

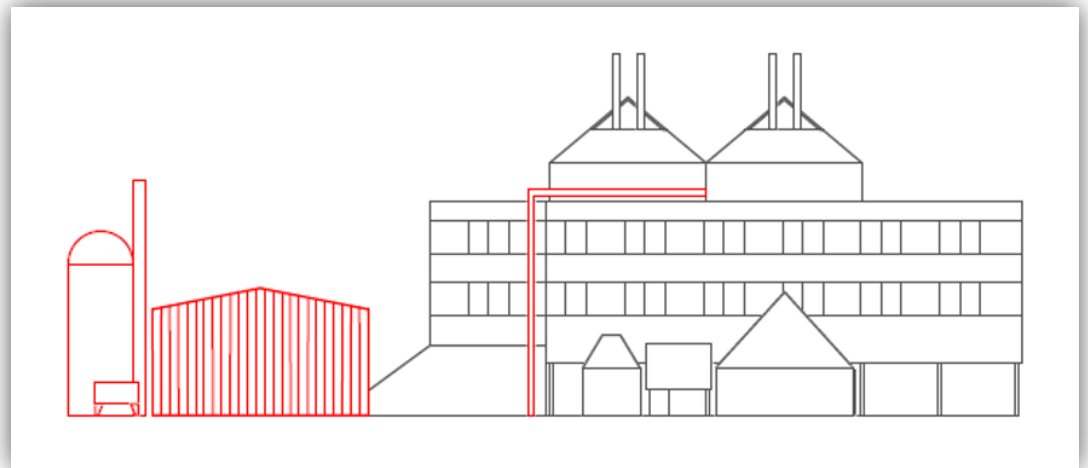
NTU CHP works – Salix RGF4

January 2016

Scott Brooks

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- Background
- Heat loads
- CHP operation / sizing
- Thermal store / sizing
- Proposed project
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Project drivers

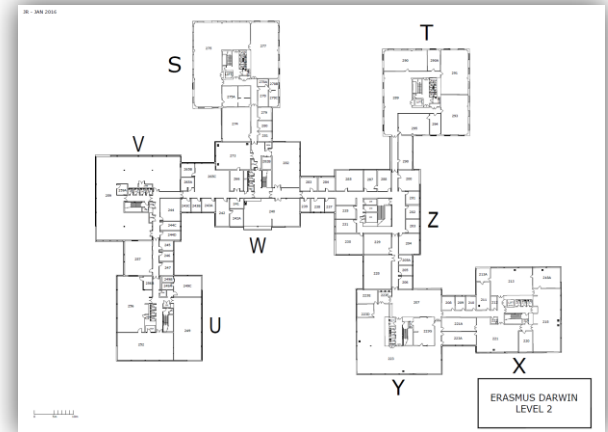
- Nottingham Trent University Carbon Elephant Plan
- Existing CHP at end of useful life
- Salix Finance/HEFCE Revolving Green Fund 4
 - Stream 1 - Project value of £50k - £750k
 - Stream 2 - Project value of £750k - £2m



Background

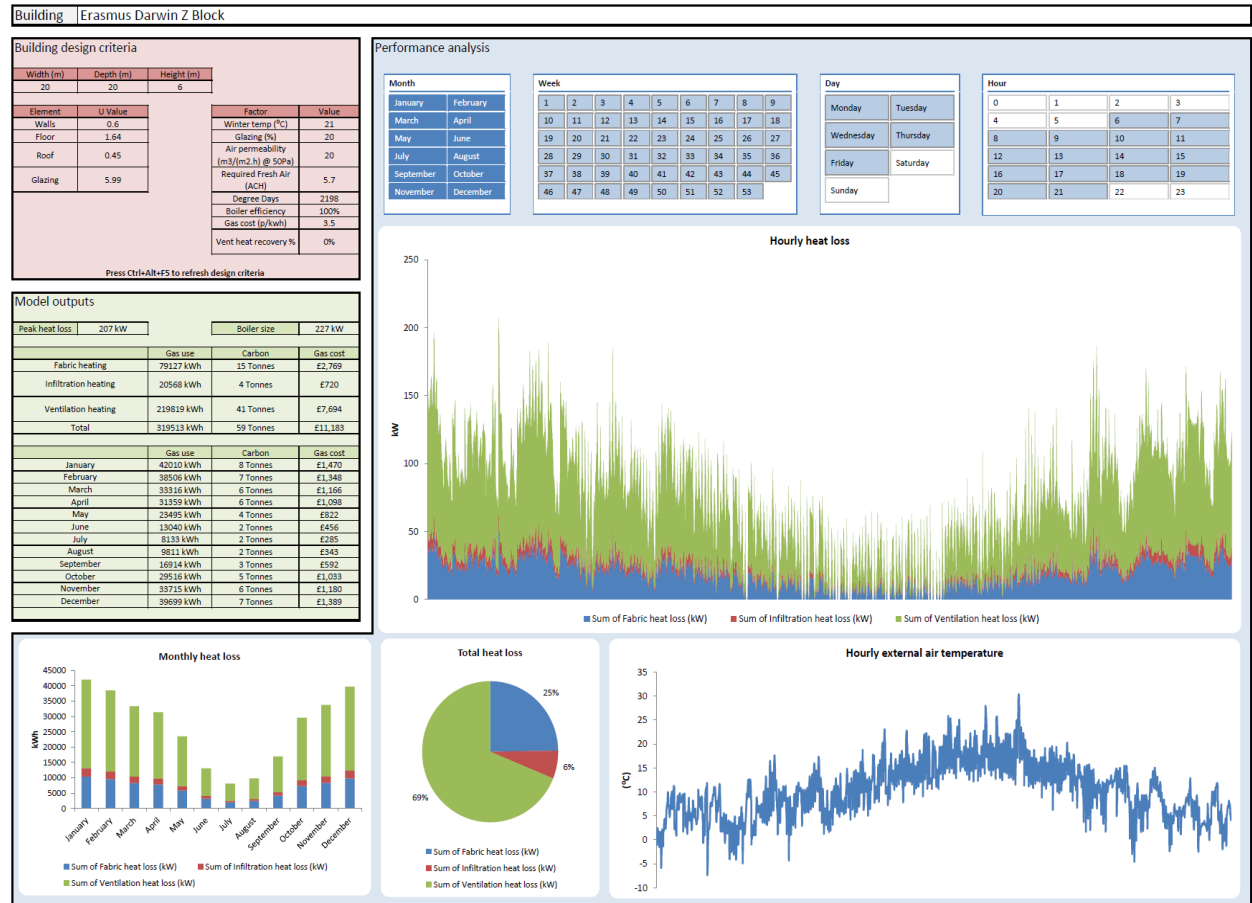
Erasmus Darwin building

- 10000m² Science / research facility
- Essentially “8 pods”
- Each pod has own plant room (gas boiler plant)
- Additional heat provided by a 400kWe CHP (at end of useful life)
- Existing rooftop heat distribution
- Ongoing works to improve energy efficiency:
 - Upgraded ventilation (with heat recovery)
 - High frequency lighting
 - Variable speed drives/pumps/extract



