

INTELLIGENT DATA CENTERS

Unleash the **power of AI** to optimize your data centers'
reliability and **energy efficiency**



coolgradient

Stay **Cool**, Work **Smart**



Ralph Rodriguez, LEED AP OM · 2nd

2h ...

Industrial Sales Lead @ Legend Energy Advisors | Energy Technology ...

We have hit 'Warp Speed' Captain. Honestly, it's incredible.

Like · 3 | Reply · 2 Replies



Bill Kleyman **Author**

2h ...

Data Center and Technology Executive || Neu.ro Board Memb...

100! No kidding, **Ralph!** So much of this is AI-driven. This demand is wild!

Like · 1 | Reply



Chris Hale (He/Him) · 2nd

1h ...

Strategy & Roadmap | Field Service Management | Incident Re...

no freaking kidding..... and not ending anytime soon

Like · 2 | Reply

AGENDA

INTELLIGENT DATA CENTERS

- How do I use AI?
- Is AI ready for my mission-critical facility?
- What is the impact of AI?
- How do I start?



Jasper de Vries
Co-Founder & Co-CEO

BUILDING THE FUTURE

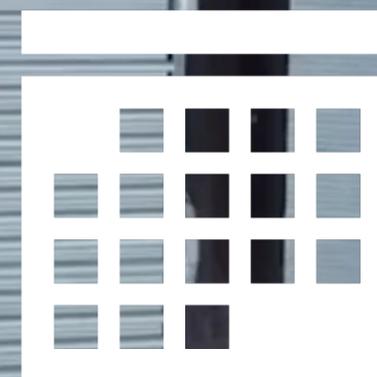
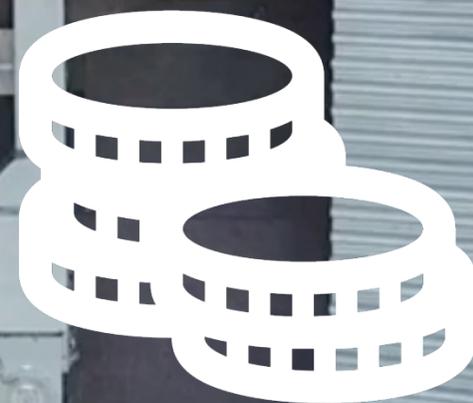
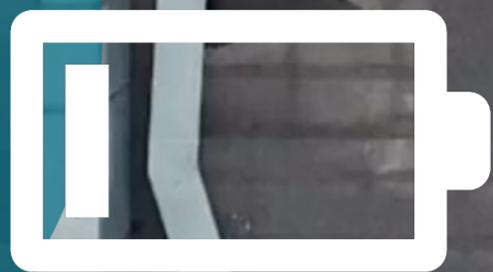
ENABLING ADVANCED DC MANAGEMENT



Data center management maturity model

LEVEL	DESCRIPTION	OPERATING EFFICIENCY
Level 5: Self-optimizing, autonomic	AI-driven integrated management software adjusts data center behavior and makes best use of resources according to goals, rules and service requirements throughout its lifecycle.	HIGH
Level 4: Optimizing	Physical and virtual IT and data center subsystems integrated; models used for prediction, service management and multiple views, optimizing in near real time. AI is applied to data lakes for advanced analytics.	MEDIUM
Level 3: Proactive	Physical data center equipment characteristics, location and operational status is tracked. Energy and environmental data is used to reduce risks and waste.	MEDIUM
Level 2: Reactive	Software installed to monitor environmentals and equipment power use. Able to adjust basic controls (e.g., cooling) to demand.	LOW
Level 1: Basic	No integration of infrastructure data. Basic monitoring supplied with equipment. Relies on BMS data. Simple alarming, error messaging.	LOW

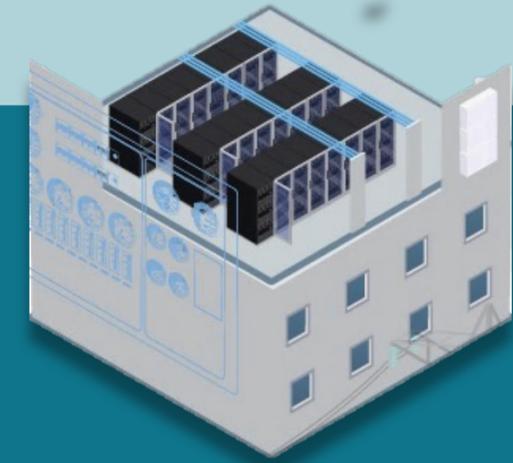
COMPLEX



TODAY

THE INTELLIGENT DATA CENTER PLATFORM

**INTELLIGENT
DATA CENTER**



**AI RECOMMENDATION
PLATFORM**



**INFRA WITH EXISTING
DATA POINTS**





OPTIMIZING OVER 300 MW OF CAPACITY

INTERNATIONAL DEPLOYMENTS

Customers include **global data center companies** like



interxion[™]

Active in **9 countries**.

