Smart Energy Connect
powered by CLP

Easy Innovations to Tune-up Your BMS

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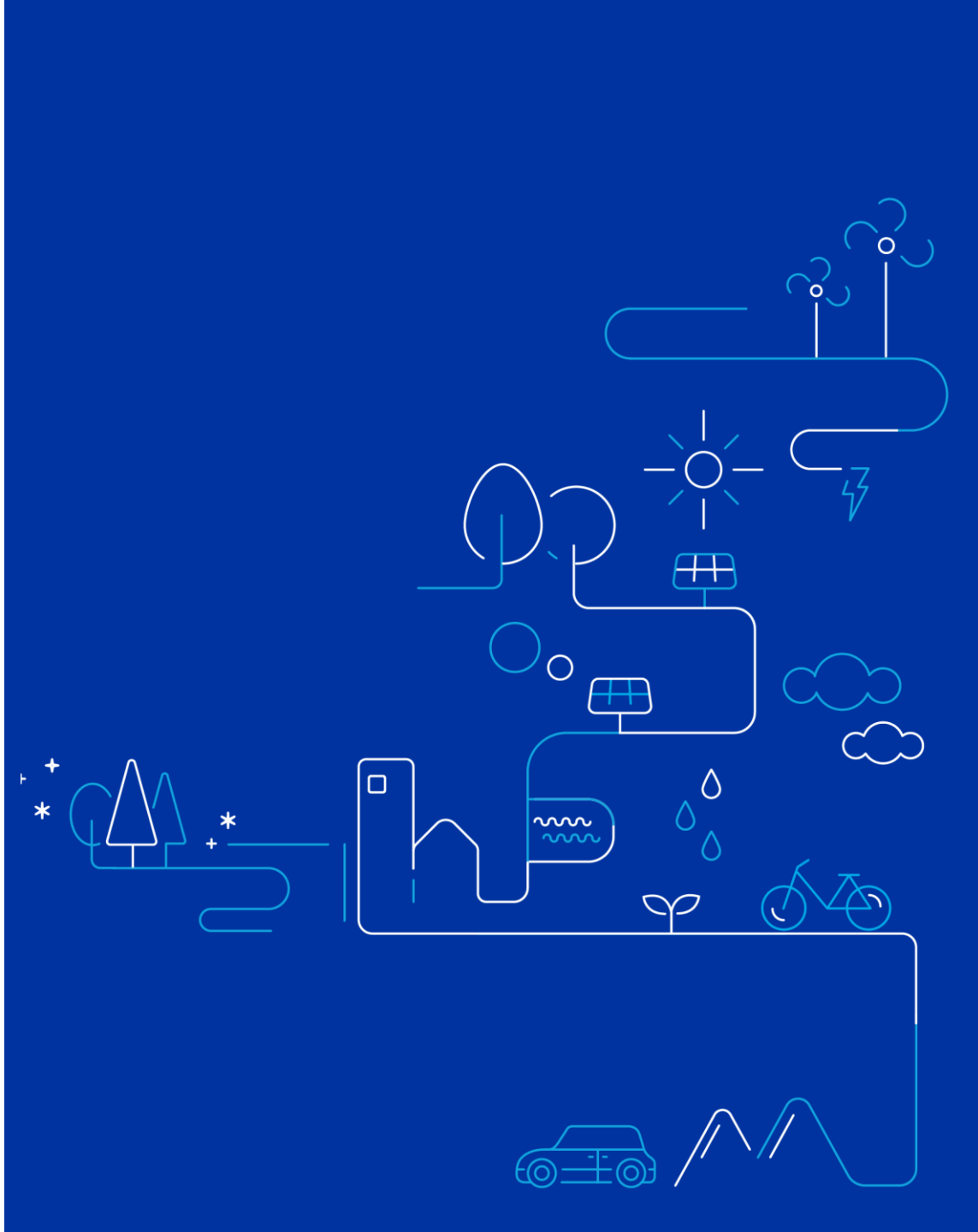
CLP 中電



Building Scope

Problems With Modern Day BMS

BMS focuses on control

BMS is managed by engineers who need to focus on multiple goals: energy saving, fault detection and more

Facility managers need to deal with customer complaints

Why Are These Problems Worth Solving?

