VITAL ENERGi

CASE STUDY

University Hospitals Bristol & Weston NHS Foundation Trust

ENERGY CENTRE REFRESH & DISTRICT HEATING

PROJECT OVERVIEW

University Hospitals Bristol and Weston NHS Foundation Trust (UHBW) have set an ambitious target to become carbon neutral by 2030. As part of their work to achieve this they are revolutionising the way they generate heat and hot water.

The project saw us refurbish their energy centre, replacing the aging 1MWe CHP engine with a more modern and efficient 3.36MWe CHP engine and Combination Boiler. We also installed the district heating network which distributes the heating and hot water around the hospital's campus.

VITAL SOLUTION

The energy scheme at Bristol Hospital saw us act as principal designer and contractor to create a "turnkey" design, build and commissioning solution.

Phase 1 of the project saw us replace the existing CHP engine with a new larger and more efficient engine in conjunction with a Combination Boiler. A heat network was installed to four satellite plantrooms, in which existing steam PHX's were replaced with MTHW PHX's and associated BEMS controls.

An additional standby diesel generator was installed to support the existing four generators and the generator controls system was upgraded to accommodate the additional engine.

To support the above works an extensive electrical infrastructure upgrade was carried out including the provision of new HV and electrical Switchgear, transformers and Sync Breaker, working closely with the Trust SAP's to ensure electrical resilience was always maintained to critical departments within the Hospital.

Whilst the project was designed to meet the current needs of the hospital, we also future-proofed the system so that additional capacity can be added, and the network can be expanded. To do this we not only replaced old equipment with more modern technology, but we also improved the performance of existing equipment

Phase 2 will see the two remaining steam boilers replaced with MTHW boilers and the network extended to an additional ten satellite plantrooms, with a view to a complete de-steaming of the Hospital. Future expansion has been included within the design and installation to provide connections should Bristol City Council wish to install

PROJECT SUMMARY:

CLIENT
University Hospitals Bristol and Weston NHS Foundation Trust

PROJECT
Refurbishment of energy centre & distribution network

TIMESCALE: 81 weeks

THE BENEFITS:

- An ultra efficient 2.45km district heating scheme connecting 4 buildings.
- Funding carbon reduction target of £500 per tonne exceeded with project delivering £250 per tonne of carbon reduction.

The project has seen district heating installed throughout phase 1 to connect 4 buildings. Phase 2 will further expand the heat network.

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a proposed district heating network of their own.

The existing CSSD is currently supported by steam and as such the sterilisers and washers will be replaced or modified to electric models, which again involves a significant electrical upgrade.

Refurbishing the Energy Centre

We initially undertook a full survey of the energy centre and existing plant. This involved performing a 360-degree digital scan of the energy centre to give us accurate measurements.

Our designers then created an optimised layout for both performance and operation and maintenance. We removed and disposed of the aging 1MW CHP engine and replaced it with a more modern 3.3MW units during Phase one. In phase two we replaced the existing steam boilers with hot water boilers.

Additional improvements saw us add NOx abatement measures to 4 existing standby generators, add a new 2.25MVA diesel generator, new SCADA system and modifications to the HV/LV network.

All works were delivered in a live-hospital environment, in consultation with hospital staff and much of the project was delivered during the Covid pandemic.

Delivering A Project During the Covid Pandemic

Two months into the project a full Covid lockdown was introduced by the Government. Careful planning of labour was required to ensure social distancing within restricted plantroom spaces and deliveries of major plant was severely impacted, with major plant items being procured from abroad. Our efforts to deliver the project safely, under difficult circumstances, were met with positive customer feedback from the Trust during our customer care review.

Distributing Heat Throughout the Campus

Phase one saw us install district heating pipework to distribute the MTHW around the campus. We primarily installed the network below ground. Overall, we installed 2.45km of steel, pre-insulated which connected 4 buildings, each of which had one or multiple plate heat exchangers in the plant rooms.

Phase two will see us employ a mix of above and below ground pipework to avoid clashes with other services and negotiate existing buildings. This phase will see us install 3.3km of district heating and connect 10 buildings. Site wide distribution has been extensively surveyed and designed to ensure that the installation has minimal impact upon Hospital operational activities, specifically Blue Light Routes, whilst being resilient and maintainable.

As phase two was planned and there was a desire from the client for the energy scheme to also meet future needs we sized all mains with this in mind. The energy centre will have 16MW capacity and the heat network can be expanded further around campus or towards a potential city-wide connection.

Converting from Steam to LTHW

It is not uncommon for hospitals to convert from steam systems to medium temperature hot water. This brings several benefits including improvements in efficiency and also simplifying the operation and maintenance requirements.

Phase 1 saw us swap out the plant and pipework and connect the waste heat combi boiler which takes heat from the CHP to produce steam. In phase two we will convert this, so it produces medium temperature hot water.

The transformation was made slightly more complicated as the hospital still had a steam requirement for its clinical sterilisation and our designers were able to create a modern, electrical solution which met this need.

Delivering Savings & Meeting Deadlines Through Prefabrication

Overall, we will be installing 50 plate heat exchange skids across 14 plantrooms. These skids range from 1.128MW to 500MW and we were able to deliver better value, have more control over delivery and quality and, importantly for this project, reduce programme time.

As the project has been part funded by the Public Sector Decarbonisation Scheme it was a requirement that we achieved heat on to each of the connected plant rooms by September. To achieve this, we manufactured the plate heat exchangers at our Blackburn prefabrication department.

This means that the skids come ready to install, dramatically reduce on-site hot works and we have full control over the production and delivery schedule.

Achieving Carbon Targets

We supported UHBW through the PSDS funding process with technical support and advice aimed at maximising carbon savings. To be eligible for PSDS funding we needed to demonstrate the scheme can achieve £500/tCO2. We were able to deliver a design which would achieve £250/tCO2 which resulted in the project being one of the first to be awarded a grant from Salix.