HEATWEB
INTEGRATED THERMAL TECHNOLOGY

Heat Network Quality Assurance

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Heat Network Quality Assurance

Why do we need QA?


NO
FISHING

Heat Network Quality Assurance

Is it possible to create effective quality assurance measures [for heat networks] without introducing the need for a 100% external inspections,

and the training of a workforce to perform those inspections?

What do we know that works ?

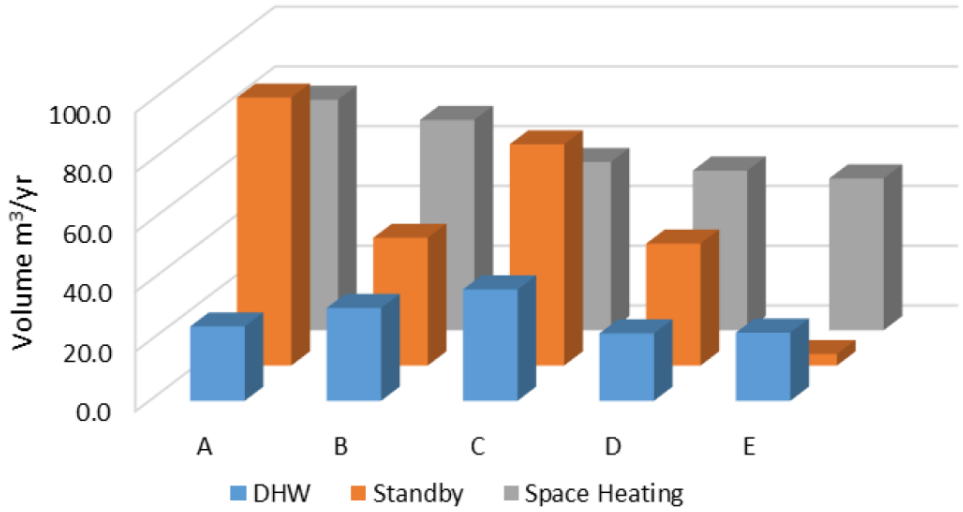
A single KPI, when on public display, motivates all stakeholders to improve quality themselves.

The BESA HIU Test Regime

"The [BESA] testing clearly shows performance differences between substations. The simplicity of the VWART as a benchmark of substation performance is having an impact – with manufacturers starting to publicise the VWART figure for their substations. Most of the manufacturers have made or brought forward planned substation improvements as a result of the testing."

Martin Crane, Carbon Alternatives

Substation E: The DATA HIU



	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

Heat Network Quality Assurance

How do we shine a light on poor efficiency in real-world heat networks ?


Q1: Do the lights work?

Service KPIs (from HNTAS)

KPI Data Points	Days In Period	Devices Reporting (24h)	Points Operational (24h)	ARMS Connectivity (24h)
174	1	100%	100%	100%

Energy Centre Flow Temperatures	
Current Value	71.1 °C
Volume Weighted Average	71.1 °C
Time Weighted Average	71.1 °C
Minimum	69.8 °C
Variance	2.81 °C

Avg Return Temp...	
Network	62.4 °C
Boilers	71.6 °C
Difference	9.12 °C

Current Differential Pr...	
block3	4.05 bar
block8and9	270 mbar
block4and5	180 mbar

Substation KPIs

Substation Blocks 1 & 2 Tem...	
Current Value	70.3 °C
Volume Weighted Average 1	69.7 °C
Volume Weighted Average 2	69.9 °C
Avg Primary Return Temperature 1	45.1 °C
Avg Primary Return Temperature 2	51.9 °C
Avg Secondary Return Temperature	43.9 °C
PHE 1 Efficiency	98.5%
PHE 2 Efficiency	71.0%

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%

Substation Blocks 4 & 5 Te...	
Current Value	72.4 °C
Volume Weighted Average 1	72.0 °C
Volume Weighted Average 2	0 °C
Avg Primary Return Temperature 1	71.5 °C
Avg Primary Return Temperature 2	0 °C
Avg Secondary Return Temperature	66.2 °C
PHE 1 Efficiency	20.7%
PHE 2 Efficiency	0%

Substation Blocks 8 & 9 Te...	
Current Value	76 °C
Volume Weighted Average 1	70.0 °C
Volume Weighted Average 2	74.4 °C
Avg Primary Return Temperature 1	66.8 °C
Avg Primary Return Temperature 2	71.6 °C
Avg Secondary Return Temperature	67.5 °C
PHE 1 Efficiency	95.1%
PHE 2 Efficiency	54.5%

Block B Low Returns		
phex1	phex2	meter
57.4 °C	45.2 °C	57.4 °C

Block B High Returns		
phex1	phex2	meter
69.6 °C	49.1 °C	69.8 °C

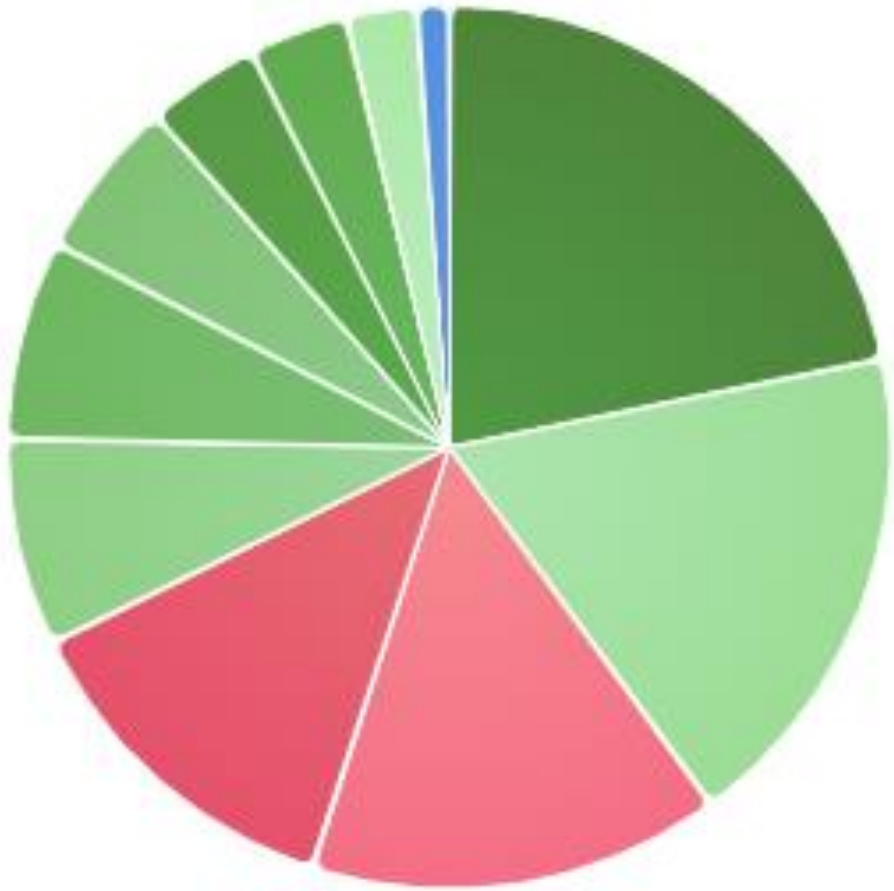
Block C Returns		
phex1	phex2	meter
59.3 °C	59.0 °C	59.6 °C

