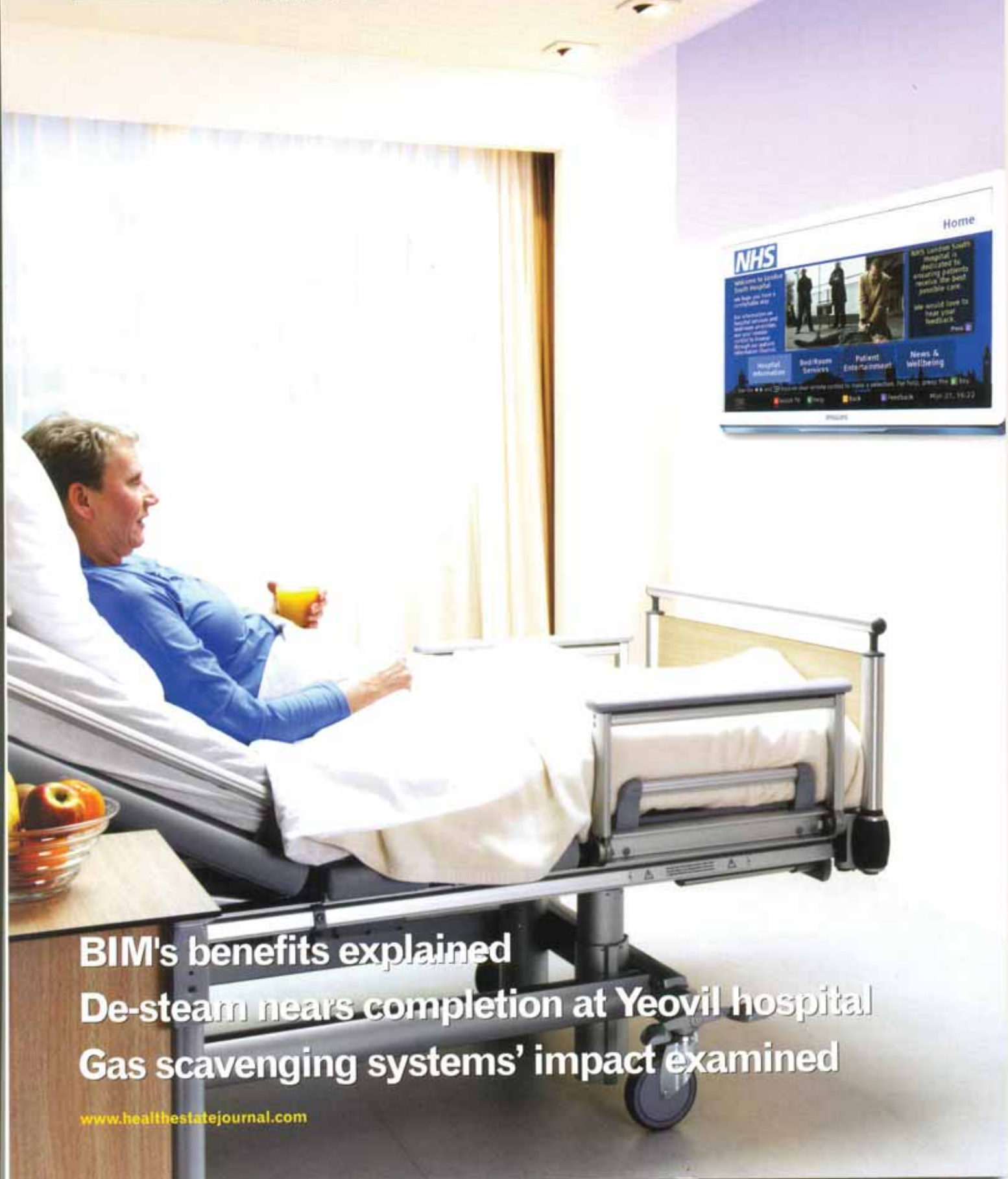


Health Estate

JOURNAL OF THE INSTITUTE OF HEALTHCARE ENGINEERING AND ESTATE MANAGEMENT



BIM's benefits explained
De-steam nears completion at Yeovil hospital
Gas scavenging systems' impact examined