Value Proposition

Smart Buildings

Improve commercial buildings and industrial facilities

Being Greener

Supporting government targets helps alleviate resource shortages

Cost Effective

Cut back on lost costs from inefficient energy management

More Visibility

Gain more insight into data if BMS services are outsourced

Building Scope Platform – Benefits (1/2)

Predictive Faults

Get early warning of faults through automated alerts and also get visibility of reoccurring faults

Auto-tagging Data Points

Deploy and scale in days instead of weeks thanks to Building Scope's machine learning and automated AI technology

BMS Agnostic

Analytics platform that sits on top of your existing BMS

Schneider Electric

Johnson Controls

SIEMENS

Inbuilt Automated Work Order Management

Streamline operations by automatically monitoring and tracking issues through an integrated work order management system

Building Scope Platform – Benefits (2/2)

Reduce Complaints

Prevent complaints by having proactive information rather than always being reactive

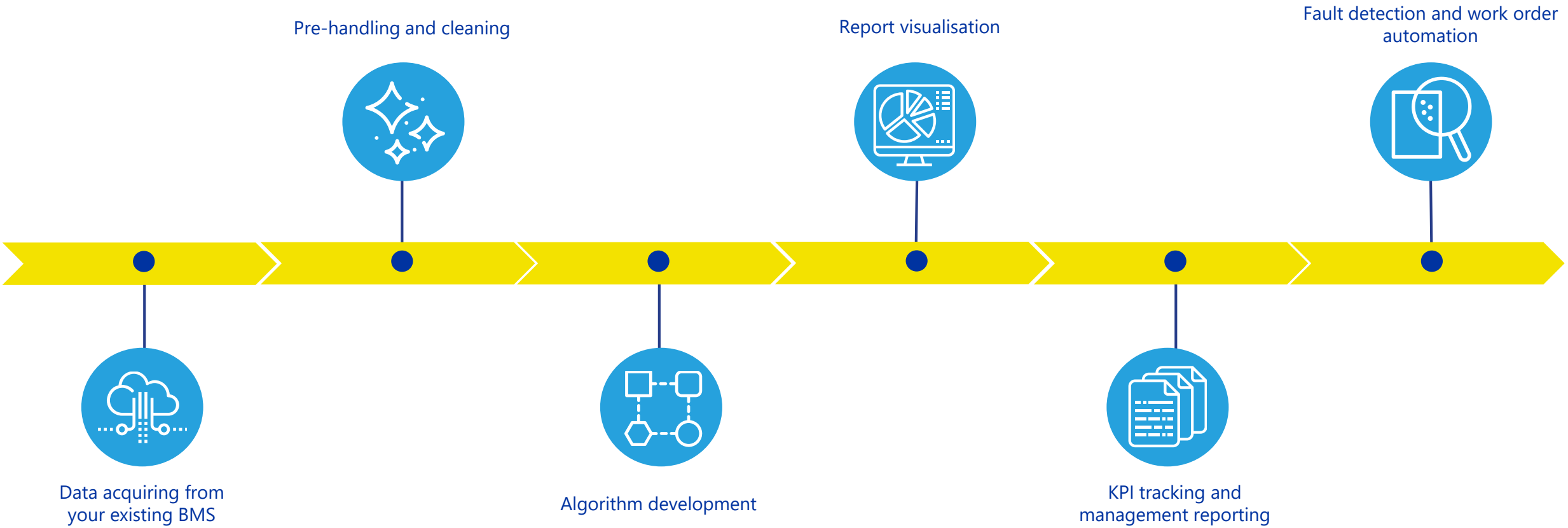
Automated Reporting

Dynamic KPI report chosen by client and fully automated

24/7 Monitoring

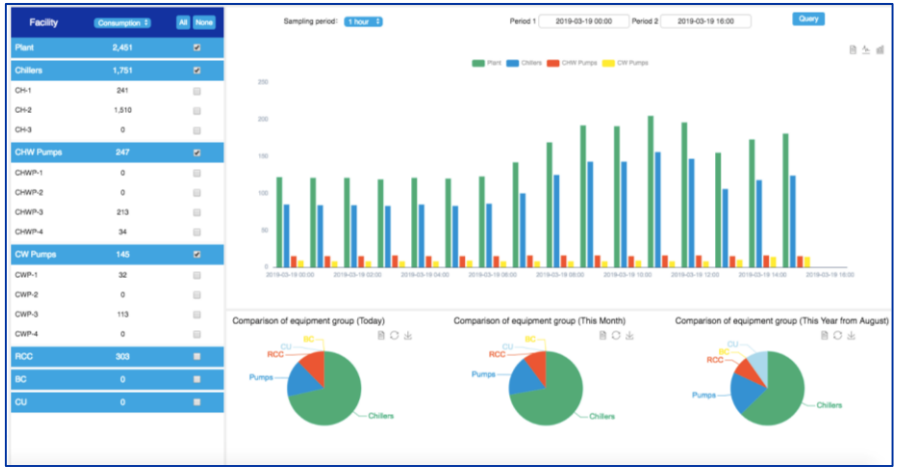
Virtual engineer that's monitoring your building health 24/7

How CLP Building Scope Works



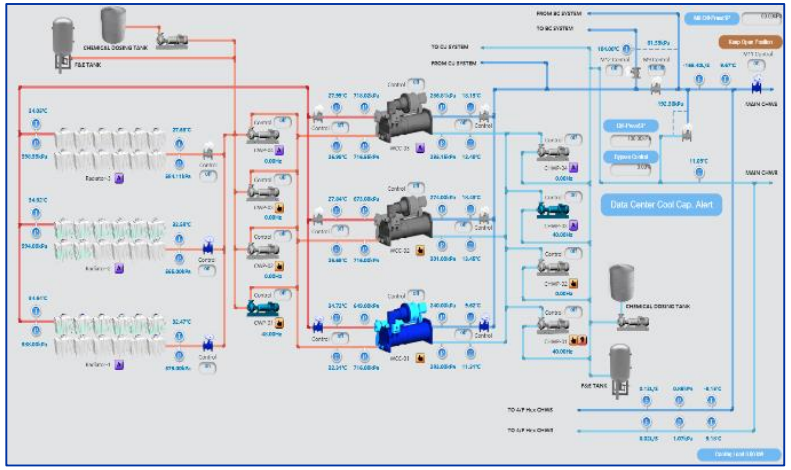
Building Scope Platform Overview (1/2)

Energy and Equipment Management



Building analytics solution that helps to save energy through energy optimization at building level

Data and Device Visualisation



Energy savings can be achieved through identifying sub-optimal equipment. Access to all types of data without going onsite

Building Scope Platform Overview (2/2)

Fault Detection and Diagnostics

Group detected faults into different categories, analyze energy waste and faults, and utilize ROI calculator

Reduce Complaints and Prioritise Repairs

Through machine learning and predictive faults, facility managers can pre-empt failures and prevent occupant complaints