Block D Returns		
phex1	phex2	meter
58.9 °C	53.5 °C	59.1 °C

Block E Returns		
phex1	phex2	meter
56.9 °C	57.9 °C	61.2 °C

Energy & Bypass KPIs

Primary Network Loss...	Primary Bypass Volume	Energy Delivered
2.1 MWh	87.2 m^3	11.6 MWh
15.2%	11.9%	EC Electrical Energy
		182 kWh

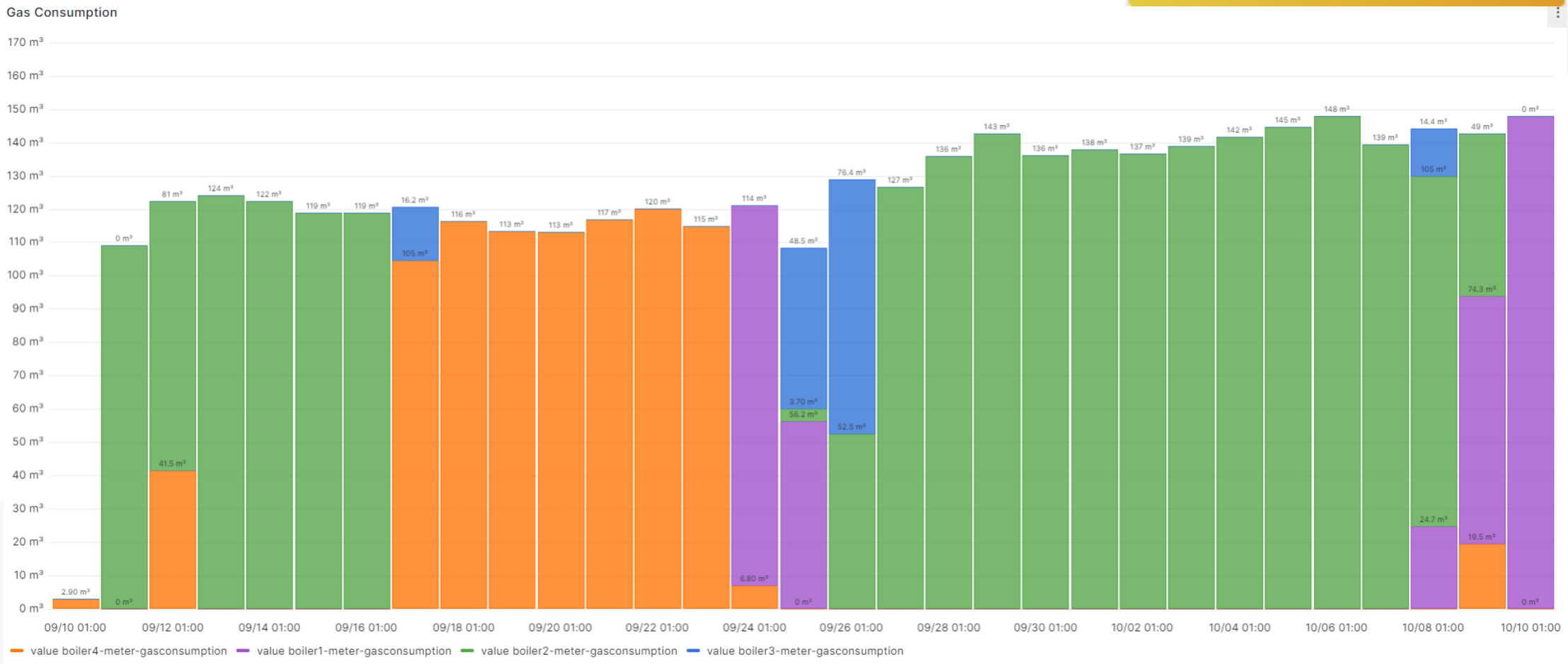


- blockd 22%
- blockc 18%
- Plantroom Losses 15%
- Primary Distribution Losses 13%
- blockblow 8%
- blockalow 7%
- blockahigh 6%
- blockbhigh 4%
- blockahotel 4%
- blocke 3%

