lease | 382,500 | £10k per annum |
| Business rates | 503,813 | Solar & BESS asset 2% capex |
| TOTAL | 5,185,195 | |

### 3.3.3 Replacement expenditure (REPEX) breakdown and assumptions made:

| ITEM | £m lifetime (uninflated) |
|---|---|
| BESS | 827,156 |
| TOTAL | 827,156 |

### 3.3.4 Pricing assumptions

| ITEM | Commercial | Assumptions |
|---|---|---|
| Connection fee (one off) | £12/m2 | Avoided cost of DNO connection |
| Fixed Electricity Tariff | £1/m2 | Power availability charge |
| All Electricity sales (kWh) | 14p | |
| Solar power price (kWh) | 0p | |
| Grid Export price (kWh) | 4.75p | |
| Grid Import price (kWh) | 12.75p | |

### 3.3.5 Electricity Cost & Revenue assumptions

- The Solar Farm will be connected to the HV infrastructure and BESS via a Private Wire Network.

### 3.3.6 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 75% 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.

| BASE MODEL ASSUMPTIONS (INFLATED) | |
|---|---|
| Discount Factor | 3.50% |
| Concession Term | 40 years |
| Connection Fee Income | £229,873 |
| Variable Electricity charge income | £28,549,872 |
| Fixed Electricity charge income | £1,234,812 |
| Grid Services income | £12,743,076 |
| Grid Export income | £3,860,353 |
| CAPEX | £5,554,355 |
| OPEX (inc commodities) | £22,518,764 |
| REPEX | £1,604,289 |
| IRR | 8.35% |
| NPV | £4,266,419 |

| SENSITIVITY | IRR | NPV |
|---|---|---|
| Base Case | 8.35% | £4,266,419 |
| 50% Solar Output to ESCo | 6.00% | £1,980,464 |
| 100% solar output to ESCo | 10.16% | £6,423,970 |
| Grid Service revenue -50% | 5.52% | £1,676,090 |
| No Grid Service Revenue | 2.23% | -£936,936 |
| Power Demand +20% | 10.80% | £6,585,566 |
| Power Demand -20% | 5.82% | £1,935,464 |

## 3.4 Grid Services

### 3.4.1 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% 0% availability to illustrate impact and risk.

## 3.5 Advantages and Disadvantages of a Power ESCo

| | |
|---|---|
| Advantages | • Ability to provide a Return on Investment and secure long-term revenue stream for IoW Council.<br>• Control over pricing regime.<br>• Ability to optimise investment in a new Solar Farm.<br>• Positioned well to exploit current and future revenue streams associated with decentralised & flexible power generation and storage. |
| 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.<br>• Grid capacity constraints for the supply of power to the electric heating systems on the development. |

# 4 Summary

## 4.1 Financial model

4.1.1 A case can be made for the development of a power ESCo for Ryde Business Park; however, the model assumptions are linear in nature i.e. total annual supply and demand assumptions.

4.1.2 In order 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 the Ryde area
- Full understanding of the available 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.

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

- Arbitrage / time-shifting
- Frequency Response
- Reserve

# Appendix A – Preliminary Risk Matrix

| RISK IDENTIFICATION & MITIGATION | | | | | | RISK ASSESSMENT - RESIDUAL RISK | | |
|---|---|---|---|---|---|---|---|---|
| **Ref** | Category | **Risk** | **Potential Impact** | **Risk Owner** | **Mitigation Action (preliminary)** | **Prob.** | **Impact** | **Risk Score (out of 25)** |
| 1 | Technical / Commercial | Grid connection import capacity upgrade possible expensive grid re-inforcements | ESCo Commercial Viability | ESCo | Urgent DNO engagement to understand grid capacity and costs for upgrade | 2 | 5 | 10 |
| 2 | Technical / Commercial | EVCP energy demand | ESCo Commercial Viability | ESCo | EV strategy to be agreed and reflected in commercial model | 2 | 4 | 8 |
| 3 | Technical / Commercial | Balance of energy demand, generation and storage | ESCo Commercial Viability | ESCo | Detailed Half Hourly modelling to underpin business case | 3 | 4 | 12 |
| 4 | Management | ESCo is an unregulated electricity supplier with no ability for consumer to switch | Delivery | ESCo | Balancing good consumer value with adequate supply margin is critical, Supply agreements to be carefully constructed with clear price review mechanisms. Regulatory advice to be taken from legal specialist. | 1 | 4 | 4 |
| 5 | Commercial | The model assumes an overall loss between generation of power and customer consumption of 5% | ESCo Commercial Viability | ESCo | Specialist M&E design of HV/LV infrastructure to provide higher certainty | 3 | 2 | 6 |
| 6 | Commercial | Not securing the forecast electricity contracts but as most of the base load is provided by ESCo controlled infrastructure. | ESCo Commercial Viability | ESCo | The majority of loads within the base case model are EVCP and site infrastructure. | 1 | 5 | 5 |
| 7 | Operation and Maintenance | Poor installation and/or operational performance by selected partner | ESCo Commercial Viability | ESCo | The Services element of the DBOM Contract should contain key Performance Indicators and should have reportable details on which the contractor is judged with penalties and termination events and consequences. The performance of the Contractor should be monitored monthly and reported at least bi-annually | 2 | 4 | 8 |
| 8 | Commercial | Indexation of Electricity Cost v Revenue | ESCo Commercial Viability | ESCo | Power should be supplied with an agreed mechanism of indexation such as projected BEIS Electricity predictions plus RPI. This should maintain the balance correctly. This ensures that any global effect on electricity cost effects both the buying and selling equally to maintain equalibrium. Standing Charges are also inxed to RPI. | 1 | 3 | 3 |
| 9 | Commercial | Bad debt. | ESCo Commercial Viability | ESCo | ESCo models typically allow a small percentage (1%-3% depending on customer profile), 1% has been allowed but can be flexed. | 1 | 2 | 2 |
| 10 | Technical / Commercial | Replacement Plant over the term | ESCo Commercial Viability | ESCo | The commercial model accrues capital cost for all major plant and equipment based on assumed replacement periods. This should be fully clarified through a specialist M&E design process. | 2 | 3 | 6 |