**Agenda Item No: 4**

# OUTLINE BUSINESS CASE FOR SMART ENERGY GRIDS FOR TRUMPINGTON AND BABRAHAM PARK AND RIDE SITES

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| *To:* | **Commercial and Investment Committee** |
| *Meeting Date:* | **25th May 2018** |
| *From:* | **Graham Hughes, Executive Director, Place and Economy** |
| *Electoral division(s):* | **Trumpington, Sawston, Shelford and Queen Edith's** |
| *Forward Plan ref:* | **Not applicable** **Key decision:** ***No*** |
| *Purpose:* | **To consider the outline business cases for two Smart Energy Grids at the Trumpington and Babraham Park and Ride sites** |
| *Recommendation:* | **Members are asked to:**<br><br>**a) agree the outline business cases; and**<br><br>**b) support the development budget of £150,000 for each site to fund the development costs to the first stage of an Investment Grade Proposal.** |



| ***Officer contact:*** | | ***Member contacts:*** | |
|---|---|---|---|
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## 1. BACKGROUND

1.1 In March 2018, Committee supported the vision for the development of a network of smart energy grids across Cambridgeshire using park and ride and other Council owned sites. See **Appendix A**. This vision builds on development work for a smart energy grid at the St.Ives Park and Ride, with a view to generate income over the medium to longer term.

1.2 St. Ives is the first smart energy grid scheduled for construction during 2018 once grant from Government is secured. It is a demonstrator project which identifies a new business model for local energy projects in areas where access to the local distribution network is heavily constrained. The lessons learnt on this project have informed the design of the next two projects, which have been a collaboration between the Energy Investment Unit and Bouygues Energies & Services Ltd.

1.3 It is proposed to develop smart energy grids on both Trumpington and Babraham park and ride sites with the addition of battery storage facilities that provide grid balancing services to the National Grid which can generate additional revenue (see section 1.7 below)

1.4 A smart energy grid consists of:

- solar renewable energy (2.1 MW each site);
- battery storage to facilitate local supply and demand;
- electric vehicle and bus charging, (including opportunities to charge autonomous vehicles coming forward under the Connecting Cambridgeshire programme and to support Greater Cambridge Partnership ambitions for electric buses);
- on-site energy efficient lighting;
- cabling to supply electricity to local consumers; and
- smarter management and control of decentralised renewable energy.

1.5 Aerial maps are shown at **Appendix B and C**.

1.6 The solar photovoltaic modules in the Smart Energy Grids will generate significant amounts of renewable electricity (estimated to be almost 2 million kWh per system per year, or the equivalent of 500 homes). This will be used to charge the battery energy storage and supply power for both the electric vehicle chargers and electric bus charging infrastructure. Upgraded LED lighting will be powered by the battery overnight. A component, called the Advanced Metering Infrastructure, will provide command and control functions of all of the above energy demand sources, ensuring maximum yield and optimum revenue generation. The surplus electricity will be exported from the site and sold to third parties.

1.7 Battery storage is seen as crucial to the transition from fossil fuels to renewable energy. In 2016 National Grid ran an auction to secure battery storage facilities to help balance the transmission network. Battery storage absorbs surplus electricity at times of excess generation and releases this when needed. Five hundred megawatts of new storage projects were procured in the auction, equivalent to a medium-sized thermal power station. This highlights the rapid change underway in Britain’s energy sector.

## 2. MAIN ISSUES

2.1 A summary of the outline business cases is included in Table 1 below and identify the

financial position for the two smart energy grids at this stage, ahead of further development work. The design of these schemes was intentionally developed without the requirements for grant or subsidy and therefore show the base case scenario for the two smart energy grids. This means, should grant schemes become available or funding contributions sought for the projects, the business cases can improve. The intention is to seek funding contributions once the schemes are established as viable.

*Table 1. Business case summary*

| | **Capital value** | **Payback period (years)** | **IRR (Internal Rate of Return)** | **NPV (Net Present Value)** | **25 year Net Return** |
|---|---|---|---|---|---|
| Trumpington P+R | £6.9M | 17.13 | 4.7% | -£502,577 | £7.0M |
| Babraham P+R | £11.4M | 12.8 | 8.59% | £4,909,799 | £24.5M |

2.2 When considered in isolation the NPV shown above for Trumpington would suggest this project should not proceed. However, while the site constraints at Trumpington mean a project there will inevitably be less attractive than at Babraham in financial terms, there are a number of opportunities to improve the expected return at Trumpington during the Investment Grade Proposal (IGP) stage. Those include:

- the possibility of joint funding for the scheme. For example a funding contribution of £500,000 would effectively improve the NPV by the same amount;
- supplying energy directly to customers at a higher price than the current baseline assumption of delivering via the grid;
- taking a less cautious view of the likely return on battery storage revenues once national proposals for the future of this market have been published; and
- building in economies of scale for the purchase of materials and services (currently each project has been priced fully independently).

