ASSOCIATION OF ENERGY ENGINEERS
IRELAND

Welcome to the AEE Ireland Webinar

How Building Analytics Can Transform Operational Performance

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About Me – Cillian Casey

- Head of Engineering, EMEA
- B.Eng Mech (Hons)
- 13 years' experience in the building services and energy management industry across commercial, retail, health and manufacturing sectors
- Expertise in building management control systems, HVAC systems, mechanical system maintenance and energy management

Today's Discussion

- What are the operational challenges
- How building analytics can assist
- The building analytics platform & process
- What data transformation looks like
- Case studies

Operational Challenges

- Increasing energy costs
- Aggressive ESG targets and goals
- Legacy systems
- Multiple vendors
- Lack of transparency
- Equipment breakdowns
- Reactive CAPEX
- Thermal compliance
- Limited view across portfolios

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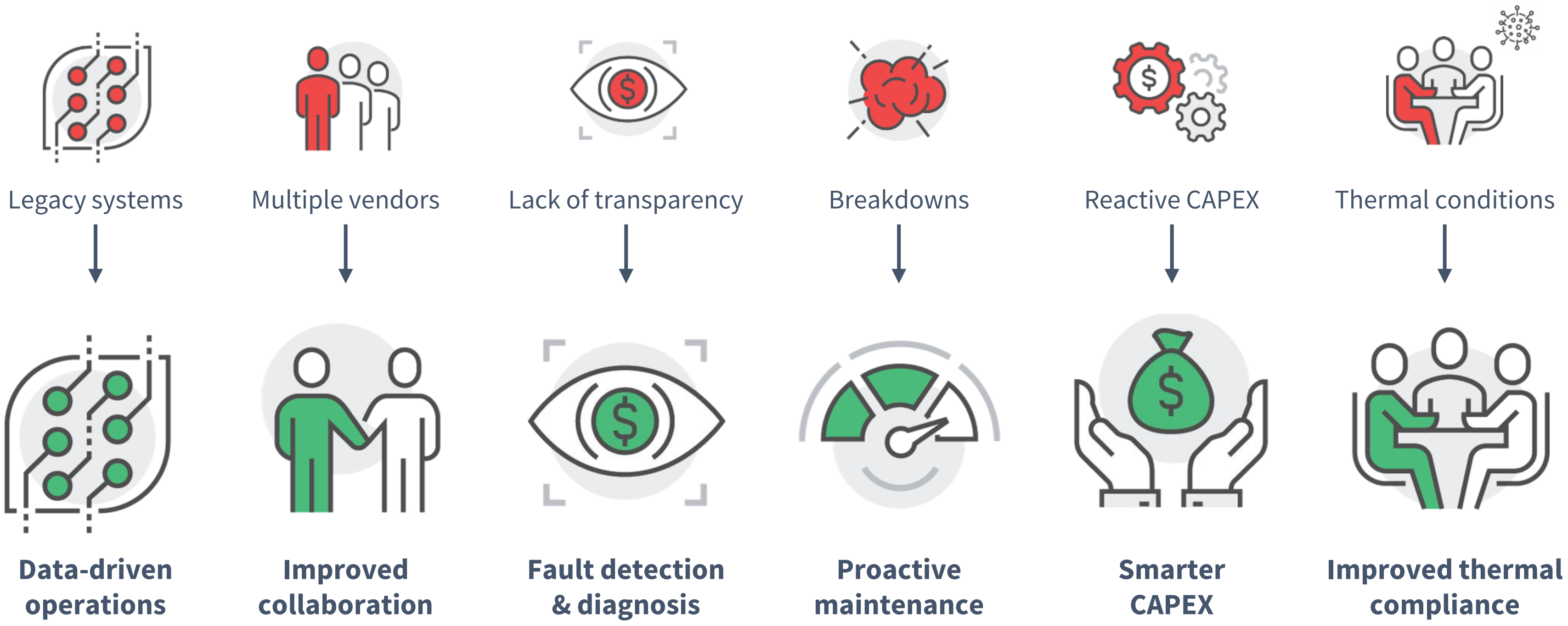
How Building Analytics Can Help



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Building Analytics: Expected Outcomes

Energy & OPEX savings

8-30% reduction
base-build energy/CO^2

30-120% ROI
against fees

Data-driven maintenance

Maximise yield
maintenance contracts

Up to 80% reduction
planned maintenance

Capex efficiency

Increase
equipment life

Avoid/Defer
Capex upgrades

Improved thermal conditions

Improved control
internal temperatures
humidity, CO2 levels etc

Visibility
thermal performance

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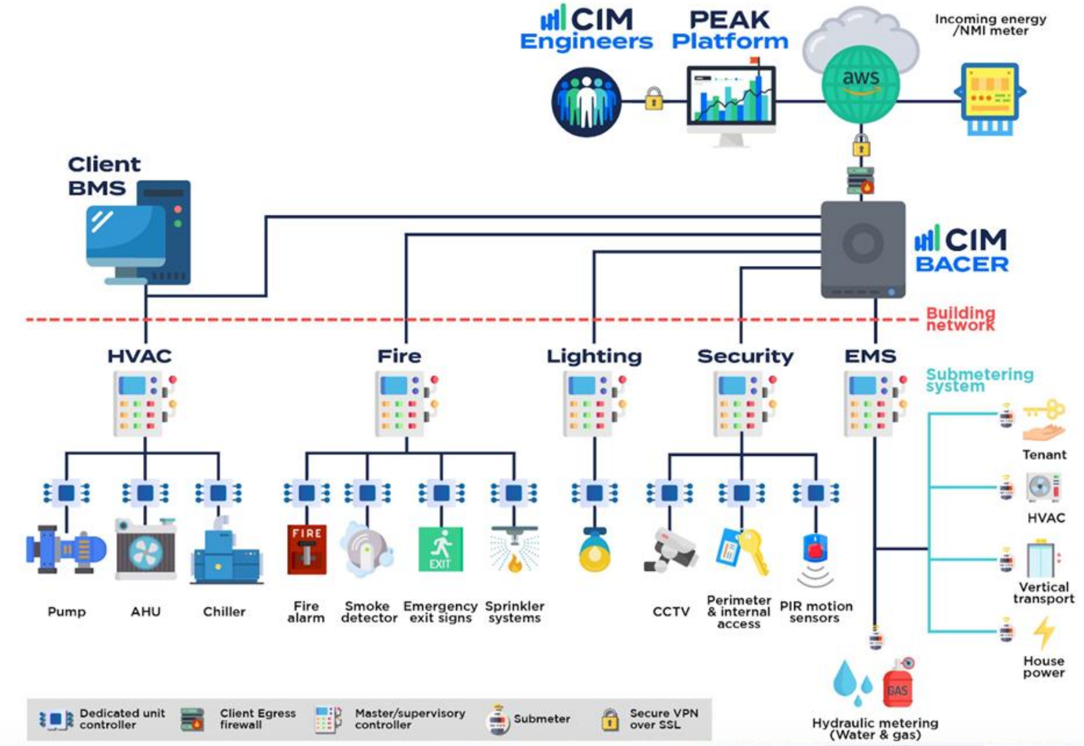
Building Analytics: Data Ingestion



