



Heat Network Optimisation

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Improving Standards since 2002



Advances in Heat Network Technology

I was at the UKDEA AGM today, and was asked to give a talk.

Link below is the presentation given - went down rather well.

http://www.heatweb.co.uk/w/images/f/fc/Advances_in_Heat_Network_Technology.pdf

If anyone would like me to come visit and present fu... Show more

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Phil Jones Richard - absolutely excellent tour de force of many key DH problems we face. All I can say is, I agree! Well done. For my part I will follow up:

- a) I will speak to my friends in the Swedish Embassy to try and get a full translation of DS439
- b) I will make sure the chair of CIBSE Guide B sees this (pipe sizing)
- c) I will work towards an update of CP1 to try and address these issues

Show less

Like

... 3h

Heat networks:
Code of Practice for the UK

Raising standards for heat supply

**Plumbing Engineering Services
Design Guide**



The Institute of Plumbing

CIBSE Design Guide

Heat networks



**WATER TREATMENT
AND CONDITIONING
OF NON-DOMESTIC
SYSTEMS AND HEAT
NETWORKS**

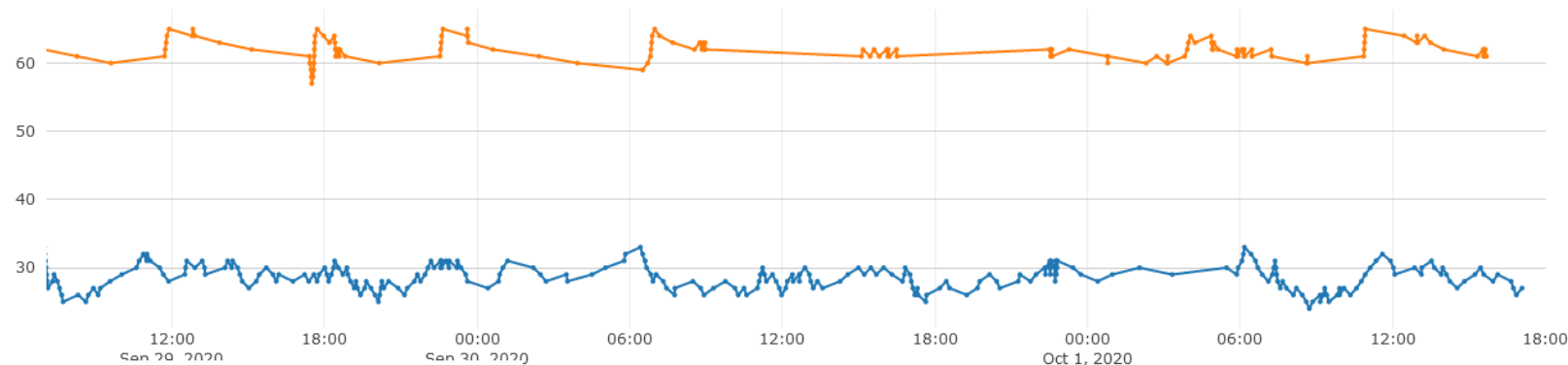
1980	1982	1989	1990	1995	1999	2000	2005	2010	2015	2016	2017
SPARTAN ET50/100 The first primatic module for vented storage systems	HYDRO PACK Framed hot and cold water storage with boiler	HEAT BANKS The first use of plate heat exchangers on domestic thermal storage	HEATBANK® STOWAWAY & PANDORA The first thermal stores free from discharges or annual maintenance	HEATBANK® XCEL The first Multi-Fuel thermal storage system	BOILER MASTER The UK's first Hydraulic Interface Units	HEATWEB The most extensive technical resource to be found online	AMAZON HXIN The first domestic unvented cylinder with plate heat exchanger reheat	THE HIFLOW Modular commercial HIU sets	THE DATA The most efficient twin plate heat interface unit in the world	THE SLIM The smallest electronic heat interface unit in the world	SLIM-EXTRA with NODE-HIU Technology Advanced direct heating HIU with contract-free open source heat network management



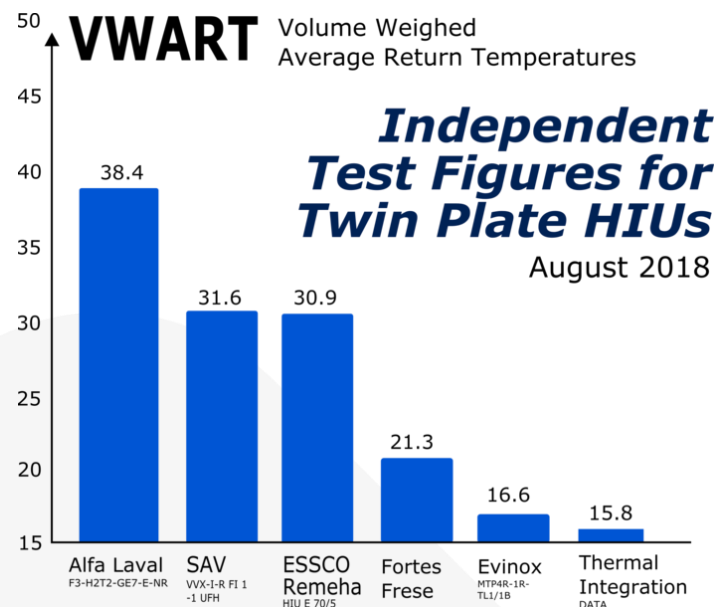
To learn more visit www.heatweb.co.uk
or telephone us on 0845 2411441



The DATA HIU



Thamesway Homes, Harrington Place, 2020



VWART with keep warm inactive *		
Period	VWART (°C)	% Time
No heating	13.9	93%
Heating	39.4	7%
Overall	15.8	

* HIU has ability to deactivate keep warm function

VWART calculation prepared by Freddie Valletta of FairHeat Ltd on 26 July 2017

Heatweb Solutions Ltd.