2.3 There are a number of challenges facing this project which will impact on the final decision of whether to proceed to contract. Key risks include:

| **Risk** | **Mitigation strategy** |
|---|---|
| The inability to secure a customer for the onsite electricity would threaten the project's financial viability. | An option being explored is to sell electricity via grid connections and expert advice has been sought on this approach from the Department for Business, Energy and Industrial Strategy (BEIS). Also, outreach is being conducted to secure commitment from local companies (i.e. Addenbrookes) in parallel with business case development. |
| Securing a grid connection in a constrained area. | An application will be made to UK Power Networks to determine the basis on which a connection to the grid can be made. This connection is necessary in order to offer grid balancing services. UKPN will provide the cost of the connection and whether any |

| | |
|---|---|
| | reinforcement is required, which could impact the revenues and scale of the project. |
| Uncertainty of future revenues from providing grid services | *Bouygues Energies & Services Ltd are consulting with Aggregators, these are companies that will seek the best revenues from our project. |

*Bouygues Energies & Services Limited were procured during 2017 by the Council to support the development of energy projects.

2.4 Proceeding with this project would also have wider advantages, for instance through providing a recharging location for electric buses as they come online, and acting as a showcase project for commuters and visitors to the City. See **Appendix A** for the wider vision for park and rides.

2.5 The full expected costs of carrying out the project are dependent on the scenario selected to go forward, however, the base case scenarios for both sites are estimated to be £6.9M (Trumpington) and £11.4M (Babraham), reflecting the larger solar and battery storage capacity than proposed for St Ives. The first stage of IGP will inform that investment decision. The project will return to Commercial and Investment Committee for authorisation to proceed to finalise the IGP and again for decision to invest.

2.6 The schemes will be built on property assets owned by the Council to generate revenue streams without disturbing its original use. The revenues generated by the schemes will be mainly through Power Purchase Agreements (PPA) and Firm Frequency Response (FFR) plus some revenue savings on energy bills. PPAs are a legal arrangement to sell electricity directly to a customer and FFR is providing services to support the grid.

**Design options**

2.7 The development of smart energy grids is complex. The sizing of different elements of a scheme is dependent on a number of variables including:

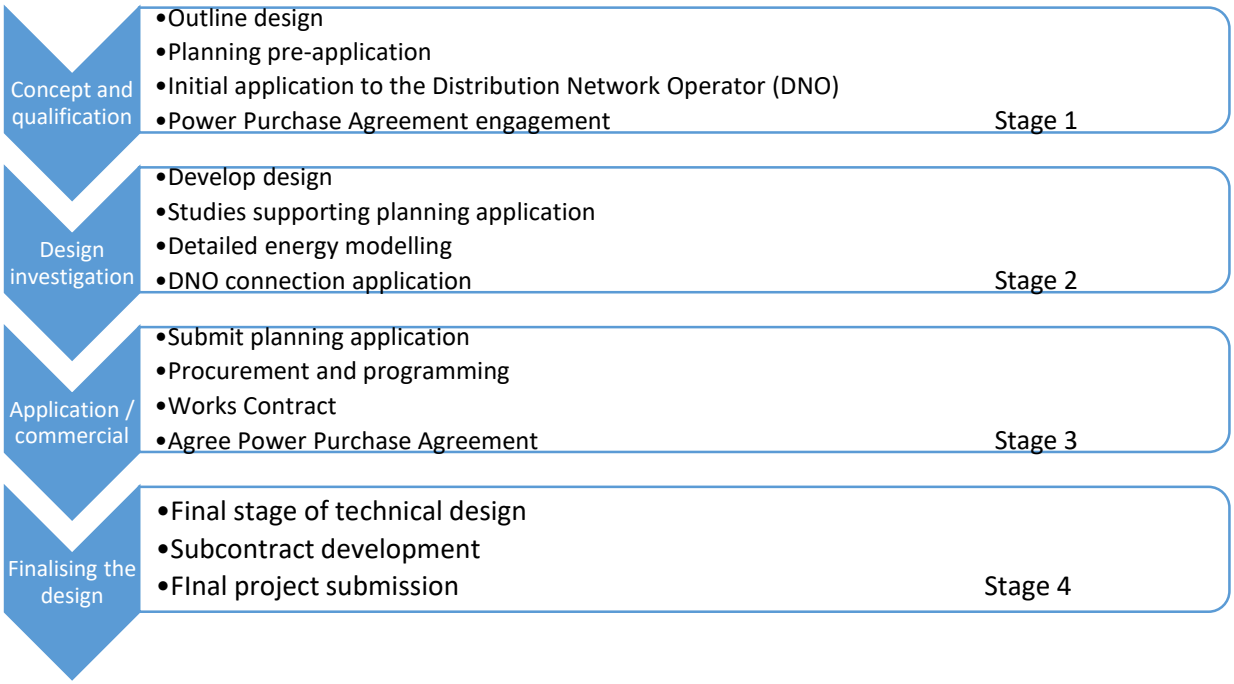
(i) the energy demand of local consumers,
(ii) interest from businesses to buy electricity directly from the scheme,
(iii) the size of battery storage needed to manage supply and demand,
(iv) expected uptake of electric vehicles,
(v) regulatory restrictions,
(vi) planning constraints and
(vii) community support.

