INTERNATIONAL DISTRICT ENERGY ASSOCIATION | DELTA DISTRICT COOLING

‘Efficient Energy for Smarter Cities’

Delta T Syndrome, Why & How?

10th December 2018

“Sustainability is our top priority”

: His Highness Sheikh Mohammed Bin Rashid Al Maktoum

Here today for

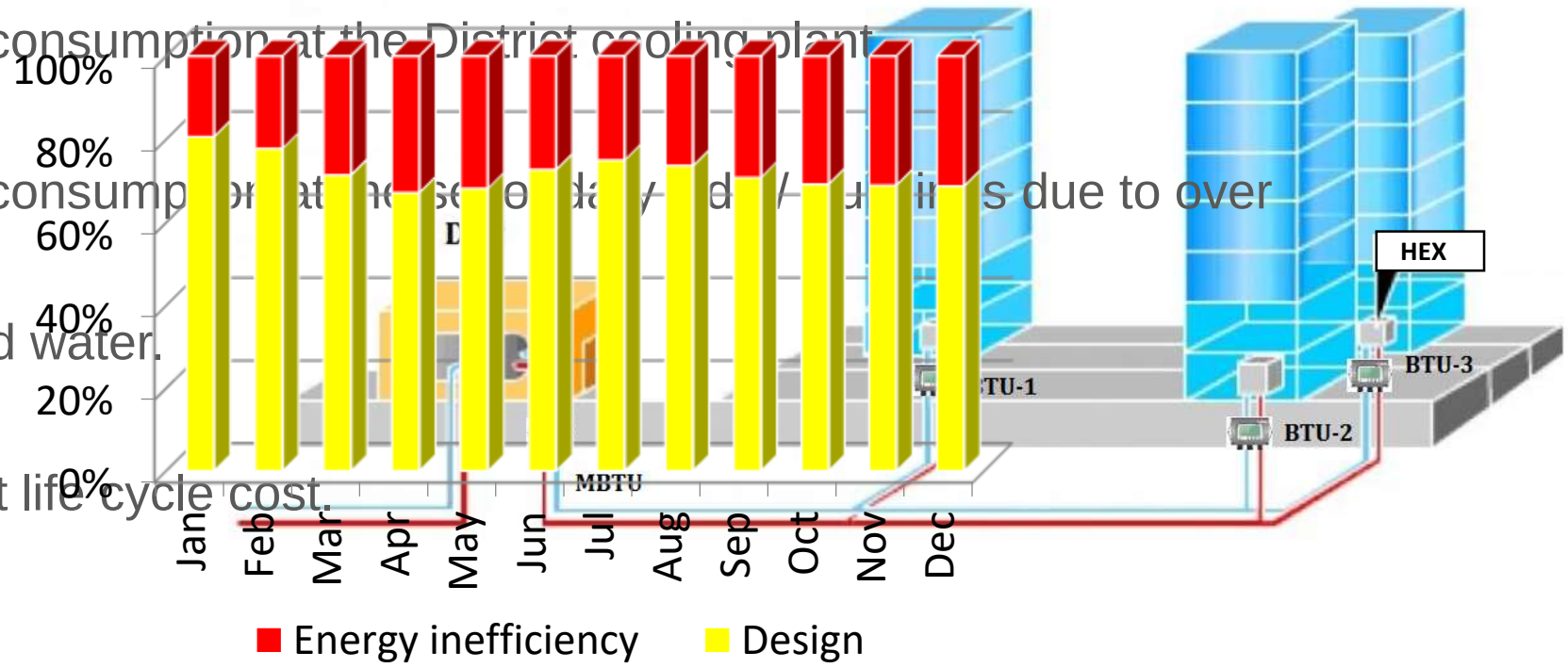
1. Present case studies- Delta T optimization.

2. What is the impact of Delta T on Facilities / Buildings and District cooling Plants.

3. How ‘Delta’ as a company is helping operate energy efficient smart cities?

Impact of Delta T

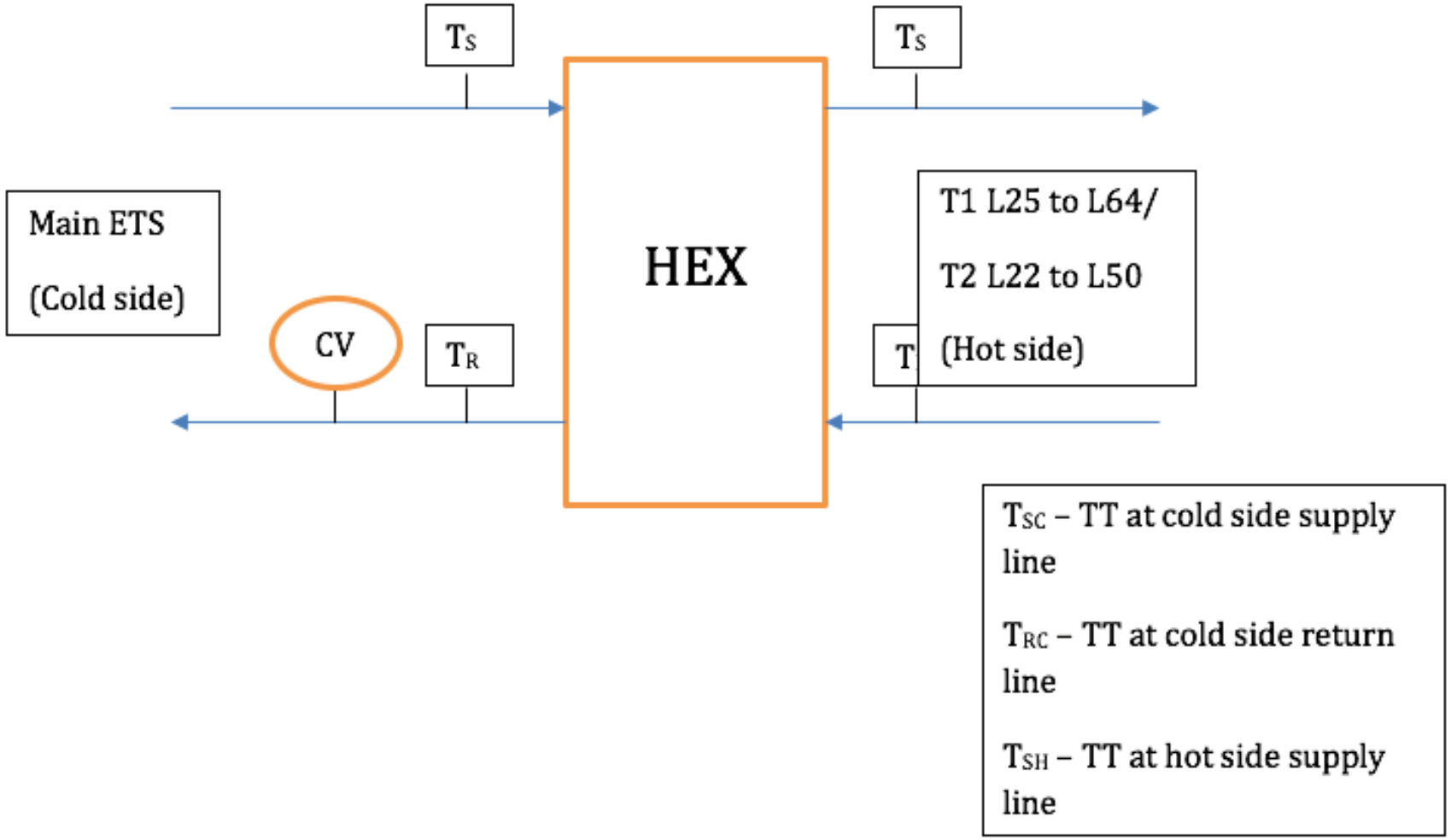
- Inefficient use of chilled water system, draining the benefits of district cooling system itself.
- Higher electrical consumption at the District cooling plant.
- Higher electrical consumption at the secondary distribution due to over pumping of chilled water.
- Higher equipment life cycle cost.