Technical Support Services for Heat Networks & Commercial Buildings

- Consultancy
- Cloud Services
- 3D Scanning & CAD
- HIU & Substation Design, Commission, & Maintenance
- MVHR Upgrades and Maintenance
- Specification Services
- BMS Strategy & Integration
- HNES & Heat Network Optimisation



The Roles of an Optimisation Engineer

- To improve the reliability of building services.
- To improve energy efficiency and reduce carbon footprints.
- To move networks to fossil-free energy supplies.
- To identify processes that improve outcomes for end-users.
- To disseminate knowledge [processes, guidance & training].
- To reduce the costs & burden of QA processes.



*Archibald 'Harry' Tuttle
Brazil*

Areas of Optimisation

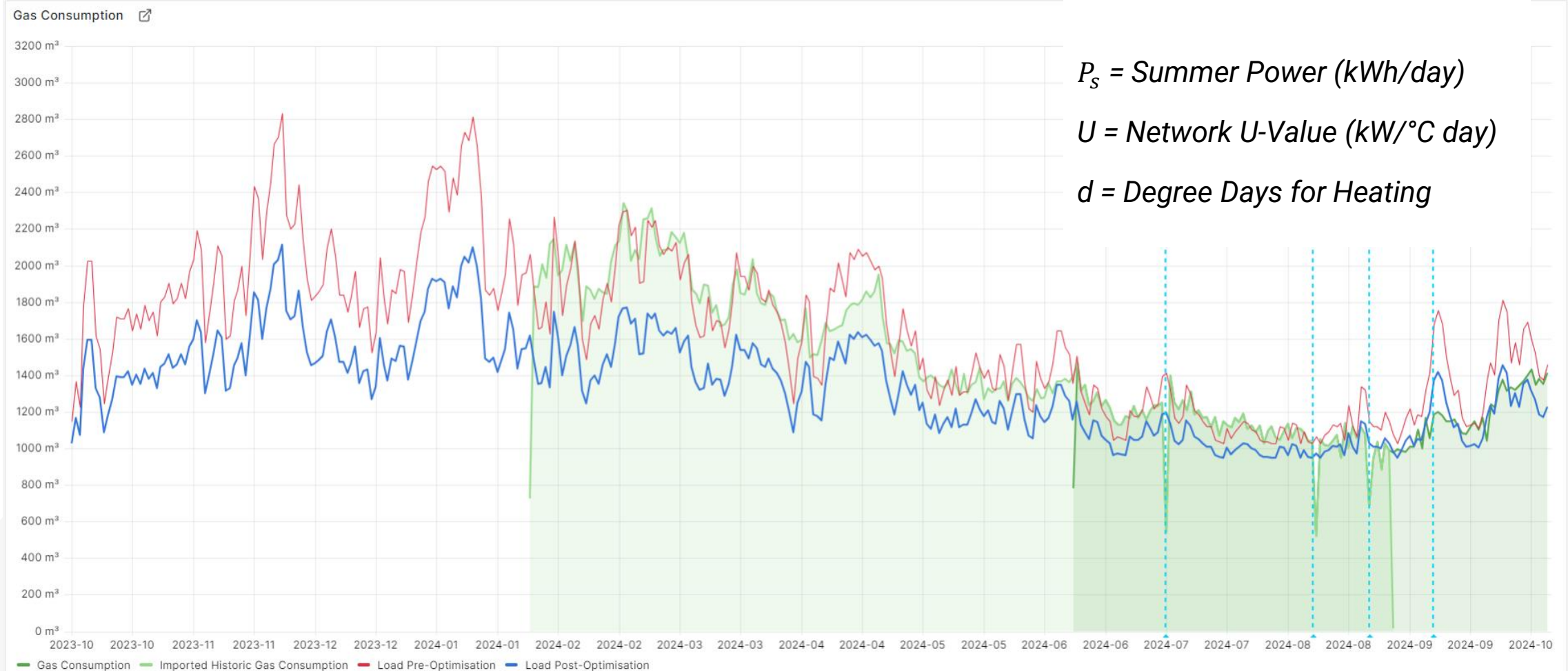
- Metering infrastructure & accuracy
- Central heating systems
- HIUs
- Distribution pipework
- Bypasses
- Substations and intake rooms
- Water quality
- DP sensing and pump control
- Buffer store arrangements
- Boiler loading
- Boiler sequencing
- Setpoints
- Temperature Dilution
- CHP integration
- Air handling units
- Fan-coil units
- MVHR systems
- Heat pump COP
- Cooling systems
- BMS point to point testing
- BMS control strategy
- BMS alarm functions
- Frost functions
- Benchmarking efficiency

Data Sources for Optimisation

- Historic gas and electric consumption data
- Historic heat meter data
- Schematic drawings
- Plantroom drawings
- Site surveys
- 3D scan surveys
- Discussions with end-users
- Clamp-on monitoring
- Live BMS data
- Live AMR data
- Weather data

Performance Benchmarks

$$kWh = \sum_{t=t1}^{t2} (P_s + (U d))$$



MVHR Optimisation

It is just over ten years since MVHR became commonplace in new build.

Alongside HIUs, they form an integral part of a home energy system.

Without proper commissioning, acceptance testing, and maintenance, properties can deteriorate with damp and mould, or significant energy can be wasted.

MVHR manufacturers warn there is a big problem coming in new-build.



MVHR + HIU + Heating + Cooling



Combined commissioning helps ensure compatible setpoints and controls.