Case Study – CLP Sham Shui Po Centre

~1,600 Staff **7** Floors **Data Centre**

BMS

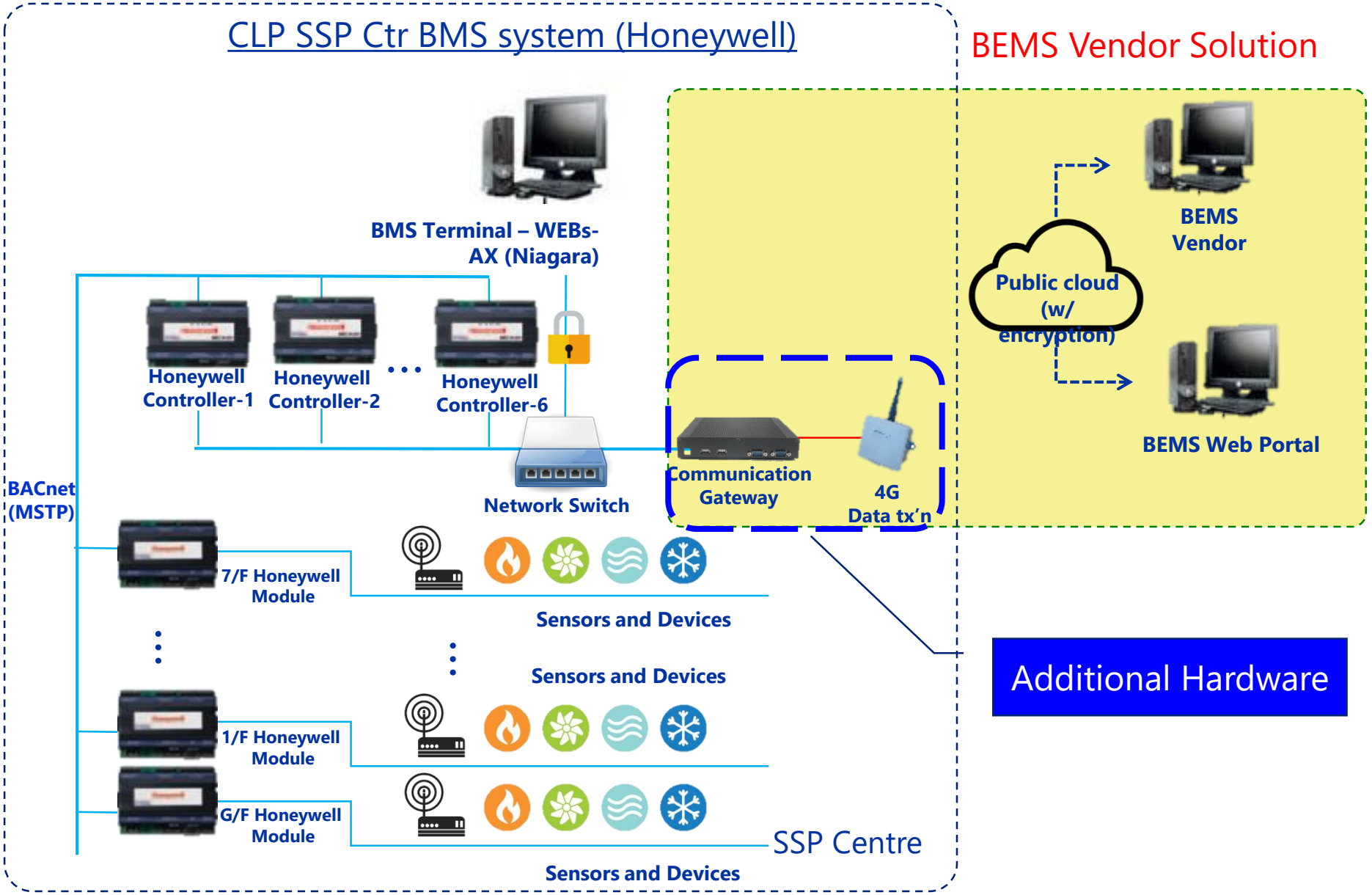
Honeywell **2,600** Data Points

Results (12 months)

7% +
Energy Saving

67%
Reduction in Complaints

BEMS Interface with Existing BMS



Case Study – CLP Benefits

Carbon Footprint Reduction

86 tCO2e avoided

Equivalent to 1,419 tree seedlings grown for 10 years

Annual Saving ($HK)

7% +
(From Jan to Dec 2018)

Equivalent to fuel used by 12 average mid-sized gasoline cars in HK over 6 months

Manpower Savings

Reduced 45 days of manpower hours required for fault investigation

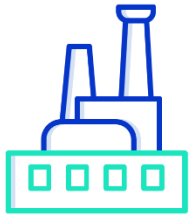
Intangible Benefits

Promote sustainable image and reduce complaints from building users

PlantPRO

Smart Energy Connect
powered by CLP

Problem Statement



Inefficient Operation of HVAC Equipment

- 65% of HVAC energy consumption in buildings is consumed in the plant room alone

Lack of Automation and Control

- The manual control of chillers or fixed chiller sequencing systems often results in energy wastage and additional cost

System Downtime

- The unexpected breakdowns of chiller units can lead to costly and ad-hoc repair

BMS Only Controls Specific Areas

- The lack of complete control over all functions and equipment does not allow for optimisation

What Is PlantPRO?

