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2024 TECHNICAL AWARDS ENTRY FORM

Entry Deadline: Friday 19th April 2024

Please tick which categories you are entering (entries may be submitted in multiple categories using the same entry form)

Large Diameter Pipeline Project Award	☐
Large Diameter Pipeline Technology Award	☐
Utility Pipeline Project Award	☐
Utility Pipeline Technology Award	☐
Subsea Pipeline Award	☐
iICE Award	☐
Health & Safety Award	☐
Net Zero Carbon Award	X

1. **Brief title of entry:** Cadent Carbon Net Zero in Major Projects – Burwell AGI
2. **Company name:** Cadent Gas Ltd.
3. **Signed:** 
4. **Date:** **18/04/2024**
5. **Company contact name:** Jake Tilley
6. **Telephone:** 07972108103
7. **Email:** jake.tilley@cadentgas.com

8. **Precis of your entry (50 words):** Burwell AGI is Cadent's pilot Net Zero project where we have challenged ourselves to reduce carbon in design, construction, and the operational life of the site. Current Lifecycle Analysis predicts a potential reduction of up to 77.5% of carbon through the 40 year operation life of the site.

9. Summary of entry:

As part of our Ten Point Plan, Cadent have committed to the delivery of Carbon Net Zero Construction Projects. Whilst the commitment within Cadent's Ten Point Plan is to focus on minimising Carbon in construction activities; the Cadent project team, in conjunction with our Designers (Murphy Applied engineering) and with the support of senior Leaders at Cadent, have stretched this ambition to look at the whole life of the site and challenge ourselves to reduce the environmental impact of the site throughout its operational lifetime.

The initial drivers and scope of the project are as follows:

- Replacement of HP-IP pressure reduction skid that creates capacity for bio-methane producers to inject gas into the Cadent Network.
- Replacement of old and inefficient preheat system (waterbath heater) with new and efficient preheat system.
- Replacement of site filters.
- Upgrade to supporting E&I on site.

Carbon Lifecycle Assessment
The project has used OneClick Lifecycle Assessment software to baseline the embedded Carbon and Operational carbon within a traditional delivery for this type of project. The software has then been used to calculate the embedded and operational carbon within the proposed carbon reduction design. This is the first time LCA software has been used in this way on a Cadent project and the team recognised the importance of doing this in the early stages of the project to identify the areas of opportunity and ensure all solutions are considered in the design of the site. **The current analysis predicts a potential carbon reduction of up to 77.5% is achievable through design, construction and the 40 year operational life of the site.**

Preheat
The traditional technology selected for preheat replacement projects is a modular boiler house which uses natural gas to fuel the boilers. Throughout the Feasibility and Concept design study, the project team have explored different preheat technologies and have selected air source heat pumps as a low carbon alternative to the traditional modular boiler system. Air source heat pumps utilise electricity as a primary energy source which significantly reduces emissions produced through preheat activities.

Clean Energy Generation and Storage
To support the increased electricity load that will be required by the air source heat pumps, the project team have proposed to install a sufficiently sized solar array to produce clean energy on site to be used directly by the new preheat system. The team have also proposed the installation of an 'Energy Centre' which consist of a battery bank to store the clean energy produced. The Energy Centre will allow the clean energy to be stored during peak energy generation, when preheat demand is low, and then be used when peak preheat demand is high. For example, peak energy production will be around noon when gas demand and preheat demand is low, the energy will be stored within the Energy Centre to be used during the peak (teatime / evening) gas demand flows. Furthermore, the project team have proposed to set up an agreement with the Electricity Supplier to allow the clean energy produced by the solar array to be exported to the electricity network. This ensures that during the summer months, when the energy generated by the solar array will be high and the preheat demand will be low that the clean energy can still be distributed and used throughout the local electricity network. The intention is that over the course of a given year, the site will have a Net Zero energy consumption by balancing the amount of energy used directly from the DNO supply with the amount of energy produced by the solar array either utilised on site or exported to the electricity network.