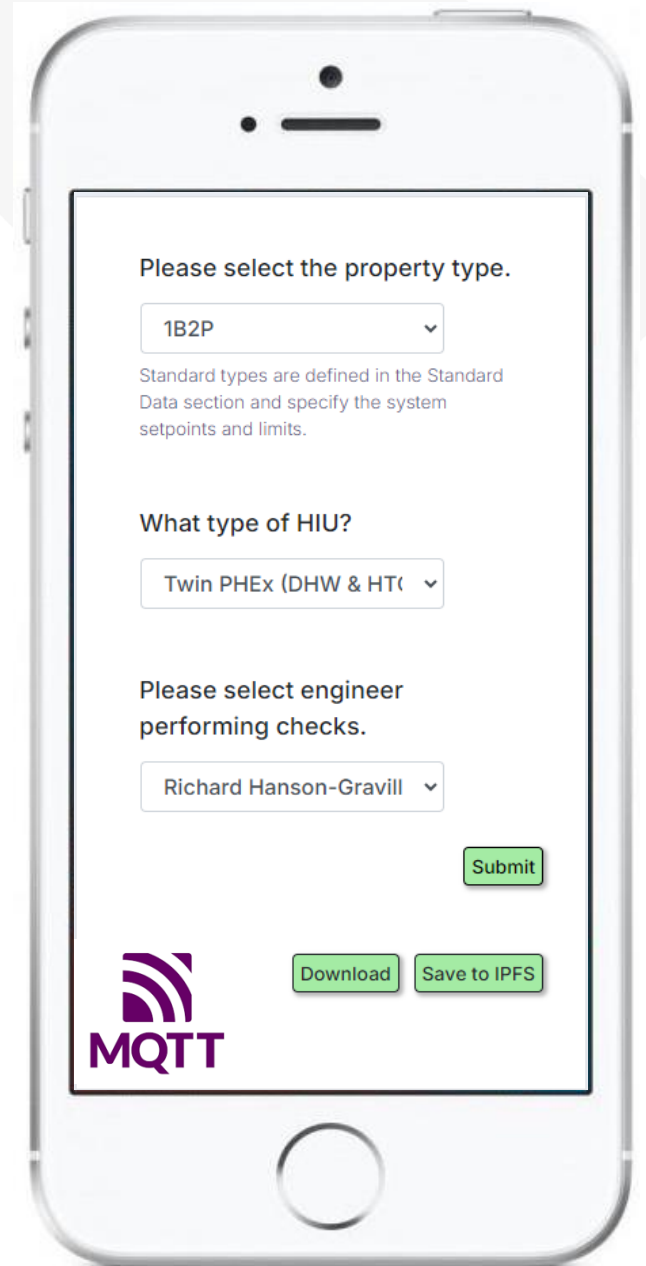
PART 2B : INSPECTION OF INSTALLATION (enter either 'Yes' or 'No')						PART 3 : COMMISSIONING DETAILS - Continued				
The Commissioning Engineer is to complete this PART before completing PART 3.						3.3) AIR FLOW MEASUREMENTS (EXTRACT) - continuous mechanical extract ventilation & mechanical ventilation with heat recovery only				
2B.1) VISUAL INSPECTION - GENERAL (all systems) - Continued						Room reference (location of termination)	Design air flow - High rate (l/s) (Table L2 ADFI)	Measured air flow - High rate (l/s)	Design air flow - Continuous rate (l/s) (Table L3 ADFI)	Measured air flow - Continuous rate (l/s)
Is the installation complete, with no obvious defects?						Kitchen:				
Do all internal doors have enough undercut to allow air transfer between rooms as detailed in paragraph L25 of ADFI (i.e. 10 mm above floor finish or 20 mm above floor surface)?						Bathroom:				
Has all protection/packaging been removed (including from background ventilators), so that the system is fully functional?						En suite:				
Are systems clean internally and externally?						Utility:				
Has the entire system been installed to allow access for routine maintenance and to repair/replace components?						Other:				
2B.2) VISUAL INSPECTIONS - GENERAL (continuous mechanical extract ventilation & mechanical ventilation with heat recovery systems only)						Other:				
Have appropriate air terminal devices been installed to allow system balance?						3.4) AIR FLOW MEASUREMENTS (SUPPLY) - mechanical ventilation with heat recovery only				
Have the heat recovery unit & all ductwork been effectively insulated and sealed for all heated & unheated spaces?						Room reference (location of termination)	Design air flow - High rate (l/s) (Table L2 ADFI)	Measured air flow - High rate (l/s)	Design air flow - Continuous rate (l/s) (Table L3 ADFI)	Measured air flow - Continuous rate (l/s)
Is the condensate connection complete and does the condensate drain to an appropriate location (MVHR only)?						Living room 1:				
Are filters installed?						Living room 2:				
For ducted systems, has the ductwork been installed so that air resistance & leakage is kept to a minimum?						Dining room:				
2B.3) OTHER INSPECTIONS - GENERAL (all systems)						Bedroom 1:				
At initial start-up, was there any abnormal sound or vibration, or unusual smell?						Bedroom 2:				
During continuous operation, was there any excessive noise?						Bedroom 3:				
						Bedroom 4:				
						Bedroom 5:				
						Study:				
						Other:				
PART 3 : COMMISSIONING DETAILS						3.5) COMMISSIONING ENGINEER'S DECLARATION				
The Commissioning Engineer is to complete this PART after completing PART 2B.						Registration Number**:				
3.1) COMMISSIONING EQUIPMENT USED						Engineer's Signature: Date:				
Model: Serial Number: Data of last UKAS calibration:										
Model: Serial Number: Data of last UKAS calibration:										
3.2) AIR FLOW MEASUREMENTS - Intermittent extract fans only						ADDITIONAL POWER TESTS TO 3.3) & 3.4)**				
Extract fan number & its values MUST reflect the extract fans listed in PART L2 (for cooker hoods, only the highest setting needs to be recorded)						Total Electrical Power***: High (.....) W Low (.....) W Specific Fan Power****: (.....) W/(l/s)				
Fan reference N° (from PART L2)	Design extract rate	Measured extract rate	Fan reference N° (from PART L2)	Design extract rate	Measured extract rate					
Extract fan: 1)	(l/s)	(l/s)	Extract fan: 2)	(l/s)	(l/s)					
Extract fan: 3)	(l/s)	(l/s)	Extract fan: 4)	(l/s)	(l/s)					
Extract fan: 5)	(l/s)	(l/s)	Extract fan: 6)	(l/s)	(l/s)					
Extract fan: 7)	(l/s)	(l/s)	Extract fan: 8)	(l/s)	(l/s)					