Building heat load/profile

- Reviewed historic building energy use
- Carried out thermal simulation of each block



Established heat load/profile

- Peak heat load \approx 2MW
- Heat load varied by:
 - Block
 - Day/night
 - Season
- Limited options for efficient CHP installation
- Explored options to include thermal storage with the CHP

CHP operation



CHP Heat supply > Demand



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+



CHP Heat supply < Demand



+



+

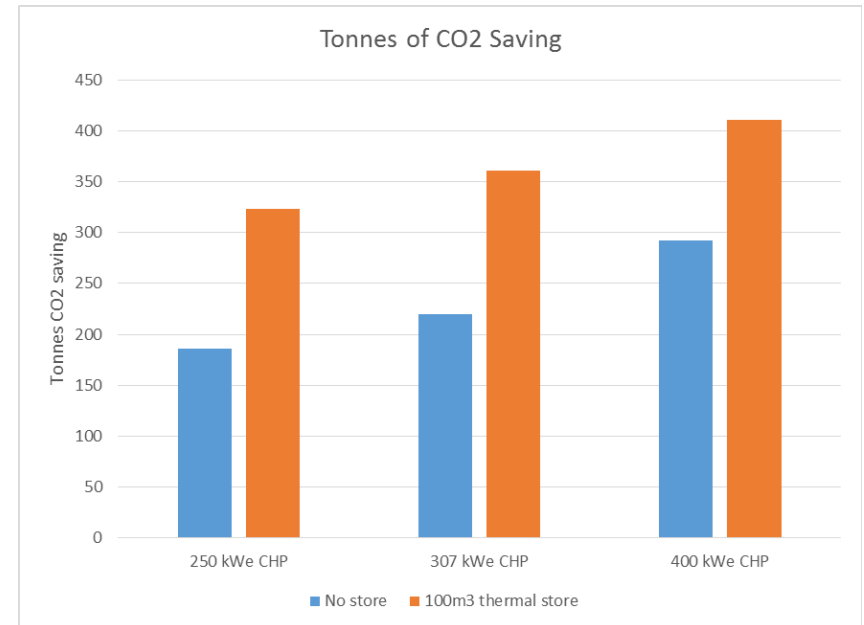
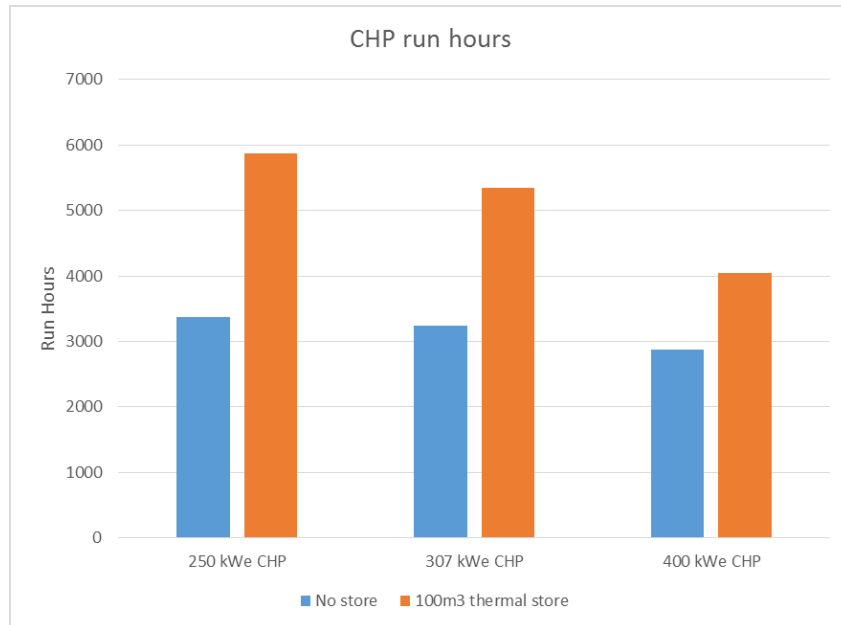