Collect, Monitor & Analyse

Building Intelligence

Technical Engineering Support

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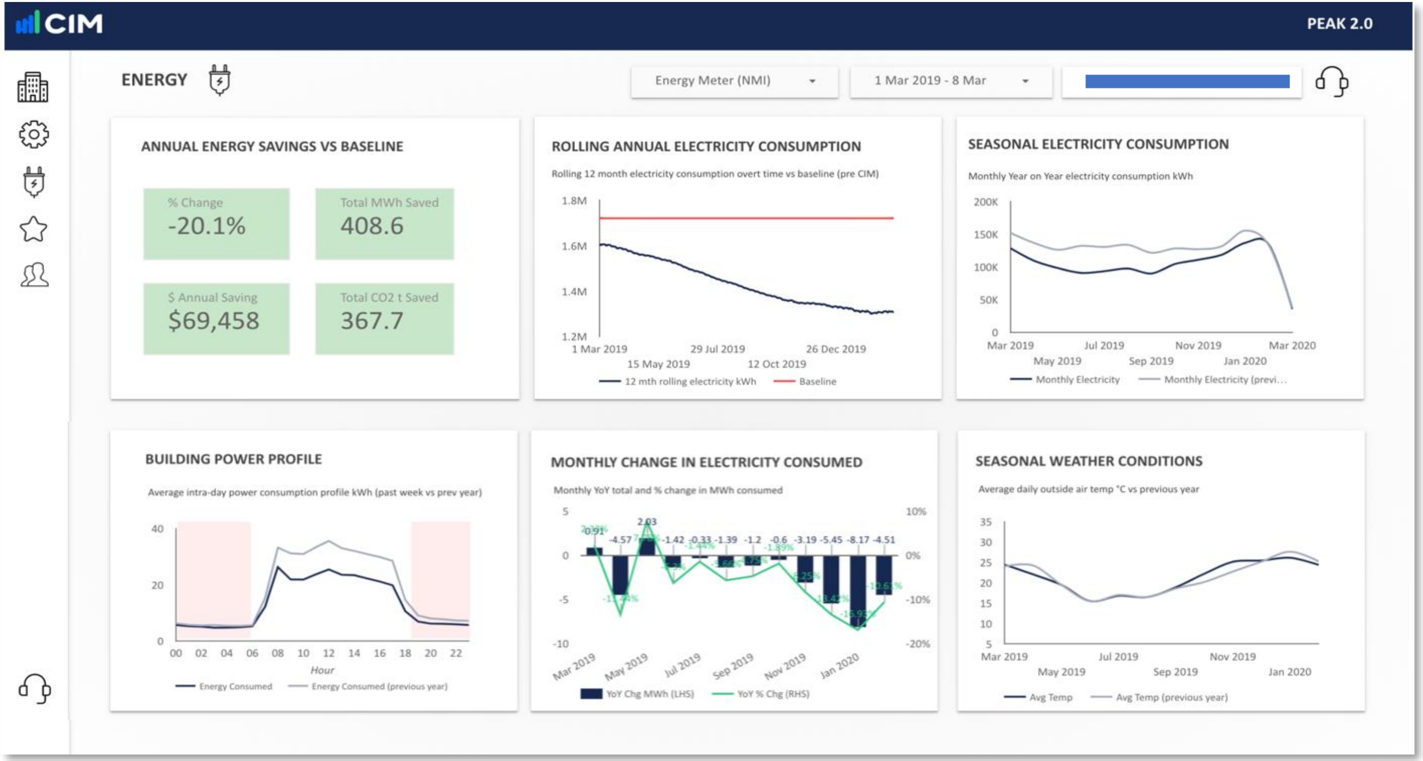
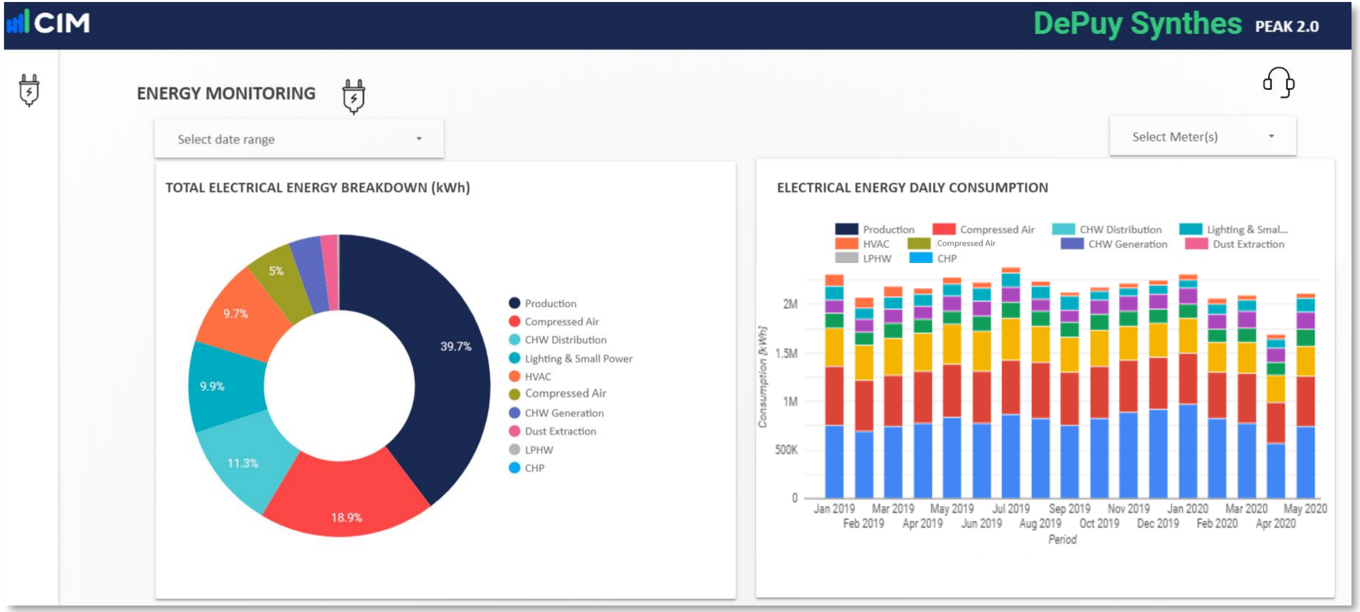
The Process: Energy Consumption Tracking



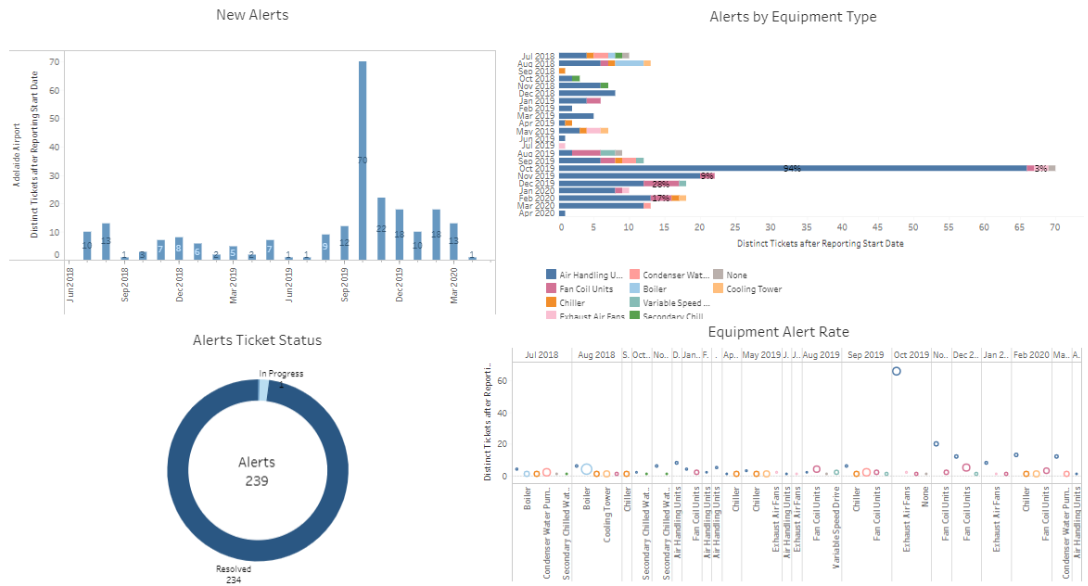
The Process: Energy Consumption Tracking (ISO50001)

These dashboards present information such as:

- Site energy consumption
- SEU consumption
- EnPIs
- Targets



The Process: Alert Generation & Tracking



Top Priority Unresolved Tickets | By Savings | Adelaide Airport

Summary	Site	Status	Potential Savings	Problem	Solution	Responsible Contractor	Date Assigned	Comments
CWP00010 - CWP Speeds Are Fixed --- CWP-1	Adelaide Airport	In Progress	$1,863.00	This alarm is generated when the CWP pump speeds are fixed.	1. Implement a strategy to allow the chillers to control the CWP speeds to maintain required internal refrigeration.	Mech Contractor	04 Nov 2018 23:30	Issue still occurring. Author :Simon Ming Jien Yong Date :08 Oct 2019 03:04

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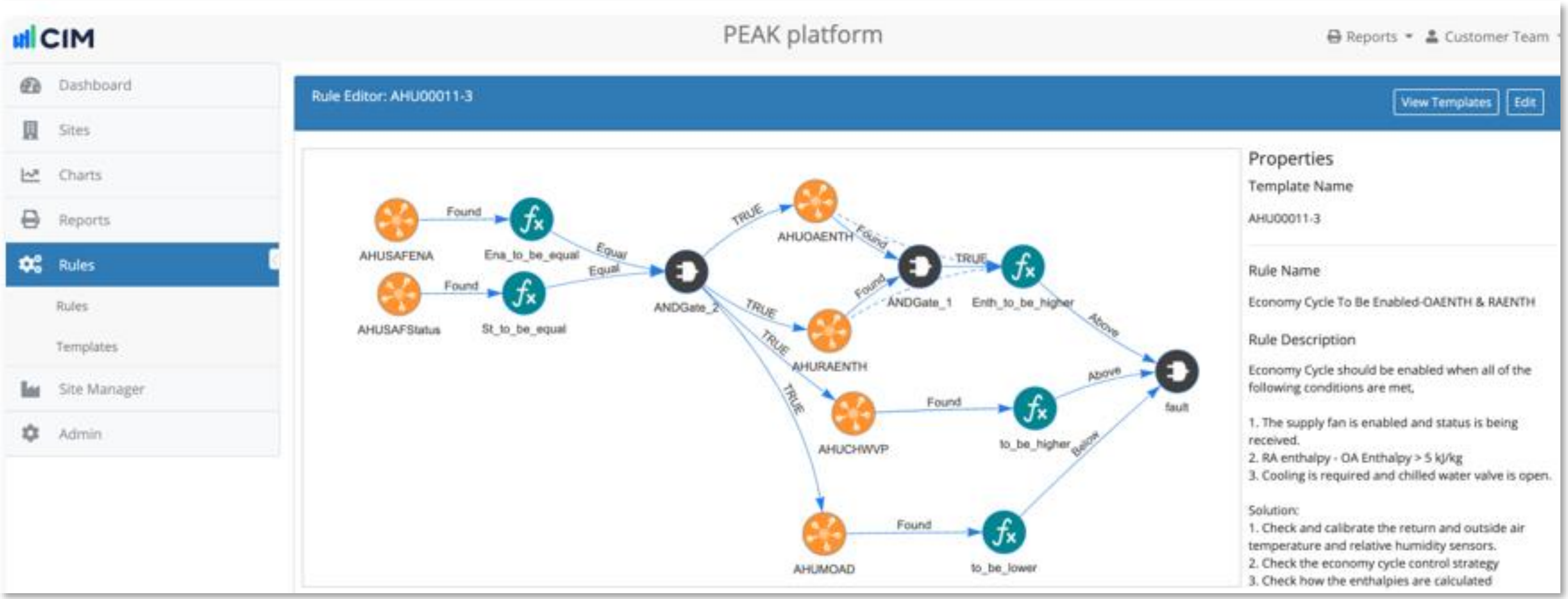
The Process: Customisable FDD Rules



The Process: Workflow Management

Open:

Automatically created by PEAK or manually added

Acknowledged:

CIM engineer has reviewed the alert

In Progress:

CIM engineer has escalated the issue and there is an action plan in place

Actioned:

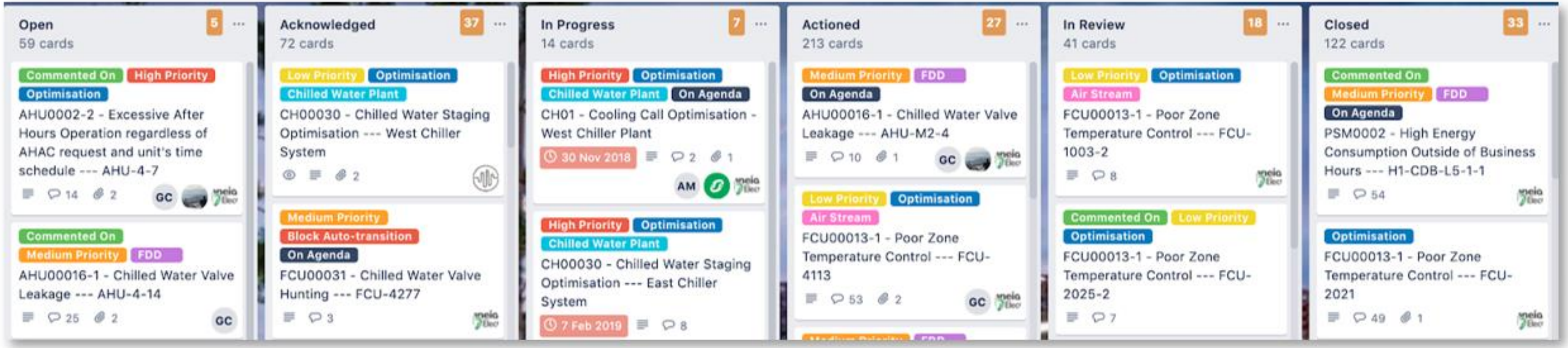
Onsite team or contractor has indicated the task has been completed

In Review:

CIM is reviewing the data in PEAK to ensure issue has been solved

Closed:

The problem or task has been resolved or completed correctly



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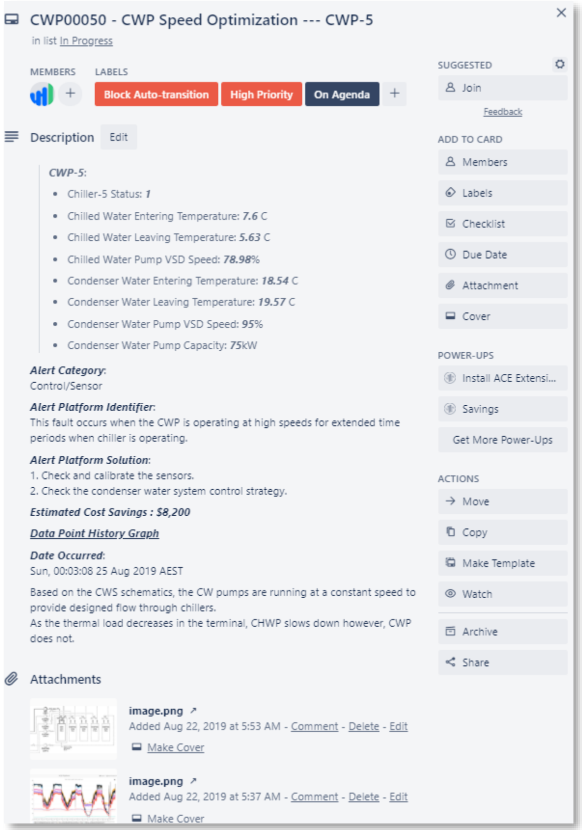
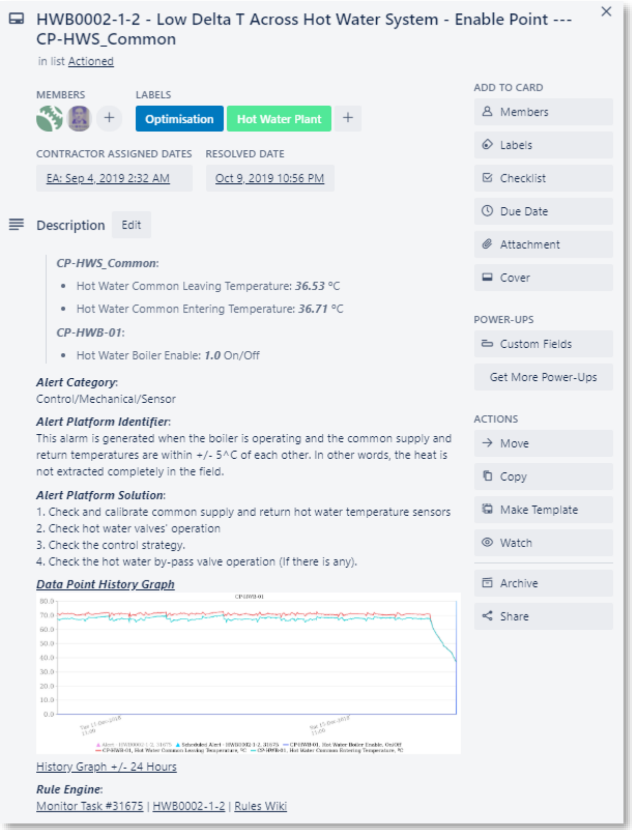
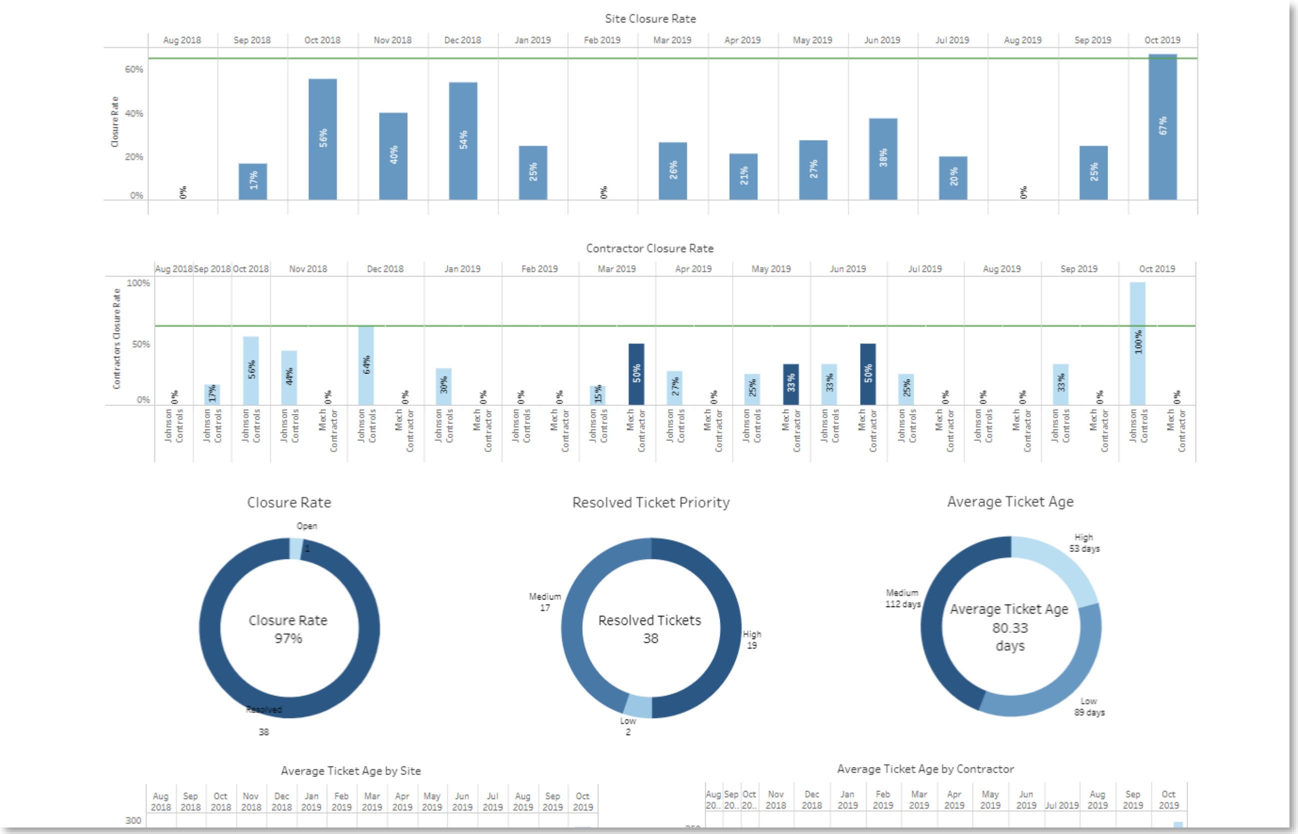
The Process: Workflow Tickets





The Process: Contractor Performance



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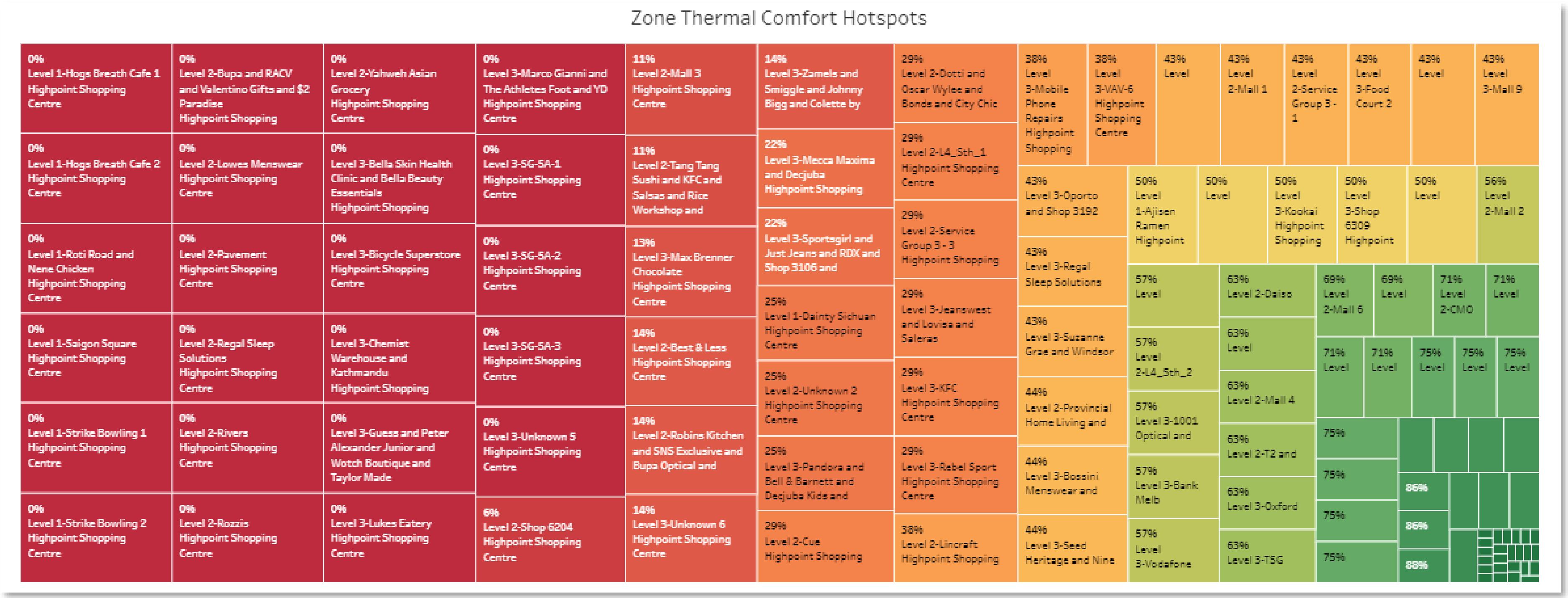
Data Transformation: Thermal Compliance Dashboard