Gas Boiler KPIs

Fuel Conversion Losses

15.3%



Heat Pump KPIs

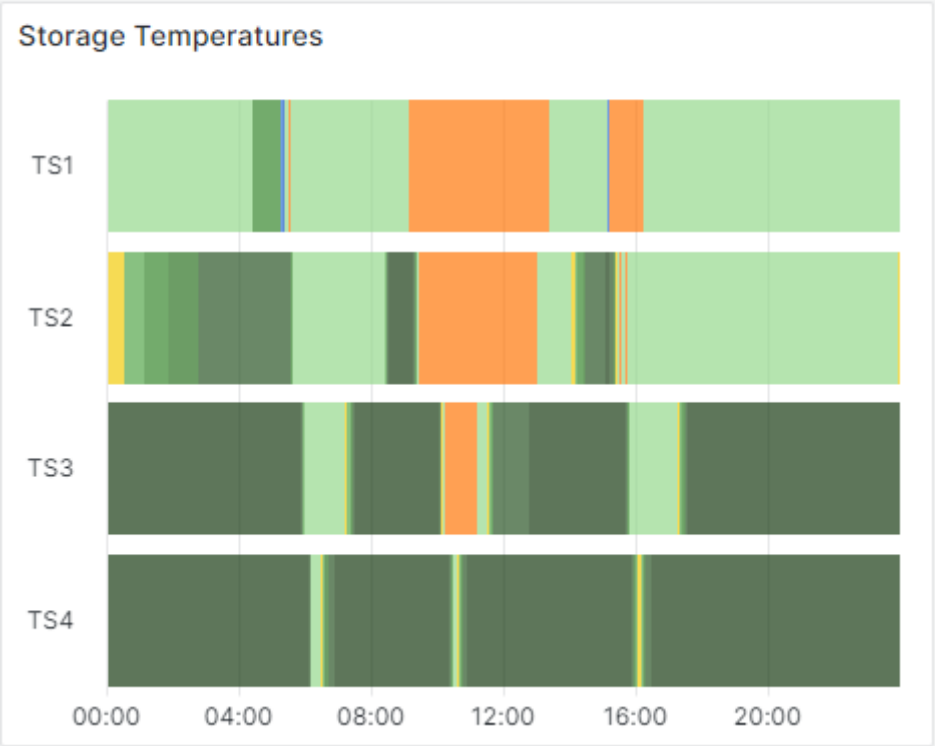
24hr VWA

82.9 °C

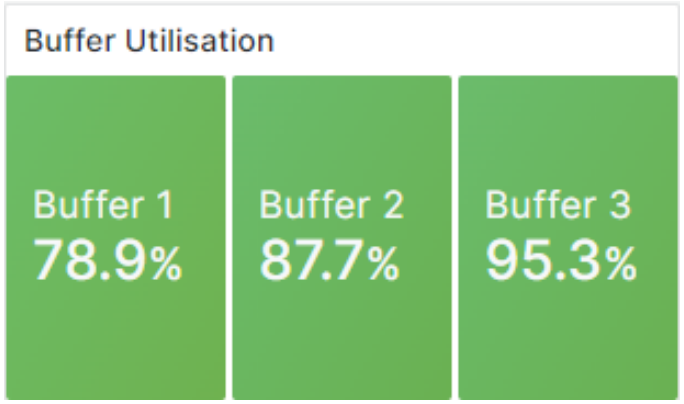
23.3 °C

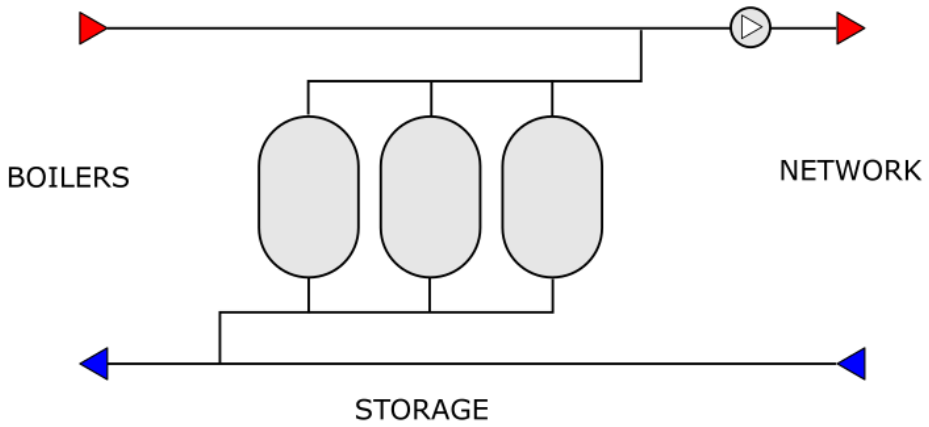
Period COP 2.00

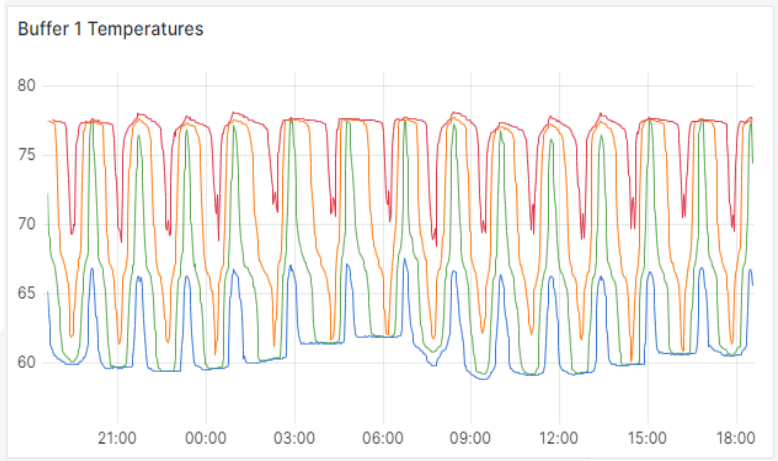
In 44.1 kWh Out 88.3 kWh

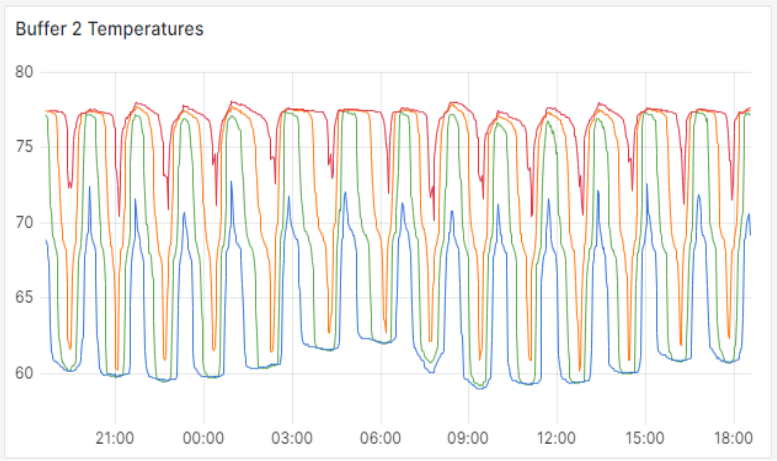


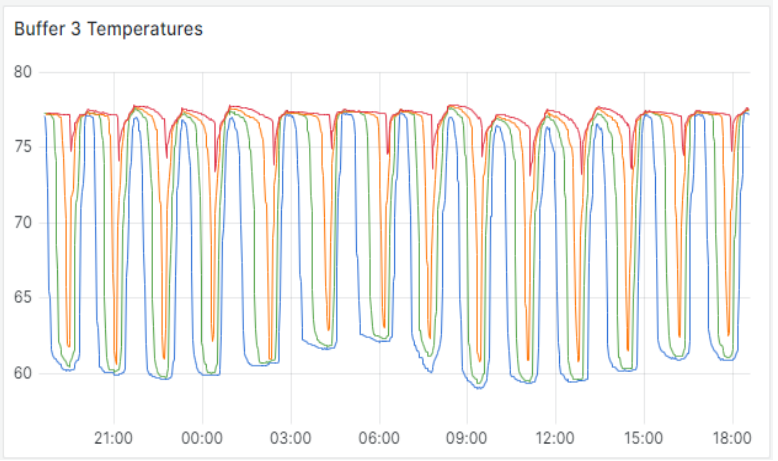
Buffer & Thermal Store KPIs



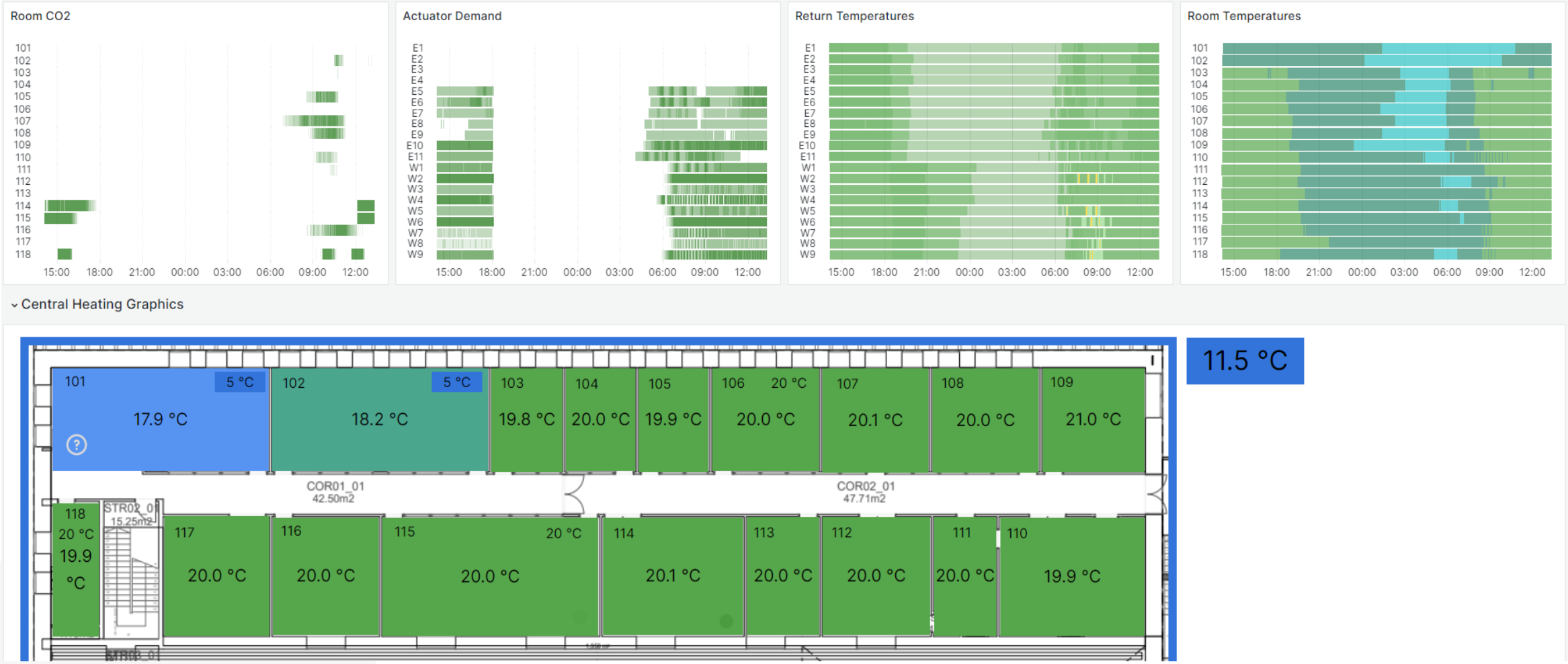




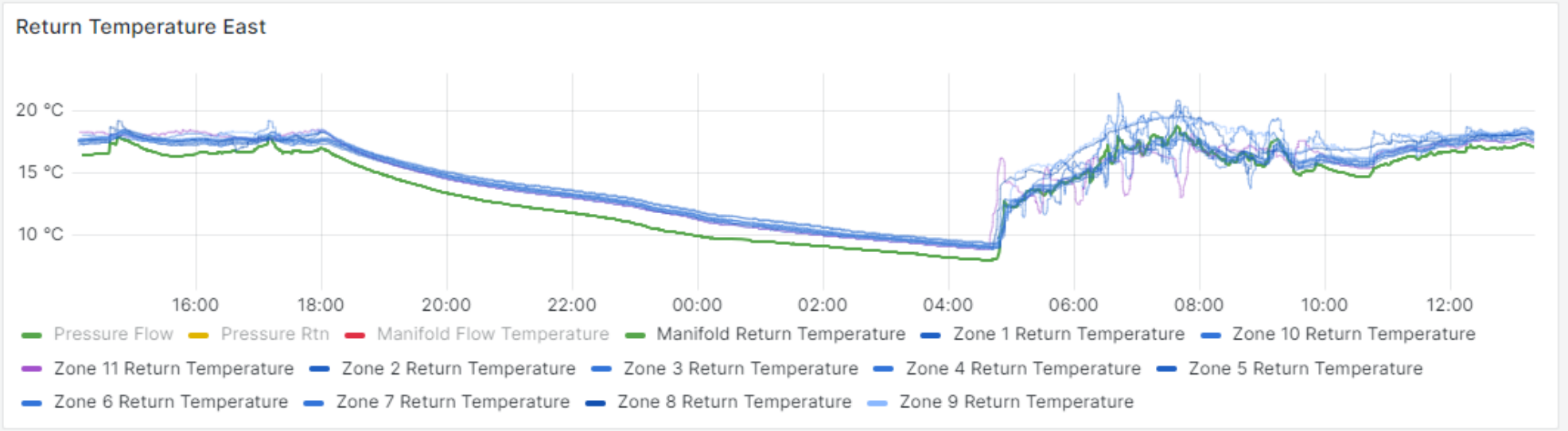