Design of vented gas capture system
The project team have also identified an opportunity to include a vented gas capture system. This system will allow gas to be 'sold' downstream to a lower pressure tier, through a pressure reduction skid. Any residual gas required to be vented off will be done so at a lower pressure tier, significantly reducing the volume of gas released to atmosphere.

Construction Activities
Whilst the design is still in development, the project team have identified several areas to reduce carbon emissions in construction as follows:

- Sustainable welfare solutions – these are currently being trialed on other Cadent projects with a combination of solar arrays, low energy consumption lighting and heating, HVO for backup generators and live data analysis from the welfare provider that gives the site teams knowledge and empowerment to use energy more efficiently on site.
- Alternative fuel plant and machinery – it is the intention to explore the use of electrically powered, hydrogen powered and HVO powered plant and machinery for this project.
- Low Carbon concrete utilised for civils work.

Cadent will also work with the selected Main Works Contractor for the project to propose further low carbon construction solutions. The contract strategy will allow the MWC to have input throughout the detailed design phase to ensure the considerations are being made in a timely manner.

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Ancilary Entry Information

Page 4: 3D Model of existing site

Page 5: Proposed General Arrangement Drawing of site

Page 6: Proposed Energy Centre Location and land take

Page 7: Concept proposal for Vented Gas Capture System

Page 8: Snapshot of sustainability report demonstrating potential reductions

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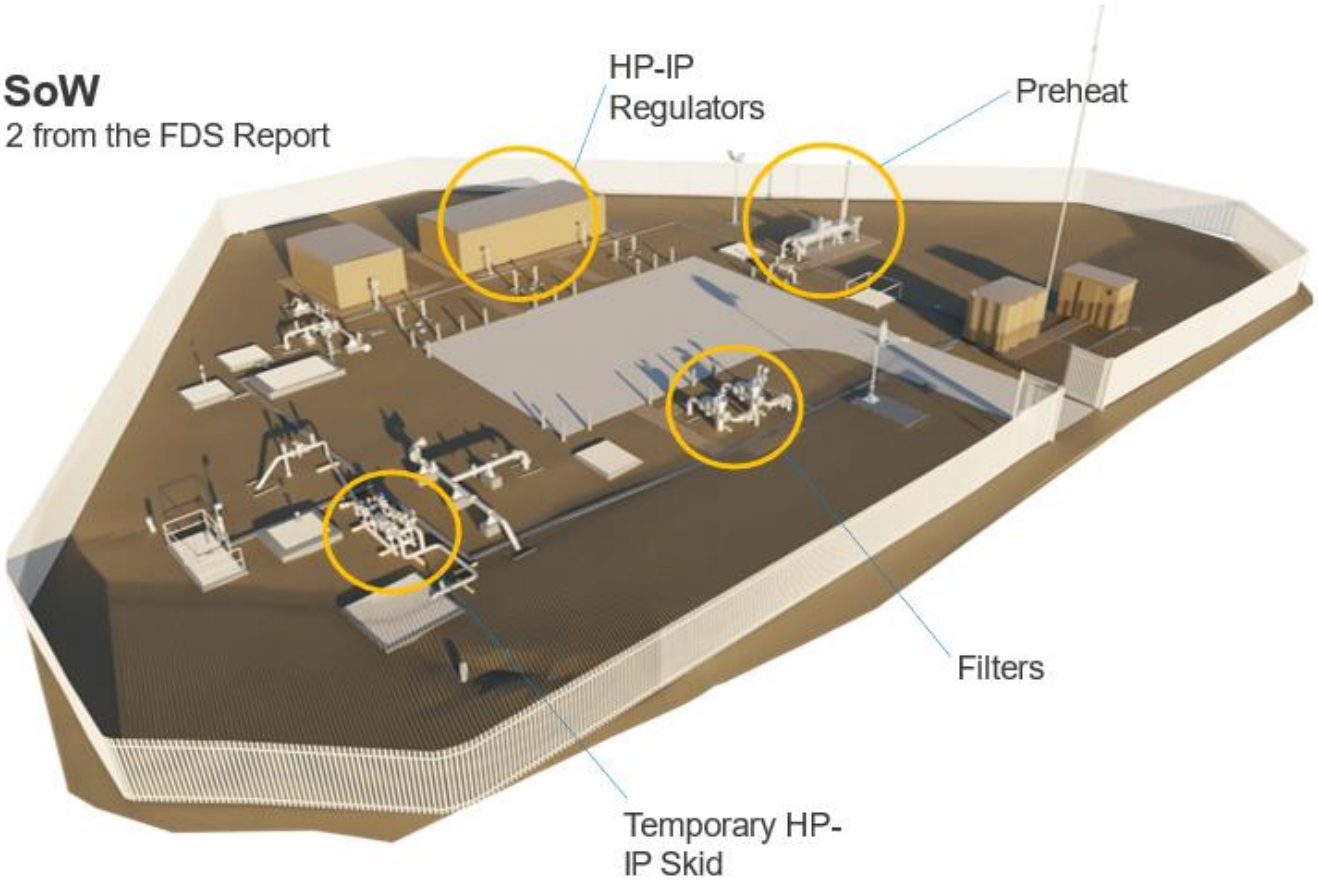
CDS SoW

