

BABRAHAM SMART ENERGY GRID – OPTIONS APPRAISAL

To: Commercial and Investment Committee

Meeting Date: 22 November 2019

From: Steve Cox, Executive Director, Place and Economy

Electoral division(s): Sawston and Shelford and Queen Edith's

Forward Plan ref: N/a **Key decision:** No

Purpose: To consider the technical options appraisal conducted for the Babraham Park and Ride Smart Energy Grid project.

Recommendation: The Committee is being asked to:

a) Approve the preferred option (Option A1 + B2) for the smart energy grid project at Babraham Park and Ride as set out in Table 1 to be developed further through the Investment Grade Proposal process.

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1. BACKGROUND

- 1.1 At the May 2018 Commercial and Investment Committee meeting, a development budget for the first stage of an Investment Grade Proposal (IGP) for smart energy grids was granted for both Trumpington and Babraham Park & Rides. A development budget of £300,000 was approved split evenly between the two sites.
- 1.2 An update on the progress of work on the Investment Grade Proposal was considered at the June 2019 Commercial and Investment Committee meeting.
- 1.3 Through the Climate Change Act, the government has committed to reduce emissions by at least 80% of 1990 levels by the year 2050. In mid-June, government proposed to increase the target to 100% of 1990 levels by the year 2050. To meet these targets, the government has set five-yearly carbon budgets which currently run until 2032. They restrict the amount of greenhouse gas the UK can legally emit in a five year period.
- 1.4 In order to meet these carbon budgets, the government has laid out ambitious plans to decarbonise heat, electricity and transport. This government has set policy to ban the sale of diesel and petrol powered vehicles by the year 2040. The London based consultancy Capital Economics has estimated that 4,000 electric vehicle chargers will have to be installed daily across the country over the next 17 years in order to meet the UK's target of cutting greenhouse gas emissions to net zero by 2050.¹
- 1.5 A carbon footprint for Cambridgeshire was developed by Cambridge University's Science and Policy Exchange (CUSPE) and adopted as an evidence base for the Climate Change Strategy in October 2019 by General Purposes Committee. The CUSPE report identifies that 100% of cars, buses, small vans, motorbikes must be electric and 91% of Heavy Goods Vehicles by 2050.
- 1.6 In addition, the Council declared a climate emergency in May 2019 and in that motion recommended steps to move further faster in recognition of the need for urgent action.

2. MAIN ISSUES

Developing outline designs

- 2.1 At the June 2019 Commercial and Investment Committee, uncertainty about the timing and level of revenues in the market for battery storage services was discussed.
- 2.2 At that meeting, it was flagged that the concept and design of the scheme remained under review to explore options including more rapid uptake of electric vehicle chargers, sales to a local customer in place of revenue from battery

¹ <https://www.ft.com/content/9cba0522-f564-11e9-b018-3ef8794b17c6>

storage services and reviewing a range of different options for the use of the battery energy storage. These options were explored to reinforce the economic business case and reduce reliance on battery storage revenues which remain uncertain.

- 2.3 Bouygues, the Council's partner, conducted an options appraisal of several combinations of technologies and / or services. Three different options were explored in terms of the sales of electricity – wholesale to the grid, a sleeved arrangement benefitting the Council and a Power Purchase Agreement. All options are summarised in **Appendix A**.
- 2.4 The preferred option to maximise the operation of the solar generation is to pursue a power purchase agreement and the expansion of electric vehicle chargers (Options A1 and B2).
- 2.5 Option B2 is a slower roll out of electric vehicle chargers (20 per year) than Option B1 (500 chargers installed on day one). Option B1 is intended to stay ahead of demand and can be adjusted according to actual uptake. In the year ending 31 July 2019, there were over 800 car charging events at the Babraham Park and Ride on the 4 existing chargers.
- 2.6 In parallel, the optimal solution for exploiting the battery storage is Option C2. While the economics do not at present stack up, there are rapid changes in the market that could change the situation. Recently, the court challenge against the Capacity Market has been dropped, opening up opportunities for maximising the use of the battery storage. Also, there is independent research supporting the colocation of solar and battery storage as described in paragraph 2.14. The economics of the shortlisted options are summarised in **Table 1**.