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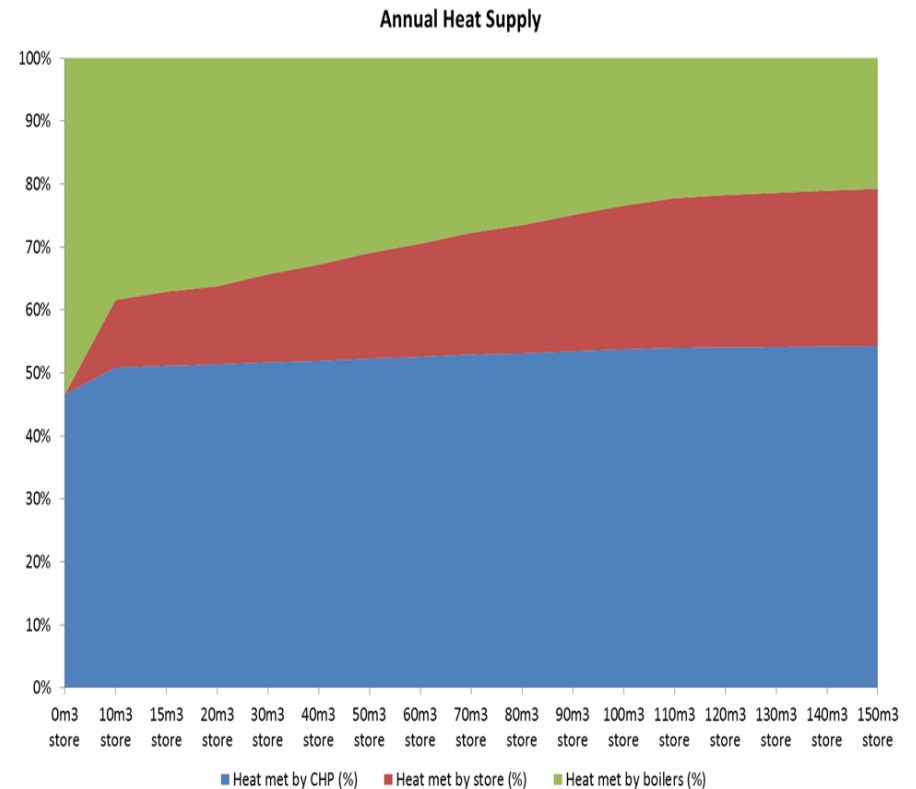
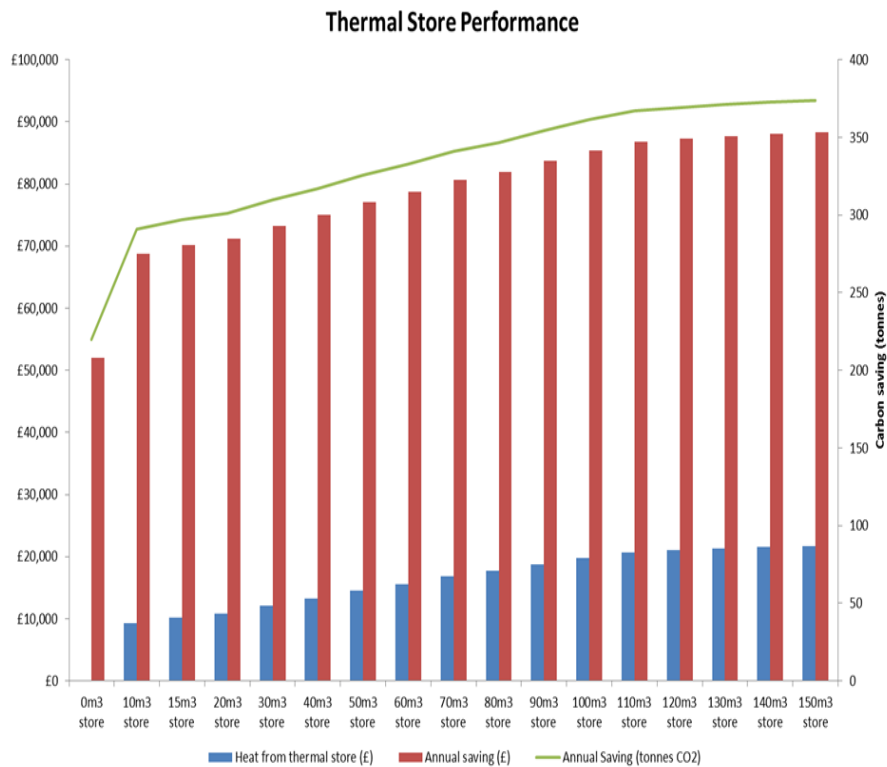
Benefit of thermal store – 100m³

- Run hours / carbon savings reviewed
- 3 CHP's considered
 - 250kWe
 - 307kWe
 - 400kWe