Option 2 from the FDS Report



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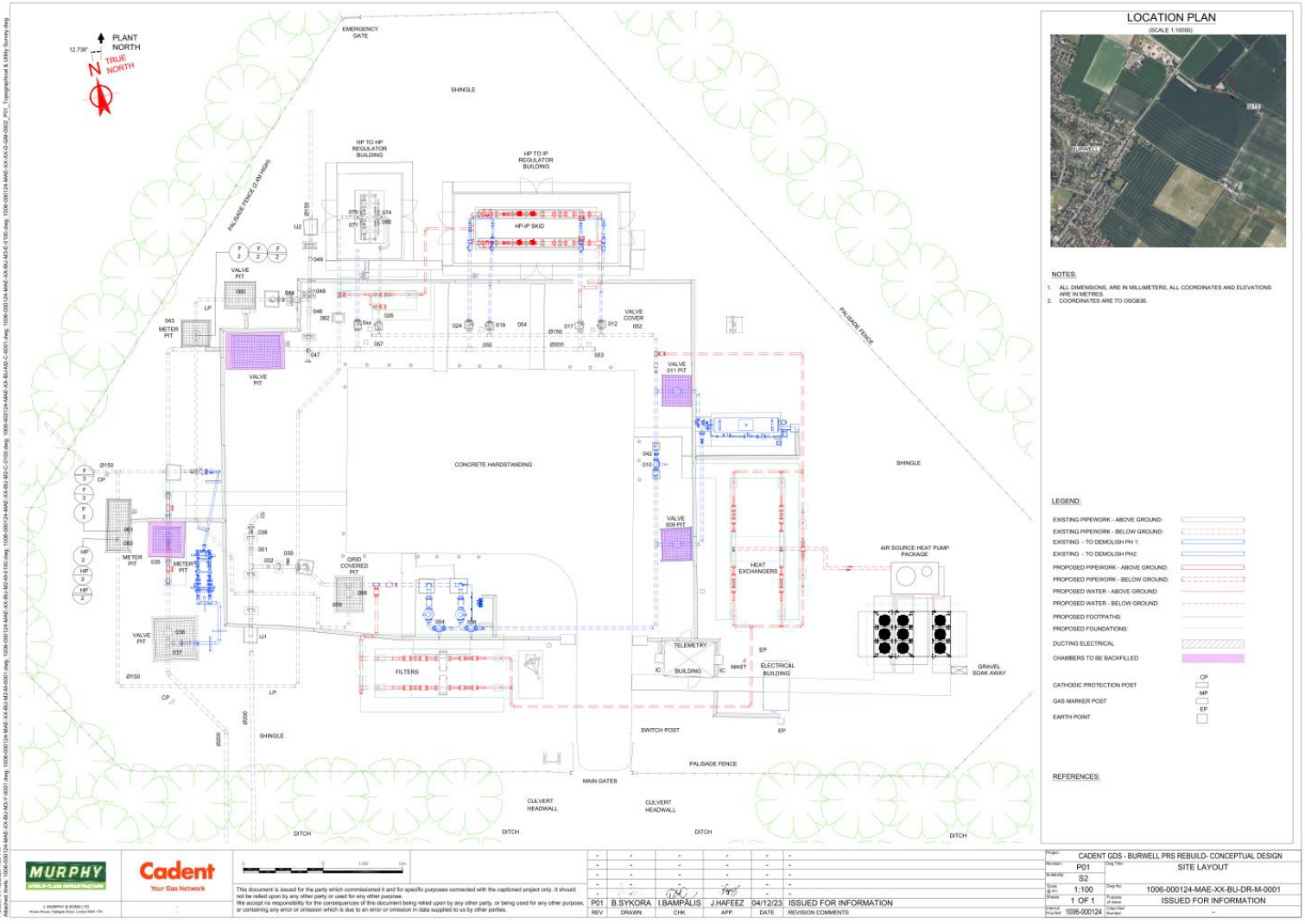