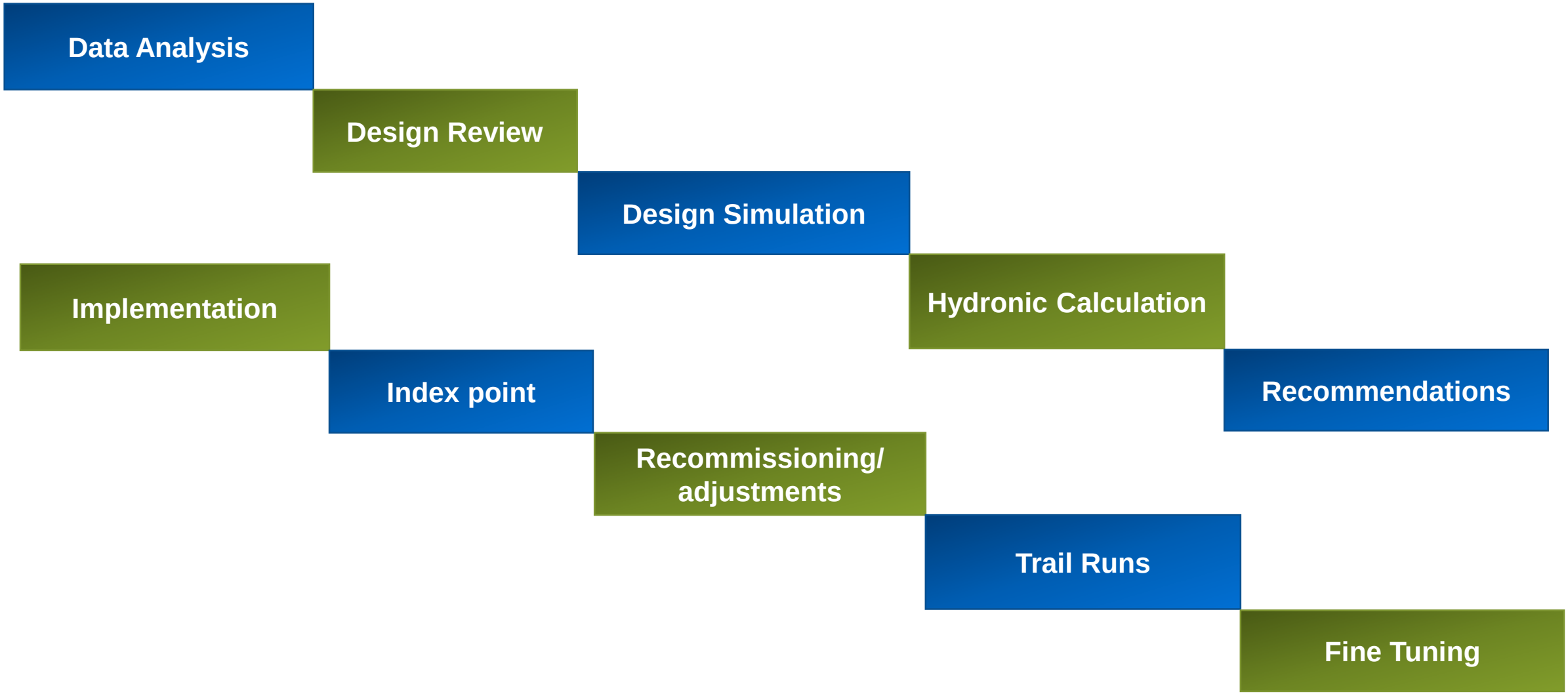
Typical causes of Delta T

- Inadequate / wrong control logic.
- Wrong Index point selection and its set point, generally not evaluated using Hydronic model.
- Lack of proper commissioning.
- Un-calibrated/ non-operational flow control valves.
- Operators / user education.
- Change of design especially in ‘Shell & Core’ building arrangement.
- Design issues, lack of provisions for a proper counter checks.