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Data Transformation: Thermal Compliance Dashboard

Thermal Comfort and Average Daily Temp

Room	Temp	Setpoint	Thermal Comfort
Room6-10	26.8	23.7	29%
Room0-20	26.8	31.9	18%
Room6-27	26.7	27.0	0%
Room6-38	26.7	28.0	3%
Room2-37	26.7	28.0	10%
Room6-1	26.7	25.0	0%
Room5-10	26.4	24.4	31%
Room6-8	26.4	28.0	0%
Room4-1	26.4	27.5	0%
Room5-22	26.3	24.6	0%
Room3-16	26.3	22.5	10%

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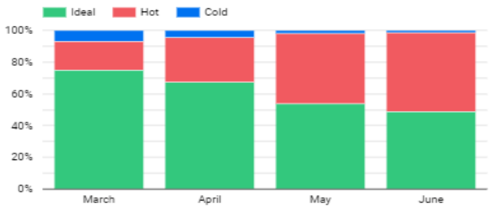
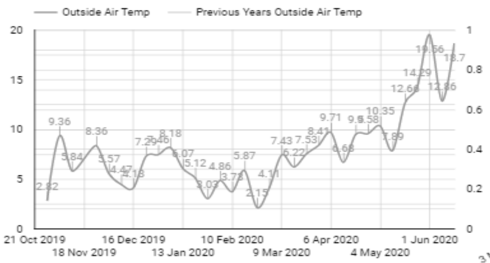
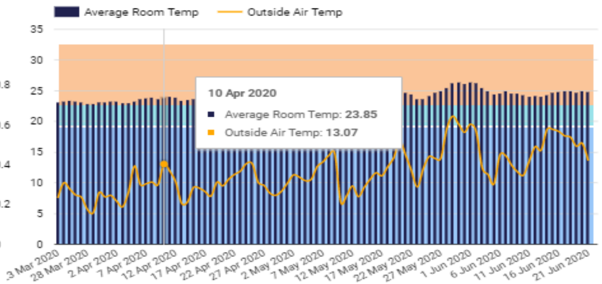
Zone Thermal Comfort (% split vs Ideal, Hot, Cold)



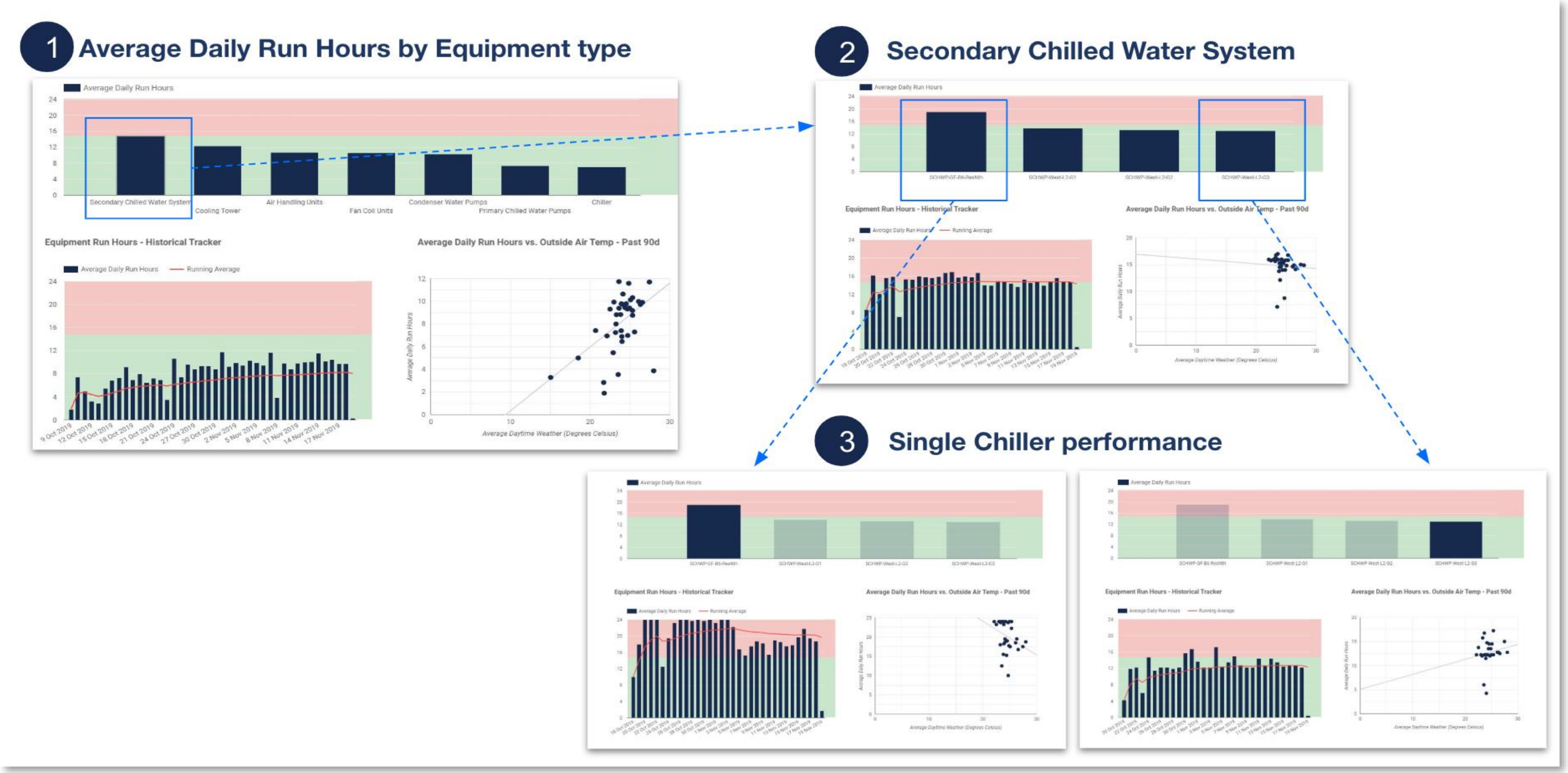
Weather Tracker - Past 2 Years (Average Weekly)



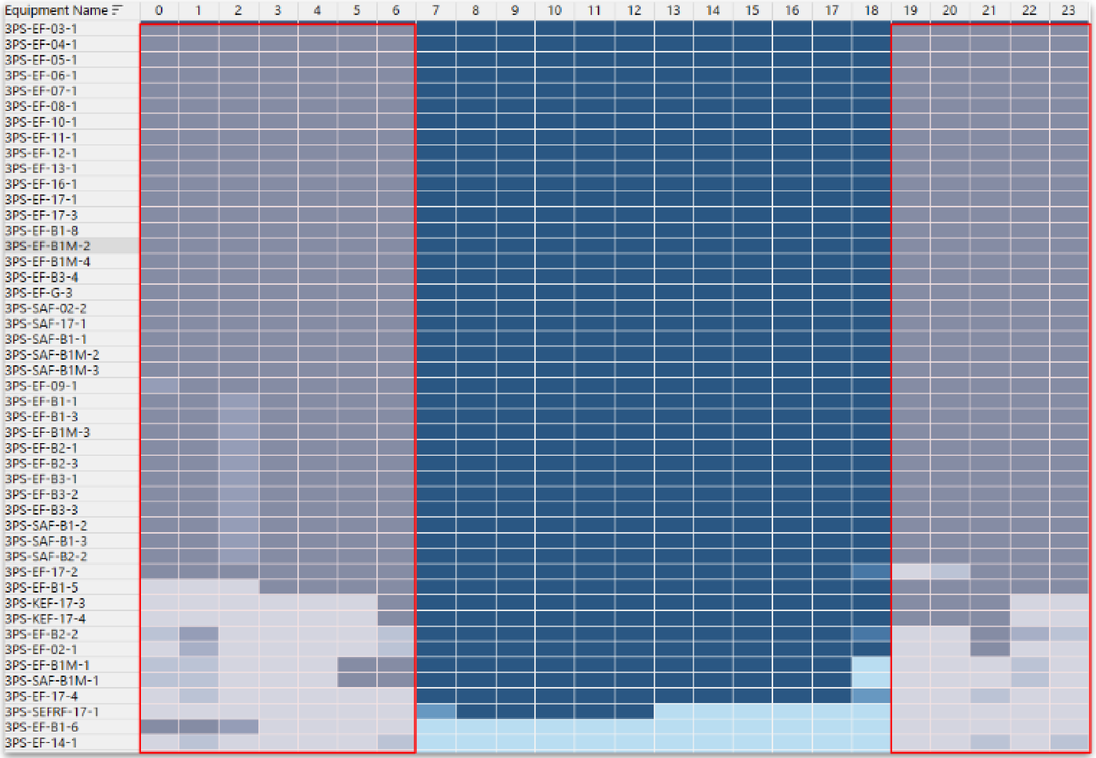
Historical Average Daily Temp vs Set-point and Outside Temp