2.8 These options will come clear as further development work is undertaken and engagement with the Local Authorities, businesses, distribution network operator and communities is progressed in more detail. Further investigative works are required to determine the optimal combination and technology sizes for the schemes before a final design can be fully costed.

**Development Approach**

2.9 In previous Committee papers, the Energy Investment Unit (EIU) has requested permission to proceed to develop a full Investment Grade Proposal (IGP). Instead, it is proposed to

split the IGP development into four phases as described below. The intention is to obtain the maximum level of certainty and security at the earliest stage of the development, in terms of cost and commitment. It is proposed that a prescribed scope of work is set for each stage of development, with a decision gateway between the stages.




2.10 Given the uncertainties at this early stage of development, instead we are requesting a budget of £150,000 for each project to proceed to the first stage of the IGP (Concept and Qualification). This is a way to de-risk the approach. This will cover internal staff and legal costs, pre-planning application discussion, and grid connection investigations. If the project proceeds this cost would be recovered as part of the overall project costs, but if the Authority chose not to proceed to the next stage, this cost would still need to be paid from profits from other energy projects.

2.11 If approved, the project will return to Committee at the end of Stage 1 to request funds to finalise the IGP. The EIU will manage the stage gate process to move between IGP stages 2 – 4. Assuming the final IGP is accepted, the EIU will return to Committee a third time to request authorisation to proceed to the implementation phase.

**Battery Storage Revenue**

2.12 There are a number of variations the project will explore, in terms of what customers to sell to and how best to exploit the battery storage. The additional battery storage allows us to provide services to the National Grid (i.e. discharge the battery at times of high demand on the grid for a payment) and balance supply and demand. It's important to note that grid services are an evolving market with uncertain revenue streams, however market reports confirm that with additional renewable energy on the grid, the necessity for frequency response to balance periods of high demand is increasing. In addition, National Grid are undergoing reform which is focusing on making the market more transparent and easier to tender to supply grid services.

**Electrification of Transport**

2.13 As major transport hubs to the south of the City centre, both Trumpington and Babraham sites are included in the planned roll out of smart energy grids to support the electrification of transport. In March 2018, Committee supported the concept of developing a network of smart energy grids to bring forward the electrification of buses across Greater Cambridge and the Greater Cambridge Partnership (GCP) Executive Board agreed the principle of electric buses and progressing an electric bus pilot. Recommendations from Greater Cambridge Partnerships Low Emission Bus study (April 2018), which includes Smart Energy Grids, are scheduled to be presented at the July meeting of the GCP Executive Board.

2.14 Connecting Cambridgeshire has recently secured a £3.2M contract to operate autonomous vehicles between Addenbrooke's / Biomedical Campus and Trumpington Park and Ride. Discussions are underway for charging the autonomous vehicles at the Trumpington P+R Smart Energy Grid.

2.15 As the Smart Energy Grids will assist these projects in meeting their objectives via the supply of low-carbon, zero emission generation, our teams have been coordinating and there is a potential to seek funding support.