Utilized by executives, data center operations and energy efficiency professionals



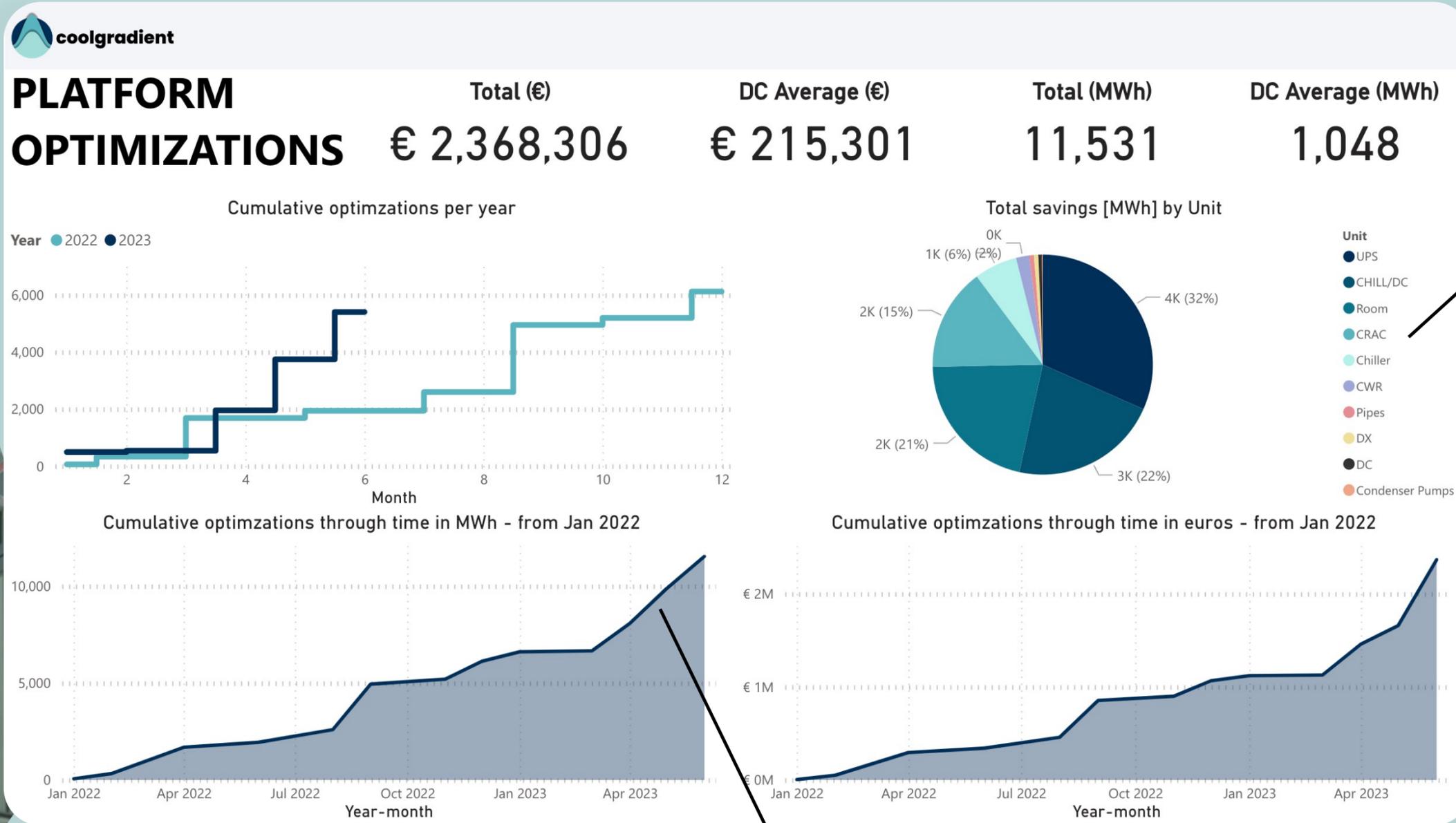
VALUE

OPTIMIZATIONS OF OVER 11,500MWh

From Jan-2022 to Jun-2023

1

Optimizing *all* assets across any data center



2

Accelerating our impact by adding new AI and taking your intelligent data center to the next level

VALUE x10

PROVEN RESULTS



Massive facility energy savings

Convert **massive amounts of data** to **energy savings** across your **entire data center** facilities infrastructure



Improved reliability

Improve asset **efficiency** to insure **reliability** and extend the **lifetime** of mission critical infrastructure



Employee productivity

Augment your **teams' productivity** with detailed **guidance** which **prioritizes** the most **impactful actions**



Benchmarking & PUE compliance

Set **PUE targets**. Identify, quantify and **replicate optimizations** across **all your data centers**



coolgradient

FAST RESULTS

KEY FEATURES



No additional hardware

ROI in less than 1 year. Use data from existing infrastructure and building management systems



Roof-to-room harmonization

Recommendations to **optimize** and **harmonize** your **entire site** facilities infrastructure on **one platform**



Continuous optimizations

Coolgradient **AI recommendation** platform plus **expert advisory** sessions for continuous optimization



Easy to implement

With our **easy onboarding** process and proven machine learning models, start **saving** in **weeks**