Data Transformation : Equipment Runtimes



Data Transformation: Equipment Runtimes



Issue:

- Multiple Fans operating 24 hours

Action:

- Confirm time schedule

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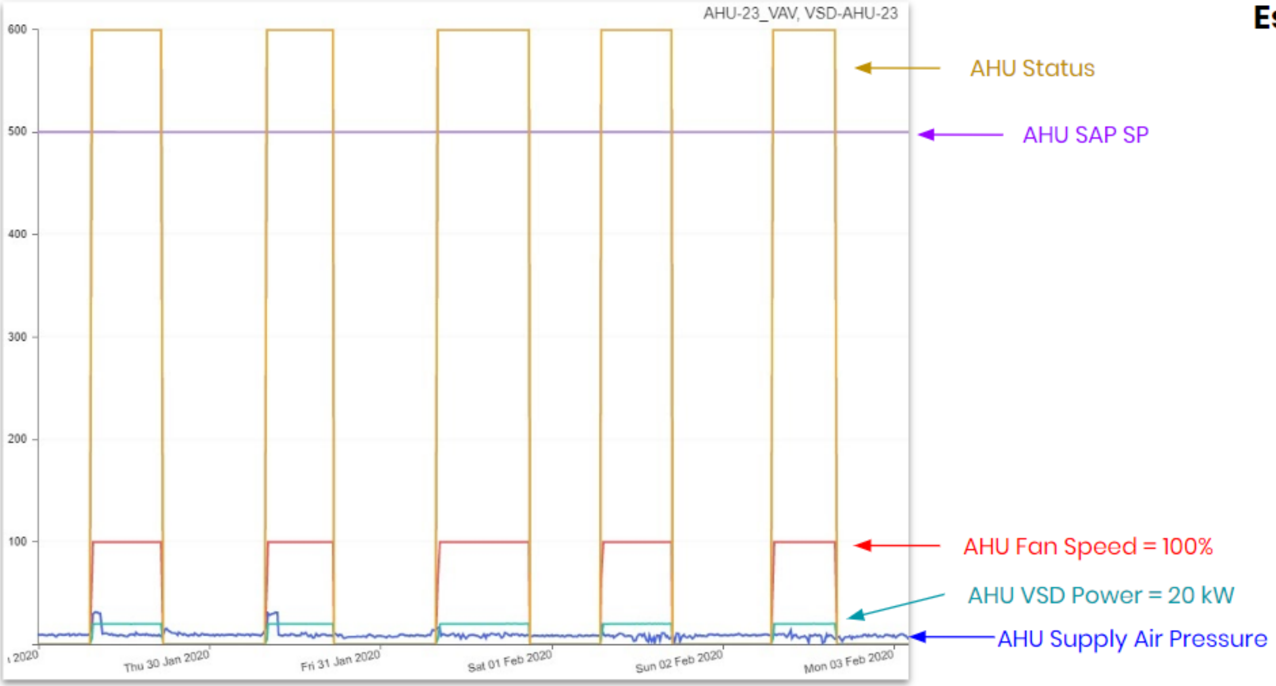
Data Transformation: Fan Speed Fault

AHU-23 fan speed always runs at 100%. Supply air pressure sensor is reading very low value



Est. Saving: 15 MWh

- Check AHU supply air pressure sensor for disconnection or need for replacement.
- If SAP sensor requires replacement, consider overriding fan speed to 90% to trim energy consumption from 20kW to 14.6 kW.

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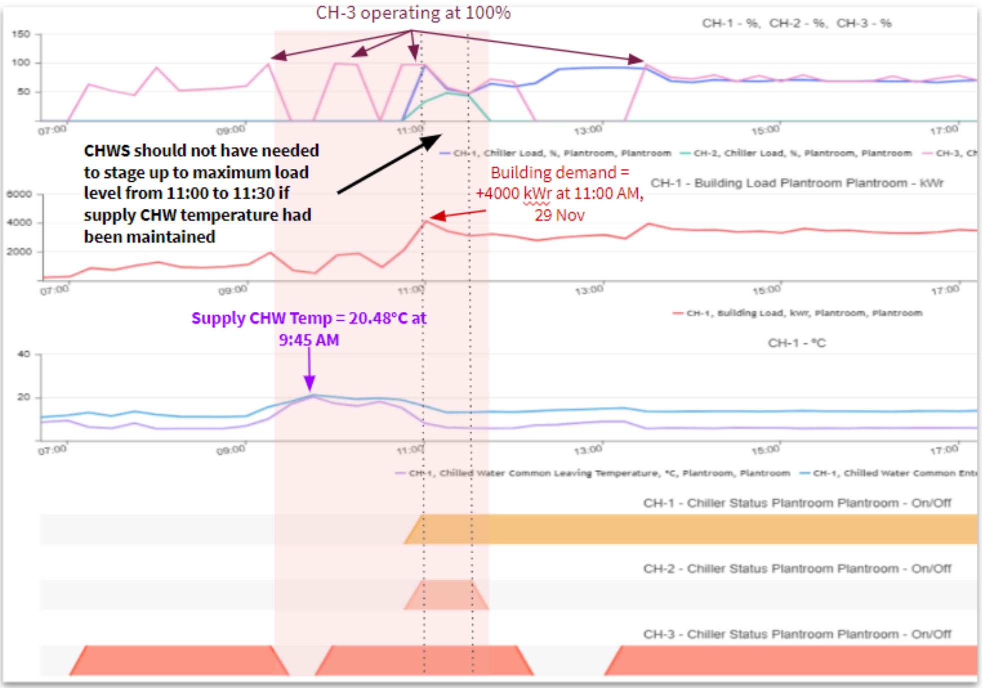
Data Transformation: Chiller Staging Parameters

