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Energy Feasibility Report Update

For

Hartnoll Business Centre Extension, Tiverton

For

Waddeton Park Ltd

October 2024

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Revisions schedule		
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Status	**FINAL**	
Revision	**Date**	**Changes**
A	14/10/2024	Costs added. Commentary addressed.
B	16/10/2024	Final minor amendments
C	22/10/2024	Integrating final comments from PCL Planning
D	23/10/2024	Final Amendments

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1. Executive Summary

1.1 Introduction

Carbon Plan Engineering have been asked to provide an addendum to the feasibility report originally published in June 2023 in support of the planning application for a new Business Park extension adjacent to Hartnoll Business Centre near Tiverton. The original planning application is described as:

> *Outline for the extension of existing business park for up to 3.9ha of employment land and up to 150 dwellings with associated infrastructure and access with all other matters reserved*.

This feasibility study focuses on connecting the heating and hot water systems for the proposed new Business Park extension to the existing consented Anaerobic Digestor system operated by the owner of the business park. The Anaerobic Digester is consented with electricity generation capacity of 500kW$_{(e)}$ for export to the grid and some of which is currently utilised for electric and heat generation for processes on the farm adjacent to the existing business park . It is worth noting that:

- The majority of the Heat generated is available for use on the proposed Business Park extension
- The majority of the Electricity generated is currently exported to the National Grid but could also be used directly to service the proposed Business Park extension.

Please refer to Section 2.2 and 2.3 for more details.

The original feasibility and this addendum concentrate on the thermal energy use as this will offset any new fossil fuel (Natural Gas) use within the proposed development. However we also discuss the direct use of the electricity that is currently generated from the consented AD scheme.

The Further Additional Statement of Common Ground between WPL and the Council refers to the AD plant in section 3.4 and this addendum confirms that the connection to the proposed new Business Park extension **does not** … “rely upon any additional output that may, or may not, be occurring in breach of planning permission”.

1.2 Summary Conclusions

We have carried out a further review of the anticipated heating demands from the proposed new Business Park extension and we have found that the development proposals:

- **would have peak thermal demand of 800 kW thermal energy**
  - there is 600kW$_{(th)}$ of spare thermal capacity currently generated from the consented AD system with no additional feedstock
  - therefore 75% of peak demands could be met by the consented AD system under current operational limits.
  - the detailed design of the new Business Park extension will utilise thermal storage and if required Heat Pumps to achieve 100% of the peak demand
- **would have thermal consumption of circa 1,500 MWh per year**

- 2,500 hours of the current running time from the consented AD system would be needed to meet this consumption
- therefore 100% of the annual thermal consumption could be met by the current available heat from the consented AD system

- **would have electricity consumption of circa 1,300 MWh per year**
  - the consented 500kW$_{(e)}$ AD system exports circa 4,818 MWh of electricity to the national grid. This is circa 3.7 times the electricity consumption requirements assumed for the new Business Park extension
  - the intention is that an electrical connection is made to the new Business Park extension which would allow all of the new electricity demands to be met by the AD System

We can therefore re-confirm our original conclusions below:

This development proposal for connection of the new Business Park extension to the AD system is a genuine example of utilising a low carbon CHP system.

The existence of the AD in close proximity to the proposed new Business Park extension offers a unique opportunity that, to the best of our knowledge, cannot be replicated elsewhere in Mid Devon.

This marks the development proposal out from other forms of CHP (for example at Cranbrook or Pinhoe) that are fuelled by fossil fuelled gas.

The under-utilisation of the existing system offers an opportunity to link the Business Park extension to an electric and heat connection and supply for new commercial floorspace. The new Business Park extension will be designed to be connected to the available heating supply from the Anaerobic Digestor system and this would achieve a genuine low carbon development.

It would be an exemplar of low carbon best practice.

2. Review of data

2.1 Proposed buildings – Energy loads

The original analysis has been reviewed and we believe this provided an accurate representation of the likely thermal loads, electrical loads and consumption patterns for the proposed Business Park extension.

The building-use mix previously utilised for the analysis is presented in Table 2.1. This would be subject to change depending upon the final tenants and the actual uses, however this is a robust representation of the likely business park uses.

Table 2.1 Breakdown of new uses

Description		
Total Office Area	3,321	35.7%
Total Warehouse / Industrial Area	3,425	36.9%
Total Manufacturing Area	1,740	18.7%
Total Retail Area	567	6.1%
Gym	237	2.6%
Totals	**9,290**	

The total assumed annual consumption requirements for Electricity and Thermal Energy were previously calculated and after review we deem these to be a robust representation and these are replicated below in Table 2.2.