Table 1. Summary of financials of short-listed options

	Capital value	Payback period (years)	IRR (Internal Rate of Return)	25 year Net Return
A1 + B2 (preferred option)	£4.9 – 5.3M	13.8 – 14.9	7.0 – 8.1%	£19M
A1	£4.9 - £5.2M	16.4 – 17.4	4.1 – 4.9%	£12.6M
B1	£5.1 - 5.4M	14.8 – 15.3	7.0 – 7.6%	£21.3M
B2	£4.7M	14.2 - 14.4	8.0 – 8.3%	£21.4M
A1 + B1	£5.3 – 5.9M	15.7 – 16.9	4.7 – 5.6%	£14.7M
C2	£9.5 – 10.5M	∞	Negative	£13.1M
Note: all scenarios were modelled with a 2.25% loan interest rate. The minimum to maximum scenario costs and returns are presented. The capital value of the preferred option is different to the maximum value presented to Capital Programme Board and included within the draft 2020-21 Business Plan, as that figure allowed for grid connection costs needed to enable the battery storage option. Once the preferred option has been decided, the capital project business case will be updated accordingly.				

Planning

- 2.7 As the site is located in the Cambridge Green Belt additional sensitivities can be expected. A community engagement officer will be procured to help manage these in November.
- 2.8 A Preliminary Ecological Assessment has been conducted identifying two issues: the existence of potential bat foraging areas on site and that one of the routes for electrical connection cabling traverses a wildlife corridor. A breeding bird survey was also conducted. An Environmental Impact Assessment (EIA) screening opinion based on the application site and excluding any cabling routes has been submitted to the County Council as the local planning authority for assessment.
- 2.9 Further surveys are in train for areas such as flooding, archaeology, noise, heritage, etc. The full planning application is scheduled to be submitted in December 2019, subject to the EIA screening opinion not finding the project to be EIA development.

Connection to the Distribution Network Operator

- 2.10 An application for a connection under UK Power Network's Flexible Distributed Generation (FDG) scheme was made in April 2019 to understand potential costs. The FDG scheme offers grid connection at a lower cost, however, generation could be subjected to curtailment. A curtailed connection means that CCC could be asked to reduce our generation over the course of the year.
- 2.11 An application was made by Bouygues to UKPN for the largest capacity of battery storage and solar PV array (12 MW in total). CCC has been advised that the connection costs could be £1.46 million with estimated curtailment of 3% of generation. A firm quote has been requested. Note that the grid connection is only needed should we pursue Option C2, it is not needed for Options A1 and B2. The cabling routes have been excluded from the EIA screening opinion until we firm up the route to the customer.

Power Purchase Agreements/Other revenues

- 2.12 Discussions with the potential Power Purchase Agreement (PPA) customer (Option A1) on purchasing green electricity from the project have been positive. They have signed a memorandum of understanding on the project as well as a Letter of Authority allowing us to apply for a grid connection on their site. Technical discussions are ongoing to confirm the best location to connect to their substations and a site visit was held on 7 November. Sales to a local customer via a PPA can produce a better return on investment as sales are at retail price rather than selling directly at a wholesale tariff onto the grid.
- 2.13 A buried private wire would be required to connect the Babraham Park & Ride site to the PPA customer in order to supply electricity, however much of the land between the two locations is owned by the County Council. Discussions regarding the private wire route have started with Rural Estates and Strategic

Assets.

- 2.14 Connecting to the PPA customer would mean the Authority incurring a significant extra cost for the additional cabling required. This cost would be covered in the longer term by the higher revenues available from selling to the customer at retail prices rather than exporting to the grid at wholesale prices. However, there would be a potential risk of loss if the customer wished to terminate the contract in the shorter term. We intend to mitigate this risk by requiring a minimum contractual term in the PPA.
- 2.15 There are still opportunities to explore the battery storage. Research from the independent body, Aurora Energy Research, suggests real returns of around 7% for co-located battery and solar schemes – more attractive than either battery or solar on its own. While they are not able to pinpoint exactly how the revenue for batteries would be generated in future, the Balancing Mechanism is likely to form a large part of revenue. As Aurora's research is commissioned by the Department for Business, Energy & Industrial Strategy (BEIS), it does give a pointer to an understanding and acceptance by government that returns need to be high enough to fund a significant expansion in the current level of battery provision.