***Total electrical power, supplied from fused connection unit to fan box, i.e. including all controls, needs to be measured when the system has been commissioned and the fans are running at the low (continuous) air flow rate.
****Electrical power divided by low extract flow rate.

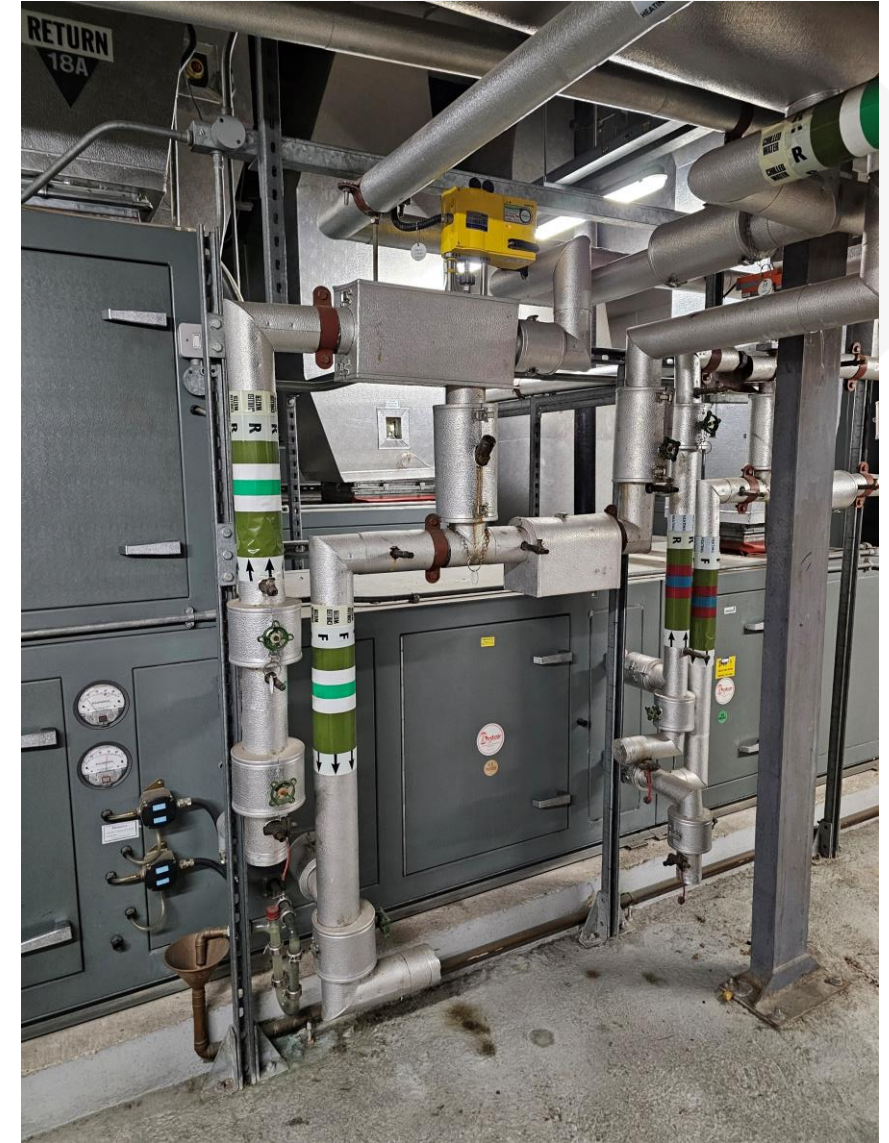
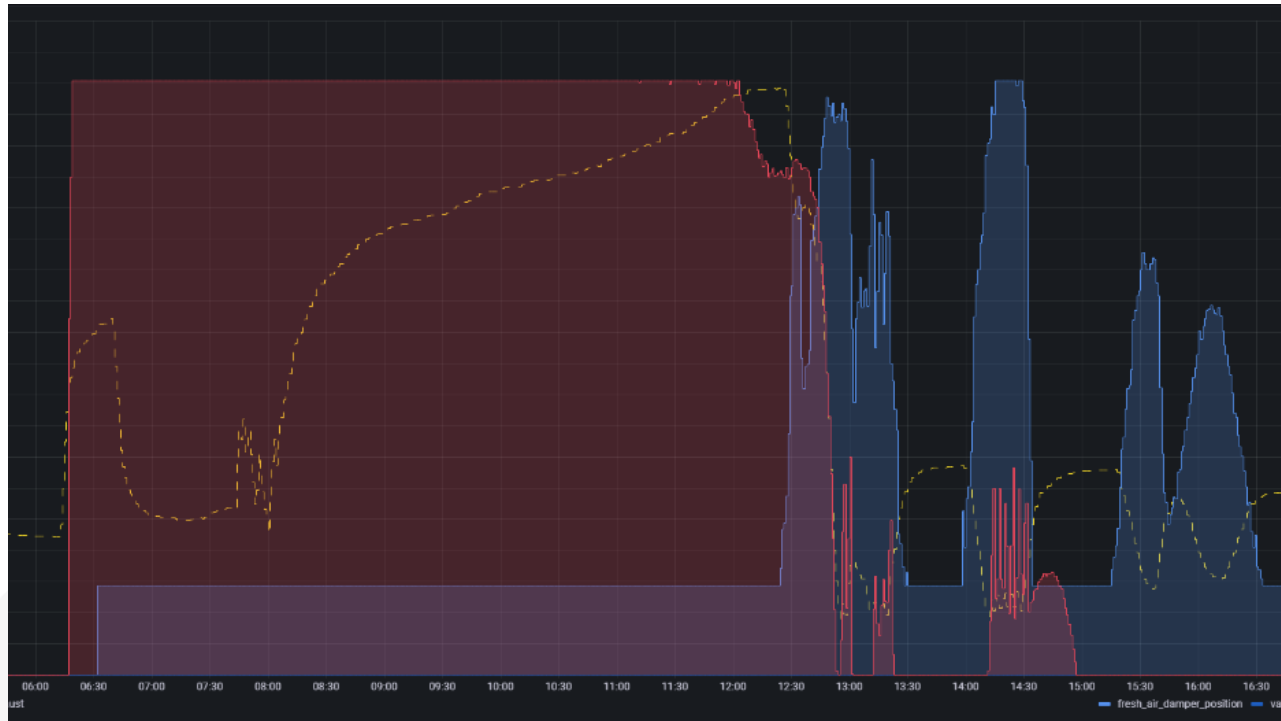
Open-Source Commissioning App