ENHANCING DATA CENTER TEAMS

INTELLIGENT DATA CENTER PLATFORM

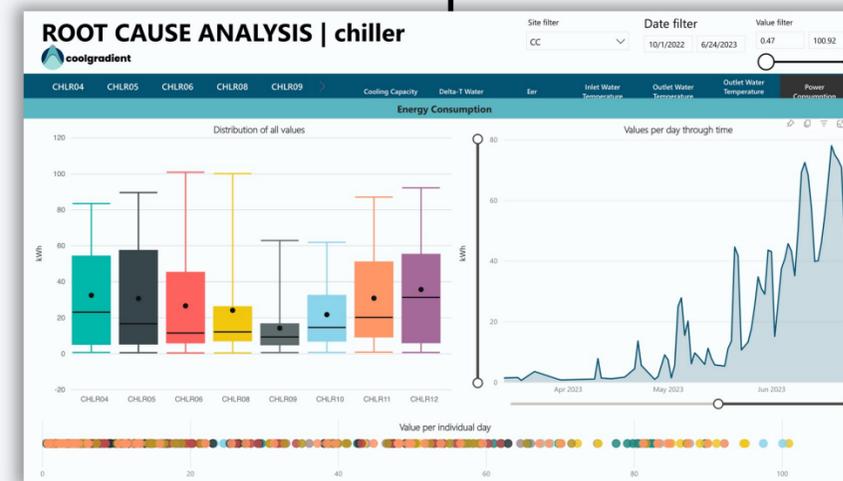
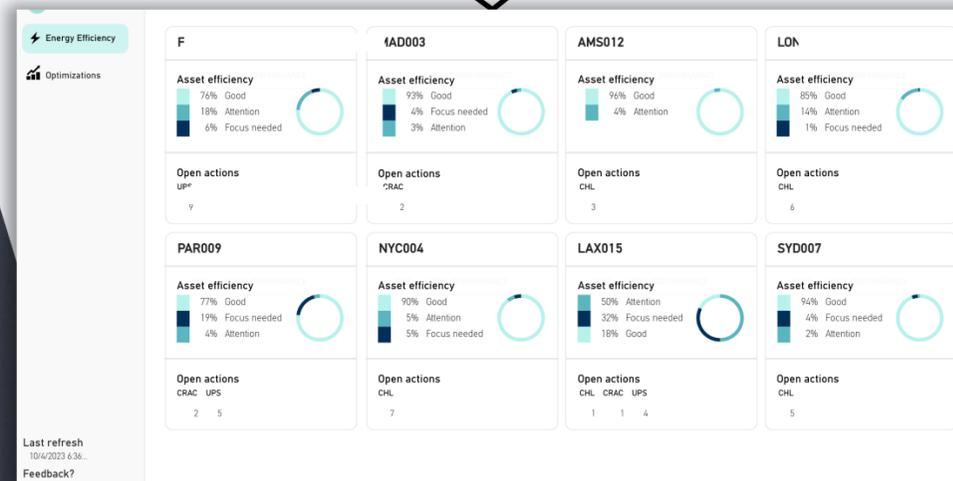
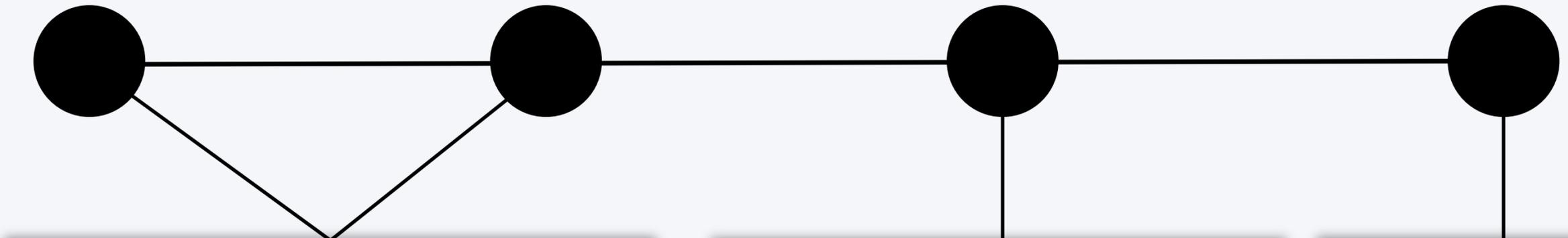
AI empowered operations

IDENTIFY

QUANTIFY

VALIDATE

IMPLEMENT



Malfunctioning FAN IN DRY COOLER

Site Name: HXA14
Unit of issue: DRY COOLER CHL0013
Detected issue: Malfunctioning Fan in the DRY cooler
Potential Energy savings: 36.3 MWh/65,545 per month
Suggested Action: Check the fan in the DRY cooler CHL0013. It is fixed turn off CHL0013 if possible.

Summary
 We noticed that while the dry cooler CHL0013 is on, the fan speed is zero (0%). The 3-way valve directs the refrigerant 100% through the dry cooler, however, the device cannot cool sufficiently, thus the chiller runs 24/7 to achieve the desired output temperature of 18-19 °C.

Further explanation
 On October 4, CHL0013 was turned with its 3-way valve to direct the refrigerant 100% through the dry cooler. However, the dry cooler is not cooling the refrigerant sufficiently, thus the chiller constantly operates. The fan speed of the DRY cooler since October 4 is constantly 0%, thus we believe that it is malfunctioning and thus the reason for the dry's insufficient performance.

As can be seen in figures 1 & 2, the CHL0013 operation pattern differs from the rest. Its dry cooler's energies (green bars) are very low since the fan is not working, while the ones of the chiller are much higher compared to the rest of CGMs. Furthermore, as can be seen in fig. 3, the dry cooler has had the same hours as the other dry coolers, while its chiller is almost 3 times more than the second one.

Recommendations – Next steps
 Check the fan of the dry cooler CHL0013. In the meanwhile, if it is possible, turn off the CHL0013 and turn on CHL0013 which was operating till the beginning of October.