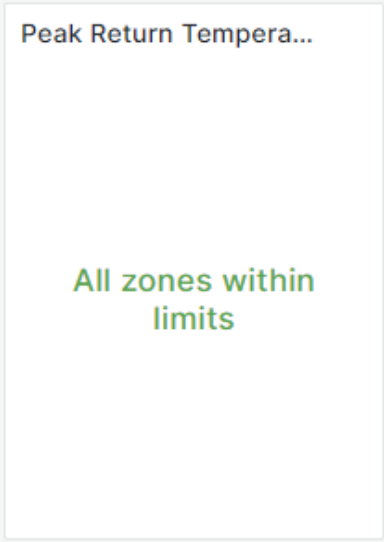


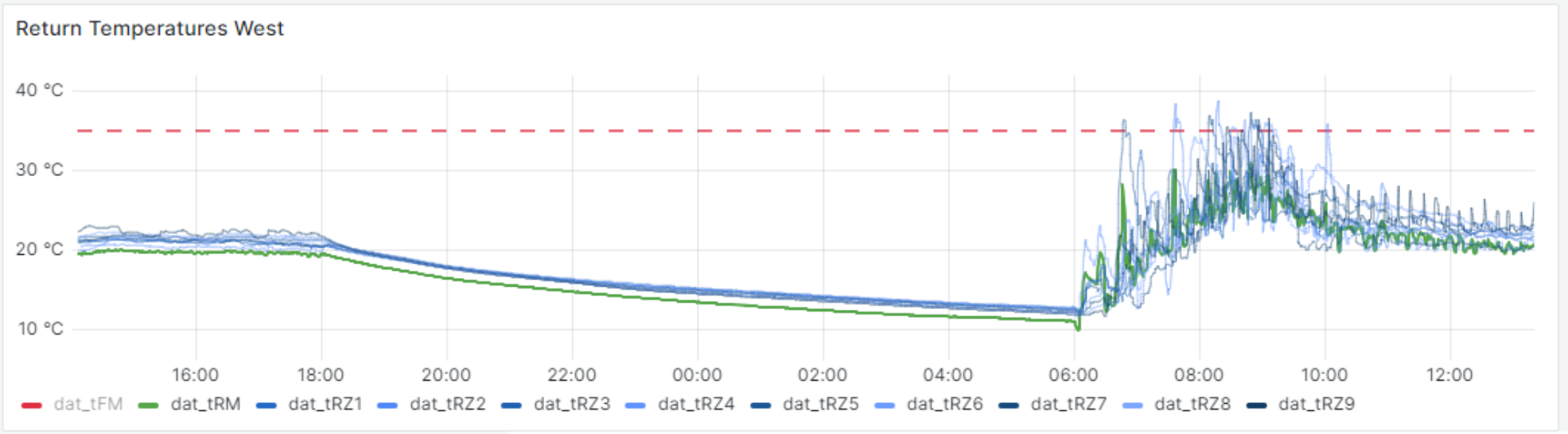
Central Heating KPIs

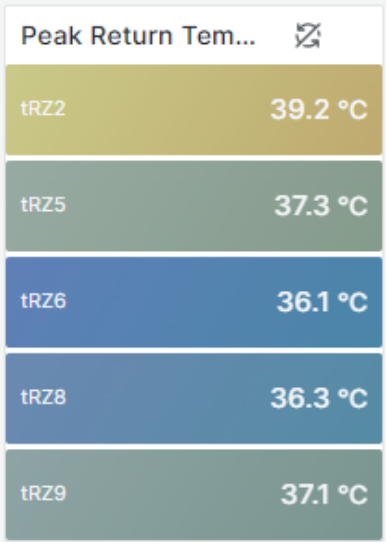


Return Temperature KPIs









Water Quality KPIs

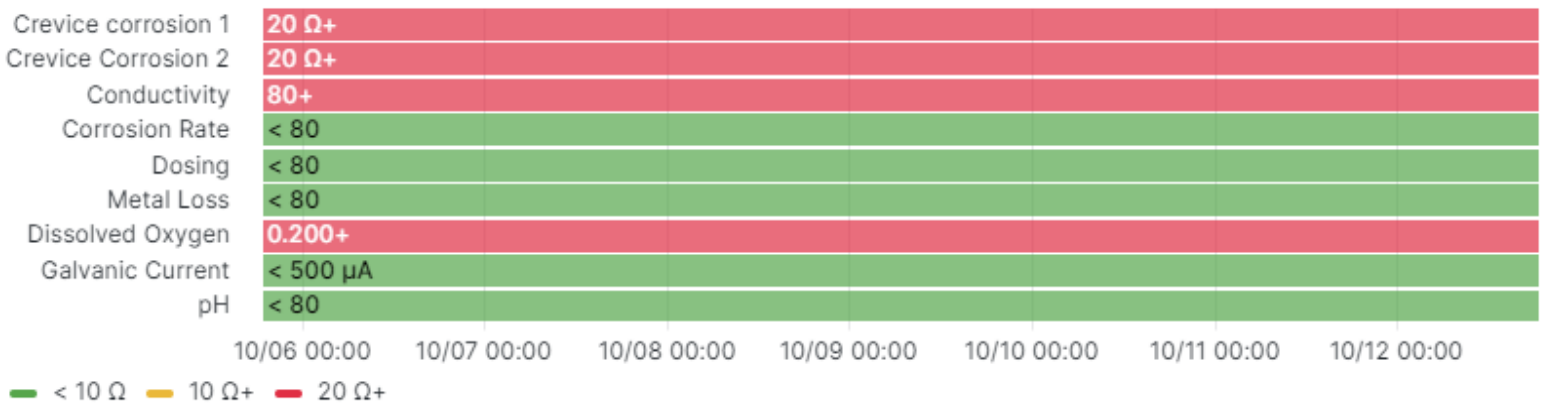
Current Values

Crevice corrosion 1	Crevice Corrosion 2	Conductivity	Calculated parameter- Corrosion rate	Calculated parameter - Dosing	Calculated parameter - Metal loss	Dissolved Oxygen	Galvanic Current	pH
220 Ω	220 Ω	302	0.0100	4.10	0.00300	7.73	90 µA	10.8