To enable wider collaboration on the rapid development of commissioning and acceptance testing procedures for all types of equipment.

- ✓ **HIU**
- ✓ **Central Heating**
- ✓ **MVHR**



AHUs and Fan Coil Optimisation



Pump Energy & DP Optimisation

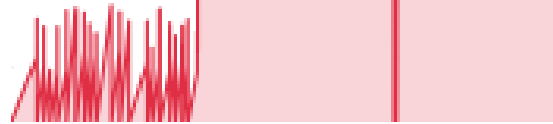
block1and2 / lthw-subSt-pump1 / driver / speed 1

20%



block3 / chw-subSt-pump2 / driver / speed 1

92.1%



block3 / chw-subSt-L35 / sensor / dpSec 1

1 bar



block3 / lthw-subSt-L35 / sensor / dpSec 1

30 mbar



block4and5 / lthw-subst-4aL7 / sensor / dpSec 1

750 mbar



Substation Optimisation

Substation Block 3

Current Value 69.6 °C

Volume Weighted Average 1 70.1 °C

Volume Weighted Return Temperature 1 69.2 °C

Avg Secondary Return Temperature 58.2 °C

PHE Efficiency 34.2%



Point-to-Point Optimisation

Combining **BMS** data points with **Meter** data points allows common faults to be automatically identified.

In this example, the sensor for Block B Substation PHE No 2 is a short sensor fitted into a long sensor pocket.