Typical Example



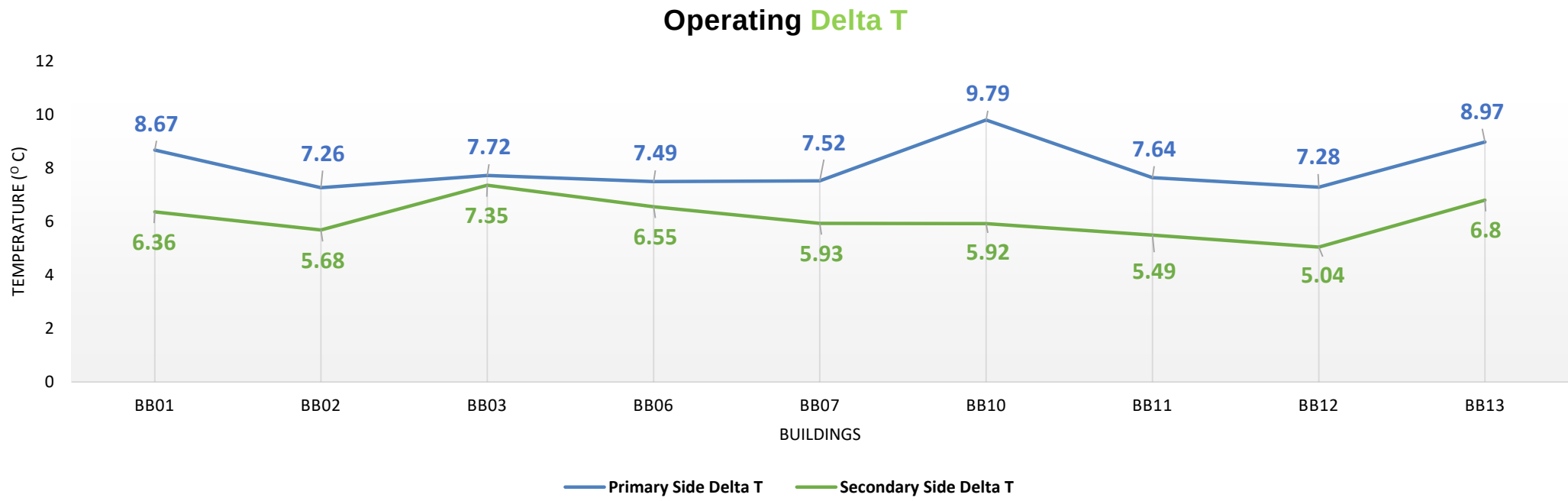
Methodologies



Due Diligence - Delta T

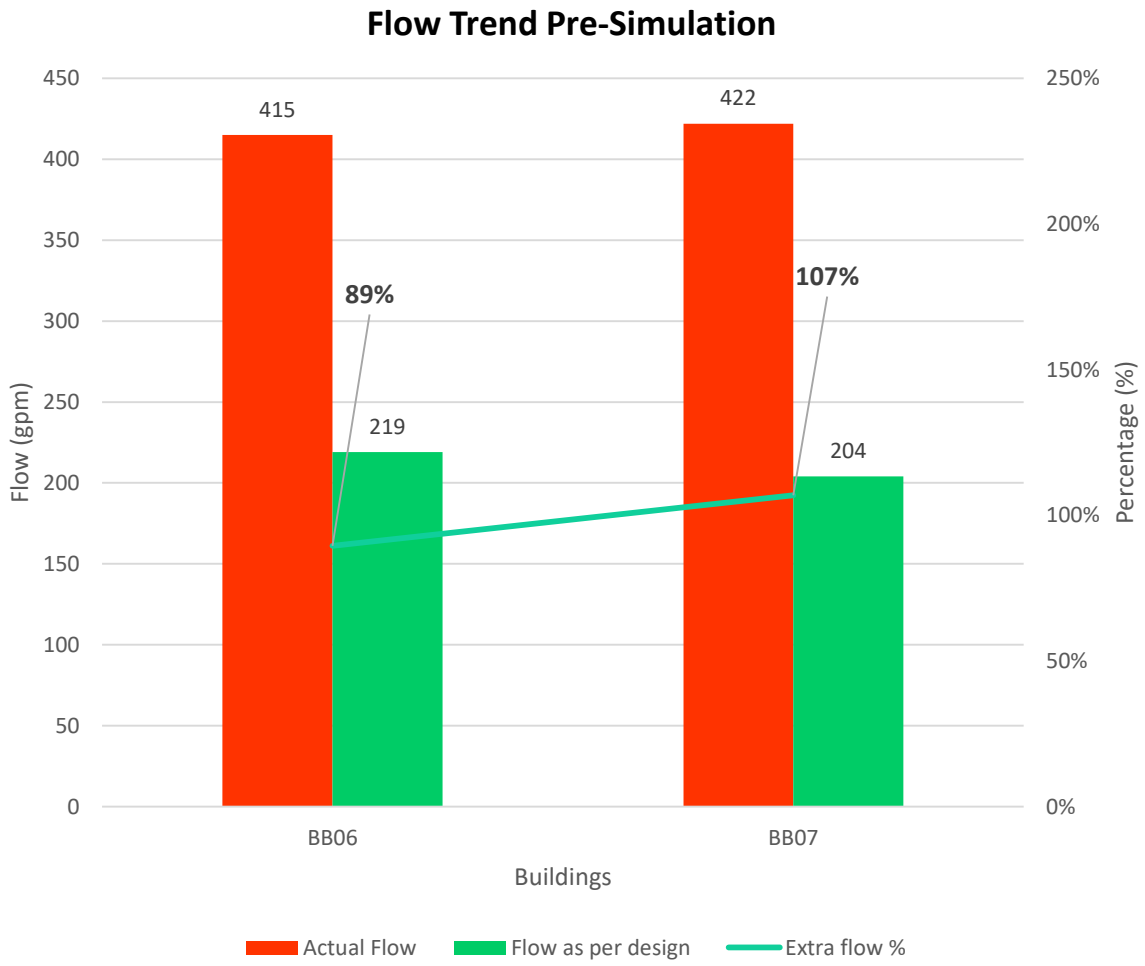
- Project : Residential & Offices
- Cooling capacity : 9,900 TR.
- Location : Dubai.
- Developer: NDA.
- Status : Study completed.

Design review – Delta T



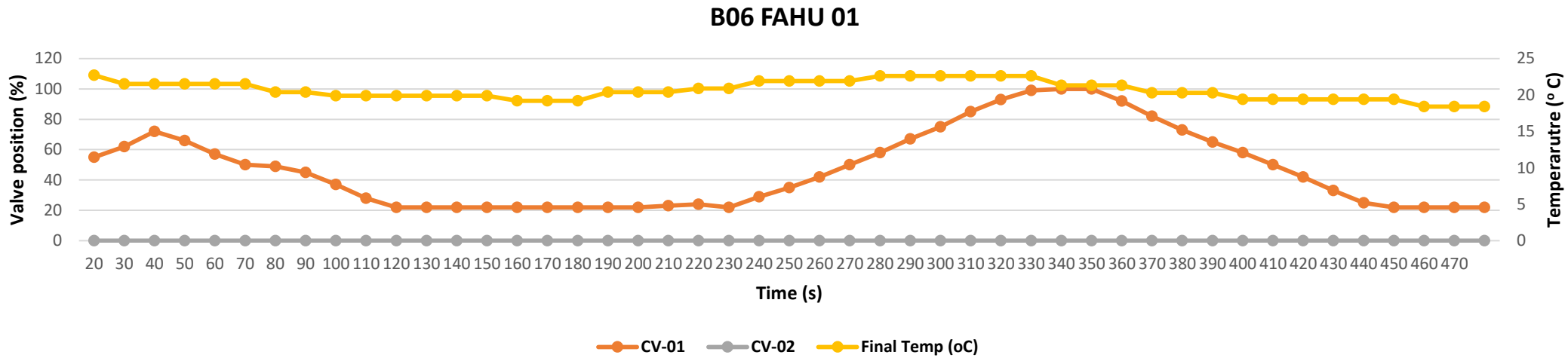
- The overall Delta-T on the secondary side was low as compared to the design Delta-T of 9.0°C.
- The supply temperature on the secondary side was higher compared to the primary side.