Outreach

- 2.16 In January and February 2019, presentations were given by officers of the County Council and partner organisation Bouygues to Great Shelford Parish Councillors and to a public meeting in Great Shelford. In addition, staff were available at the Babraham Park and Ride site to talk to commuters about the project on several occasions. A letter was delivered to local residents, information posted on the County Council's Facebook, Twitter and LinkedIn sites and www.mlei.co.uk advertised the above events.
- 2.17 Local businesses were also visited in person ahead of the above meetings to provide information about the project.
- 2.18 A presentation on the project to Great Shelford residents was given on 19 November 2019 and a presentation to the Great Shelford Parish Council on 20 November 2019. This has been promoted on social media (Facebook, Twitter and LinkedIn), to local Councillors, to local community newsletters and a direct mailer to homes and businesses near the Babraham Park and Ride site.
- 2.19 Periodic updates are also provided to local Councillors via email.

Other risk management

- 2.20 The Biomedical campus continues to grow as does the demand for parking at Babraham Park and Ride site. Since the relocation of Papworth Hospital, monitoring at the Babraham Park and Ride identifies that the site is at or near capacity. Discussions are now ongoing with Greater Cambridge Partnership on expanding car parking capacity when construction of the smart energy grid starts on site. Different options have been designed and will be progressed in parallel

with the clean energy project. There is the potential for up to 160 additional car parking spaces.

- 2.21 The Office of Gas and Electricity Markets (OFGEM) has been consulting on changes to its charging regime for use of the network for all asset types across the UK power system. The proposals aim to level the playing field between different forms of generation from 2023. However, the current proposals would negatively impact solar and battery storage schemes connecting to the distribution or transmission network more than any other type of asset. This has led OFGEM to review their proposals but if left unchanged, this has the potential to delay subsidy free solar and battery schemes by up to 3-5 years, as there may be no mechanism for these projects to recover the additional charges. Other asset classes can access Contract for Difference or capacity markets to recoup the additional charges. Discussions are now ongoing with BEIS to prepare Government on the impact of these proposals on their Clean Growth Strategy.

3. ALIGNMENT WITH CORPORATE PRIORITIES

3.1 A good quality of life for everyone

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.

3.2 Thriving places for people to live

There are no significant implications for this priority.

3.3 The best start for Cambridgeshire's children

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, capital costs to date will have to be transferred back to revenue. These costs would then be funded by the contingency for aborted schemes element of the Transformation Fund bid previously approved by General Purposes Committee in May 2019.

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.

Sustainable Resources. The project's goal is to generate low-carbon electricity, reduce electricity usage on-site, increase the provision of electric vehicle charge points 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 projects must only be under contract for developing the Investment Grade Proposal by the time the Framework expires in April 2020, there are no significant implications from a procurement or contractual standpoint.

4.3 Statutory, Legal and Risk Implications

Regulatory risk. The OFGEM Targeted Charging Review referenced in paragraph 2.20 presents risk to forming viable business cases for solar and battery storage projects which require connection to the distribution network. A direct connection to a local customer would mitigate this risk.

Reputational risk due to a lack of parking during construction. Greater Cambridge Partnership is investigating additional permanent car parking to the west of the bus entrance. It is possible that, subject to planning consent, these spaces will be in place before the smart energy grid construction is scheduled to start.

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.

A private wire connection to the PPA customer would necessitate wayleaves / easements on third party land. A private Power Purchase Agreement would also be necessary.

4.4 Equality and Diversity Implications

There are no significant implications. See Equality Impact Assessment Screening Form attached as Appendix B.

The electric vehicle charge points will be available to the entire community. The carport foundations will provide little impediment to parking as they will be arranged in the centre of the double bays, therefore they will not impede on drivers exiting vehicles or impact elderly, disabled or family access. During construction, the work areas will be cordoned off and drivers will be redirected to other areas of the site. The provision of disabled and family car parking spaces will be retained.

4.5 Engagement and Communications Implications

A letter explaining the project was distributed to the surrounding households and businesses in person during January 2019. Staff manned a table at the Babraham Park and Ride to communicate details of the project to commuters in the same time period. A presentation to the Great Shelford community was made in February 2019 and another is programmed for November 2019.