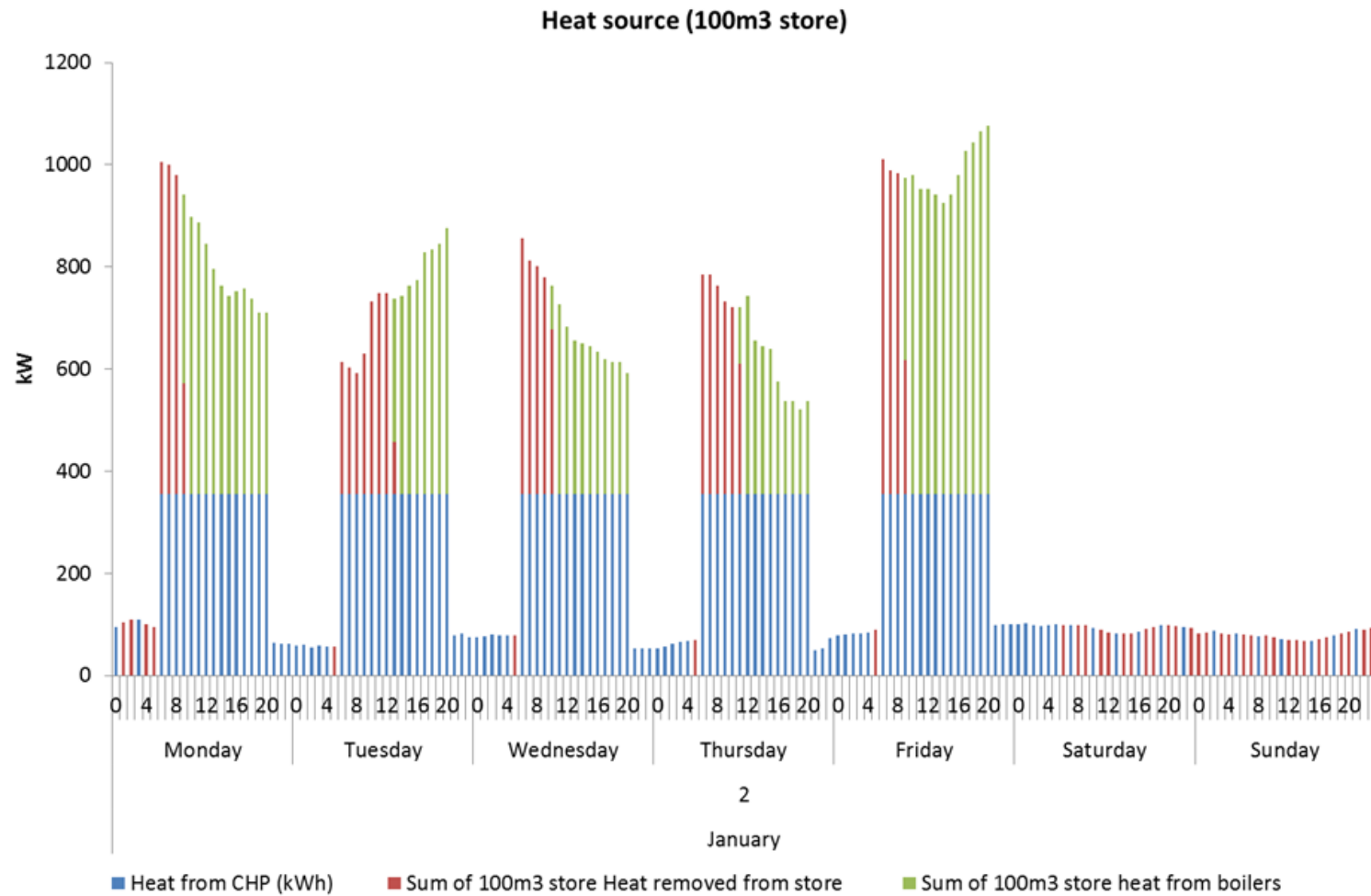


Thermal store performance

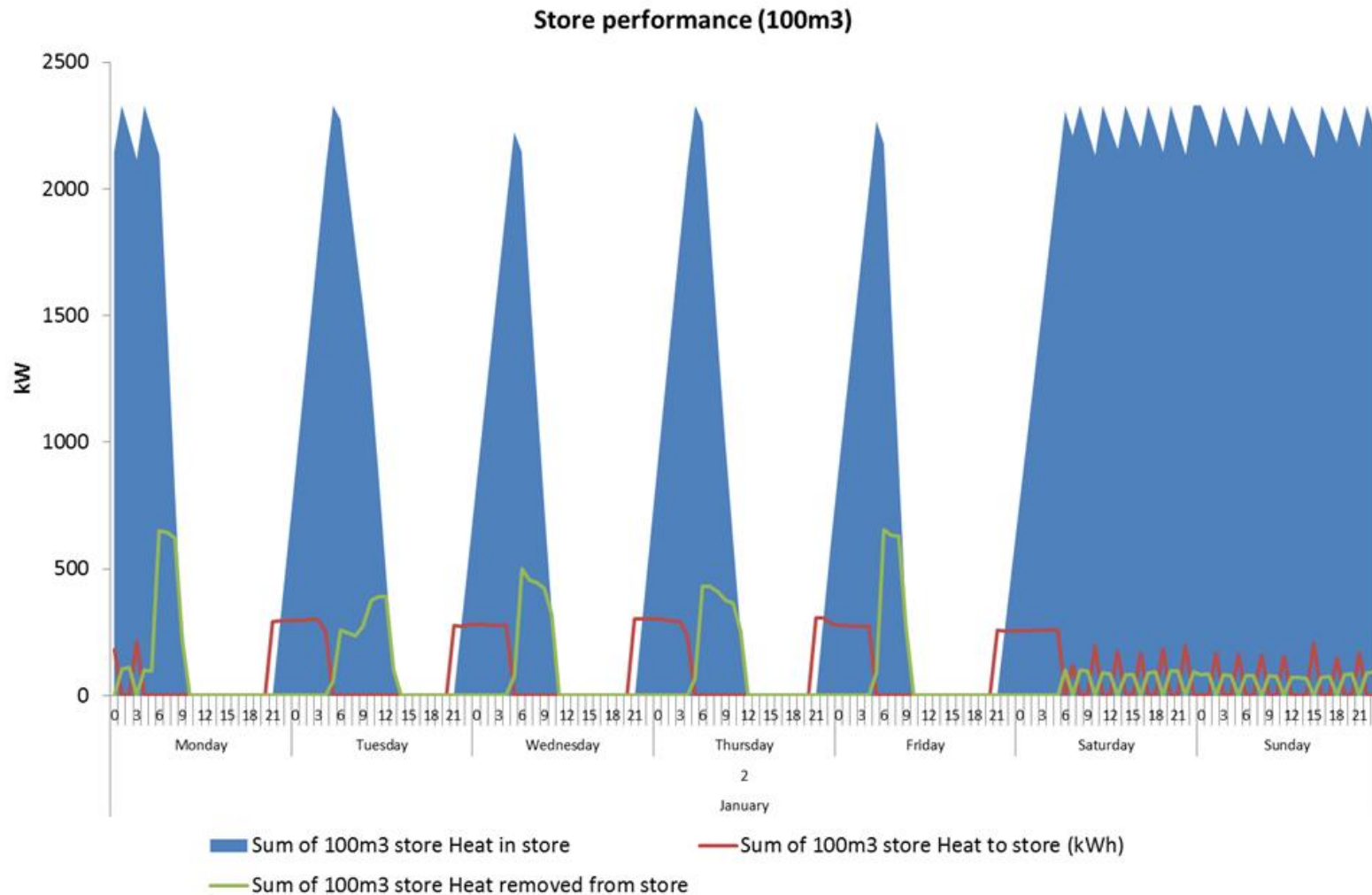
- 307kWe, 356kWth CHP



CHP operation – Peak winter



Store performance – Peak winter

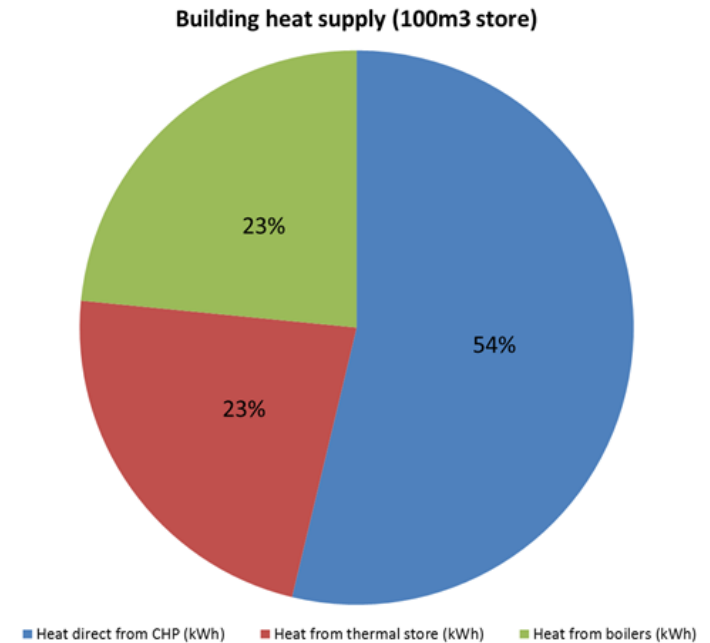


Heat source

Given:

- 2MW heat load
- Mon – Fri, 6am – 8pm occupation
- 307kWe CHP
- 100m³ thermal store

The CHP and stores will meet 77% of the annual heating requirement of the building.



Proposed project

Works include:

- Fabrication of new central plant room
- $\approx 300\text{kWe}$ Combined Heat and Power Unit (CHP)
- $50\text{-}100\text{m}^3+$ of thermal storage (water @ 85°C)
- Supplementary boiler plant
- Modifications to existing heat network
- Connections to existing infrastructure
- Demolition/relocation of existing gas bottle store