Table 2.2 Total energy demands

Zone		
Office	399	316
Manufacturing	599	99
Suppliers Depot	198	92
Retail	84	72
Gym	37	15
Untreated Storage	193	677
Totals	**1,511**	**1,271**

The total peak loads were also reviewed and are reproduced in Table 2.3 below and these calculations take account of diversity in consumption.

Table 2.3 Peak energy demands

Office	217	172
Manufacturing	326	54
Suppliers Depot	76	35
Retail	32	28
Gym	10	4
Untreated Storage	131	460
Totals	**793**	**753**

The building-use mix utilised in the original feasibility study represents a high demand scenario to give robustness when testing the peak loads. However the industrial sector is currently experiencing very strong demand across all sites in the South West. At the same time the retail sector is facing significant challenges and as such the final likely mix will potentially lean more toward industrial uses.

We previously utilised the following benchmark figures to predict the peak and annual site energy usage and these figures remain robust. However, a move away from retail and manufacturing towards industrial depot and storage would materially reduce the peak demands.

Table 2.4 Benchmark values

Benchmark Figures		
Office	120	95
Manufacturing	175	29*
Suppliers Depot	114	53
Retail	149	127
Gym	158	64
Untreated Storage	10% of total	29

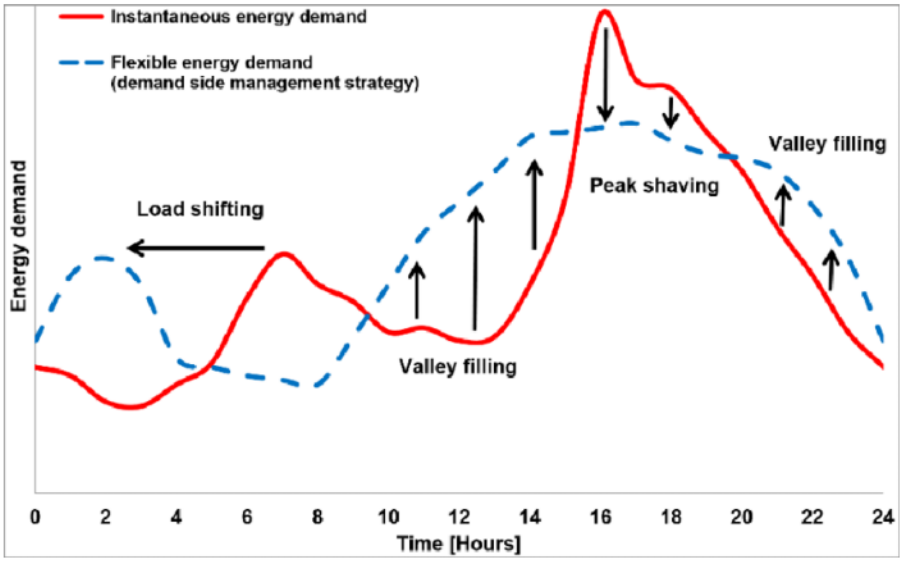
*we have used this electrical demand for the untreated storage.

1.3 Managing Peak Thermal Demands

We are conscious that the peak **thermal** demands may not be fully met by the current available heat from the AD system and so the following discusses how this could be managed.

The peak loads will be managed and reduced through the provision of appropriately sized thermal stores integrated into the service mains and within the buildings and these would be used to compensate for the daily load variations in the thermal demands. For example during the nighttime the peak load is 'shifted' by charging the thermal stores which are then discharged to meet peak daytime demands and 'shave' off peaks.

Figure 1 - Example thermal management strategy with peak shaving, valley filling



A detailed design will be developed for the scheme as a whole and this will incorporate the necessary level of thermal storage to ensure that peak demands can be met utilising only the 600kW$_{(th)}$ available from the CHP. This design will be submitted as part of the reserved matters of the new Business Park extension and can be secured via the imposition of a suitable condition.

2.2 The Consented Anaerobic Digester

The Anaerobic Digester system in its current form was permitted under 17/01142/FULL in October 2017 through a variation of the original approval (15/01034/MFUL) to accommodate alterations to feedstock.

The approved Anaerobic Digester system consists of 2 Gas CHP engines and 2 Biomass Boilers with the following capacities for electrical and thermal generation.

Current Consented Electrical Generation

- 1 No CHP with 500kW$_{(e)}$ peak output
- 1 No **Backup** CHP with 500kW$_{(e)}$ peak output

The permitted scheme allows for fuel for the 500kW$_{(e)}$ electrical generation which assuming the system runs for 8,760 hours generates 4,818 kWh per year.

This output would meet 100% of the total electrical requirements for the proposed new Business Park extension.