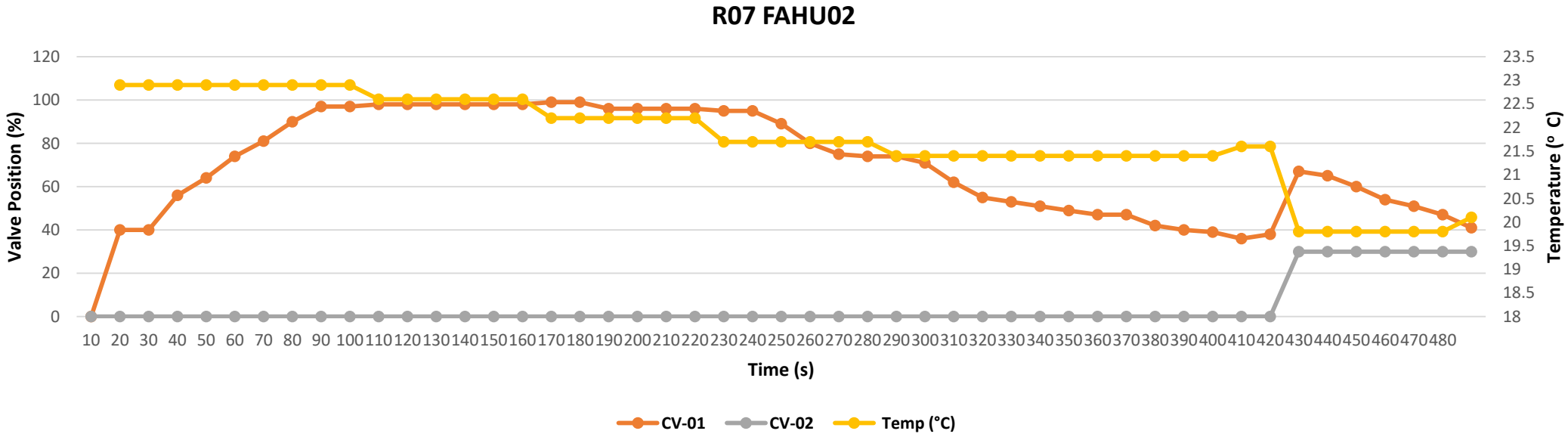
Design review – Chilled Water Flow



- As per the load profile, additional Chilled water was being pumped compared to the corresponding design flow required.
- The extra flow pumped in BB06 (107%) & BB07 (98%) was very high.

Control Valve Test





Capacity Check

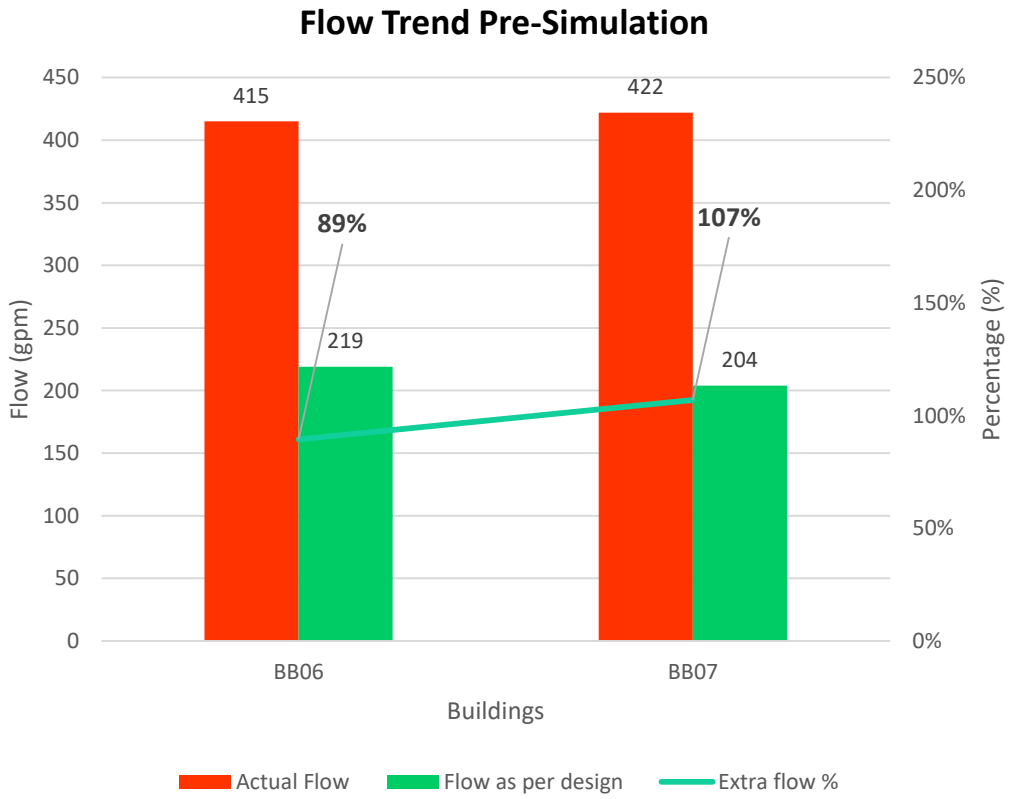
Buildings	Load as per heat load calculation (TR)	Load based on cooling area(TR)	Capacity of HEX connected (TR)
BB01	567.11	508.00	1462
BB02	521.2	481.34	1142
BB03	398.11	386.20	876
BB06	253.88	234.81	990
BB07	417.47	386.34	1080
BB10	272.54	240.51	982
BB11	345.10	317.39	1028
BB12	477.08	433.54	1074
BB13	447.53	434.30	1300