Conductivity quality	Temperature	Calculated parameter - Cumulative DO	Calculated parameter - Cumulative GC	Dissolved Oxygen Quality	Dissolved Oxygen Temperature	Flow Count	Pressure	pH quality	pH Temperature
100%	19.8 °C	7704	241	100%	20.5 °C	1	0.400	30%	19.9 °C

Hevasure Aq...

Historic Status

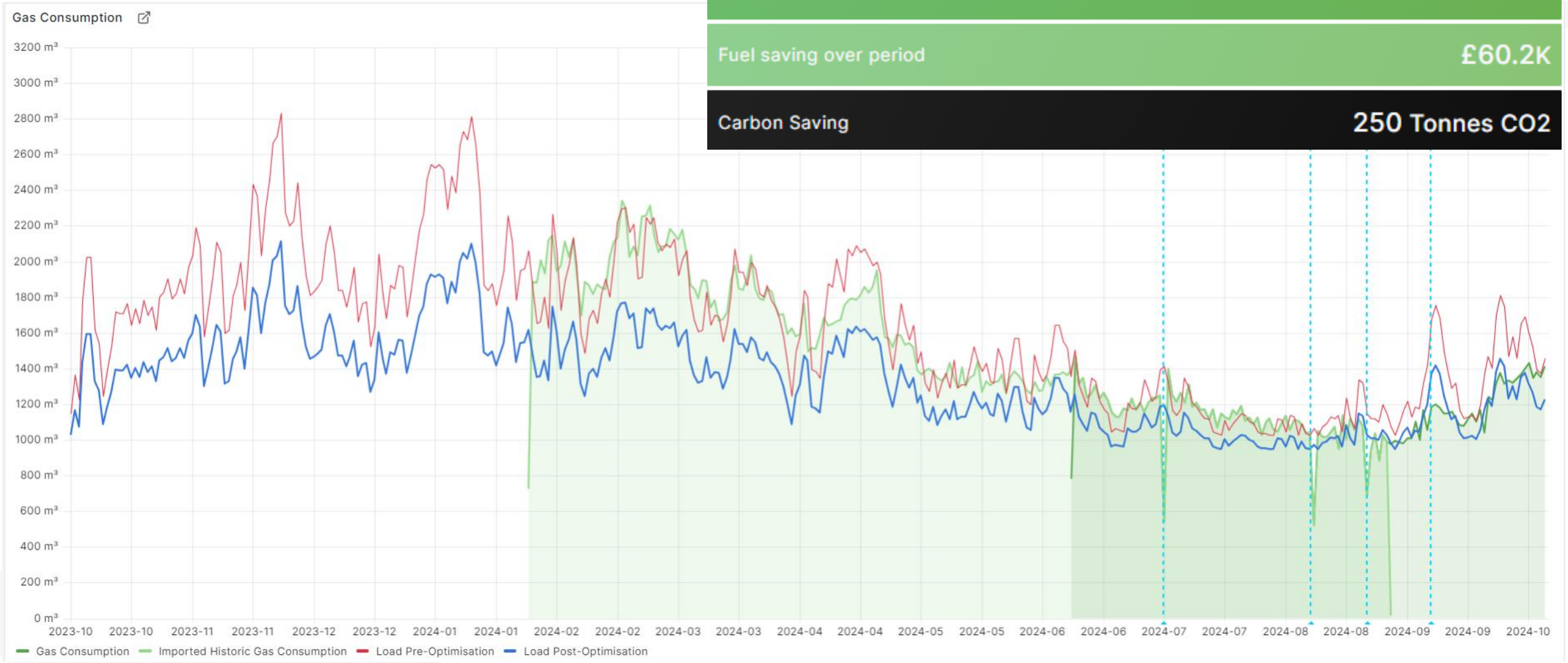


Comments

System Commissioned	2023-11-12 01:52:22

Net-Zero KPIs

Degree Days for Heating	2398 HDD
Percentage Saving	18.1%
Energy saving over period	1.20 GWh
Fuel saving over period	£60.2K
Carbon Saving	250 Tonnes CO2