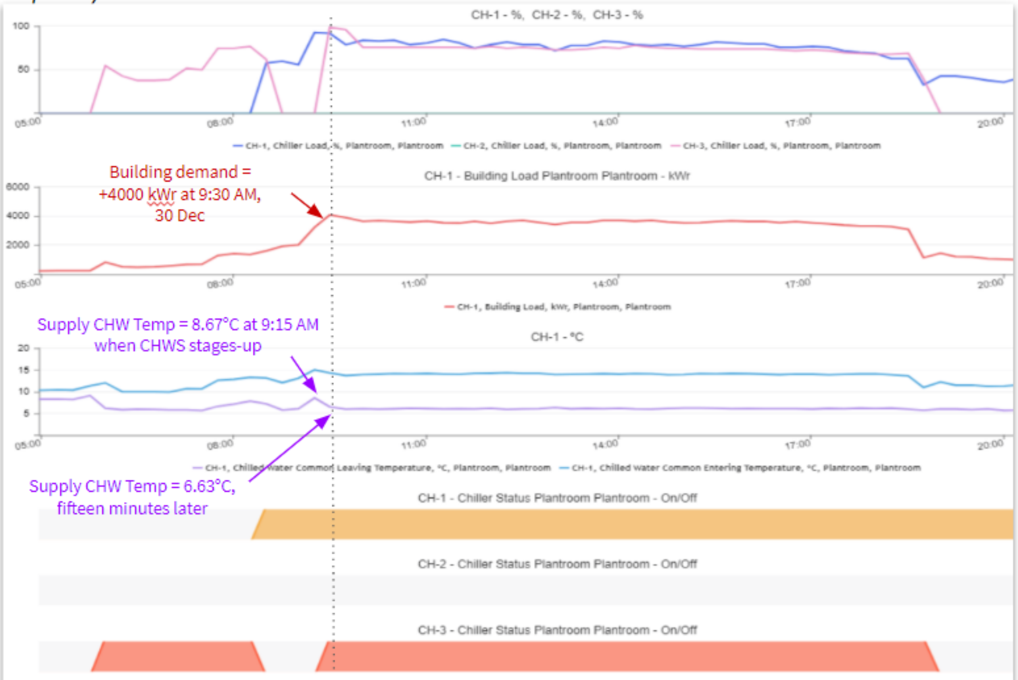
CHWS staging parameters cause the chilled water system to stage-up when chillers are at their lowest COP



- CHWS regularly and unnecessarily operating >90% due to staging-up setpoint of 99%.
- The supply chilled water temperature to the building is allowed to increase too high before staging up and during changes in system load level.
- Reducing the stage-up load setpoint to 80% will allow the chillers to operate at partial load and improve the overall CHWS efficiency.

Data Transformation: Chiller Staging Parameters

The supply chilled water temperature control has been improved by staging-up before the building demand exceeds the chiller's capacity



- Adjusting the chilled water system stage-up setpoints to:
  Stage-up Temp SP = 1.5°C
  Stage-up Load SP = 80%

  has improved the efficiency of the chilled water system.

- The aim of optimising the chilled water system staging setpoints is to ensure,
  - the system stages up before the building cooling demand exceeds chiller capacities,
  - to reduce the occurrence of short-cycling and
  - maintain the supply chilled water at its setpoint.

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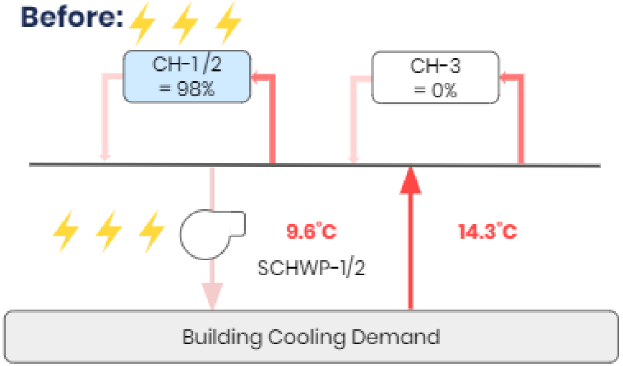
Data Transformation: Chiller Staging Parameters

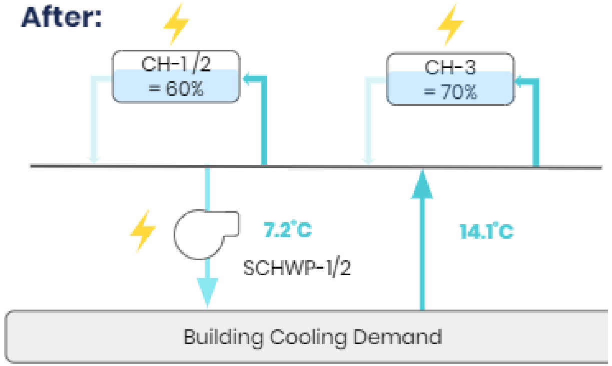
PEAK Platform Solution: Customised chilled water system staging optimisation to maximise efficiency, based on building cooling demand.

Before:



- ↑ Chiller operation & capacity utilisation
- ↑ Inability to meet building cooling demand
- ↑ Electricity consumption

After:



- ↑ Asset lifecycle
- ↑ Thermal comfort
- ↓ Electricity consumption

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Data Transformation: Smarter Use of Data

Smart Capital Planning

Enabling optimal spend of available Capex across a portfolio

Reduce Capex

Data-Driven Maintenance

Transforming building maintenance through data

Reduce Opex

Adaptive Controls

Make changes to BMS with no cost of implementation

Streamline

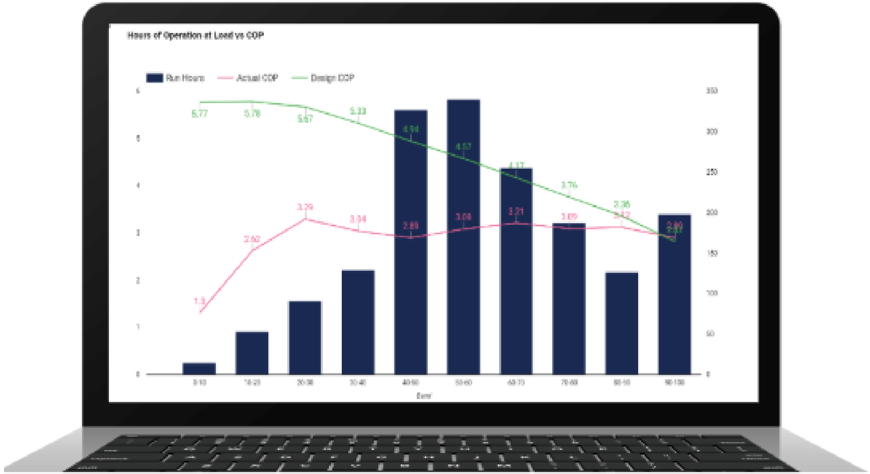
Fire Safety Compliance

Improve safety and compliance through real-time fire analysis

Improve Safety

Data Transformation: Smart Capital Planning

Leveraging the insights and performance trend data captured by the analytics platform enables smarter, data-driven Capex planning decisions



1. **Enable** optimal spend of available Capex across a portfolio
2. **Avoid** Capex wastage
3. **Cost/benefit** analysis of potential upgrades
4. **Data-driven** Capex plans per site and across the portfolio
5. **Digitised** asset register
6. **Removal** of Consultant costs

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Data Transformation: Smart Capital Planning

Leveraging the insights and performance trend data captured by the analytics platform enables smarter, data-driven Capex planning decisions