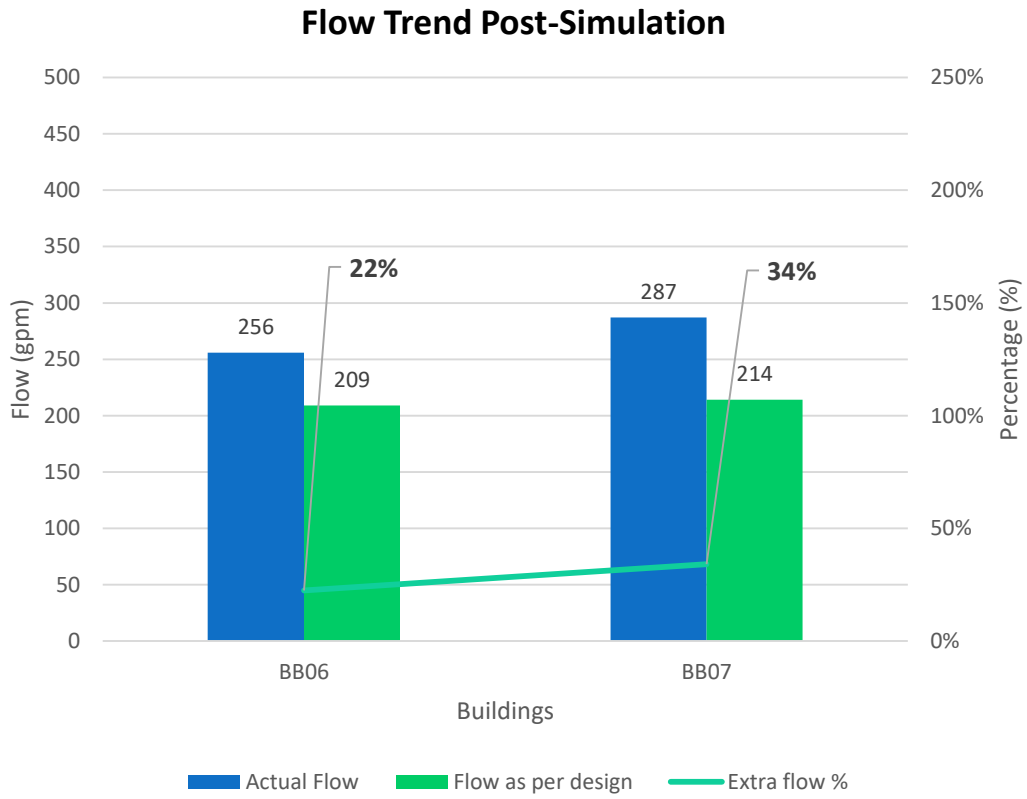

Delta T
Cost Savings

Design Simulation

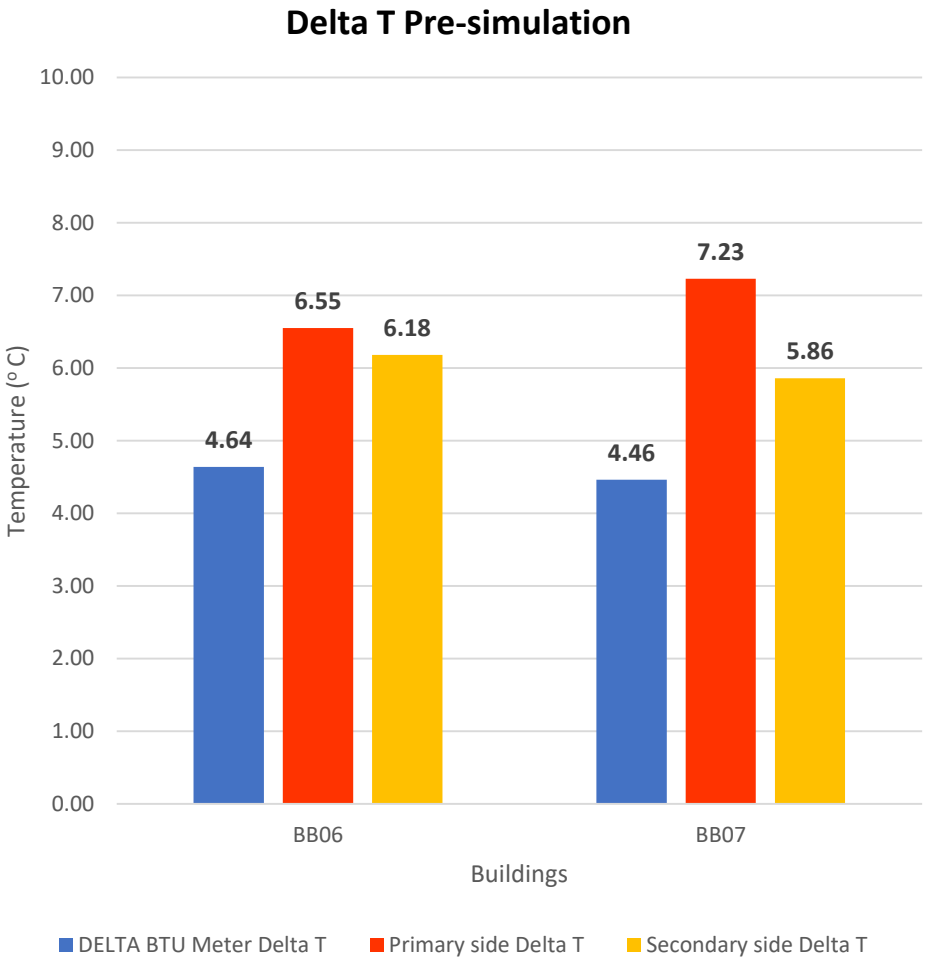
Operating the chilled water system as per design conditions of the building by manual changes on pumps and control valves.