Full de-steam ahead for Yeovil facility

Keen to address one of the major priorities on its backlog maintenance list, and, in the process, to significantly reduce both its carbon footprint and energy bills, Yeovil District Hospital NHS Foundation Trust has recently entered into a 15-year Energy Performance Contract (EPC) with Cynergis which involves the conversion of the existing steam-based heating and hot water infrastructure at Yeovil District Hospital to a considerably more economical, efficient, and future-proof, low temperature hot water (LTHW) system which should also provide added resilience. *HEJ* editor, Jonathan Baillie, reports.

In a project involving an initial £2.7 million capital investment, but under which Cynergis is guaranteeing its client, the Yeovil District Hospital NHS Foundation Trust, £5.8 million in savings at today's prices, plus a 26,000 tonne carbon reduction, over the 15-year contract term, the energy services specialist has not only taken on all the design and installation elements of the major de-steam project, but, through the Carbon and Energy Fund (CEF) procurement framework, is supporting the Trust through the project.

The engineering element of the eight-month project – scheduled for completion this April – includes removing and replacing three existing steam boilers and the associated infrastructure with a site-wide low hot temperature hot water system for both heating and hot water; a partial refurbishment of the existing main boiler house to accommodate two new dual fuel boilers; installation of two further identical boilers within the separate Women's Health and Maternity Unit building; and supplementing the hospital's existing CHP unit with a second CHP engine. Cynergis is also supplying a new building management system for primary heating and hot water, and replacing a wide range of existing, mainly fluorescent, lighting, in both clinical and non-clinical 'spaces', with over 2,500 new LED light fittings.

Acute hospital offering wide-ranging services

Located close to Yeovil town centre in Higher Kingston Road, Yeovil District Hospital is a 345-bed acute hospital that provides inpatient and outpatient services for a wide range of specialties, has a busy Accident & Emergency Department, and its own Women's Health & Maternity Unit, one



An aerial photograph showing the main hospital 'tower', centre, the Women's Health & Maternity Unit, below and to the right, and opposite it, to the other side of the Higher Kingston Road and car park, the main boiler room and Convamore building.

of the features of which is a special care baby unit. Among the inpatient services provided on the site are general medicine, cardiology, general and orthopaedic surgery, and trauma and paediatrics, while outpatient services – many offered out of the smaller, recently built, South Petherton Hospital – include audiology, elderly care, dermatology, diabetes care, eye consultations, orthopaedics, paediatrics, sleep problems, ultrasound, urology, and X-ray.

On visiting Yeovil District Hospital to discover more about this Carbon and Energy Fund EPC-based project, I met with Cynergis associate director, Southern region, Dr Howard Stone, who explained that the site is split in two by the Higher Kingston Road, which also connects the hospital to Yeovil's ring road and town centre.

He said: "Taking the existing plant, the main boiler house's three steam boilers, now all at least a decade old, currently distribute the steam in two main directions – to the neighbouring Trust estates offices and nurses' accommodation (the Convamore building), and, via steam ducts running under the Higher Kingston Road, to the Women's Health & Maternity Unit and adjacent main 10-storey hospital 'tower' opposite." Once the steam reaches the Women's Health & Maternity Unit, he explained, it is fed into calorifiers to provide hot water. A second steam duct runs from the boiler house to a second plant room within the hospital 'tower' – which accommodates many of the site's key medical and clinical departments, where the steam is again converted into hot water to serve the entire tower.

Courtesy of Dave Harris, Yeovil District Hospital NHS Foundation Trust



Existing steam boilers in the main boiler room – two Cradley Steampacket units installed in 1994, and an older Yorkshireman.



The old steam-powered heating calorifiers that have provided heating to the Women's Health & Maternity Unit.

