VITAL ENERGi

CASE STUDY

Paddington Village

ENERGY CENTRE & DISTRICT HEATING NETWORK

PROJECT OVERVIEW

The £1bn Paddington Village project is a 30-acre development in Liverpool City's Knowledge Quarter which will develop 1.8m square feet of science, technology, education and health space. Vital Energi were initially appointed on a pre-construction services agreement and worked in partnership with the developer, Morgan Sindall, to design an energy solution which would evolve alongside the development's build out and deliver maximum decarbonisation.

Our solution was a ground-floor energy centre which would later have a multi-storey car park built above it. Heat is distributed via a district heating network and electricity via a high voltage private wire network. After developing the energy infrastructure concept, we were appointed to a design, build, operation and maintenance contract to deliver the full energy solution.

The new energy scheme serves the entire Paddington Village site, with the energy centre sitting on the ground floor of a 14-storey car park which was built later in the process. The energy centre houses a 1.1MWe / 1.3MWth CHP engine which will provide both heat and electricity. Morgan Sindall constructed the energy centre and car park, with Vital Energi fitting out the building.

VITAL SOLUTION

The first phase of Paddington Village is the central development which is comprised of a mixture of residential, commercial, hotels and laboratories.

We worked in partnership with the client to enhance the design of the energy infrastructure, create the energy model and look at various commercial options for the ESCo.

Unusually, we created a 3D model of the energy centre during the bid stage to help the client visualise the scheme and this proved successful, with Andy Dinnage, Head of Building Services – North Construction for Morgan Sindall saying, "In the pre-construction period, Vital couldn't do enough for us, they found solutions to any and every challenge. Vital demonstrated an understanding of their audience who hadn't completed a district heating scheme before and the bid document and videos helped the client team visualise the complexity, and scope and scale of the project."

Our initial contribution involved working with the client's team to enhance the design of the energy infrastructure. Once the optimum design had been finalised, we then

PROJECT SUMMARY:

CLIENT
Morgan Sindall

PROJECT
Paddington Village Energy Centre & Heat Network

THE BENEFITS:

- Ground-floor energy centre delivered in preperationf or multi-storey car park being built above it.
- Flexible approach seeing us liaise with other contractors and meet deadlines.
- Improved design bringing significant CAPEX savings for the client.

The chimney is made up of 5 flues, two of which are connected to the CHP engines (installed and future) and three which serve the boilers (2 installed, 1 future). This is surrounded by a wind shield and overall the chimney has a diameter of 4.5m and reaches a height of 47.5m.

'What was particularly impressive on this job was that Vital were severely hampered by the work going on around them. They regularly suffered access issues and were expected to work around this. They did this admirably through logistical planning and flexible programming.'

TOM MILLS
PRINCIPAL ENGINEER - WSP

delivered the energy centre, district heating network and private wire network to meet the client's challenging time scales.

Delivering an Improved Solution Through Enhanced Design

One of the most significant modifications we made on Paddington Village was to change the design of the original "stand alone" energy centre. This was made necessary due to the civil and structural challenges of the local Williamson tunnels which underpinned the proposed standalone site location, as well as the adjacent railway cutting. Our enhanced solutions created the energy centre on the ground floor of a planned multi-storey car park with the additional floors being added later in the construction programme. This saved the developer significant space on the development, which brought substantial CAPEX costs.

The new solution created some challenges, but our team were able to create design solutions to overcome these. One example of this was that the ground floor solution restructured the natural crossflow ventilation, but our designer created a mechanical ventilation solution which compensated for this.

Meeting the Clients Programme

It was important that the construction works began quickly and adhered to a strict timetable, so they were delivered alongside other infrastructure works across the site and created minimum disruption.

The "heat on date" was also extremely challenging to allow the scheme to deliver heat to the first phase of connected buildings. To achieve this, we utilised the facility at our Blackburn headquarters to supply prefabricated skids and prefabricated pipework.

Our client was clear that they valued flexibility in their partners as the site was changing constantly and they needed an organisation with an agile approach to the pre-construction and construction phases.

Fitting Out the Energy Centre

The energy centre was designed to facilitate the long-term O&M of the plant and machinery which includes the removal of the 1.3MWe CHP engine for its milestone scheduled overhauls by the manufacturer.

To facilitate distribution of the CHP's electrical output we installed the HV switchboard, 2 private wire ring feeders and CHP synchronising breaker.

In addition to the CHP we installed two gas fired 5MW boilers which serve two purposes. The first is to add resilience to the project and ensure heat and hot water are available, even when the CHP is offline due to maintenance. The second is to contribute to the short periods of peak demand. This allowed us to specify the 1.3MW engine, rather than a larger engine and as a result, the overall efficiency of the project will be improved.

Efficiency is further enhanced by two thermal stores which sit externally to the energy centre and are placed either side of the 47.5m flue. These allow the CHP to have greater contribution to the heat demand of the system by extending its runtime. This also reduces the wear on the engine and parts by not cycling the CHP on and off too often.

Delivering the District Heating Network

The initial phase of the district heating network saw us supply, deliver, offload and install 1.13km of pre-insulated Logstor Series 2 pipework. This is an important step as we carefully create storage compounds and laydown areas to combine safe storage of materials with easy access for our operatives.

Additionally, we had responsibility for all aspects of civil engineering which included setting out, excavations, H&S and creating segregated areas, backfilling and reinstatement.

District heating works were split into 4 main phases to make the installation integrate with the wider construction programme. This approach allowed us to install pipework to plots where construction hadn't begun yet and ensured all the district heating infrastructure was in place.

Creating The Private Wire Network in Consultation With Scottish Power

As part of the Paddington Village Project we delivered the private wire installation. This allowed for the main substation to accept the electrical utility supply (Scottish Power) and distribute the power, via buried 11kV cables to the connected buildings. Each building required a transformer substation to reduce the voltage to a usable level for the customer's needs.

All works had to be done within Scottish Power's design guidelines and we successfully completed the G99 application for the CHP engine.