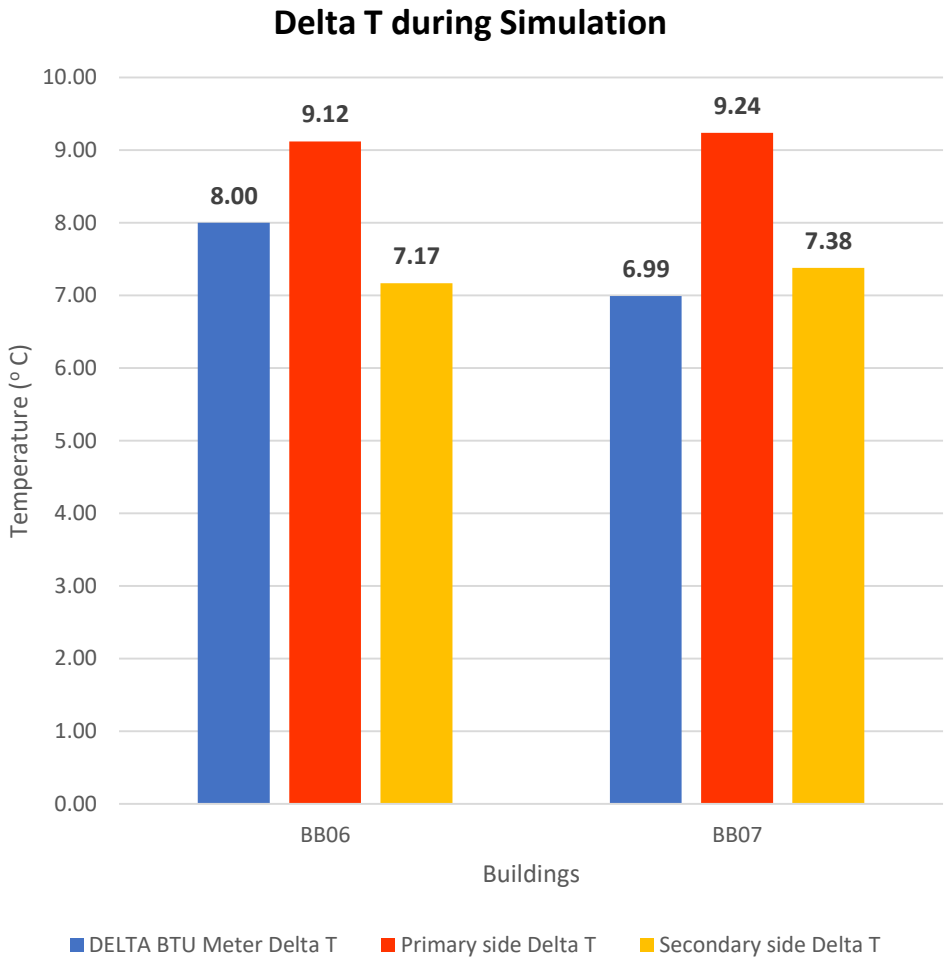
Simulation Results





Simulation Test Results





Hydronic Calculation

- Index circuit is the FAHU-BH-R-1 located on the roof.
- Existing location of DP switch is valid.
- Recommended index point set-point value is 93.7 kPa.
- Recommended pump head value is 317 kPa.

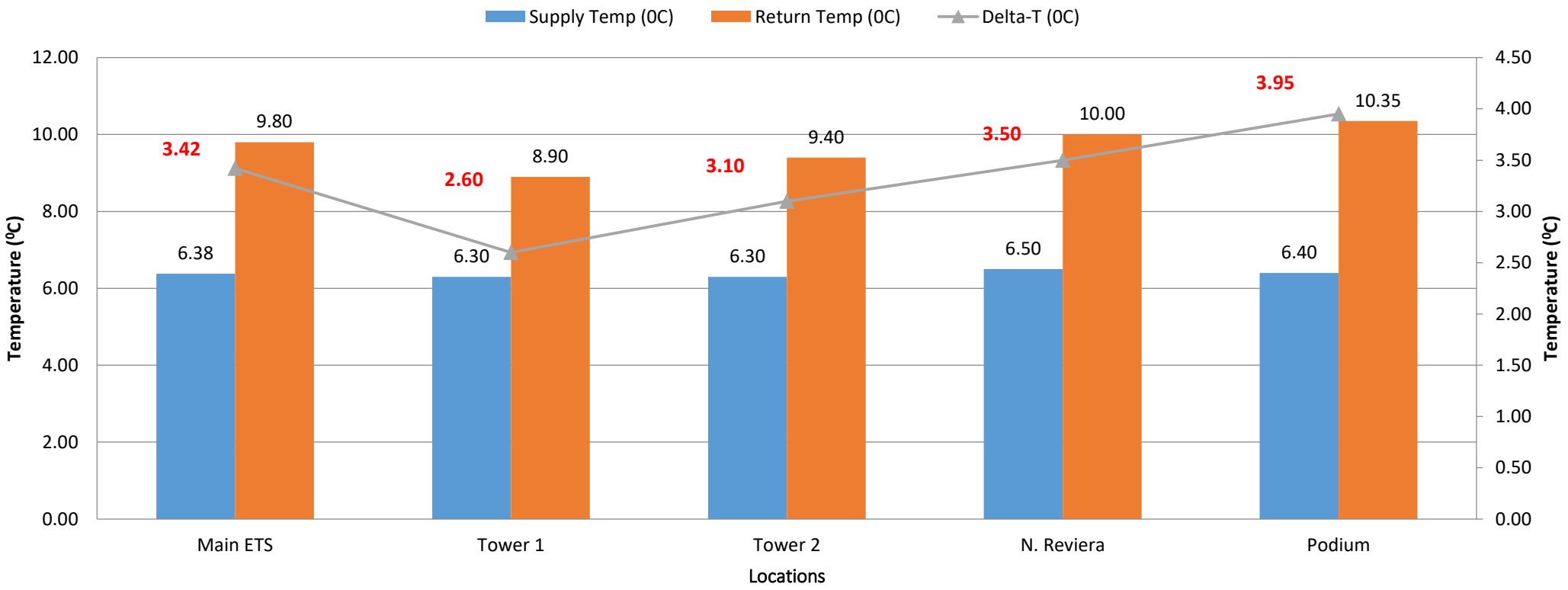
Case - 2

Due Diligence & Implementation

- Project : Mixed use development
- Cooling capacity : 12,000 TR.
- Location : Abu Dhabi.
- Status : Fine tuning.