Removal of steam boilers

Central to the de-steam project, Howard Stone explained, would be the removal of the three steam boilers in the main boiler house, and their replacement with two new Stokvis 160 REX 1.4 MW dual fuel boilers. A further two of the same Stokvis boilers (all will run on natural gas, with oil back-up) will be installed concurrently within the ground floor plant room of the Women's Health & Maternity Unit, and will take most of the heating and hot water load of both that facility and of the tower. As a result, the site will convert from a large steam-based heating and hot water system to a more economical, and, it is expected, lower maintenance, low temperature hot water system.

Howard Stone said: "On the project's completion, there will be two energy centres providing low temperature hot water around the site; one in the main boiler room, and the other in the ground floor of the Women's Health & Maternity Unit. We will also be installing, in the main boiler room, a new ENER-G 230 kW CHP engine, to supplement the existing 300 kW Cogenco CHP system, which is located at the back of the tower block near the main restaurant."

Our first stop as we toured the site was the Cynergin project office above the main boiler house, where Howard Stone, and the company's project manager, David Nield, showed me detailed drawings illustrating the main elements of the de-steaming project. Howard Stone explained that, currently below us in the main boiler house were three steam boilers – two Cradley Steampacket units installed in 1994, each providing 4,500 lbs/hour of steam, and a slightly older Yorkshireman boiler, providing some 11,000 lbs/hour.

CHP benefits proven

"In place of these," Howard Stone explained, "we will be installing two of the four new Stokvis boilers, and, close to these, the new ENER-G CHP engine. The site's electricity supply is split into two radial arms; with the existing CHP

connected to one 'arm', and the new one to the other," he continued. "This configuration should provide better savings, since the existing CHP will not be able to 'see' the electrical load that the new one will be picking up." The Trust decided to install a second CHP engine because of the savings it has achieved with the existing one in its three years in operation. Howard Stone said: "The existing Cogenco CHP already saves the Trust around £100,000 annually; the new CHP engine should bring a further £80,000 per year saving."

Under the EPC, the new CHP and boilers will need to meet specified performance and availability measures, as well as achieving guaranteed savings. Howard Stone elaborated: "The CHP will need to be available for around 88-90 per cent of the year, while the boilers will need to provide N+1 resilience; this means the load will always be taken by three out of the four, with the fourth boiler held in reserve. In reality, however, we will cycle the various boilers using the new Sauter building management system we are installing as part of the contract."

Equipment 'package' proposed

Here I asked Howard Stone whether, under its EPC with the Trust, Cynergin had recommended particular equipment? "As part of the tender process," he replied, "we effectively put together a design, via detailed drawings and specifications, which we then proposed. Strictly speaking, an NHS Trust cannot say 'yes' to such an equipment package, since that would make it liable for the design, so the customer has the option, as the Trust did here, to say 'no comment', which effectively means that they feel the design and equipment recommended will do the job well."

Financially, Howard Stone explained, at the juncture at which Cynergin bid for the Yeovil District Hospital contract, there were 10 approved contractors operating under the CEF. He said: "The Trust first held an industry day, in April 2012, to which it

invited representatives from all of these CEF contractors. Interested contractors then had the option to come back and present their proposals to the Trust; I believe five did so. Thereafter, having looked around the site, and the existing plant, each potential bidder made a presentation, after which a period of meetings took place."

Invitation to tender

Following these meetings, the companies that were still keen to tender put their ideas and proposals together as part of the invitation to tender process, after which, following a further four-six week preparation period, each submitted a tender submission for the Trust's consideration. Howard Stone said: "A number of bidders were then invited to a tender interview, and, following these, and some further analysis by the Trust, one company – happily in this case us at Cynergin – was made the preferred bidder, after which we finalised and signed off the contract."

Net present value

He added: "A part of the CEF procurement process measures each bidder's net present value (NPV) on the project, i.e. examining the overall costs of its scheme compared with the savings over a 15-year period. Each bidder is gauged on all the key considerations against its rivals, which requires all the bidders to list and cost all the equipment proposed as part of their package, together with the savings calculation, i.e. how much electricity, gas, and water, might be saved. The savings themselves are typically used to fund the project. You could however, have a cash-releasing project, where, say, the Trust's goal is to get cash from the project. In such a case it might perhaps not, as we have done here, invest money on de-steaming; it might only spend on new boilers, or putting new burners into them. If you are embarking on a strategic project, such as this, however, it's likely you will consume nearly all the savings set inside

the contract. Conversely, if the scheme realises additional or 'excess' savings – for example if a new CHP system outperforms what the contractor has guaranteed, then the savings can be shared."