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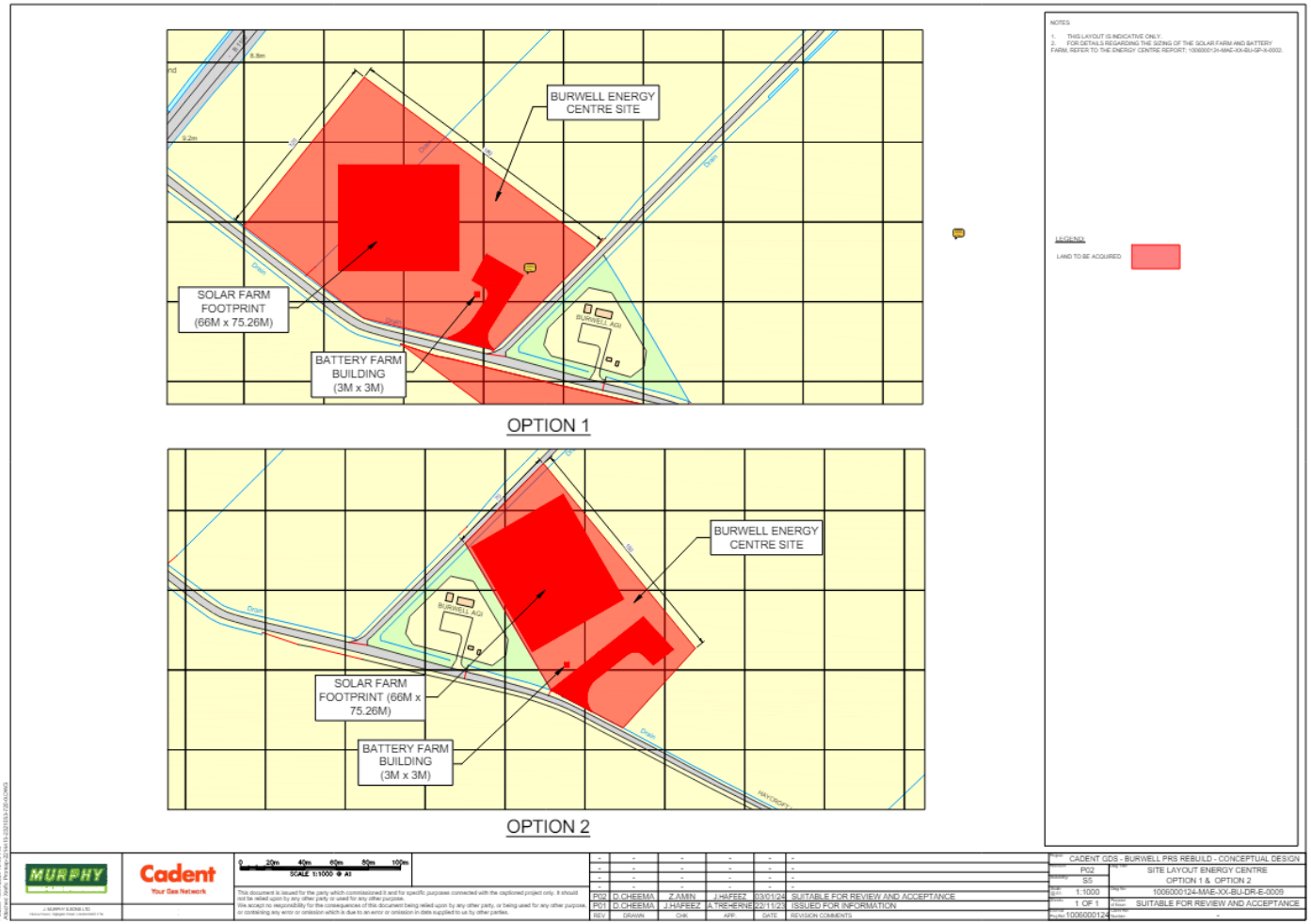

