VITAL ENERGi

CASE STUDY

The University of Strathclyde

CHP ENERGY CENTRE RETROFIT & DISTRICT HEATING NETWORK

OVERVIEW

The University of Strathclyde plans to invest £650 million in its campus and infrastructure over a 10 year period. As part of this investment the University wanted to create a £20m Combined Heat & Power district heating system which would significantly reduce CO2 emissions and save £2m annually.

Phases 1 & 2 of the project were well established, but Phase 3 had not been finalised. This meant that we would need to design and deliver an energy centre and network which were flexible. Additionally, the project would need to be BIM level 2 compliant and adhere to the Heat Network Code of Practice.

In addition to the financial and environmental benefits, the University were keen to include a "Demonstration Space" to offer an enhanced learning and teaching experience. Alongside this, the project would adhere to the "Strathclyde Commitment" which aims to create socio-economic benefits for the local and regional communities.

THE SOLUTION

Value Engineering is at the heart of everything we do and our designers were keen to work with the University and their professional team to evolve the existing design and find ways to make enhancements while reducing costs.

We achieved this by undertaking a review of the District Energy Route around each building individually with the university team and producing a bespoke design to overcome issues and deliver betterment on the originally planned routes, which resulted in savings on time & money for the University

Delivering a District Heating Network for the Future

This project saw us deliver an unusual hybrid of above and below ground district heating network. This solution was necessary to avoid clashes with existing services, but also to navigate the existing buildings on the campus.

Below ground we installed 2.2km of Series 2 Logstor steel pipework. This ranges from 400/630mm down to 80/160mm and involved 664 below ground welds and 617 below ground joints. This is an unusually high number of welds and joints and reflects the work needed to avoid clashes with existing utilities and buildings.

We also undertook thrust boring works, enabling 2No 700mm diameter sleeves to pass below one of Glasgow busiest vehicles route (Cathedral Street) This allowed us to extend the district Heating serving the University new state of the art sports facility along with other existing buildings.

In addition to connecting 16 buildings we also created six "future use" connections which will be used to facilitate network expansion during the build out.

We also installed over 800m of District Heating that had to be above ground to overcome existing restrictions and services that were assessed as too high a risk with underground pipework in a city centre location.To give an indication of the scale of the heat network, when operational the

PROJECT SUMMARY:

CLIENT
The University of Strathclyde

PROJECT
Energy Centre & District Heating

TIMESCALE:
96 Weeks

CONTRACT VALUE:
£25 Million

THE BENEFITS:

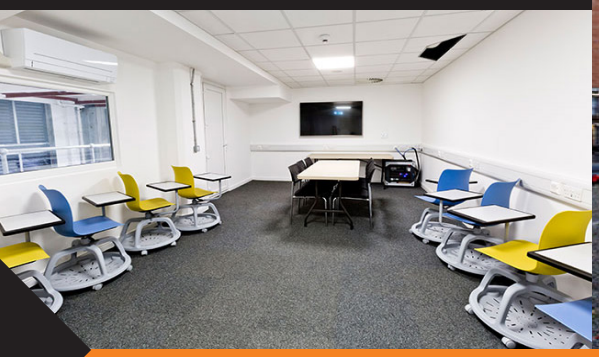
> Financial savings in excess of £2m per year.

> Substantial carbon emission savings.

> Cost and time savings through prefabrication works.

> Varied community benefits through Strathclyde Commitment which included employment, training and education as well as maximising local and regional spend.

We creates a secure storeage compound to ensure district heating materials were easily accessible to the deliver team, but did not cause disruption to the staff and students.



"Communication was exemplary, from the start we had a partnership, with clear responsibilities, decision making and clear lines of communication. Hugh was really good at reporting, he has a nice way about him. He set up monthly progress meetings and weekly comms meetings which have never been done before. Communication and reaction to issues was very good, they managed stakeholder relationships very well."

DR RODDY YARR, - ASSISTANT DIRECTOR (SUSTAINABILITY)

entire system will hold in excess of half a million litres of water.

The project constraints required us to install pipework through a range of terrains including roads, landscaped areas, basements, a footbridge, stairwells and an internal car park.

We planned the route of the network employing a thorough Ground-Penetrating radar survey to ensure the planned route did not have any unmapped services which could cause potential delays and in another initiative aimed creating flexibility of programme to ensure delivery times were met, we delivered the network in multiple zones. This was a key element to ensuring the programme delivery schedule was met.

Upgrading Energy Centre through Structural Engineering.

During the surveying period it became clear that the building, which was built circa 1970's had several issues which would need to be addressed to get it to the standard required for a 21st century energy centre. The most significant issue was that the plant room would be situated above a basement. Flooding and water damage had impacted the structural integrity of the basement and this needed to be remedied.

The primary support structure in the basement was a concrete encased steel frame. Over the years the exposure to water had caused the concrete to degrade which had also caused degradation to the steel. It was essential to the structural integrity of the building that this frame was repaired, so it was stripped of concrete to expose the steel beams. These had plates welded, where necessary, to strengthen them and were then covered by a waterproof resin.

The equipment which would sit above the basement was extremely heavy, with some individual items weighing upwards of 25 tonnes. After calculating the exact loads, our in-house architectural technologists added additional steelwork to the basement including a series of frames and individual columns.

Another issue which faced our team was getting enough ventilation into the plant room to meet legislation. Our designers were able to convert the existing windows and skylight into ducts and louvres. Similarly, noise, was an important issue for the University and Vital were able to create a range of attenuation solutions, which included acoustic louvres and an acoustic enclosure for the CHP engine. These measures combined to ensure that the noise emissions were within acceptable levels.

Fitting Out The Energy Centre

Within the plant room we installed a 3.3MWe CHP engine. Whilst working with the client we also installed an additional 44M Flue, Ventilation, Gas distribution, Electrical distribution & Mechanical connections to future proof the second 3.3MWe CHP should the campus require its use. Additionally, we installed 24MW of boiler capacity and a 100,000 litre thermal store.

Phase 1 & 2 of the project had been finalised, but Phase 3 was still in the planning phase and the heat loads were not yet known. We therefore needed to design a flexible solution and replaced the professional team's design of two 2.2MWe with a single 3.3MW CHP engine. This, alongside the boilers and thermal store would meet the initial peak demand, with the option to install more CHP capacity as needed at a later date.

As many of the items for the energy centre were large and heavy, we schedule the deliveries for outside of core hours, with the first pieces arriving at 12pm on Friday and all the lifts and manoeuvres being completed by Sunday afternoon. This included the 100,000 litre thermal store, two 8MW boilers, the main pump skids, side filtration vessels, and 12 pallets of equipment and pumps. By organising the deliveries in this manner we were able to complete all disruptive works outside of the Monday-Friday busy periods.

Delivering Benefits for the Whole Community

When we win a contract we see it as an opportunity to bring social, economic and employment benefits to the local and regional community. The University share this outlook and created the award-winning "Strathclyde Commitment" which sought to maximise the financial and employment opportunities for the communities of Glasgow and the surrounding area.

As part of this Vital agreed to a range of measures which included spending 65% of the budget with companies from Glasgow and the immediate surrounding area. This approach proved successful and we were able to spend in excess of 70% of the budget locally.

One important area where we could make an impact was with employment. The project create 230 years of person employment overall and we were able to employ apprentices and provide work placements and graduate opportunities.

Quantifying The Benefits

The project will substantially reduce Co2 emissions as well as generating financial savings of £2m per annum. In addition to the technical aspect of the project we strived to ensure the socio-economic benefits were felt across the local community and, overall, the project contributed £12.5m to the Scottish GDP.