BMS Focused Quality Assurance

Data

net	node	device	vargroup	varkey	value
city...	energycentre	boiler3	driver	module2enable	true
city...	energycentre	lthwPumps	driver	enable	true
city...	energycentre	boiler4	digin	module2Fault	true
city...	energycentre	chw-pump1	driver	speed	100.0
city...	energycentre	chiller1	sensor	tInlet	10.98
city...	energycentre	chiller2	sensor	tInlet	7.56
city...	energycentre	boiler3	sensor	tFlue	26.45
city...	energycentre	boiler1	driver	module1enable	true
city...	energycentre	boiler1	digin	module2Run	false
city...	energycentre	boiler4	digin	module1EndSw	true
city...	energycentre	chw	sensor	tRPrim	7.8
city...	energycentre	condenser	sensor	tR	20.35
city...	energycentre	lthw	sensor	dpPrimMin	-0.38
city...	energycentre	boiler4	digin	module2Run	false
city...	energycentre	pu	digin	highPress	true
city...	energycentre	pu	digin	lowPress	true

‹ 1 ... 8 9 10 11 12 13 14 ›

177 - 192 of 210 rows

Message Queuing Telemetry & Transport (MQTT)

Substation

MQTT

NODE0001 NODE0002

MQTT Enabled BMS Controls

NODE0003 NODE0004

MQTT Gateway

Modbus

0-10V Pressure Sensors

Modbus Heat Meters

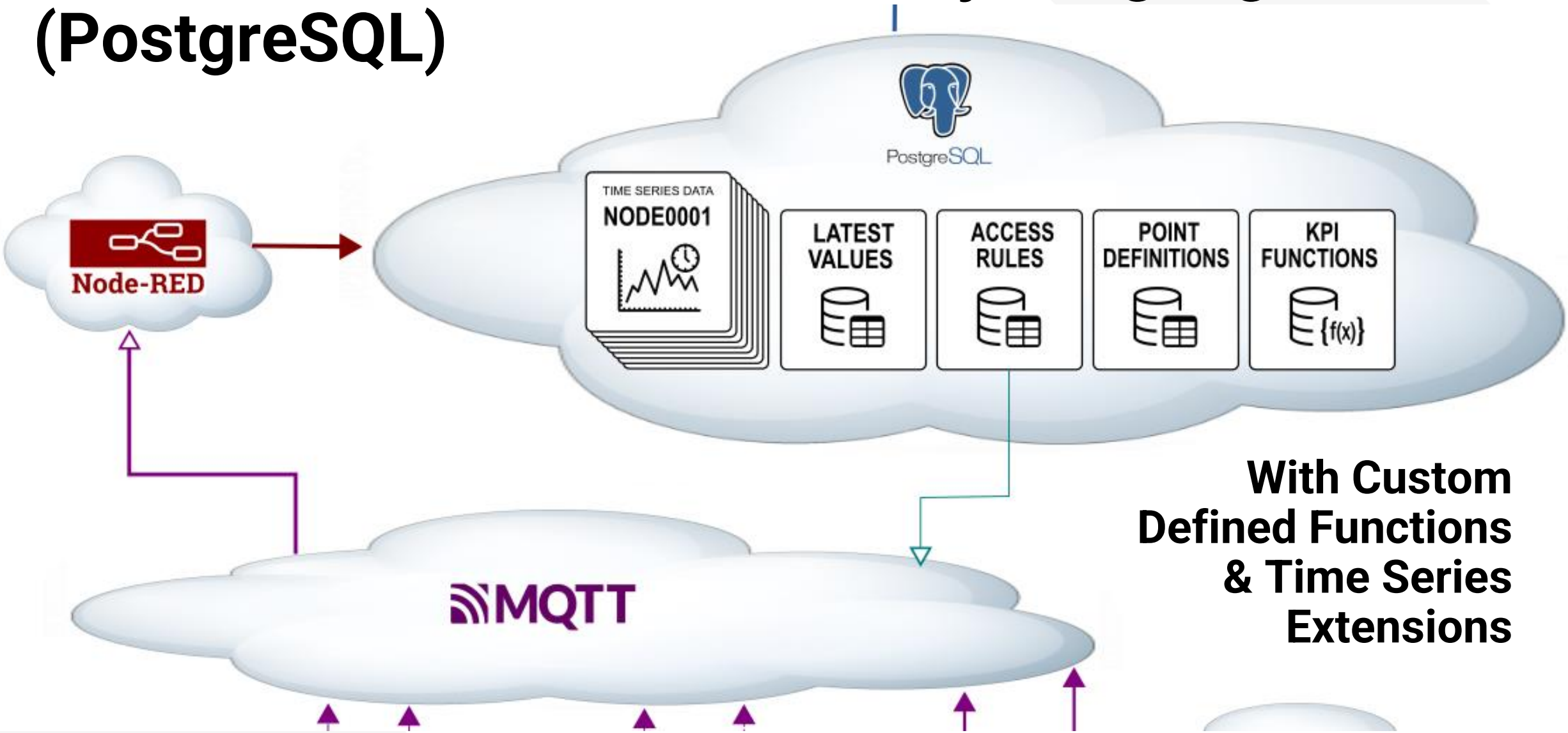
MQTT Bridge

MQTT

MQTT Explorer for PC

M-Bus Heat Meters

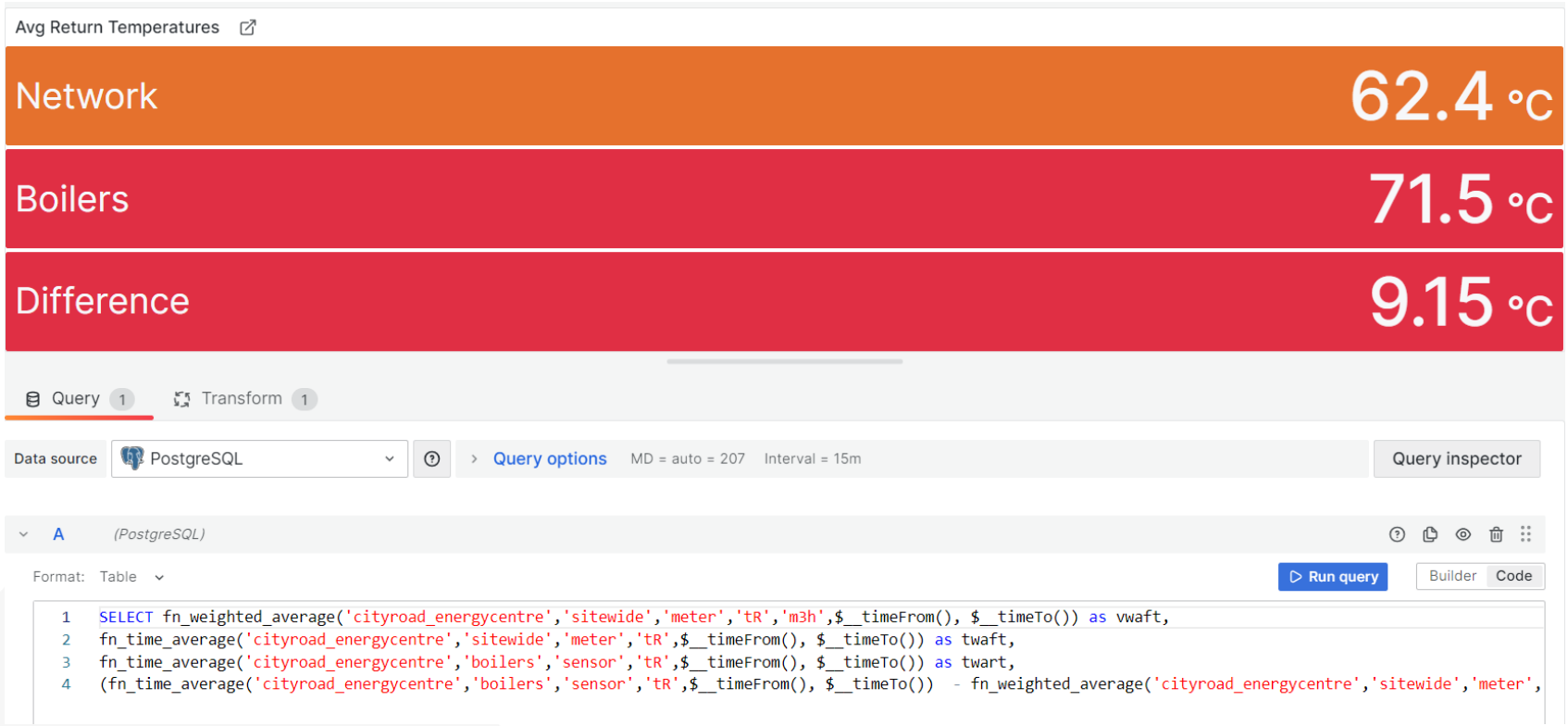
Database and Structured Query Language (PostgreSQL)



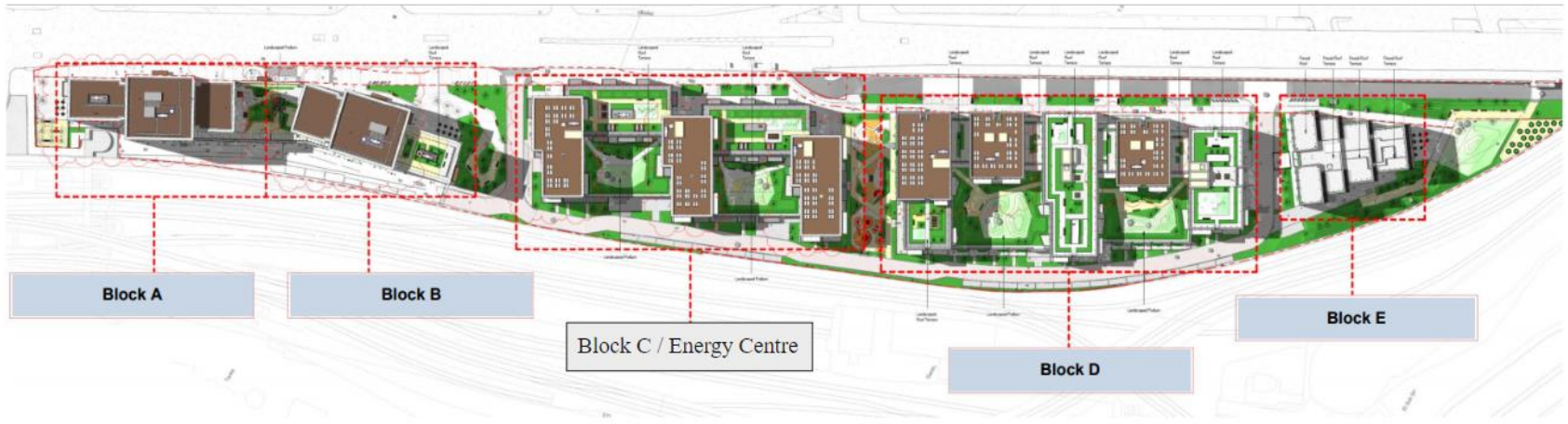
With Custom Defined Functions & Time Series Extensions

Standardised Labelling & Query Functions

```
SELECT fn_weighted_average('my_site','sitewide','meter','tR','m3h',$__timeFrom(), $__timeTo()) as vwaft,
```



Visibility (Grafana)



Dashboards

- Block C BMS Data
- Connectivity KPIs
- DHW Consumption
- Energy KPIs
- Energy Centre BMS Data
- Gas Consumption

Sitewide KPIs

Energy Centre Flow Temperatures

Volume Weighted Average	77.1 °C
Time Weighted Average	77.1 °C
Minimum	63.7 °C
Variance	17.7 °C

Buffer Utilisation

Buffer 1	Buffer 2	Buffer 3
82.0%	94.2%	98.9%

Energy Centre Return Tempe...