1. **Enable** optimal spend of available Capex across a portfolio
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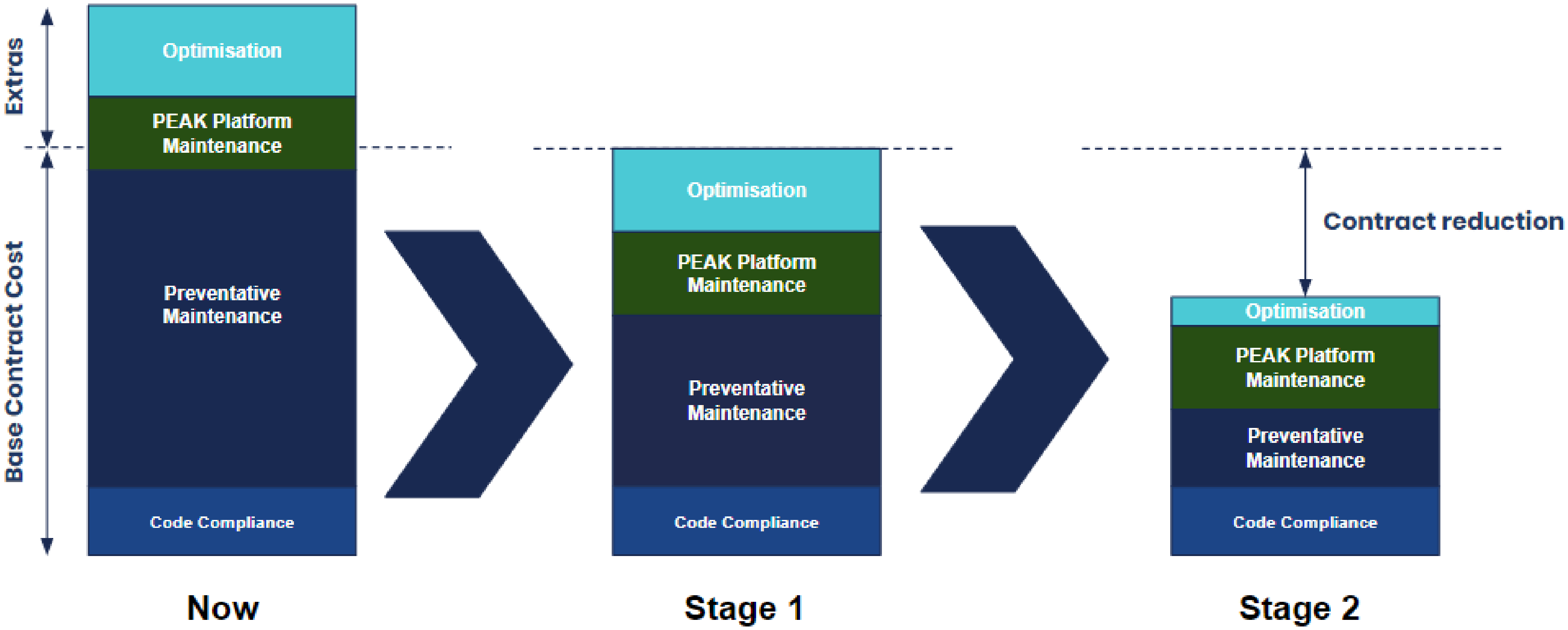
Data Transformation: Data Driven Maintenance

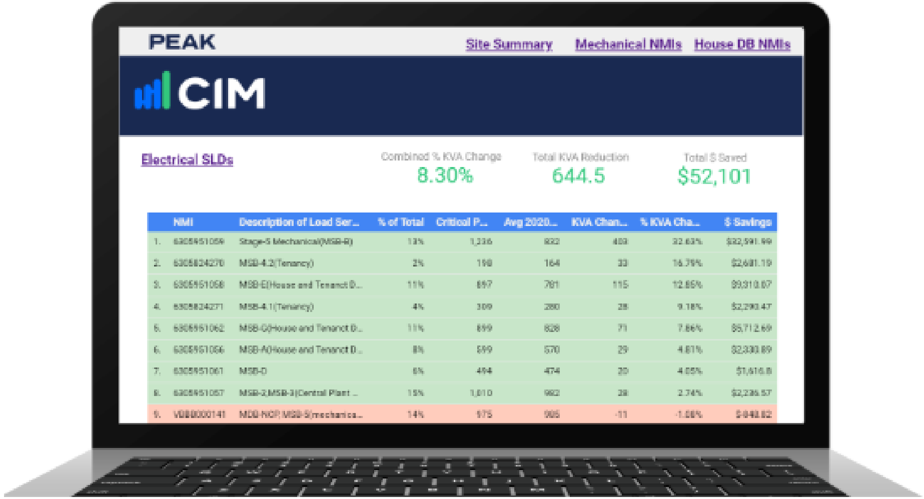


Data Transformation: Data Driven Maintenance

	Core Manual Maintenance			Analytics Driven Maintenance
	Monthly	Quarterly	Annually	
BMS HEAD END AND SOFTWARE				
IT Services Checks (backups, virus checks etc)	X			
Server Performance Checks	X			
MAIN PLANT – CHILLED WATER PLANT				
Check performance of control loop against set points				X
Operate and confirm correct machine sequence				X
Test changeover sequences including pump/chiller fault				X
Check operation of current transducer/flow switches			X	
Verify lead/lag changeover				X
Check for valve close off and free running operations of valves				X
Confirm all chiller parameters in auto mode operation			X	X

Data Transformation: Adaptive Controls

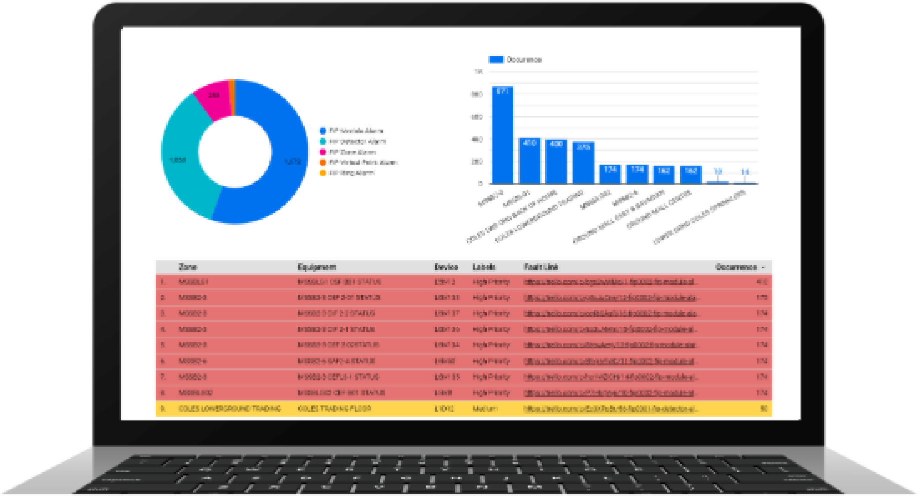
Leading analytics platforms have “Adaptive Controls” functionality which can programmatically write back to the BMS to more efficiently manage usage.



1. **Automated building control logic** adapting to outside weather conditions
2. **Minimal impact** on tenant comfort
3. **No costs of implementation** for algorithm changes
4. **Share control strategies** and learnings across different sites
5. **Systematic** way of managing overrides performed on site

Data Transformation: Fire Safety Compliance

Automatic, always-on verification of fire safety system maintenance activities, equipment function and system performance testing. Enhancing the safety of building occupants and improving service delivery



1. **Real-time data collection** from the FIP
2. **Monitoring and reporting** across the full period between physical tests
3. **Proper labelling and mapping of detectors and zones** for instant identification and real-time FDD
4. **Online FIP** reporting dashboard
5. **Time series analysis** of alert history
6. **Alerts and online workflow** management system

Case Study: Delivering Value Within 5 Weeks

Equipment	Performance	Comfort	Safety
visibility & efficiency improved	customised dashboards for asset insight	improved asset safety & thermal comfort	flagged potential Legionella issue

Opportunities Identified

- **206MWh** of projected energy savings
- **£31,100** of projected OPEX savings
- **58,312kg tCO2** emission savings

ISSUE: PEAK identified malfunctioning solar thermal array.

SOLUTION: Rectify issue with solar equipment to save **£7,300 pa.**

ISSUE: PEAK identified that hot water heating immersions were manually turned on.

SOLUTION: Returned immersions to automatic control, saving **£15,000 pa.**

ISSUE: PEAK identified poor thermal control.

SOLUTION: Restrict zone temperature setpoints and max unit runtimes to improve thermal comfort and save approx **£2,500 pa.**

ISSUE: PEAK identified OHS non-compliance with pasteurisation in domestic hot water heating system.

SOLUTION: Ensure water is periodically heated to **65°** for OHS compliance (Legionella control).

ISSUE: PEAK flagged excessive Supply Capacity Charge on utility bill.

SOLUTION: Reduce existing threshold of agreed Supply Capacity Charge for annual savings of **£3,500 pa.**

ISSUE: PEAK pinpointed unnecessary electrical loads via stopgap solutions.

SOLUTION: Temporary plug-in electrical heater locations identified by PEAK. Heaters to be removed from rooms after **ACU repairs** to reduce load for savings of **£3,300.**

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Thank you!

Get in touch

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Thank you and Stay Safe

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