Block B High Returns

phex1

69.6 °C

phex2

49.1 °C

meter

69.8 °C

Block C Returns

phex1

59.3 °C

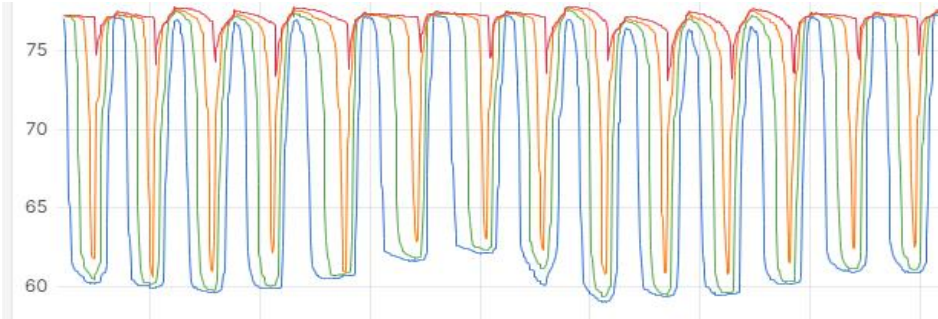
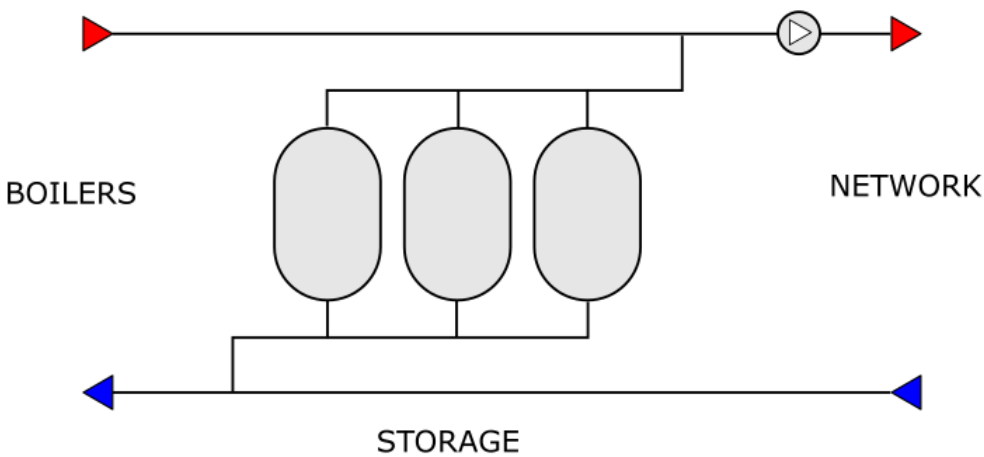
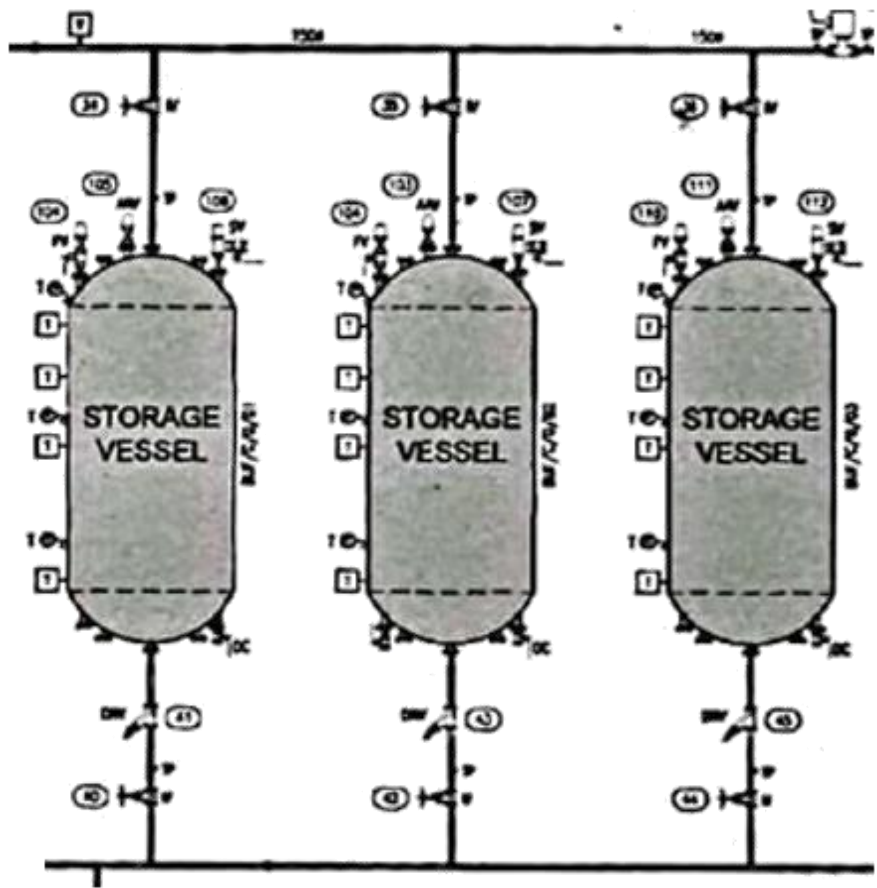
phex2