Volume Weighted Average	60.7 °C
Time Average	60.9 °C

Gas Consumption

1495 m³

16.6 MWh

2.85 tCO2

Sitewide Volume

733 m³

Volume Delivered

648 m³

Primary Bypass Volume

84.7 m³

11.6%

Time Average PHEx Secondary Temperatures

62	62	62	62	76	67	65	59	62	62	62	62	62	62

Sitewide Energy

13.7 MWh

Energy Delivered

11.7 MWh

EC Electrical Energy

184 kWh

Gas Consumption

Plantroom Losses

2.90 MWh

Primary Network Losses

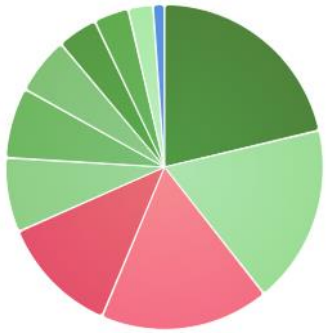
2.0 MWh

14.8%

Fuel Conversion Losses

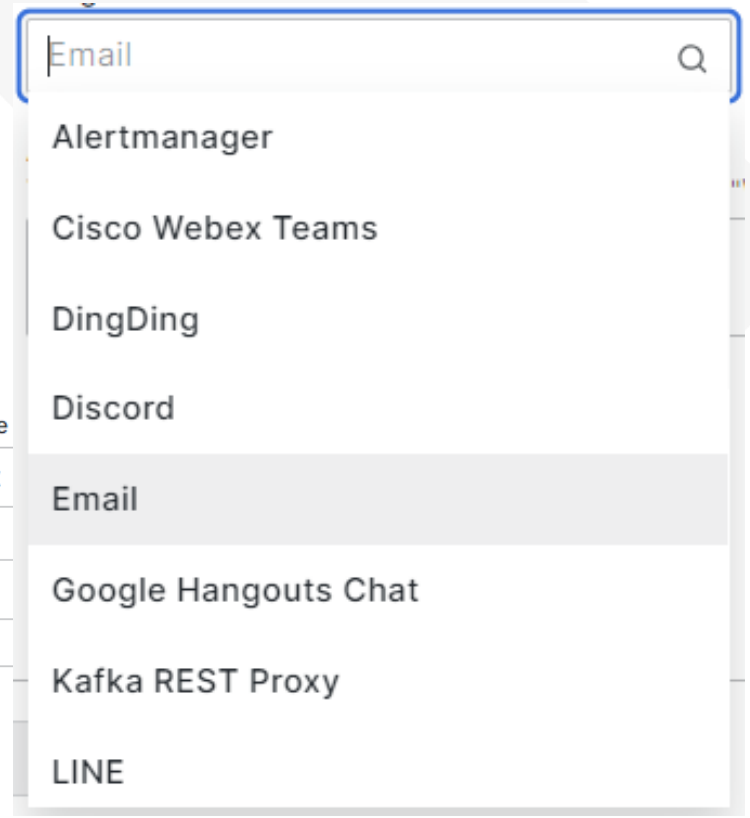
17.5%

Energy Delivered to Blocks



blockd 21% blockc 18% Plantroom Losses 17%
Primary Distribution Losses 12% blockblow 7%
blockalow 7% blockahigh 6% blockbhigh 4%
blockahotel 4% blocke 2% electricicity 1%

Operational Alerts (Grafana)



Rules that determine whether an alert will fire

Search by data sources

All data sources

State

Firing Normal Pending

Rule type

Alert

Search

Search

1 rule 1 normal

Grafana

Alarms › standard

1 normal | 1m

State	Name	Health	Summary	Next evaluation	Actions
Normal	Network Flow Temperature LOW	ok		in a few seconds	

Organisation & User Management (Grafana)

Manage settings for this specific org.

Edit organization

Name

Heatweb Demo

Update

Invite user

Send invitation or add existing Grafana user to the organization. Heatweb Demo

Email or username

email@example.com

Name

(optional)

Role

Viewer | Editor | Admin

Send invite email

Submit | Back

RHG@heatweb.co.uk

Manage settings for an individual user.

User information

Name	Richard Hanson-Graville
Email	RHG@heatweb.co.uk
Username	RHG@heatweb.co.uk
Password	********

Delete user | Disable user

Permissions

Grafana Admin	No

Organizations

Heatweb Demo	Viewer

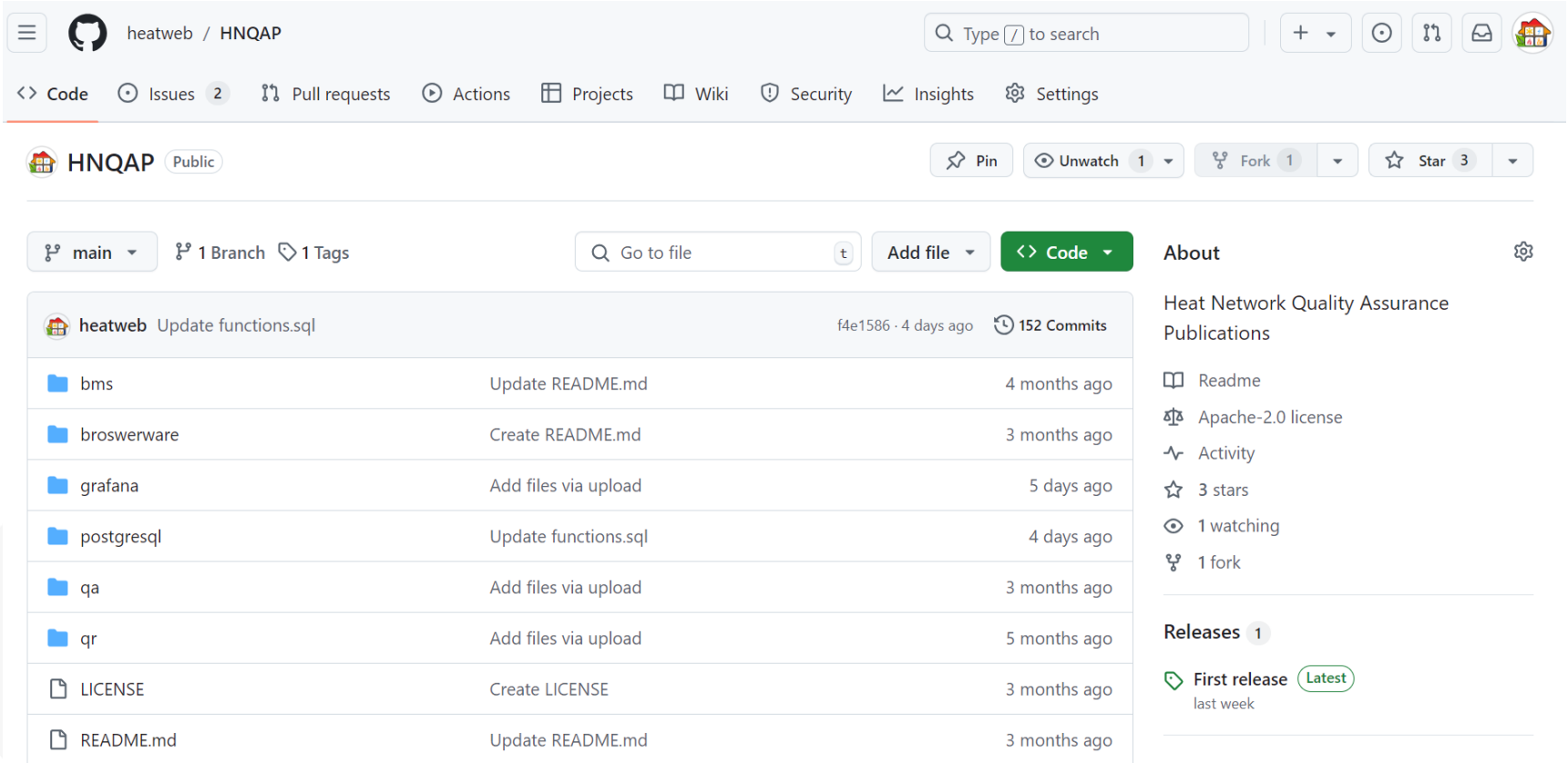
Open-Source Software (OSS)

Ask an AI, “Which companies use PostgreSQL?”

Made possible through Collaboration

heatweb / HNQAP

Apache-2.0 license



Heat Network Quality Assurance Publications

What does the Governor say ?

Mark Carney
Governor of The Bank of England
2013 to 2020

"On some measures we only have 10 years left at current emissions rates before we have blown through 1.5 degrees of warming and moved to more catastrophic levels."

"We all know that what gets measured gets managed. Climate change is not yet consistently measured, although the private sector has moved in this direction since Paris. We now need to make measurement and disclosure mandatory."

How can .gov help ?

- Set a deadline of up to 2 years for ALL heat network ECs and Substations to be MQTT connected [to Ofgem] and publishing HNTAS KPIs.
- Provide grants of £5000 per site to upgrade BMS [head end] systems for connectivity.
- Make Open-Source Collaboration a centre-piece of quality control and net-zero technical standards.