Gain sharing mechanism

As an illustration, Howard Stone explained that, should the new ENER-G CHP engine at Yeovil District Hospital 'hit', say, 95 per cent availability in a given year, with the contract only having required 88 per cent availability, both the Trust and the prime contractor would gain. He said: "We are thus incentivised to make a system as efficient as we can by running the equipment as hard as possible."

Howard Stone explained that the CEF prime contractor borrows the funds needed to get the project through the installation period, and, once the installation is complete, the customer, in this case Yeovil District Hospital NHS Foundation Trust, assumes the debt. He said: "Throughout the installation phase Cynergis will use its own cash, supported by milestone drawdowns – where we take money from the bank to pay our suppliers – and the Trust then underwrites the money as it starts to mount up. One key element of how one's contract is gauged at tender stage, and thus an element of the NPV, is how competitive the financing rates are."

Undertaken in stages

As we looked around the main boiler house, Howard Stone explained that the removal of the three existing boilers in the main boiler room would be 'staggered'. He said: "Our installation of a new roller shutter door at the front of this main boiler house will enable the steam boilers to be removed, when the times comes, on skids. A lorry will transport the four new boilers to site, with the two for the main boiler room delivered by the vehicle backing right up to the doors to allow lifting into position. Lowering in the two new boilers for the Women's Health & Maternity Unit plant room will be a little more challenging, and will require the siting of a crane close by, which will need to lift them over the roof of the podium at the foot of the tower to their ground floor location."

Continuing to point out new building services elements within the main boiler room, he said: "The new LTHW distribution pipework will connect up to both the boilers and new CHP unit here, with

any hot water produced and not destined for the estates offices and nurses' accommodation next door, carried via underground pipework across to the Women's Health & Maternity Unit plant room. From that plant room, after the temperature has been boosted, the low temperature hot water will be taken, via a twin-run of 220 m stainless steel pipework – which will run from the Women's Health & Maternity Unit boiler room all the way

across the roof at the back of the adjacent tower block, and then down to its second floor, into the so-called ZPL8 main tower plant room – for use throughout the main hospital building. As we looked around the site, two large new boiler flues were taking shape running to the right hand-side of the Women's Health & Maternity Unit to serve the new Stokvis boilers in its boiler room.



Dr Howard Stone, Cynergis associate director, Southern region, said: "One of the challenges is to undertake all the elements in a well-planned sequence, so as to minimise any disruption to clinical activities."