## 3. ALIGNMENT WITH CORPORATE PRIORITIES

### 3.1 Developing the local economy for the benefit of all

In many parts of Cambridgeshire, decentralised energy cannot connect to the local grid as it has reached capacity; also fault levels on existing networks are in danger of being breached. Without significant investment in Super Grid Transformers (approximately £10million) and localised network upgrades, some decentralised energy projects cannot connect to the grid. This is a significant market barrier for cleantech companies. New thinking and business models must be developed to overcome this challenge and to bring forward investment. In addition, the investment returns over the medium to long term will input finance to support Council services.

Locally generated electricity improves our energy security by reducing our reliance on imported energy and helps build a local energy economy that can benefit our communities.

### 3.2 Helping people live healthy and independent lives

The project will provide clean renewable energy to power the sites' usage, and local customers either directly or via electric vehicle charging, thereby reducing the Council's and Cambridgeshire's carbon footprint and mitigating climate change. Electric bus charging will have a direct and positive impact on air quality.

### 3.3 Supporting and protecting vulnerable people

There are no significant implications for this priority.

## 4. SIGNIFICANT IMPLICATIONS

### 4.1 Resource Implications

If, following the development of the detailed business case, it is decided not to implement the projects, the funding for the development of the detailed business cases will have to be paid. The current proposition is to offset the costs from these projects against the wider program of energy projects in the pipeline.

There are no implications for Information and Communications Technologies or data ownership.

**Impact on human resources**. The costs for county council staff involvement to deliver the project are included in the requested development budget.

**Sustainable Resources**. The project's goal is to generate low-carbon electricity, reduce electricity usage on-site and provide solutions to the grid capacity problems experienced across Cambridgeshire.

### 4.2 Procurement/Contractual/Council Contract Procedure Rules Implications

Bouygues Energies & Services was procured under a mini-competition run under the Refit 3 Framework. As the Framework does not expire until April 2020, there are no significant implications from a procurement or contractual standpoint.

### 4.3 Statutory, Legal and Risk Implications

There is the potential for State Aid implications even if we do not pursue grant funding. The EIU would need to demonstrate that neither Bouygues nor the potential customers received non-commercial treatment.

Health and safety implications. The canopies could provide some potential cover for crime, therefore the CCTV cameras on site will be repositioned for better coverage. Under canopy lighting will also be provided for better visibility.

### 4.4 Equality and Diversity Implications

There are no significant implications.

The electric vehicle charge points will be available to the entire community.

### 4.5 Engagement and Communications Implications

There are no significant implications.

The EIU has discussed the project with:

- relevant members of the Guided Busway and Park and Ride teams;
- South Trumpington Parish Council at a meeting on the 24th of April;
- potential customers for the electricity generated;

- the Trumpington Resident's Association on the 25th April; and
- planning officers at South Cambridgeshire District Council and Cambridge City Council.

A questionnaire was provided to commuters at the Trumpington Park and Ride and made available on www.mlei.co.uk to gauge support and concerns. The 39 respondents to date overwhelmingly supported this type of investment (94.9%) and 94% stated that the project would not change how they use the Park and Ride.

Cambridge International Airport and Duxford were notified of the proposals for their feedback on the impact of the solar panels on radar or glare to pilots. Cambridge International requested that we complete an impact assessment during the planning application phase. We met with Duxford representatives on the 15th of May to discuss the breadth of energy generation projects proposed.

Public outreach was done at the Babraham Park and Ride on two mornings in May.

Overall there has been solid support with a few concerns expressed over construction noise, glint and glare from the panels, and length of construction program on active park and rides. All of these issues will be explored and mitigation strategies put in place, as appropriate.

**4.6 Localism and Local Member Involvement**

There are no significant implications.

Information on the project has been shared directly with relevant Councillors.

Early discussions with planners from Cambridge City and South Cambridgeshire have been held.