UNBERSEERAND PERSONENANBE



USE CASES

USE CASE 1

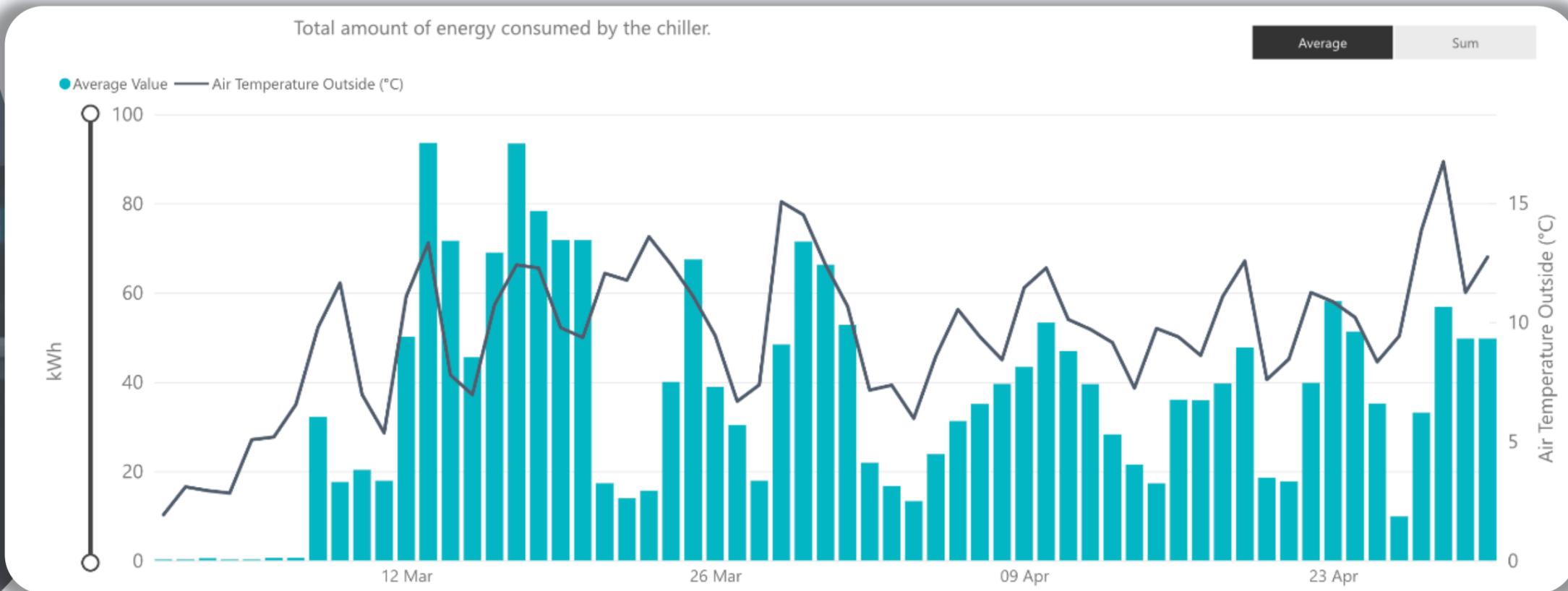
Chiller Dry cooler control

SPECS

Location	South European
Size	20 MW
Cooling plant	Chiller, Dry cooler, CRAH
Build	2022

IDENTIFY

Chiller running outside of design points (cold temperatures)