Permission for flues

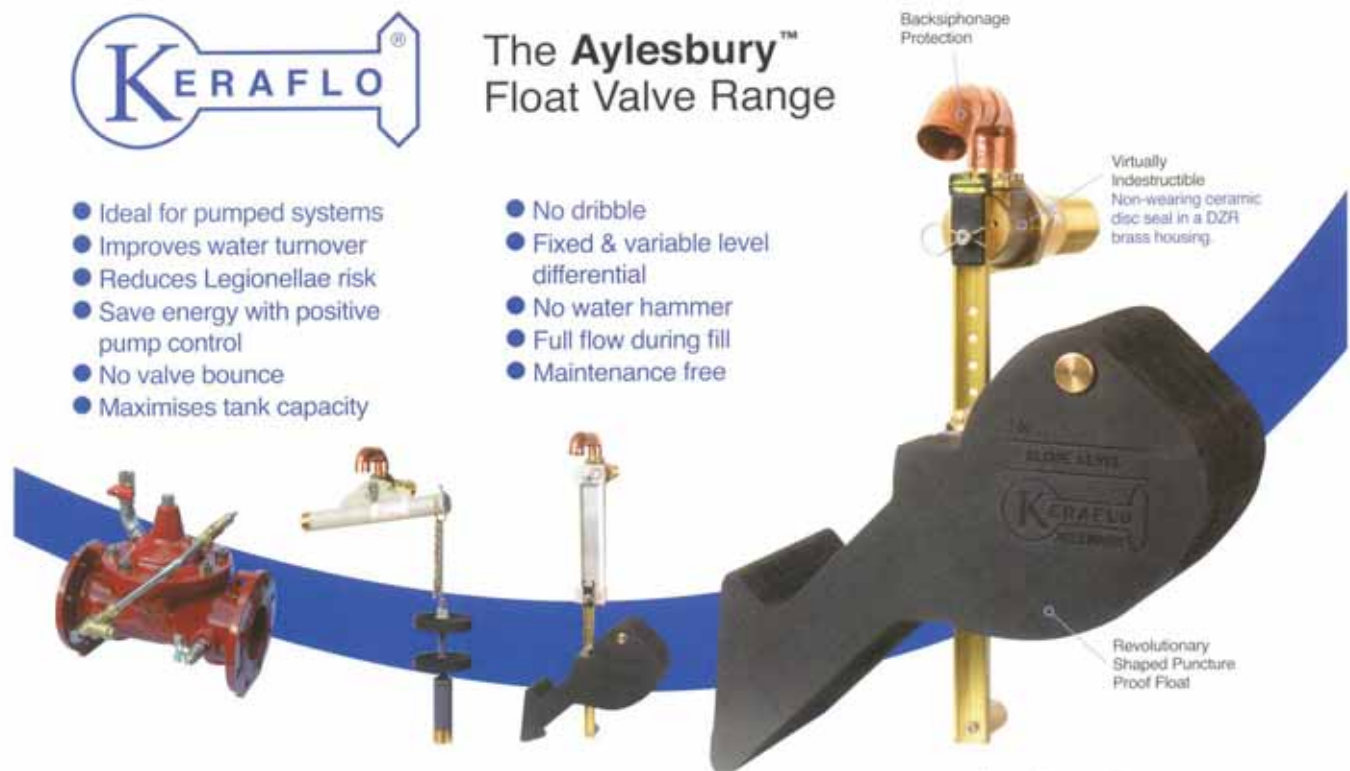
Howard Stone added: "Currently the steam from the existing boilers is converted to hot water for heating and domestic hot water by plate heat



The Aylesbury™ Float Valve Range

- Ideal for pumped systems
- Improves water turnover
- Reduces Legionellae risk
- Save energy with positive pump control
- No valve bounce
- Maximises tank capacity

- No dribble
- Fixed & variable level differential
- No water hammer
- Full flow during fill
- Maintenance free



Keraflo Ltd, Unit 1, Woodley Park Estate, 59 - 69 Reading Road, Woodley, Reading, Berkshire, RG5 3AN
Tel: +44 (0)118 921 9920 Fax: +44 (0)118 921 9921 E-mail: info@keraflo.co.uk Web: www.keraflo.co.uk



exchangers in what will become the new Women's Health & Maternity Unit boiler room. The new flues required planning permission from South Somerset District Council, which gave us the go-ahead, the only stipulation being that we aimed to match the colour of the flues to the colour of the building."

By this point, as we walked around the site, we were nearing the Women's Health & Maternity Unit plant room/boiler room. Howard Stone said: "The local gas main runs around the site perimeter, and we will be tapping off this to supply the boilers in the Women's Health & Maternity Unit building by bringing the pipework up under a footpath, and installing a new gas meter kiosk. The pipework will run through a bank on which the Women's Health & Maternity Unit sits straight to the new boilers."

He added: "One of the main challenges is to undertake all the elements in a well-planned sequence, so as to minimise any disruption to clinical activities." A quick glance inside the Women's Health & Maternity Unit plant room revealed a number of domestic hot water calorifiers, with some asbestos contamination, which Howard Stone explained would soon be cut up and removed, while already installed were new pumps for domestic hot water and heating, together with new plate heat exchangers, a header, and the pipework for connection, on their arrival, to the new boilers, as well as to the main boiler house, and the main plant room in the tower block.