PlantPRO software is embedded on EDGE gateways hardware ready for on site integration

Hardware

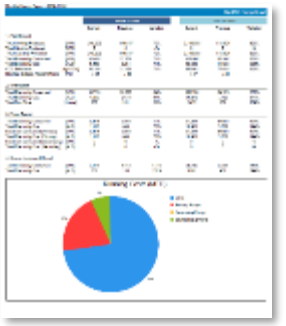
- 1 X PlantPRO controller is required per chiller system
- Can control up to 10 chillers in a single circuit

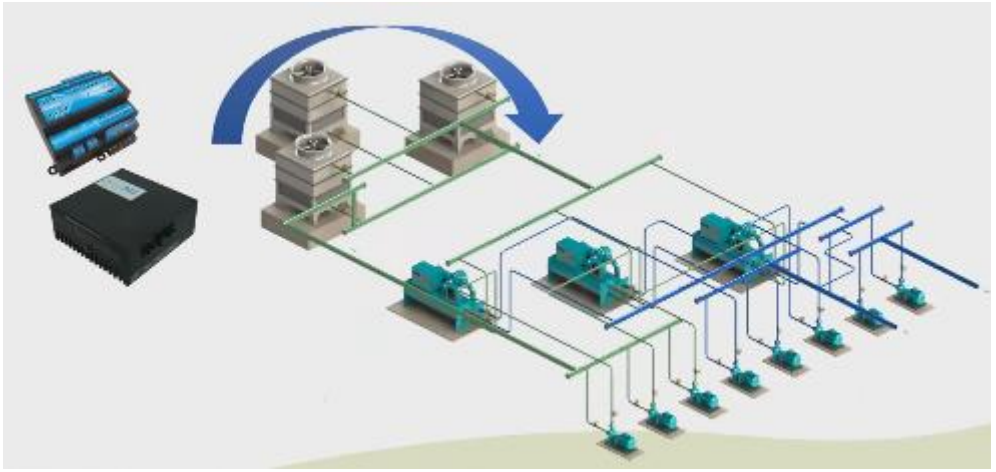
+

Software

+

Monthly Reports





Plant Control & Optimisation

PlantPRO has the ability to control the following equipment

Chillers

Pumps

Cooling Towers

Valves

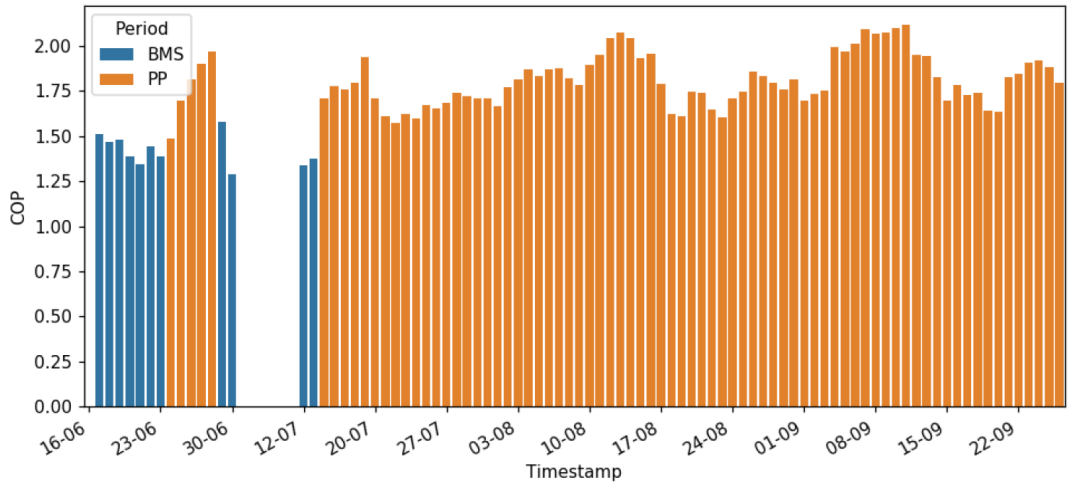
Chillers – Control & Optimisation

Chillers

- Up to 10 units with the same circuit
- Water cooled, air cooled and district cooling
- Chiller brand agnostic

Chiller Plant COP under PlantPRO control higher than the COP under BMS control

A daily trend of COP (for both BMS control and PlantPRO control) is shown below.