59.0 °C

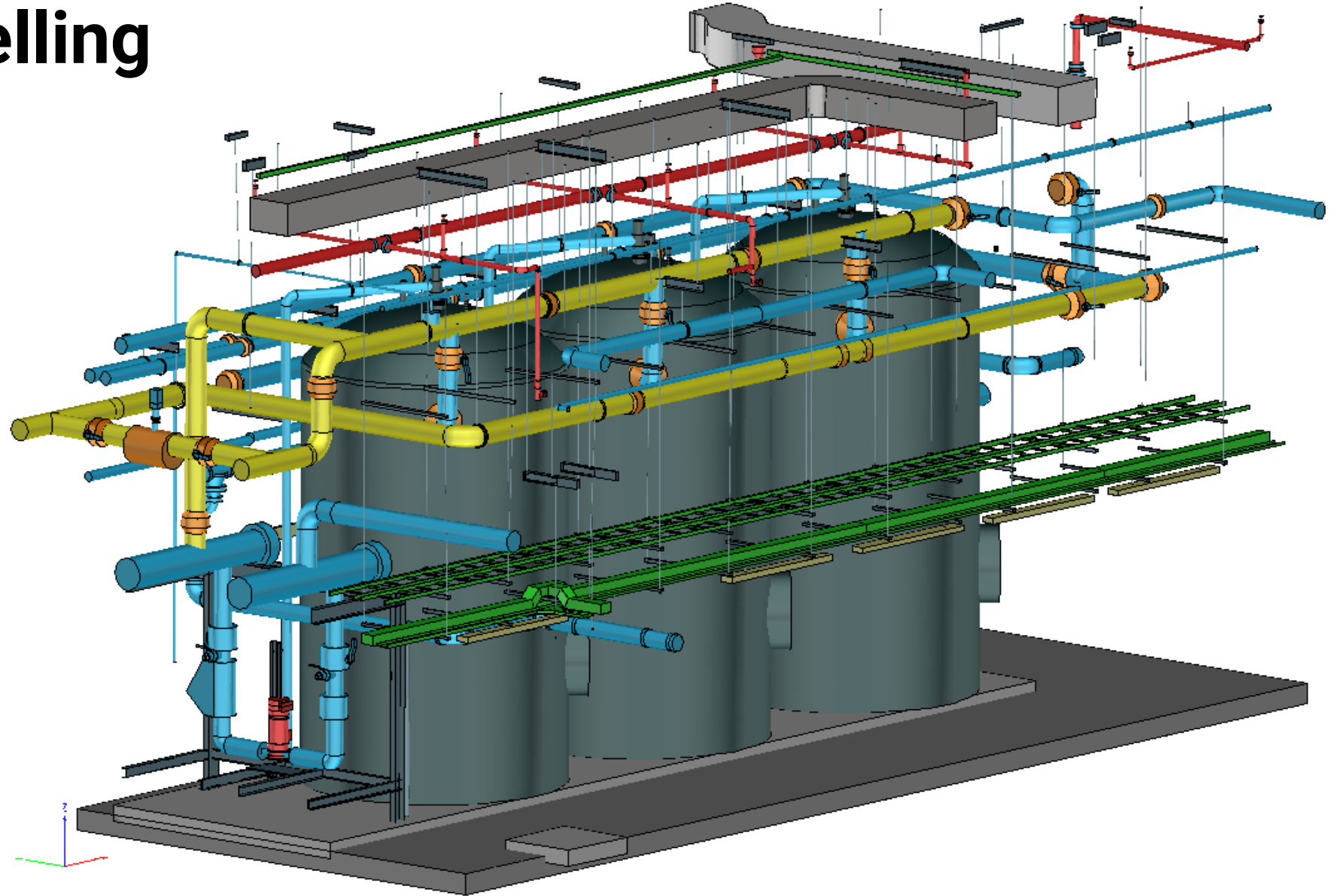
meter

59.6 °C

Buffer Store Optimisation

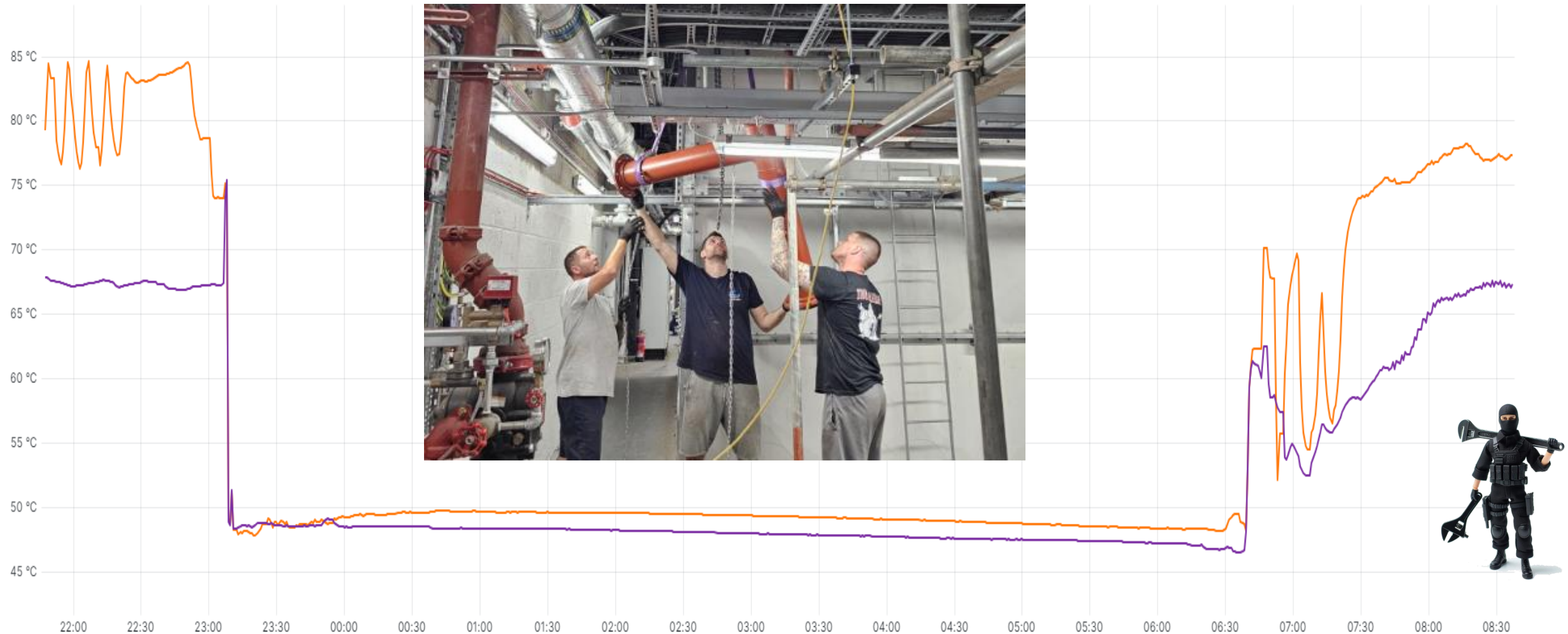


3D Scanning & Pipework Modelling

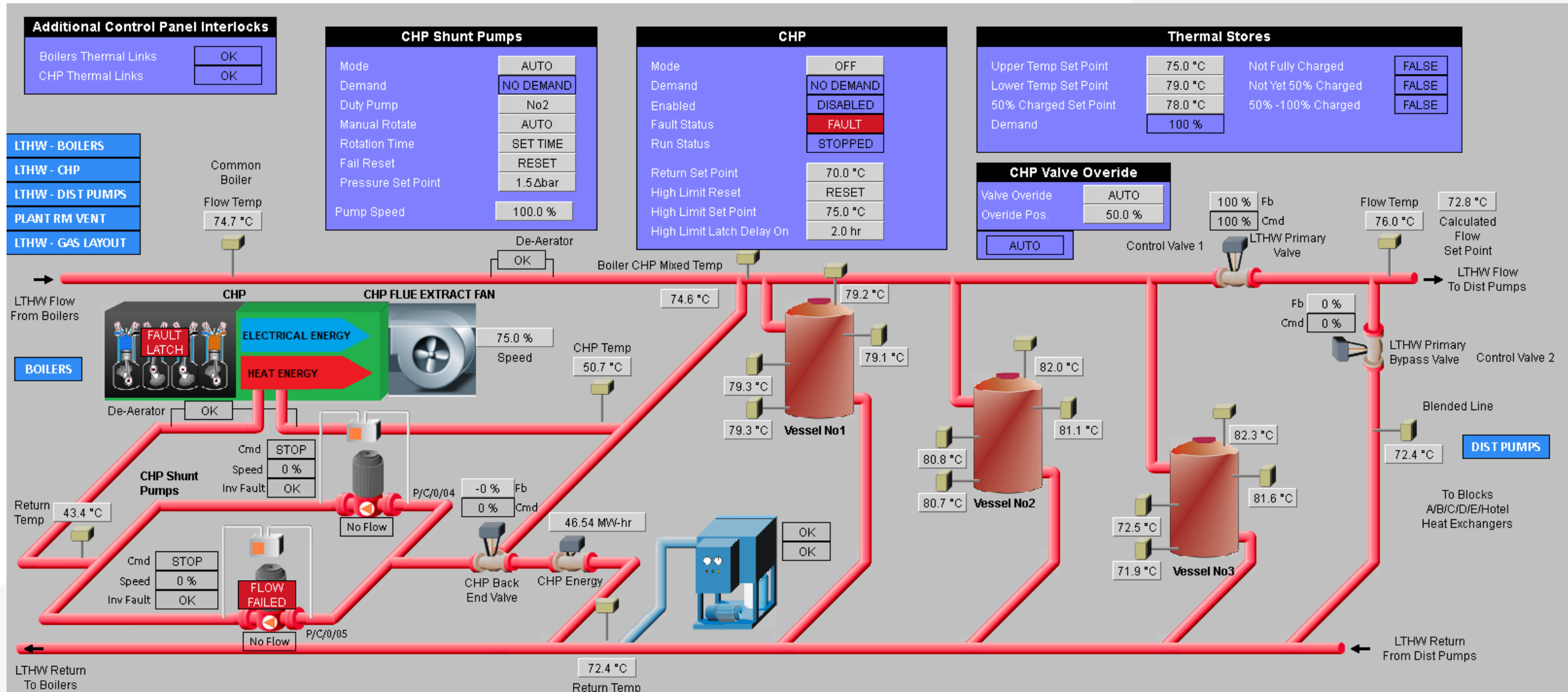