Howard Stone said: "You can see here that the welders have just re-plumbed in for us the heating calorifiers to keep the Women's Health & Maternity Unit 'live' on steam while we take everything else out."

Re-configuration of existing CHP

Over in the tower block's main plant room, Howard Stone was able to show me the 'other end' of the LTHW pipework from the Women's Health & Maternity Unit, which had run over the roof of the restaurant, and then, via a core-drilled hole, into a length of ducting, which itself extends the entire length of the second floor corridor right to the end of the hospital. This pipework will also connect up with a series of new LTHW heating plate exchangers. A series of existing larger CHP plate exchangers in this main plant room will also be removed; thereafter Cynergin plans to re-plumb the existing



David Shire, maintenance manager at Yeovil District Hospital, said: "The longest part of the process was agreeing the contract and getting it signed, but, once that was complete, Cynergin has worked quickly to progress the project to its scheduled completion."

CHP engine in different configuration to capture more of the heat it is producing.

A considerable volume of existing pipework and fittings to remove, and replace with new infrastructure, to get the project completed, and all the new equipment up and running. Howard Stone said: "We spent a considerable time early on getting to understand how we could install the system optimally, yet maintain supply to all the hospital services, which entailed programming particular elements at the least busy times. Work generally proceeds five days a week, although some of the enabling works were

done at weekends, requiring a two-hour shutdown of the hot water to the Women's Health & Maternity Unit. A de-steam is one of the more complex projects, not necessarily technology-wise, but more due to the need to be fully cognisant that a hospital's activities never stop. You need to ensure that, when you must shut down services, you do it quickly, and with the minimal impact.

Reasons for Cynergin's selection

"Robert Steele, the Trust's former estates director, who originally led the procurement and contract negotiations from the Trust side, told me he chose Cynergin as prime contractor because we offered the right engineering solution, while the finance team, led by Dean Stevens, favoured the operating lease

model we offered," Howard Stone explained. "As an analogy, when you buy a car on hire-purchase, at the end of the term you either make a final payment and the vehicle is yours, or start again with a new car. An operating lease works similarly; the Trust has an option, but not an obligation, to buy some of the equipment it does not own at end of the contract. I would say it was a combination of our technical expertise, our pedigree as a company, our planning and co-ordination abilities, and the financial package we offered, which saw us win this key contract."

Howard Stone explained that Cynergin was established in 2000, originally to develop and sell EPCs to large contracting companies such as ABB, Total Gas & Power, and ENER-G. In 2010, however, the company was acquired by the Brook Henderson Group (which also owns managed equipment services provider, Asterol) and, 'with a greater balance sheet', now has the ability to bid for projects itself.

Concurrent operation

Looking ahead to the project's completion, he explained that all four boilers should be installed and operational by mid-March, with the new CHP coming on stream in early April. He said: "Because of the way we are staggering the installation, we will not turn off the steam until the new LTHW system has been operational for a month or so, giving the site some additional initial resiliency while we make sure that all the new plant and equipment is running optimally. Thereafter we will shut down the steam side, and all the steam boilers can come out; currently the only equipment on site entirely reliant on steam to operate is a large dishwasher in the main hospital kitchen, which is set to be replaced."



From the Women's Health & Maternity Unit boiler room, the low temperature hot water will be taken via a twin-run of 220 metre stainless steel pipework across the roof at the back of the adjacent tower block, and then down to its second floor, into the so-called 'ZPL8' main tower plant room.

Courtesy of Cynergin

Courtesy of Dave Harris, Yeovil District Hospital NHS Foundation Trust



The Women's Health & Maternity Unit at the YDH site. Centre: The new flues at the side of the unit. Right: Low temperature hot water ring pipework leaving the Women's Health & Maternity Unit plant room on its way to the main hospital's plant room.

The site's electrical profile

The two CHP engines will take the hospital's base heating load, of approximately 700 kW, while electrically, the new ENER-G CHP will follow the site load profile on top of the existing machine. Howard Stone said: "The new boilers will be delivered over a weekend. The key now is to ensure we have all the infrastructure, including the pipework, plinths, pumps, and plate heat exchangers, for the heating and domestic hot water system, in place ready for the boilers' and new CHP engine's arrival. We will also be installing a new Sauter building management system in the estates office, to control the primary part of the system, i.e. the circuit the boilers sit on. The Trust will retain management of the secondary side."