Current Consented Thermal Generation

- 1 No CHP with 600kW$_{(th)}$ peak output
- 1 No **Backup** CHP with 550kW$_{(th)}$ peak output
- 1 No 200kW$_{(th)}$ Biomass boiler
- 1 No **Backup** 200kW$_{(th)}$ Biomass boiler

The permitted scheme allows for fuel for 500kW$_{(e)}$ CHP generation and so we take the thermal output to be 600kW$_{(th)}$ output which assuming running 8,760 hours generates 5,256 kWh per year.

This output would meet 100% of the total thermal requirements for the proposed new Business Park extension.

2.3 Meeting Proposed Energy demands

Thermal Energy

The total consented thermal generation from the CHP unit of 600kW$_{(th)}$ can therefore be diverted to the proposed Business Park extension.

Thus, the proposed connection would allow the consented AD system to provide 600 kW$_{(th)}$ and so 5,256 kWh thermal energy per year can be provided to the proposed new Business Park extension which more than meets the overall annual demands.

Electrical Energy

The entirety of the electrical demands for the proposed new Business Park extension can be met locally by the 4,818kWh per year generated by the consented AD system which is exported each year to the national grid.

It is also worth noting that currently, around 6% of the electricity that enters the National distribution network will not reach the end-consumer due to a variety of transmission losses. By providing a direct low carbon electricity connection from the AD system to the new Business Park extension the majority of these loses will not happen and so there is an additional co-benefit to this for the National Grid.

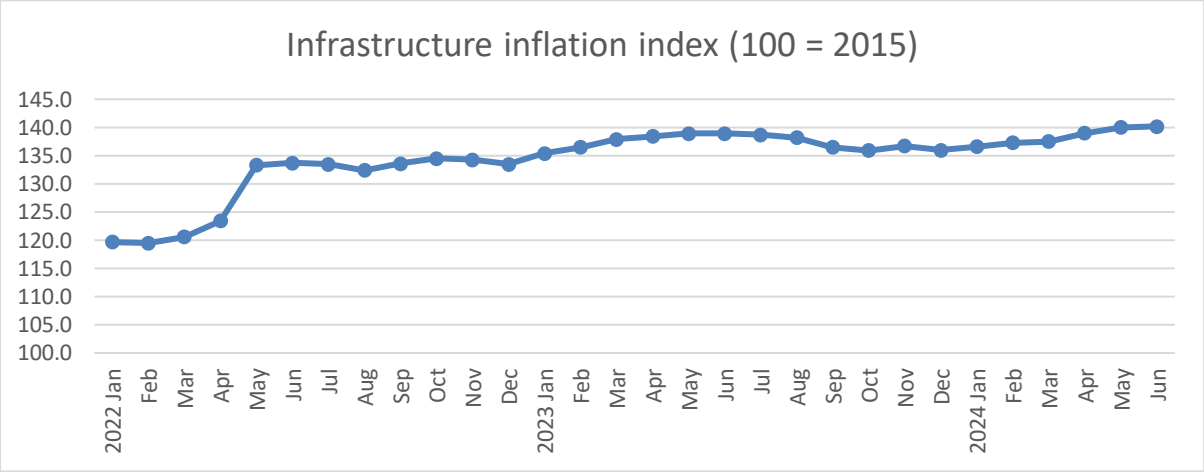
3. Updated Financial information

Since the original report issued in 2022, inflation has caused construction prices to rise so the costs have been updated to reflect the change. Values to update the cost figures are obtained from the Office of National Statistics, a reliable UK government body that provides a large range of economic and statistic values.

3.1 Inflation

The following shows a variety if inflation indexes from the last 3 years for relevant construction products and processes.

The conversion values are taken from a spreadsheet updated last within June 2024. Using the June 2022 and June 2024 values, the main capital costs have been updated to a current estimate. The values of 133.7 for 2022 and 140.2 for 2024 stated are taken from the New Work Infrastructure Index which starts with 2015 having a base index value of 100.



3.2 Updated Costs

Originally the capital costs for the **thermal main** were estimated at **£1,647,751**. The updated 2024 value is **£1,727,859**. The breakdown of total thermal costs is now:

Main capital costs (2022)	£1,647,751

Main capital costs (2024)	£1,727,859
Surveys	£25,000
Design	£75,000
Contingency	£329,550
Inflation (1 year forward)	£494,325
	£2,157,409
Overheads and profit	£409,908

Total costs	**£2,567,316**

The electrical mains capital costs were initially estimated capital costs to be **£2,019,125** and has been increased to **£2,117,287** for 2024. The breakdown of total electrical costs is now:

Main capital costs (2022)	£2,019,125

Main capital costs (2024)	£2,117,287
Surveys	£10,000
Design	£25,000
Contingency	£403,825
Inflation (1 year forward)	£605,738
	£2,556,112
Overheads and profit	£485,661

Total costs	**£3,041,774**

The overall cost for the scheme is now estimated as being £5,609,090.