USE CASE 1

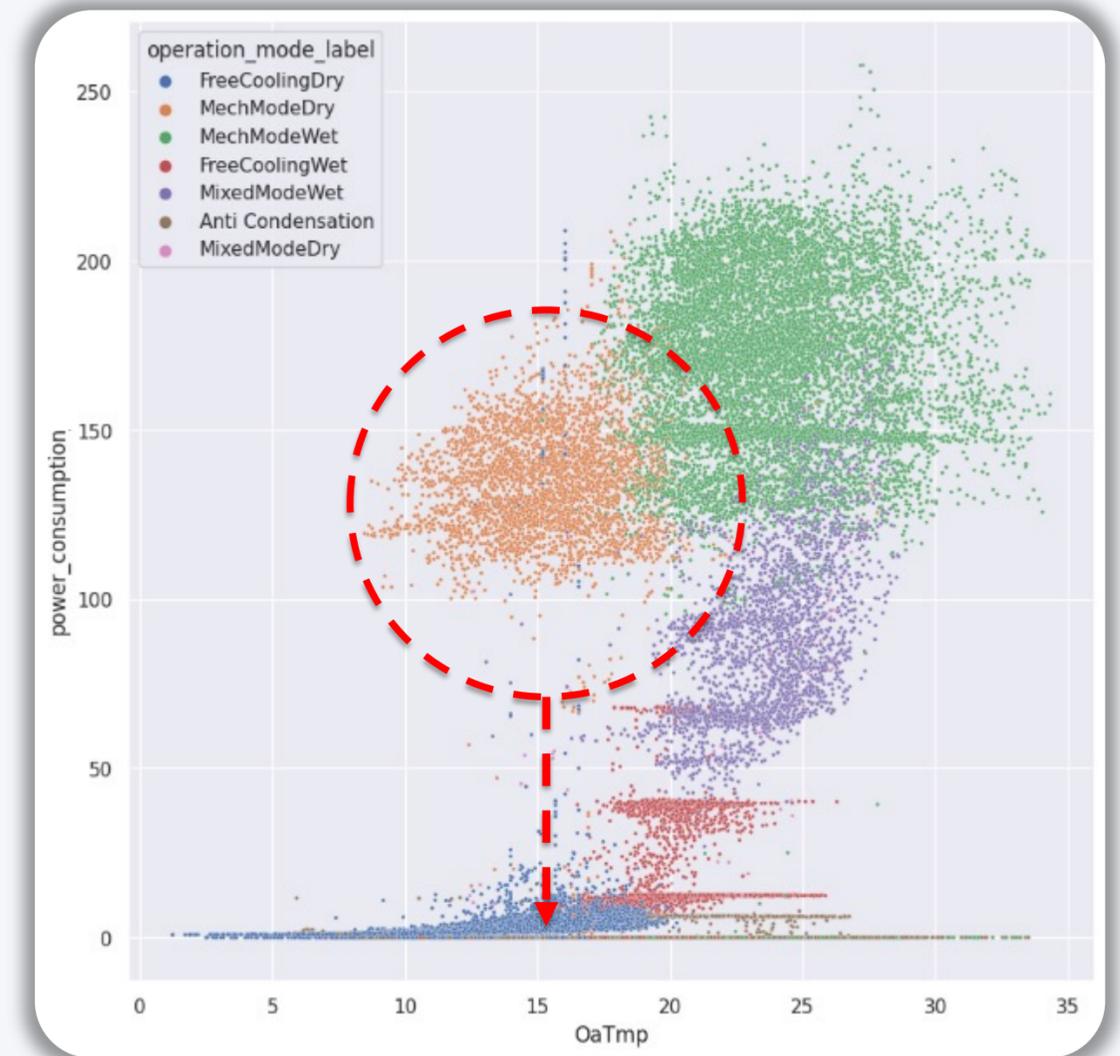
Chiller Dry cooler control

SPECS

Location	South European
Size	20 MW
Cooling plant	Chiller, Dry cooler, CRAH
Build	2022

IDENTIFY

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USE CASE 1

Chiller Dry cooler control

SPECS

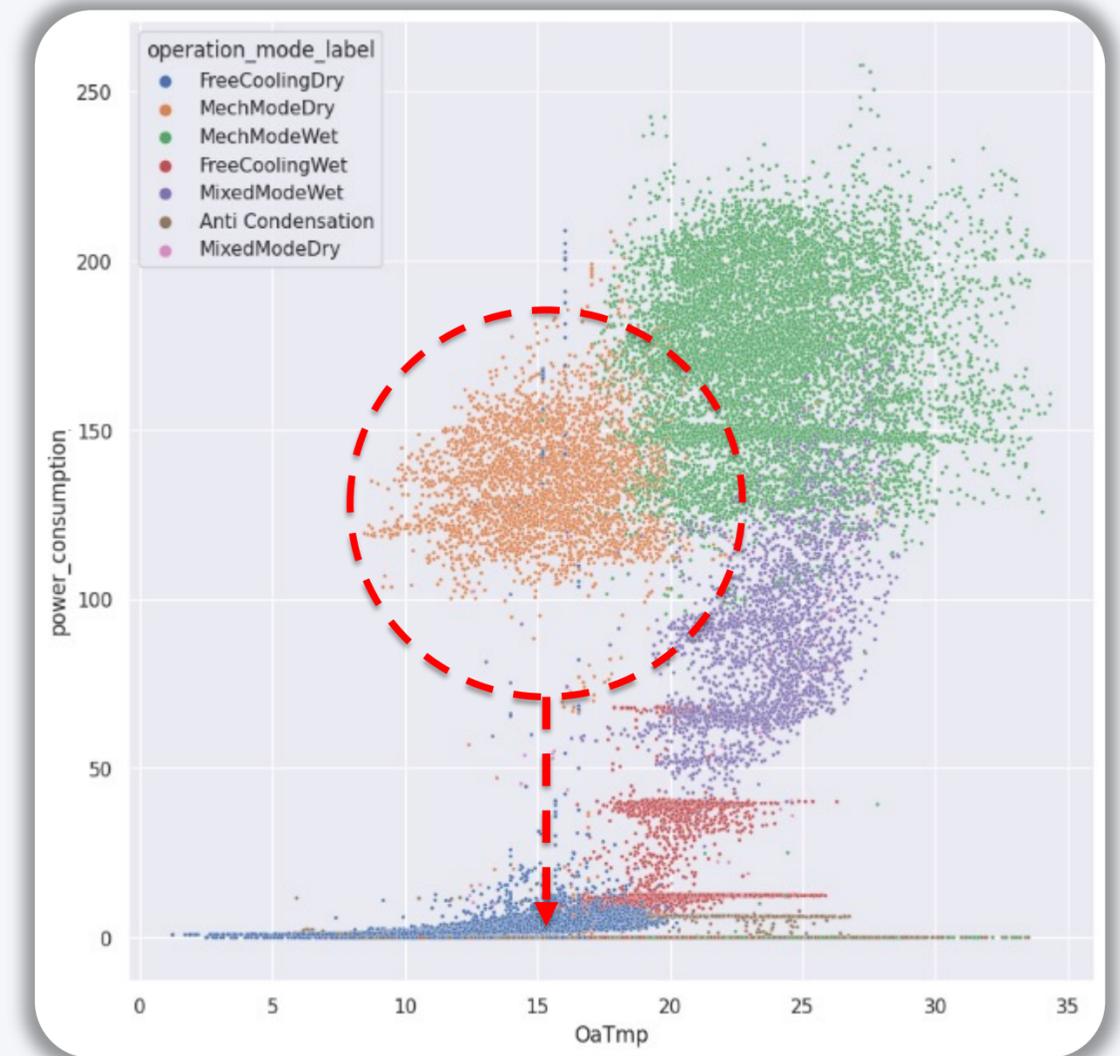
Location	South European
Size	20 MW
Cooling plant	Chiller, Dry cooler, CRAH
Build	2022