Please see 4.5 above for further details

**4.7 Public Health Implications**

Vehicle emissions are a direct cause of poor air quality and the introduction of additional electric charging points for cars powered by zero emission electricity could therefore contribute to lower emissions and therefore result in positive health benefits through improved air quality. The Transport and Health Joint Strategic Needs Assessment 2015 states that new low emission vehicles are either fully electric with no emissions at the point of use or hybrid vehicles which have significantly reduced emissions for periods of the drive cycle and may be capable of some zero emission running. Therefore, with new low emission vehicle technology there is the potential for substantial real world cuts in emissions.

| Implications | Officer Clearance |
|---|---|
| | |
| **Have the resource implications been cleared by Finance?** | Yes<br>Name of Financial Officer: Sarah Heywood |
| | |
| **Have the procurement/contractual/ Council Contract Procedure Rules implications been cleared by the LGSS Head of Procurement?** | Yes<br>Name of Officer: Paul White |
| | |
| **Has the impact on statutory, legal and risk implications been cleared by LGSS Law?** | Yes<br>Name of Legal Officer: Debbie Carter-Hughes |
| | |
| **Have the equality and diversity implications been cleared by your Service Contact?** | Yes<br>Name of Officer: Tamar Oviatt-Ham |
| | |
| **Have any engagement and communication implications been cleared by Communications?** | Yes<br>Name of Officer***:*** Joanne Shilton |
| | |
| **Have any localism and Local Member involvement issues been cleared by your Service Contact?** | Yes<br>Name of Officer: Tamar Oviatt-Ham |
| | |
| **Have any Public Health implications been cleared by Public Health** | Yes<br>Name of Officer: Tess Campbell |

| Source Documents | Location |
| --- | --- |
| 1. High Level Assessment, Trumpington Park and Ride, Smart Energy Grid, April 2018<br>2. High Level Assessment, Babraham Park and Ride, Smart Energy Grid, April 2018<br>3. Cambridge City Council, Cambridge Local Plan 2014: Proposed Submission, July 2013 (section 4)<br>4. South Cambridgeshire Local Plan, July 2013 | 1. Energy Investment Unit<br>2. Energy Investment Unit<br>3. https://www.cambridge.gov.uk/local-plan-review-proposed-submission-consultation<br>4. https://scambs.jdi-consult.net/localplan/ |

**Appendix A**

# Connected Futures: Smart Energy Infrastructure for Cambridgeshire

Developing an innovative network of Smart Energy Grids along key routes to support the electrification of public transport and generation of renewable energy to sell locally.

## Vision

- A network of Smart Energy Grids at Park & Ride Transport Interchanges in and around Cambridge and along public transport routes to support the electrification of transport
- The network will generate renewable energy, facilitate EV charging for buses, cars and freight and allow for selling of energy to local customers via Power Purchase Agreements (PPAs)

## Smart Energy Grids

- Smart Energy Grids provide renewable energy, battery storage, EV and bus charging for vehicles, and electricity for sale to local customers
- First Smart Energy Grid will be built at the St Ives Transport Interchange on the Guided Busway during 2018
- Planning is underway for Smart Energy Grids at Trumpington and Babraham Transport Interchanges, with other sites to be assessed during 2018
- A microgrid is planned for Northstowe Business Park once construction is complete

## Interval Bus Charging Infrastructure

- Interval charging along the Busway and on streets across the city
- A single eco-system of energy generation to support public transport
- Renewable energy generated locally helping to balance the demand for energy at a local level

3D images of Smart Energy Grid for St Ives, courtesy of Bouygues Energies and Services Ltd.






## Supporting the Smart Cities Programme

The Smart Energy infrastructure supports innovation and growth through the Smart Cities Programme, which includes:

- Autonomous Shuttle trials on southern section of the busway
- Linking to Rapid Mass Transit proposals
- Mobility as a Service (MaaS) plan

## Growing Technology and Life Science Clusters

- Babraham Research Campus – 60 bioscience organisations, employing 1,200 people, expanding labs and offices by 2019
- Cambridge Science Park – over 100 companies from small start-ups and spin-outs to subsidiaries of multinational corporations
- Granta Park – 20 life science companies, employing 2,500 people, expanding to 4,000 by 2020
- Cambridge Biomedical Campus – expanding rapidly with 26,500 visits to the campus every day from staff, patients, academics and visitors
- Wellcome Genome Campus – home to some of the world's foremost science institutes, with 2,600 workers travelling in from a wide area

MLEI

Clean local energy supplies are essential for a modern economy and a quality public transport system.

As a society, we need to move towards energy sustainability and clean air. Generating energy for local users is a key step on this journey.

**www.mlei.co.uk**

Cambridgeshire County Council · connecting CAMBRIDGESHIRE · GREATER CAMBRIDGE PARTNERSHIP · MLEI

**APPENDIX B** – Trumpington Park and Ride aerial map

**APPENDIX C –** Babraham Park and Ride aerial map