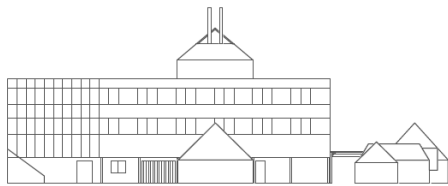


Existing site photos



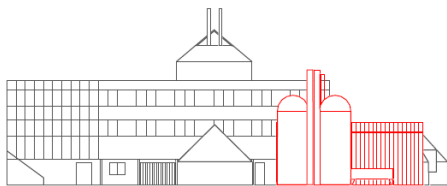
CHP + Stores proposed location

West Elevation
Existing



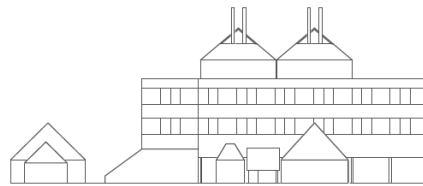
View A

Proposed



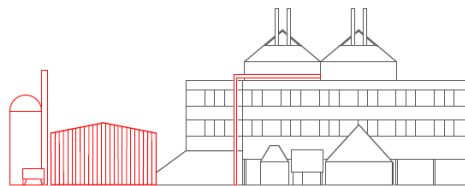
View A1

South Elevation
Existing



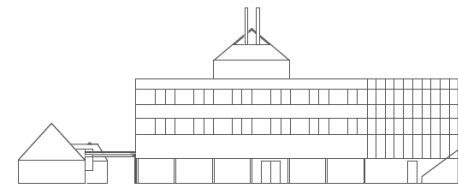
View B

Proposed



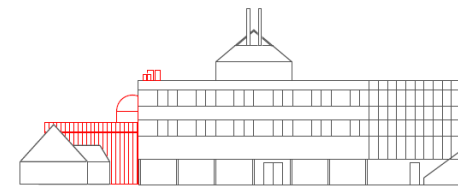
View B1

East Elevation
Existing



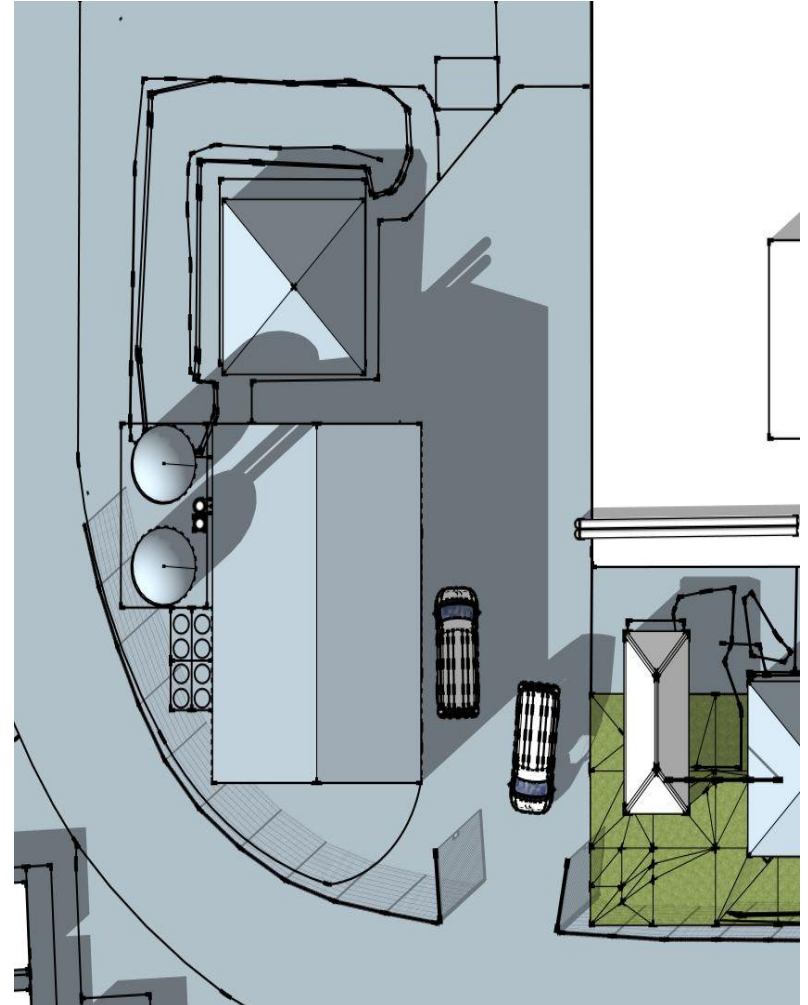
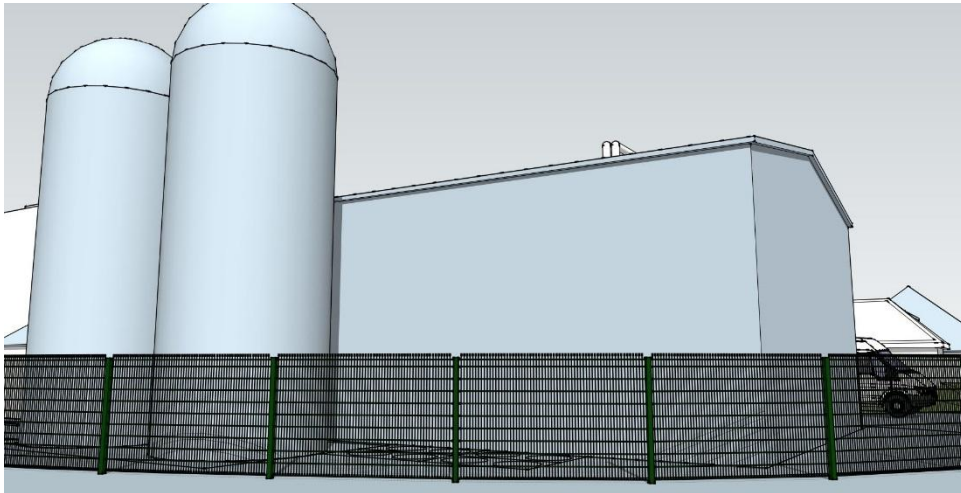
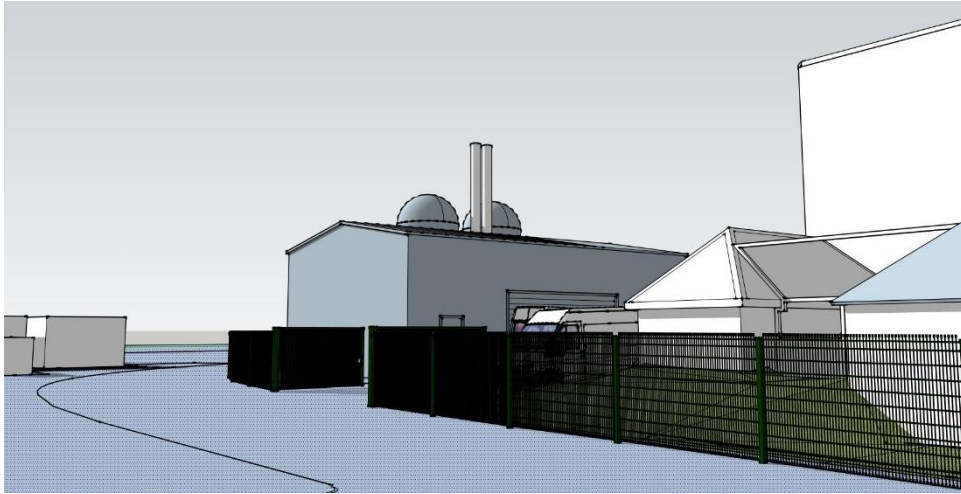
View C