PlantPRO Control & Optimisation

Smart Sequencing

Future cooling load is calculated

The chosen chiller combination is applied

All chillers which can support the target cooling load are calculated

Power consumption of each chiller combination at the most desirable load point is calculated (including pump power)

The most optimum load point of each chiller which can satisfy the target cooling load is calculated

Pumps – Control & Optimisation

Pumps

- Primary chilled water pumps
- Secondary chilled water pumps
- Condenser water pumps

Week Starting	Actual Power Consumption (kWh)	Predicted Power Consumption (from baseline) (kWh)	Weekly Energy Savings (kWh)	Energy Savings (%)
28/06/2020	28,858	37,699	8,841	23.5%
19/07/2020	30,004	38,429	8,425	21.9%
26/07/2020	41,462	54,957	13,495	24.6%
2/08/2020	40,867	52,834	11,967	22.7%
9/08/2020	35,649	46,617	10,968	23.5%
16/08/2020	34,585	50,560	15,975	31.6%
23/08/2020	34,097	48,051	13,954	29.0%
30/08/2020	32,604	43,730	11,126	25.4%
6/09/2020	37,382	50,153	12,771	25.5%
13/09/2020	33,139	45,151	12,012	26.6%
20/09/2020	36,180	45,561	9,381	20.6%
27/09/2020	31,383	37,869	6,486	17.1%

PlantPRO Control & Optimisation

Variable Primary Flow Control

Traditional System

Directly control pumps to the system differential pressure and rely on the bypass valve to ensure minimum flow through the chiller

- Can be difficult to tune to ensure stable operation at all times

PlantPRO

Control to design chiller flow and reset the design chilled water flow setpoint based on the trend of the field differential pressure

- Ensure chiller flow only varies between acceptable limits and there is no over reliance on the bypass valve to maintain sufficient flow level.

