VITAL ENERGi

CASE STUDY

University of Strathclyde

CHP ENERGY CENTRE AND DISTRICT HEATING

PROJECT OVERVIEW

The University of Strathclyde's John Anderson Campus is located in the heart of Glasgow with over 21,000 students enrolled. The university is in the middle of an ambitious £600m investment into its infrastructure over a 10 year period. Due to the rising costs of energy, and a desire to reduce carbon emissions by 25% by 2020, the university sought to improve its method of energy generation and distribution.

We were asked to carry out the first phase of the project which is a complete refurbishment of their existing John Street Boiler House to a CHP led energy centre and implementation of a district energy network, whilst maintaining constant operation of the campus throughout the project.

VITAL SOLUTION

The client's ambition for the project was that it was to be implemented across 3 phases to eventually serve all campus buildings and future buildings, with the first phase connecting 16 buildings via a 2.2km buried and 4km above ground heat network running through the campus' city centre location. When producing the design for the first phase, we had to take into consideration the overall project plan and future phases to determine a suitable solution.

Adaptable approach to ensure best solution is provided

We were originally requested to provide a proposal for the works according to suggestions made by the university's project team. The suggestions made were for the installation of two 2MWe CHP engines with an overestimation of carbon savings. We analysed the data supplied to us to identify that the savings would be actually in the region of 4,100 tonnes per year.

Additionally, through the design process, we acknowledged that the proposed CHP units could be altered to a single 3.3MWe CHP engine which would better suit the current and future loads, with a view to installing a second engine for later development phases when the future connections and their requirements were more accurately identified. The design also consisted of three 8MW boilers for top up and back up loads, a 100,000 litre thermal store, and 2.2km of Series 2 pre-insulated district heating pipe.

PROJECT SUMMARY:

University of Strathclyde

CLIENT
The University of Strathclyde

PROJECT
CHP Energy Centre and District Heating

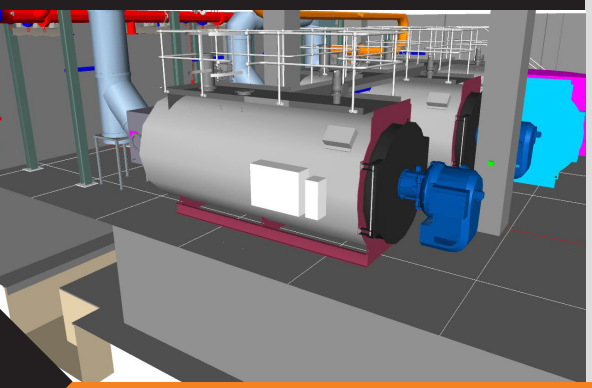
TIMESCALE:
November 2016 - October 2018

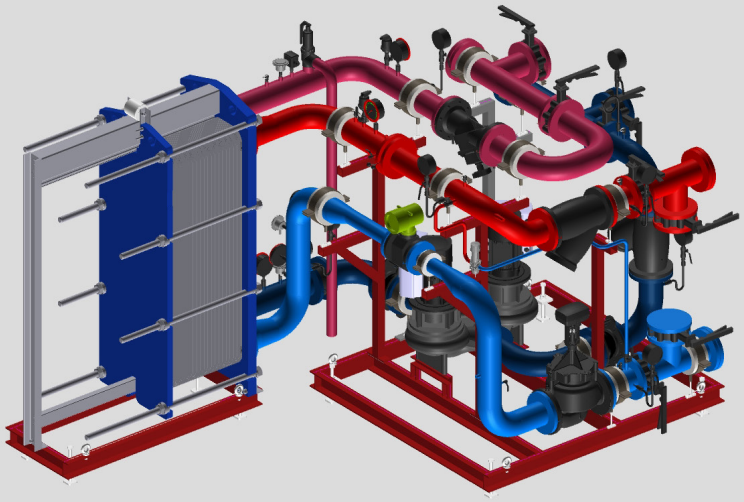
CONTRACT VALUE:
£14.5m

THE BENEFITS:

- Predicted to deliver savings of 4,100 tonnes of CO2 emissions per year
- Using our knowledge and expertise to adapt proposals to benefit client
- Intricate planning to implement project avoiding plant hire
- Future-proofed design to cater for future campus developments
- Improving the operation and performance of the existing heating system controls

We used 3D modelling software to assist in the design process, ensuring an accurate and compatible design prior to manufacture.





‘Vital Energi were very committed to the project and they had very good engagement. They were proactive with good communications, there was lots of work going on and they are a good team who understand what they are doing.’

RODDY YARR, ASSISTANT DIRECTOR (SUSTAINABILITY AND ENVIRONMENTAL MANAGEMENT, THE UNIVERSITY OF STRATHCLYDE

This provided a more financially viable, along with future-proofing the energy centre for later building developments.

The project also provides an upgrade to the client’s existing high voltage network with a new 11kV Switchboard, and connection to the existing central substation.

Avoiding the necessity to hire plant through performing a phased installation

The new energy centre would be a refurbishment of an existing boiler house that was in constant operation, containing existing steam boiler plant that provided heat and hot water for the Island Site Buildings on the university campus at all times. We were tasked with designing an installation that would not compromise the operation of this equipment and, in turn, university life. The original design intent within the ITT was to replace these steam boilers with temporary hired oil boiler plant to enable them to be removed without being detrimental to the existing heating system.

However, we presented a design strategy that would allow the existing boiler plant to remain on site and operational during the first installations of the new plant equipment. Once these new boilers had been installed, the production of the heat and hot water could be transferred to this new equipment, allowing for the existing steam boilers to be removed without loss of service to the connected buildings. The CHP would then be installed in the place of the older boilers. This would evade the necessity to hire any equipment, thus saving capital expenditure on plant hire, allowing the budget to be re-distributed to increase the scope of the Phase 1 building connections.

Developing the design to implement the client’s long term plans

We developed our initial designs to incorporate some of the long term aspirations of the university, such as planning the route for the energy centre pipework to take into account the planned corridor link between the Student Union building and the Royal College building, which was a long-term desire by the university’s projects team. By adjusting the pipework route, we were able to adapt the design for the pipework’s supporting brackets to incorporate plans for the link corridor that would be constructed above the pipe. As we were already installing substantial support steelwork for the pipework, we modified the design to allow for this steelwork to simultaneously form the support structure for the corridor. Therefore, this provides the foundations for the corridor removing the need to carry out substantial alterations in the future, and assists the university to achieve their plans in a time effective manner.

As the university wanted to implement a ‘Demonstration Space’ within the energy centre to use for student engagement, we had to incorporate high-level glazing and a viewing area into our design. This led us to adapt the CHP ventilation configuration and the boiler flue route in conjunction with these requirements to ensure that the view from these platforms was not blocked in any way, and as much of the energy centre could be seen as possible from this angle.

Utilising intelligent software to ensure effective design proposals

Following detailed site surveys of the building plant rooms that would be interfaced with the heat network, we designed the necessary interfaces with the existing heating, hot water and ventilation systems. We produced general layout drawings, process and instrumentation diagrams, block-cable diagrams and equipment schedules, which were developed into 3D CAD models for each of the 18 skids. Our designers reviewed these models before producing full pipework spool drawings, and prior to the pre-fabrication of the skids at our Blackburn HQ. Producing these 3D models is beneficial to the design process as it allows for us to review how different components will interact with each other to ensure there are no errors or incompatibilities, and any issues can be rectified prior to manufacture. This allows for an efficient design process with a high level of accuracy.