Proposed

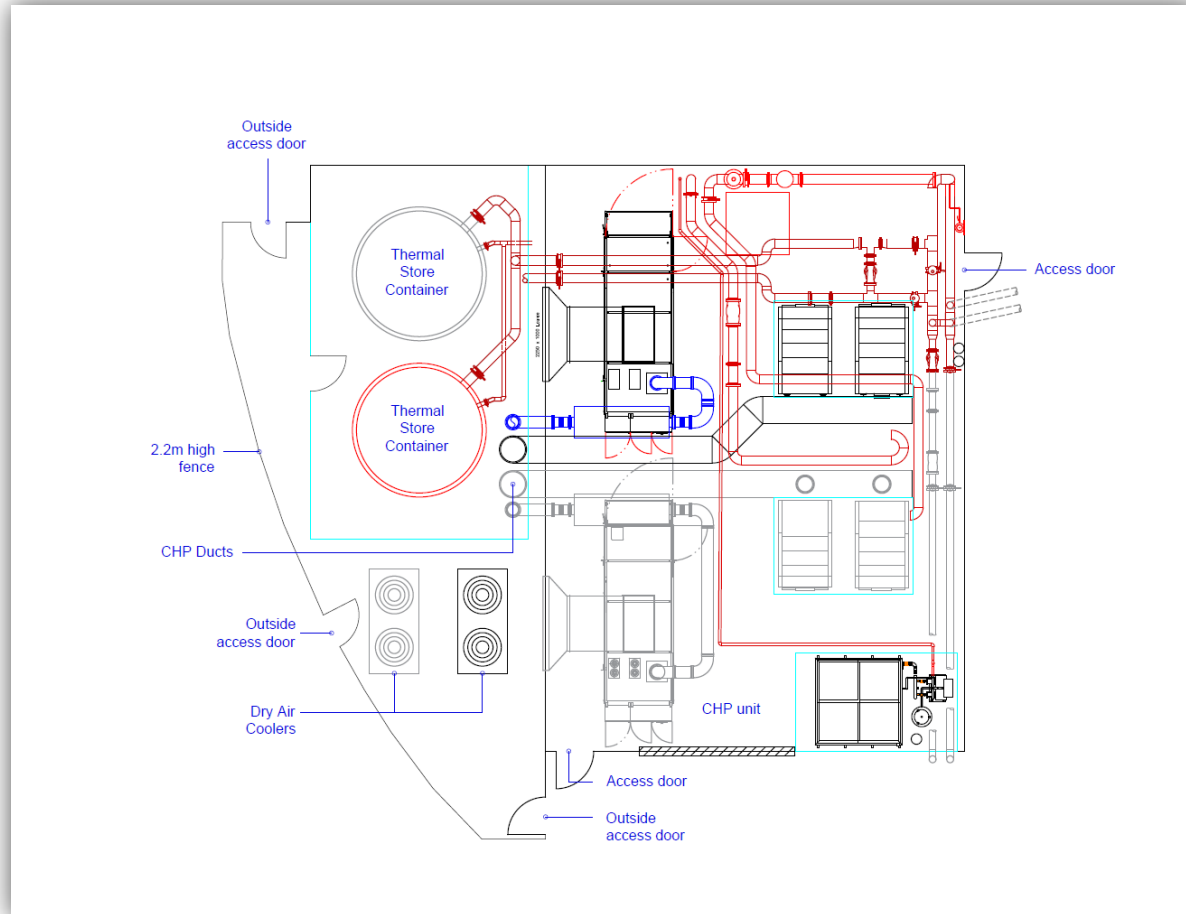


View C1

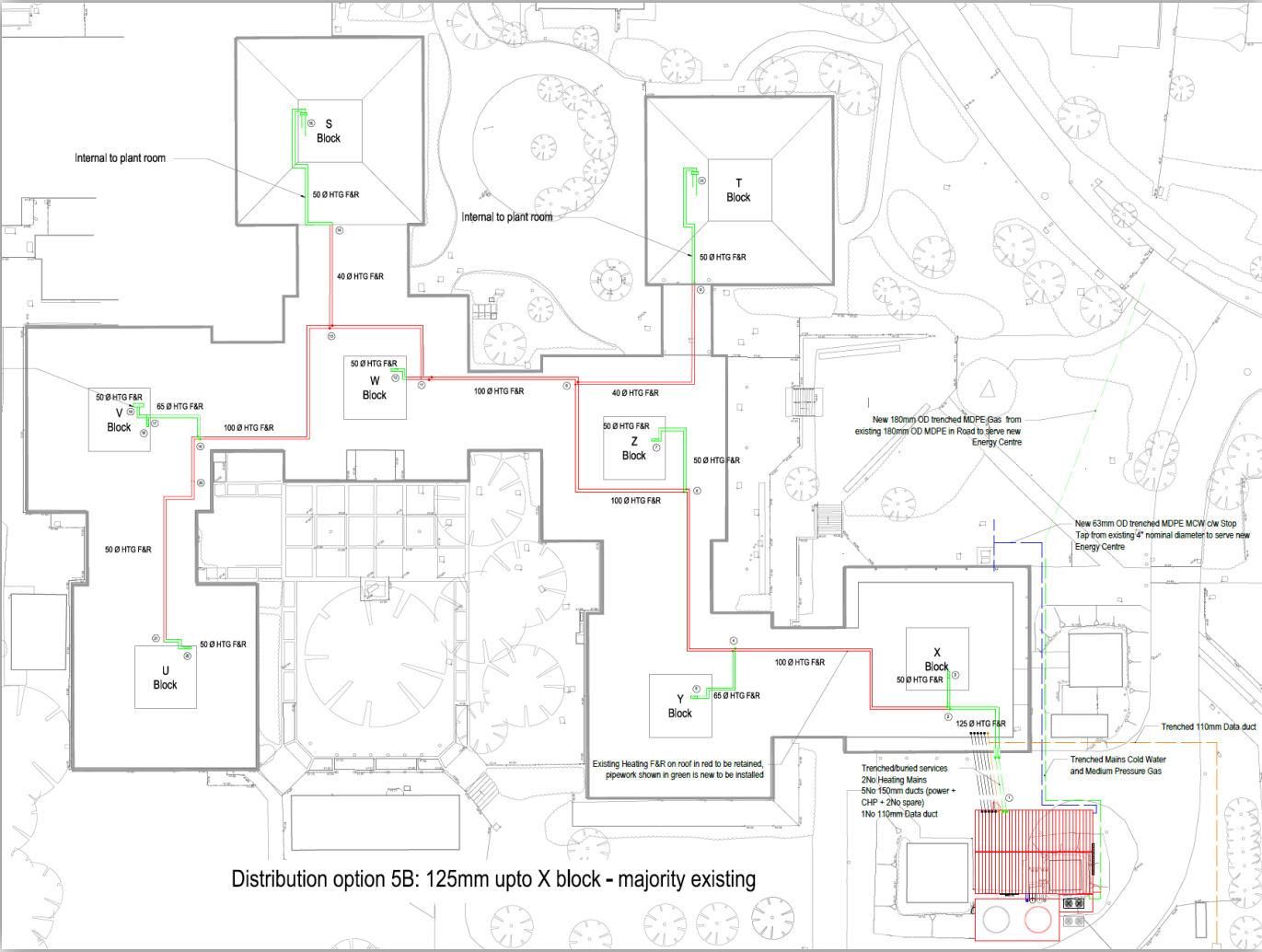
CHP + Stores proposed location



Proposed plant room

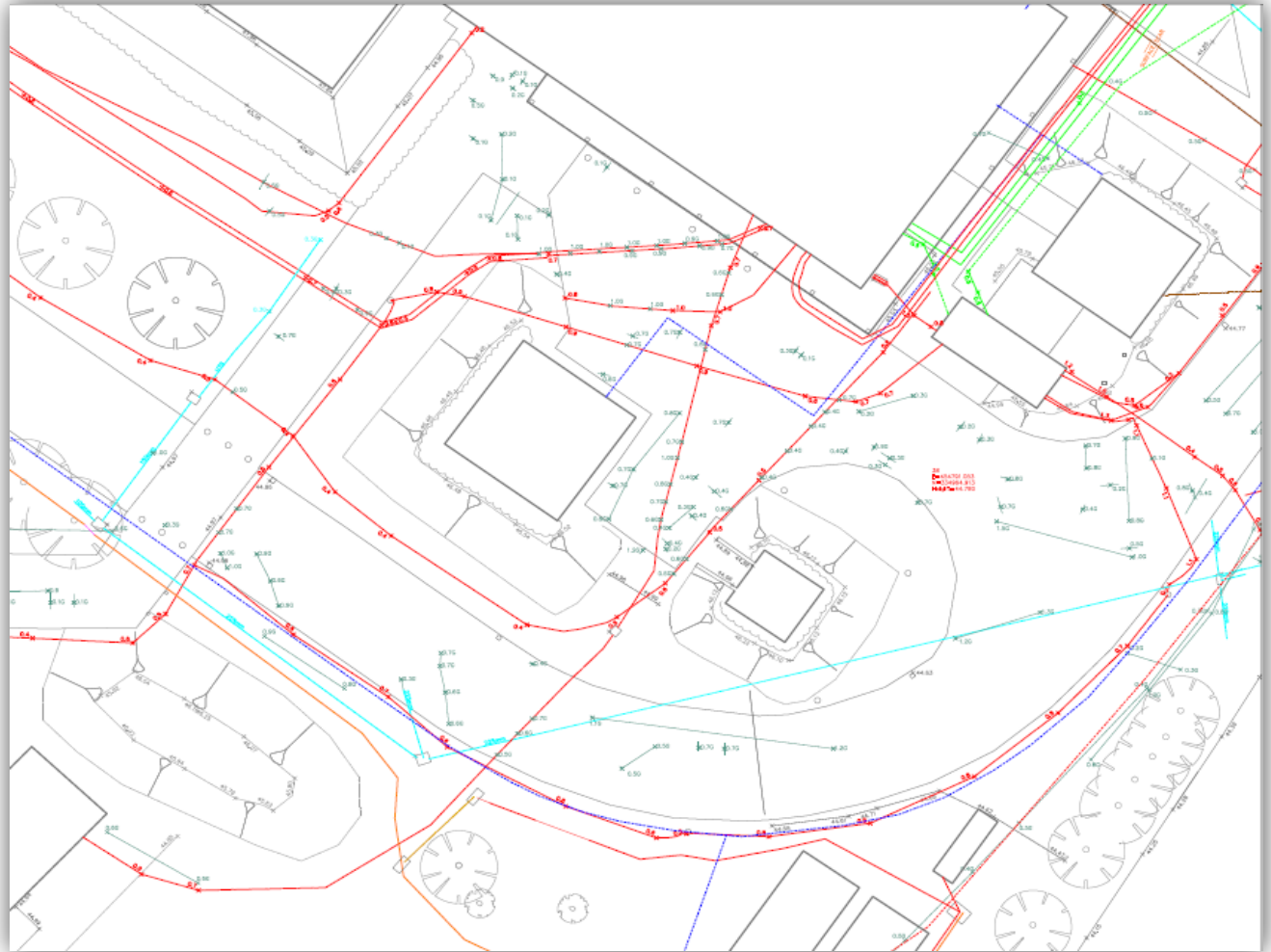


Roof distribution

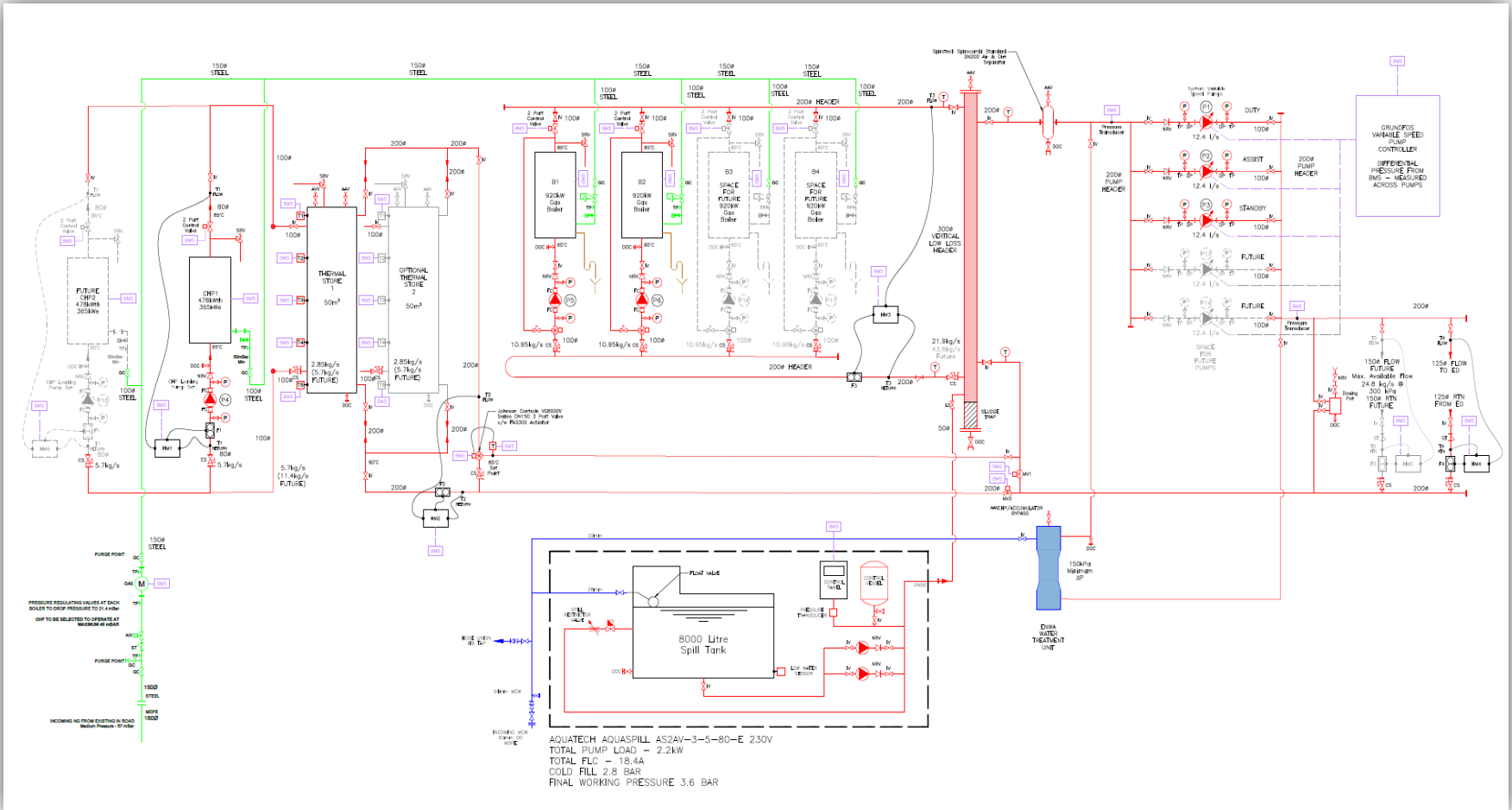


Site restrictions - Buried site services