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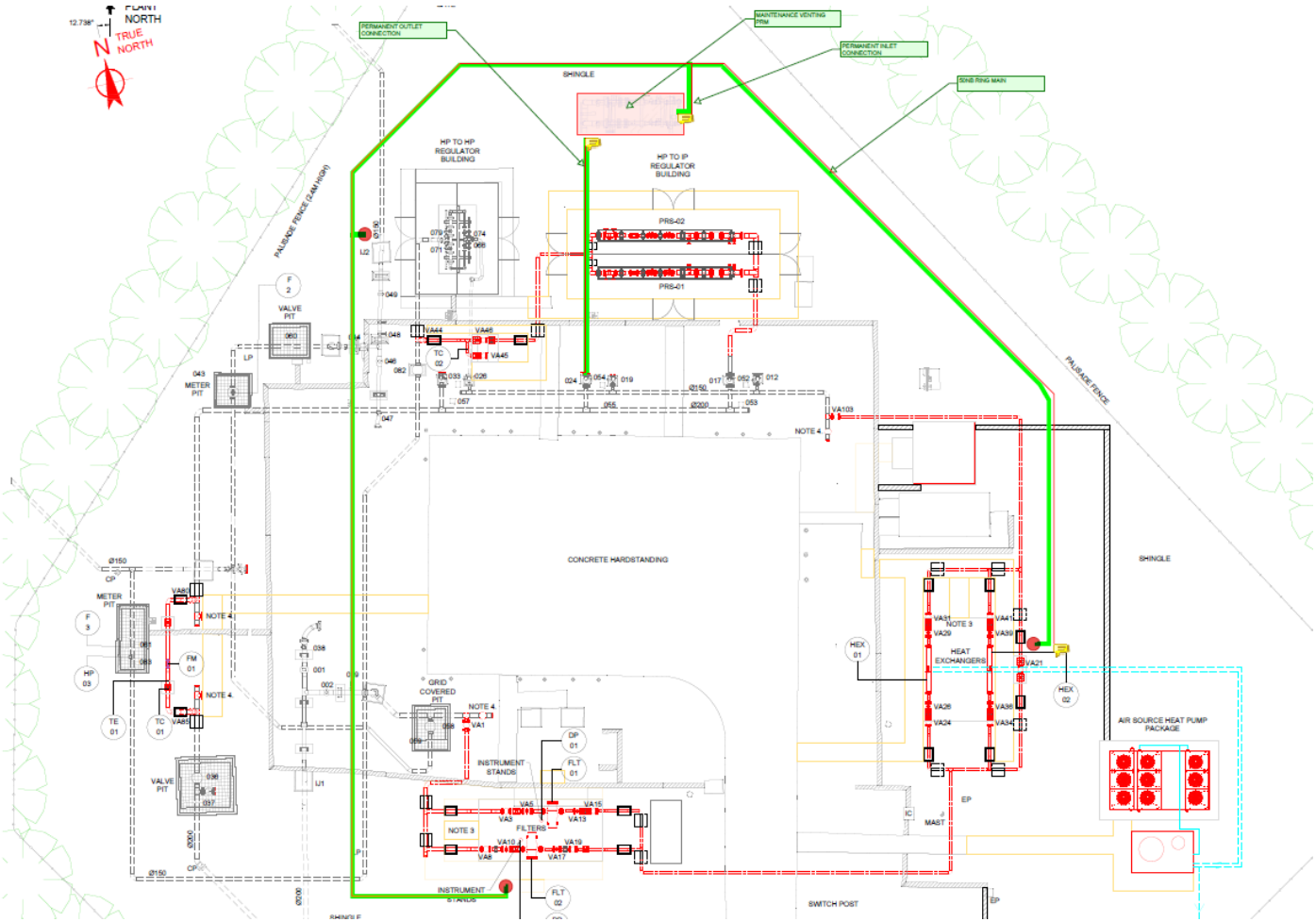