IDENTIFY

Chiller running outside of design points (cold temperatures)

QUANTIFY

1.12 GWh in last 6 months



USE CASE 1

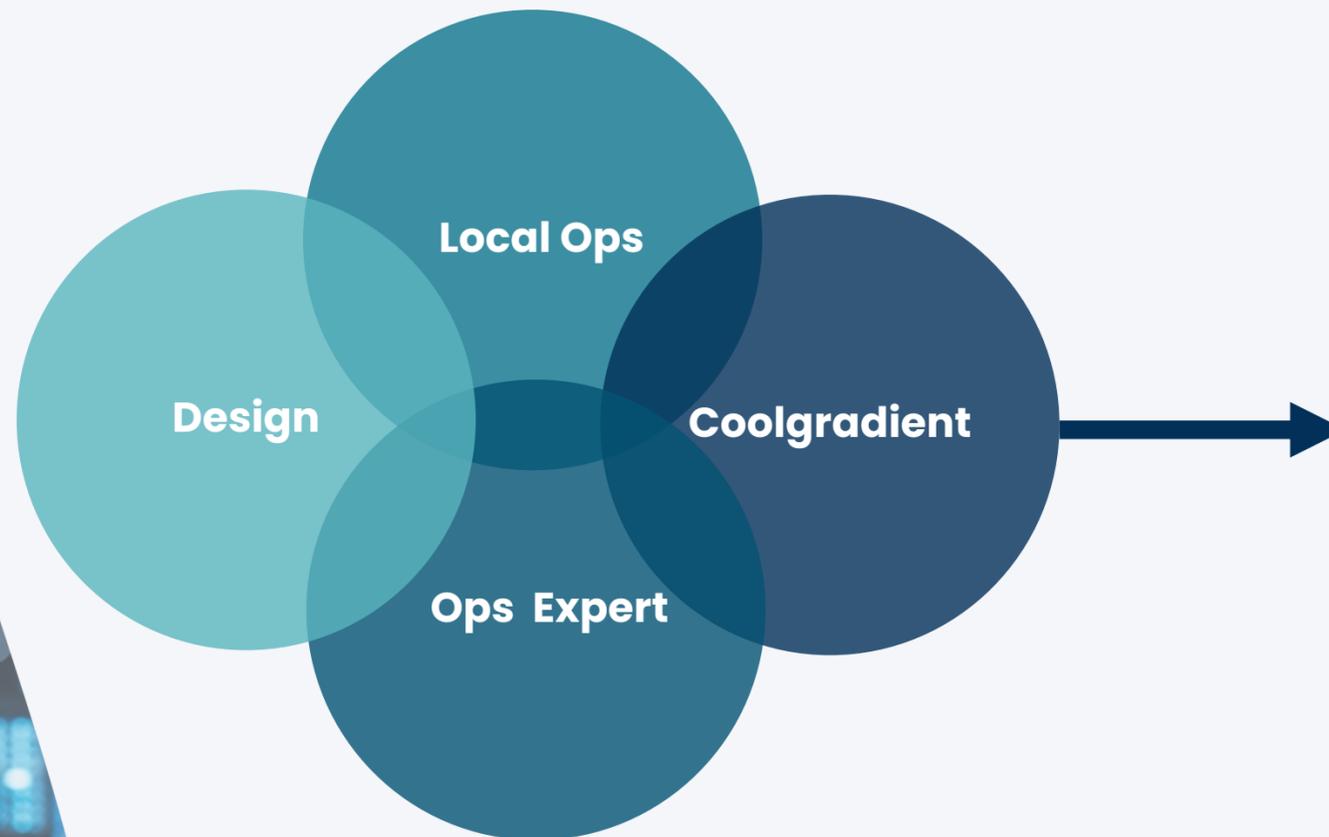
Chiller Dry cooler control

IDENTIFY

QUANTIFY

VALIDATE

IMPLEMENT



Implementation actions

- 1 Adjust differential pressure
- 2 Pump vendor change operating range
- 3 Chiller vendor change control strategy from enthalpy to temperature
- 4 Request enhanced analytics/ monitoring