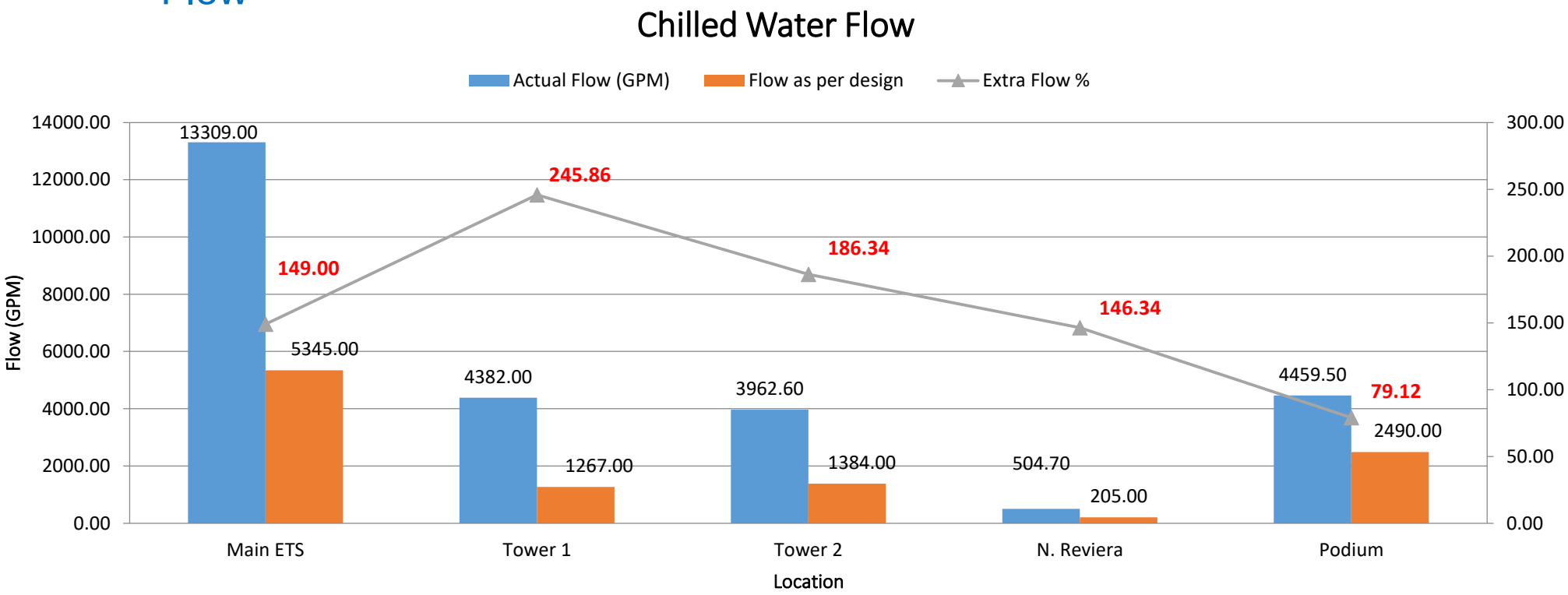
History of Delta T

Operating Delta-T



- The overall Delta-T on the main ETS was 3.42^{0}C.

History Chilled Water Flow

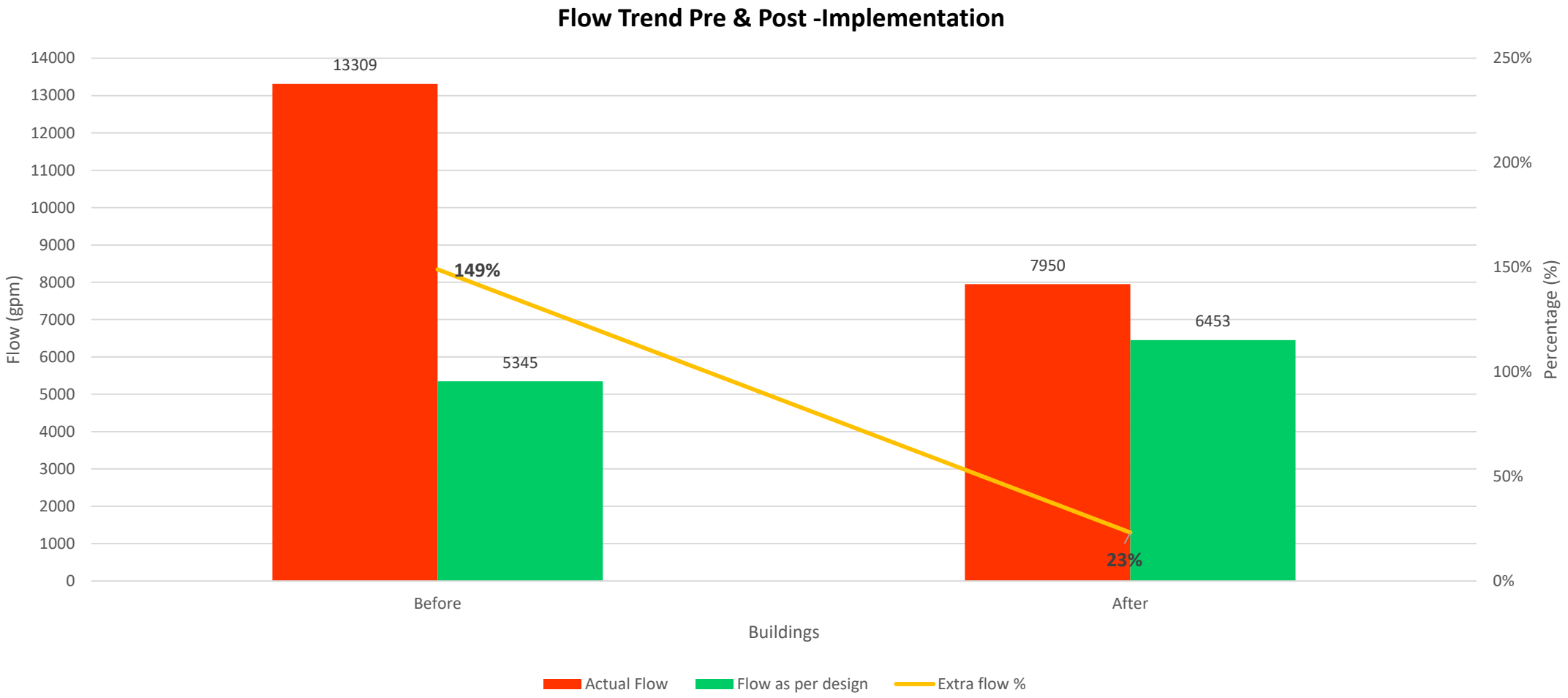


- As per the load profile, additional Chilled water was pumped compared to the corresponding design flow required.
- The extra flow pumped on the main ETS was 149% compared to the design flow.