Alter 40m of 6" Pipework & Install 2 x 6" Control Valves

11pm Shutdown,
6:30am Fire up

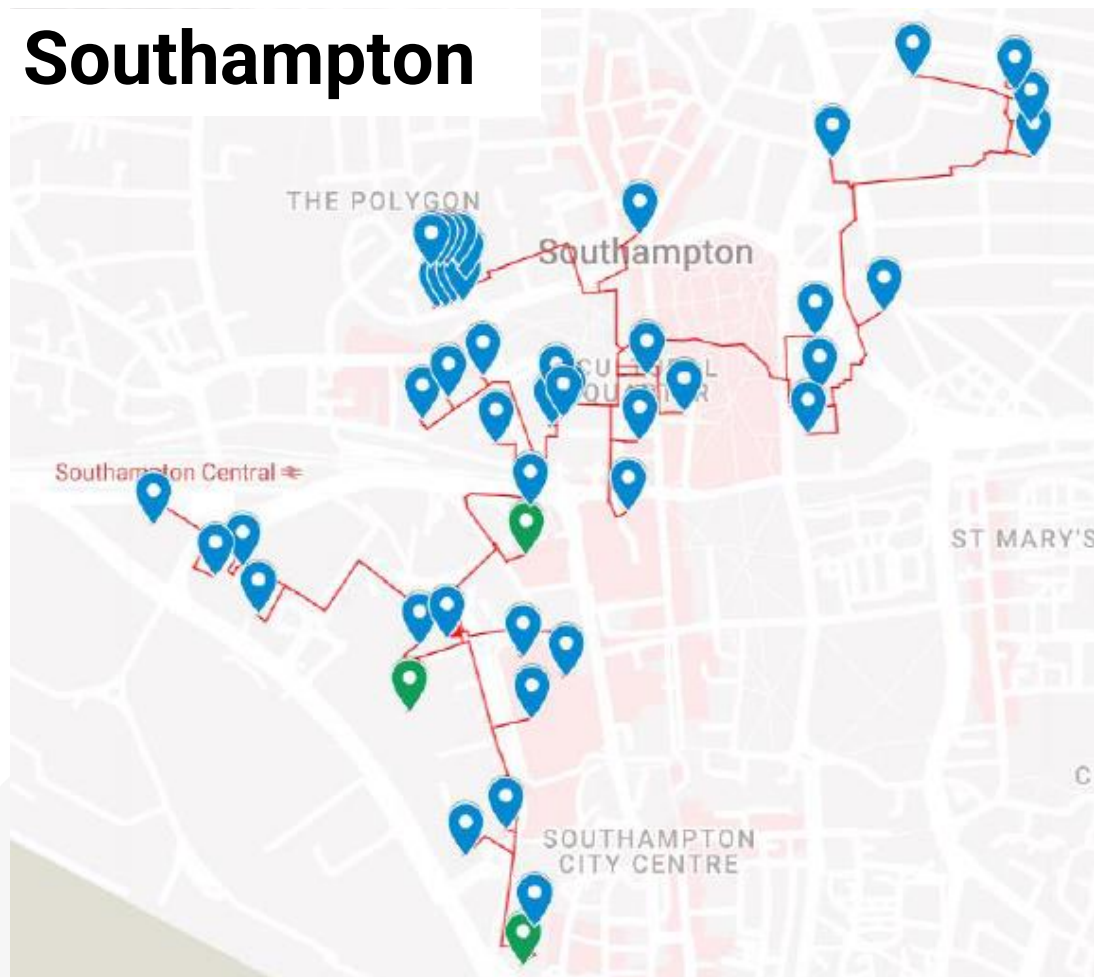


BMS Optimisation



HNES: Optimising Cities

Southampton



Birmingham