Cooling Towers – Control & Optimisation

Cooling Towers

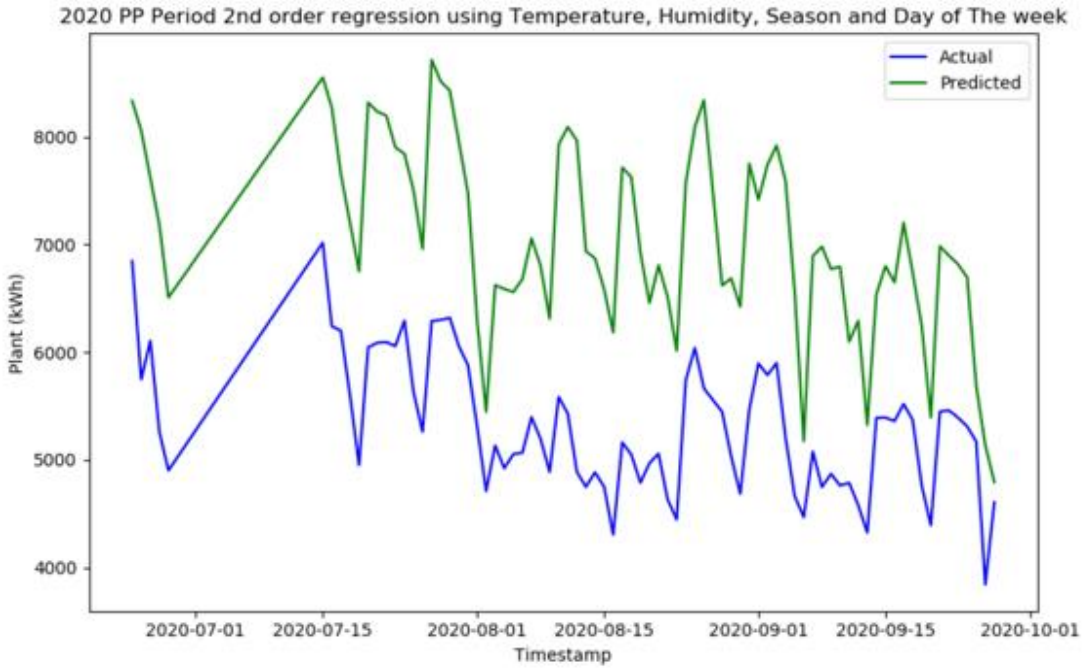


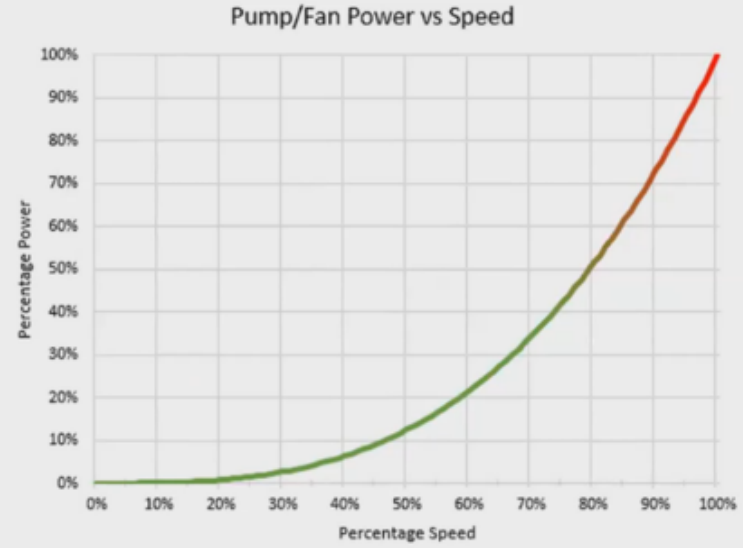
Figure 6 - Daily Energy Prediction VS Actual Daily Energy

PlantPRO Control & Optimisation

Fan Efficiency and Fan Control

A small reduction in fan speed by PlantPRO results in a large energy saving

Example: A 10% fan speed reduction equates to a 30% reduction in power consumption



Cooling Towers – Control & Optimisation

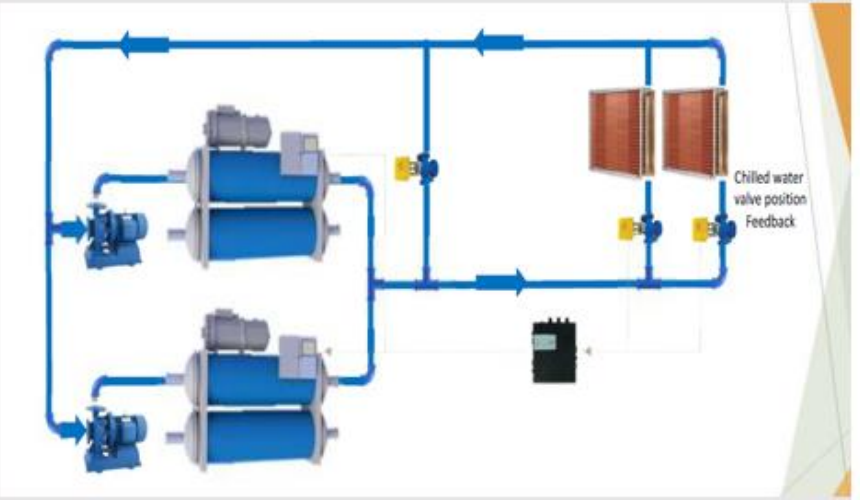
Valves

PlantPRO Control & Optimisation

Chilled water valve open percentage

PlantPRO optimises the chilled water valve open percentage.

A low average chilled water valve open percentage indicates low field load, which raises the chilled water set point



Case Study – CLP Benefits

Carbon Footprint Reduction

253 tCO2e avoided

Equivalent to 4,175 tree seedlings grown for 10 years

Annual Saving ($HK)

8% +
(From Jan to Dec 2020)

Equivalent to fuel used by 14 average mid-sized gasoline cars in HK over 6 months

Manpower Savings

Reduced 44.5 manpower hours per month required for adjusting chiller water temperature, pump setting and radiator frequency

Intangible Benefits

Promote sustainable image and reduce complaints from building users

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Q&A

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Thank You!