Lighting replacement

Cynergis is also replacing a wide range of the hospital's lighting, but predominantly T8 fluorescent lights in wards, corridors, and office blocks, with new LED lighting. This elements accounts for about 15 % of the capital cost, and should save around 100 kW in electricity. Howard Stone said: "Under our EPC contract we also guarantee savings via the lighting refurbishment work."

He added: "Practical contract completion of the project is due in late April/early May, 3-4 weeks after the CHP is installed, by which time all the new plant will have been installed, tested, and commissioned. At this point the Trust will start repaying the bank, which will then pay us, a process that will continue throughout the 15-year contract, and will cover the capital cost of the equipment, the finance, and our service fee. The goal will be for the plant to be in Condition B at the contract's completion."

The £5.8 m in savings guaranteed over the 15-year contract lifetime, Howard Stone pointed out, equate to an annual saving to the Trust of £390,000, made up of savings in electricity, gas, and other utilities, plus,

since Cynergis will be responsible for any maintenance activity, operational costs. "We also forecast the Trust saving 26,000 tonnes of CO₂ over 15 years, i.e. about 1,700 tonnes of carbon per year," he explained.

Trust benefiting substantially

"The Trust is effectively getting a complete new, more efficient and flexible primary heating and hot water system, and making the savings for free, because the guaranteed savings more or less equal the service cost, including the capital outlay. The NPV is thus small, but the Trust is getting substantial benefit. It can thus keep the money it saves to invest in frontline services."

All the design work on the project was undertaken by Cynergis personnel. The company is also undertaking all project and site management. Howard Stone said: "Cynergis has undertaken all the detailed design and project planning, and has then purchased all the new plant. We have then sub-contracted out much of pipework fitting and other infrastructure installation, as is common practice in the EPC sector."

The Trust's standpoint

Speaking from a Trust standpoint, David Shire, maintenance manager at Yeovil District Hospital, said: "The Trust has struggled for a number of years with life-expired steam plant, which has swallowed up valuable resources in both time and revenue costs. Most estates professionals will be aware of the energy and planned maintenance costs in running a steam system, in terms both of ensuring compliance to BG01, and utility costs. However there are also 'hidden' costs associated with ageing steam plant – steam leaks that can't be repaired because the isolation valves won't hold; flooded ductwork caused by corroded condensate pipework, the time and effort wasted in tracking down that blown tube bundle, and the standing losses from oversized plant

installed when each ward had numerous baths.

"We therefore jumped at the chance to work with the CEF and Cynergis to replace the hospital's steam system with a LTHW system. The Trust could not, at the time, justify finding the capital sum to undertake these works, and the EPC framework was thus an attractive option.

'Slick' selection process

"The process of selecting a contractor was fairly slick, with Richard Pearson of the CEF leading the way, and we were also assisted by Nifes Consulting. Once Cynergis was selected as preferred bidder, it worked closely with us to agree the final design. The longest part of the process was agreeing the contract and getting it signed, but, once that was complete, Cynergis has worked quickly to progress the project to its scheduled completion this April.

"One of the key risks for the Trust was carrying out the works on our main heating system during the winter months, but I am happy to say there have been no problems, and that the hospital heating and hot water systems have remained unaffected, without the need, and associated costs, of installing temporary steam boilers. This is testament to the teamwork between Cynergis and the Trust, a partnership I am sure will continue into the EPC's maintenance phase.

"The Trust has an existing CHP unit, installed three years ago, and so is fully aware of such plant's benefits. We therefore welcomed Cynergis's proposal to install an additional CHP engine. It has been difficult to manage electrical consumption on site with the increasing demand for air conditioning/air-handling in newly refurbished areas, the installation of major equipment such as MRI scanners, and growing demand for additional clinical services. This project will provide us with electrical power at a reduced cost from the new CHP, and we will also benefit from the heat produced." +