 **Facility energy savings**

 **Improved reliability**

 **Employee productivity**

 **Benchmarking & PUE compliance**

USE CASE 2

PRESCRIPTIVE MAINTENANCE

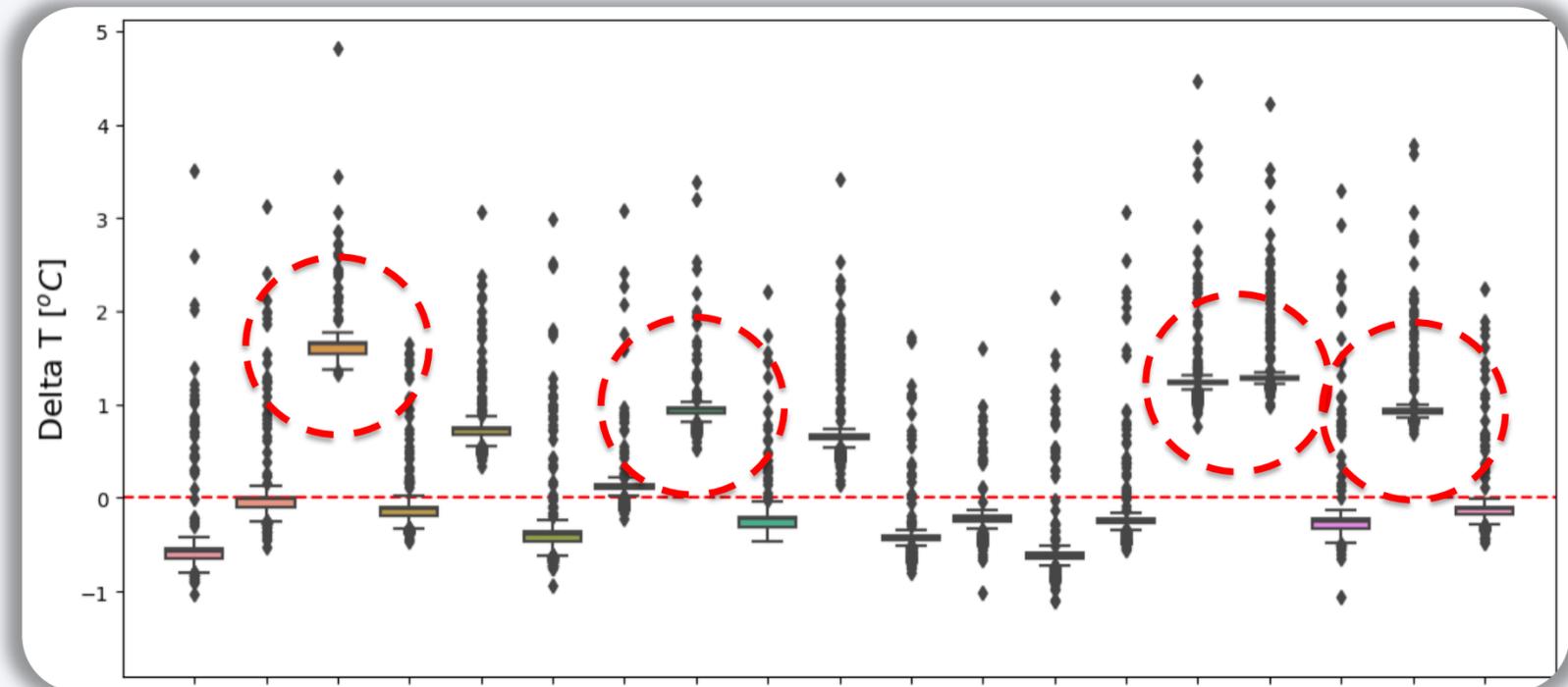
Identifying unknown issues

SPECS

Location	North European
Size	19 MW
Cooling plant	Chiller, Dry cooler, CRAH
Build	2019

IDENTIFY

Temperature difference over buffer vessel high.