4.6 Localism and Local Member Involvement

Presentations were made to Great Shelford Parish Council and to Great Shelford residents and businesses in January and February 2019, with another event programmed for November 2019. An email update was also provided to the Parish Council, County Members, and City Councillors for Queen Edith's, Shelford, and Cherry Hinton in May, June, July and October 2019. These areas were chosen as they contain housing nearest the park and ride so may experience some disruption.

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 lower pollution 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 Name of Financial Officer: Eleanor Tod
Have the procurement/contractual/ Council Contract Procedure Rules implications been cleared by the LGSS Head of Procurement?	Yes Name of Officer: Jon Collins
Has the impact on statutory, legal and risk implications been cleared by LGSS Law?	Yes Name of Legal Officer: Fiona MacMillan
Have the equality and diversity implications been cleared by your Service Contact?	Yes Name of Officer: Elsa Evans
Have any engagement and	Yes

communication implications been cleared by Communications?	Name of Officer: Joanna Shilton
Have any localism and Local Member involvement issues been cleared by your Service Contact?	Yes Name of Officer: Emma Fitch
Have any Public Health implications been cleared by Public Health	Yes Name of Officer: Iain Green

Source Documents	Location
1. Outline Business Case for Smart Energy Grids for Trumpington and Babraham Park and Ride Sites, paper to Commercial and Investment Committee, 25 May 2018. 2. Babraham Smart Energy Grid – Investment Grade Proposal Stage 1 Update, paper to Commercial and Investment Committee, 21 June 2019. 3. Battery Energy Storage System Market Opportunity & Risk, paper to Commercial and Investment Committee, 21 June 2019.	1. https://tinyurl.com/y4rypxyn 2. https://tinyurl.com/y2ml34y4 3. https://tinyurl.com/y4fmkgzq

Appendix A – Options appraisal results conducted by Bouygues

Table 2. Discounted options assessed

Name	Scope Overview
Base case	2.1 MW solar carport scheme only, exporting electricity to the grid on a wholesale tariff.
Option A2 – Sleeved PPA	This is as the base case in terms of technical specification but instead of selling the electricity into the wholesale markets, a private agreement is reached with a licensed electricity supplier to purchase the electricity and sell back to CCC to offset demands across the wider estate.
Option C1 – 12MW Connection Infrastructure (no battery)	Includes the infrastructure and statutory approvals to facilitate future installation of battery energy storage, to an import/export capacity of 10MWp. Infrastructure will include the electrical switchgear and connections but not the battery energy storage system (BESS) or housing.
Option A1 + Option C3 (5MW)	The private wire connection between the PPA customer and the site that is sized to a larger capacity of 5MW, thus allowing the introduction of a BESS in future. Includes all electrical infrastructure, except the BESS and associated controls. The DG connection application is limited to the 'day 1' generation capacity of 2.1MW and does not include for introduction of the BESS – this would need to be done as part of any future business case.

Table 3. Shortlisted options

Option A1 - Direct Power Purchase Agreement	As base case, except the point of connection shall be made at the PPA customer site, via circa 1.5km of trenched cabling from the site. A new customer transformer and modifications to the PPA customer's HV switchgear is included.
Option B1 – Electric Vehicle Chargers (Day 1)	Includes the installation of electric vehicle (EV) chargers throughout the car port installation and integrated controls to manage demands with generation capacity.
Option B2 – Electric Vehicle Chargers (roll-out)	A variant to the above, although instead of installing the EV chargers as part of the initial installation, they are rolled out in phases, to align with the increase in EV.
Options A1 + B1	The private wire connection between the PPA customer and the site as set out in A1 and the introduction of EV chargers, as set out in B1. The volume of power exported to the PPA customer will be less than that in A1, as a proportion of electricity will be consumed on site. In addition, the electrical infrastructure will be designed to facilitate supply by the PPA customer to the site, so as to allow import during low generation periods. Thus, a bi-directional commercial agreement will be in place for supply and demand.
Option A1 + B2 (preferred)	Using the PPA customer connection point as the grid connection and an EVC Roll-out - 20 at project initiation and further 20 per year, additional lifecycle/maintenance costs have been

	added periodically.
Option C2 – 12MW Connection Infrastructure + BESS	As C1 above, although includes the BESS and all associated controls as a complete installation.