3.5 Summary

Figure 6 and Table 9 show the calculated values for both the BLMs and the Proposed Model.

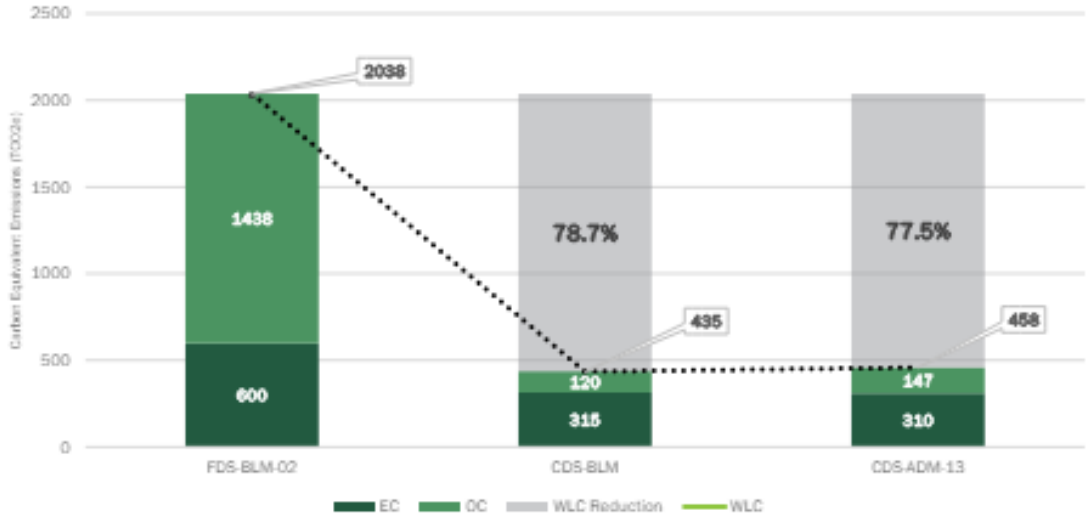

Figure 7 – WLC Comparisons

LCA Model Reference	Embodied Carbon (TCO_2e)				Operational Carbon (TCO_2e)	Whole Life Carbon (TCO_2e)
	Product	Construction	Maintenance	End Of Life		
FDS-BLM-02	47	512	39	1	1,438	2038
CDS-BLM	148	56	107	4	120	435
CDS-ADM-13	166	56	85	4	147	458

Table 9 – LCA Model WLC Breakdown

The development of alternative technologies and inclusion of more assets on site has increased product, maintenance and end of life emissions, however the overall EC emissions have reduced by 48.3% compared to a conventional rebuild (i.e. FDS-BLM-02). OC emissions have decreased by 89.7% compared to FDS-BLM-02, leading to an overall **WLC reduction of 77.5%.**

As the project progresses in the Detailed Design Stage, refinement shall be made to the LCA to provide more accurate figures. It is also advised that Cadent review the design recommendations listed in Table 8 to further reduce WLC.