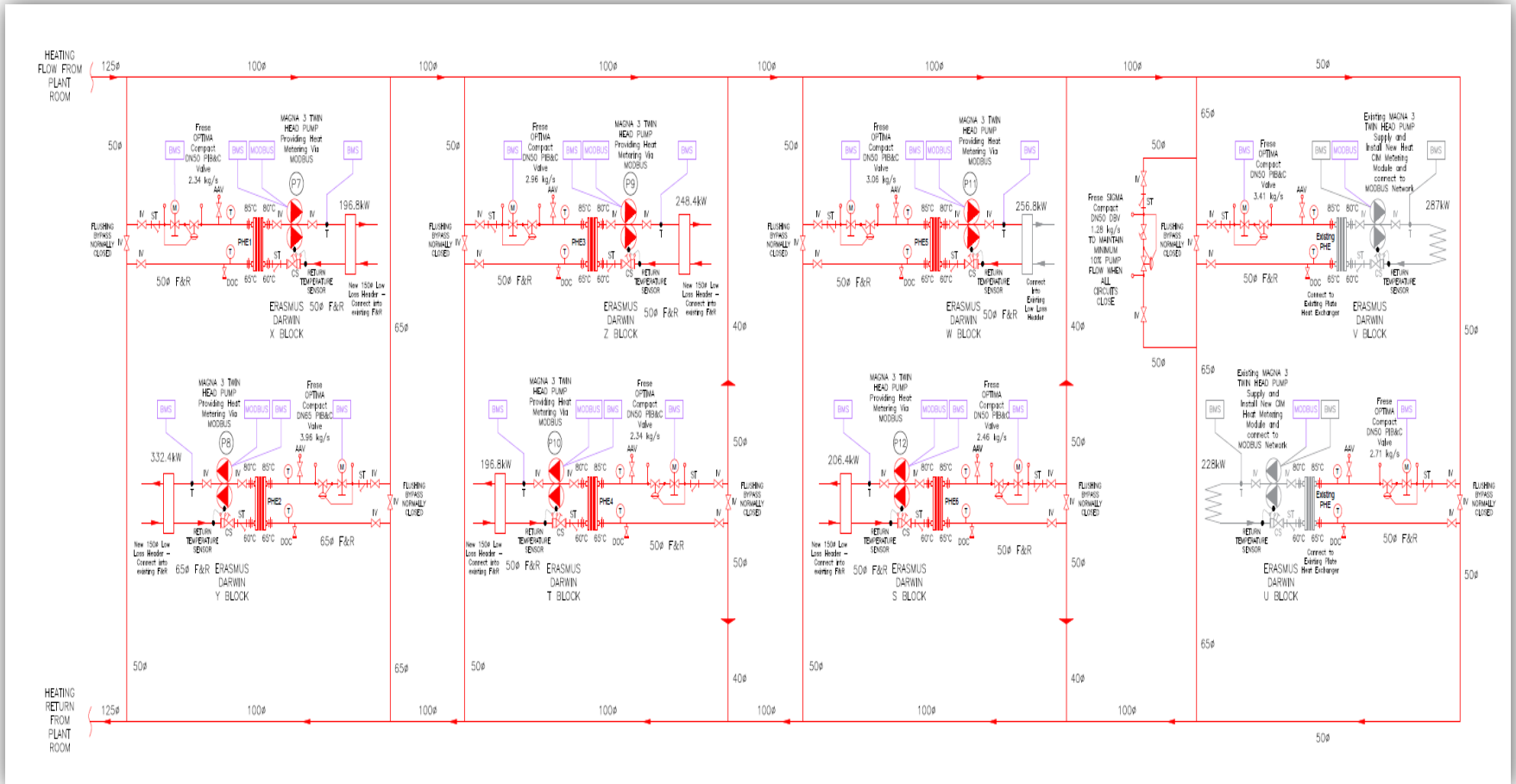
- Restrictions on proposed CHP location given extensive buried services



System schematic



System schematic



Costs / benefits summary

Costs

- Estimated cost £1.1m

Funding

- £1m secured from Salix RGF4
- £37k from existing NTU Salix revolving fund
- Remainder – NTU internal

Benefits

- 360 tonnes CO2 annual saving (140 > than no store)
- 5300 CHP run hours (2000 > than no store)
- 8 year payback

Timeline

- Currently out to tender - Jan 2016
- Proposed on site - April 2016
- Completion – August 2016

Thankyou
Questions?