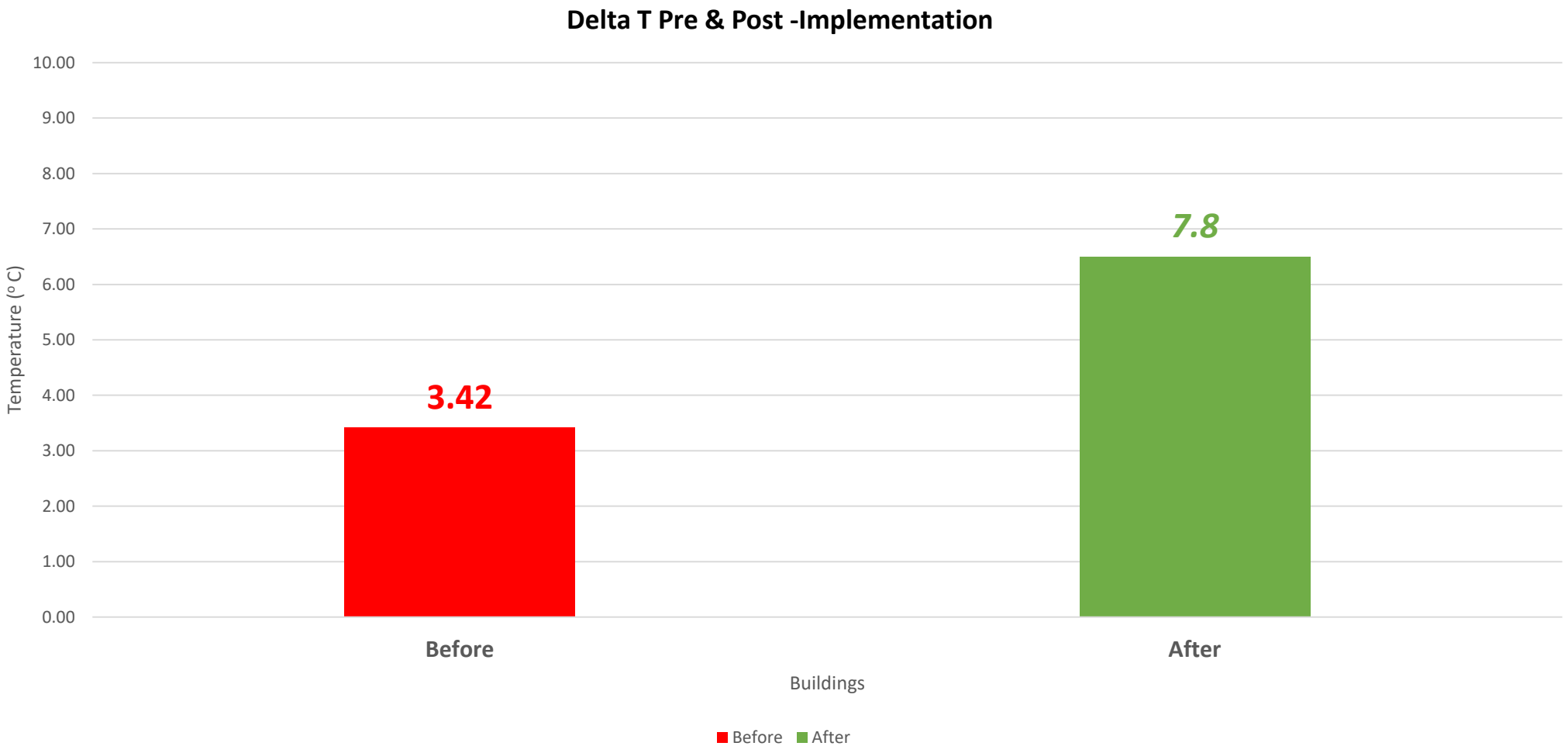
Root Causes

1. Controls logic.
2. Non-industrial grade pressure transmitters.
3. Integration of PT with CHW pumps.
4. Bypassed flow control valves.
5. Lack of CHW balancing provisions.
6. Lack of standard operating

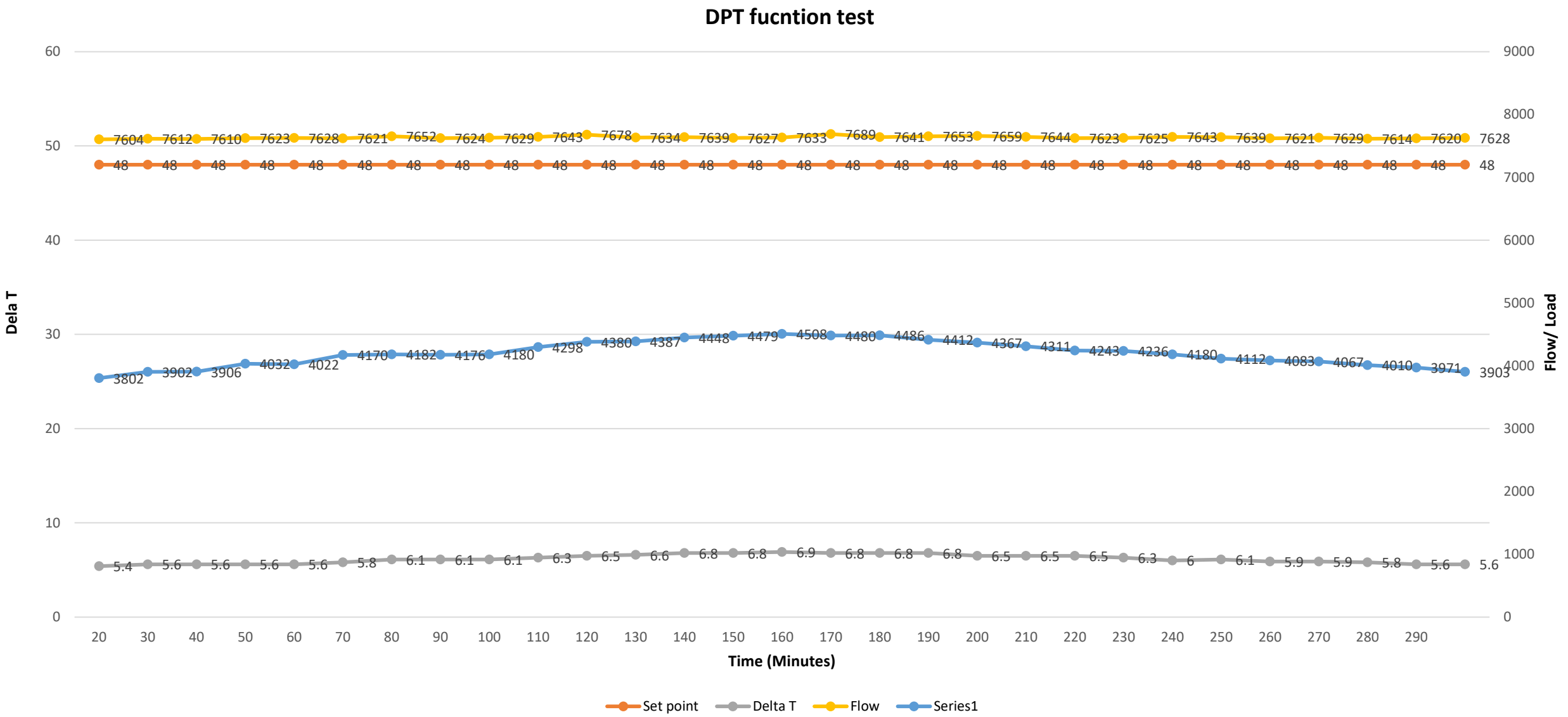
Results


Flow Trend Pre & Post -Implementation
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
Flow (gpm)
250%
200%
150%
100%
50%
0%
Percentage (%)
13309
5345
7950
6453
149%
23%
Before
After
Buildings
Actual Flow
Flow as per design
Extra flow %

Results


Delta T Pre & Post -Implementation
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Temperature (° C)
3.42
7.8
Before
After
Buildings
Before
After

DTP Analysis



How is Delta helping operate energy efficient smart cities

1. Lowering the energy consumption on secondary side pumping system.

2. Improving the efficiency of DCPs by ensuring they get the correct return water temperature.

3. Overall cost savings for all stake holders by optimized use of chilled water.

Delta Vision & Mission

"Head quartered in the world's most iconic smart city, Dubai, Delta is adding value to the **Sustainability goals** by staying **True** to our **Values** and being **INTELLIGENTLY DIFFERENT.**"

CEO,
Delta District Cooling Services.

DELTA
DISTRICT COOLING

شكرا

Thank you!

Appreciate your patience…..!