USE CASE 2

PRESCRIPTIVE MAINTENANCE

Identifying unknown issues

SPECS

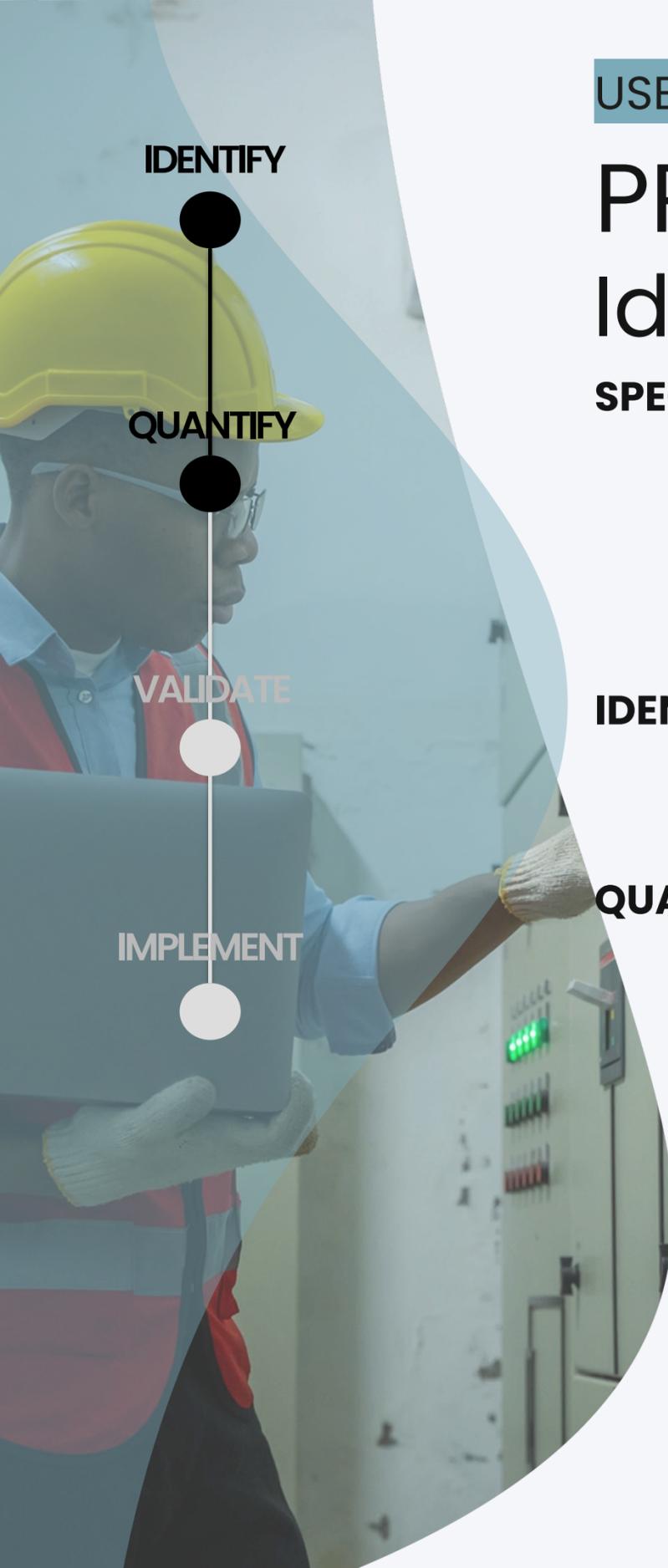
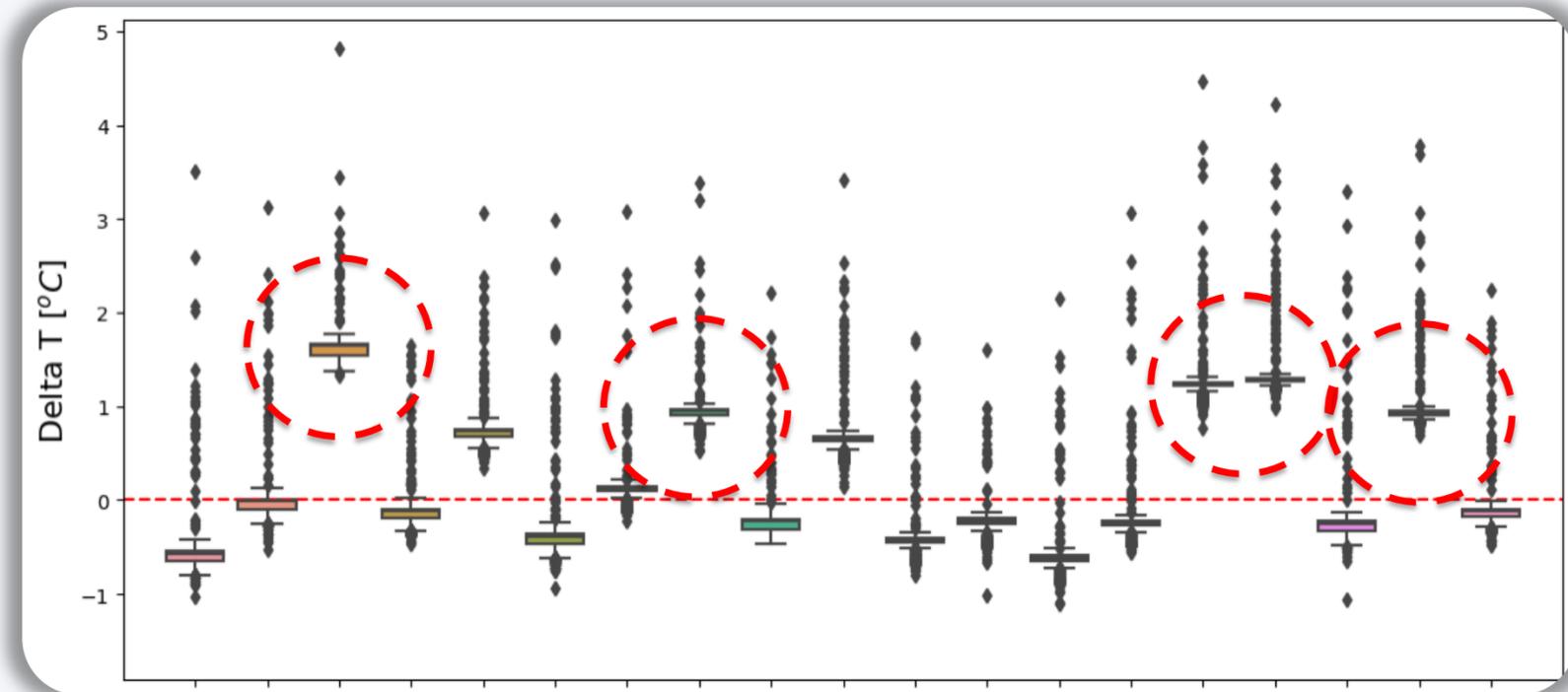
Location	North European
Size	19 MW
Cooling plant	Chiller, Dry cooler, CRAH
Build	2019

IDENTIFY

Temperature difference over buffer vessel high.

QUANTIFY

75 MWh/month



IDENTIFY

QUANTIFY

VALIDATE

IMPLEMENT

USE CASE 2

PRESCRIPTIVE MAINTENANCE

Identifying unknown issues

SPECS

Location	North European
Size	19 MW
Cooling plant	Chiller, Dry cooler, CRAH
Build	2019

IDENTIFY

Temperature difference over buffer vessel high.

QUANTIFY

75 MWh/month

 **Facility energy savings**

 **Improved reliability**

 **Employee productivity**

 **Benchmarking & PUE compliance**



USECASE 3

ASSET OPTIMIZATION

SPECS

Location	North European
Size	15 MW
Cooling plant	Chiller, Dry cooler, CRAH, well cooling
Build	2015

IDENTIFY

Inefficient and non-optimal use of CRAHs

USECASE 3

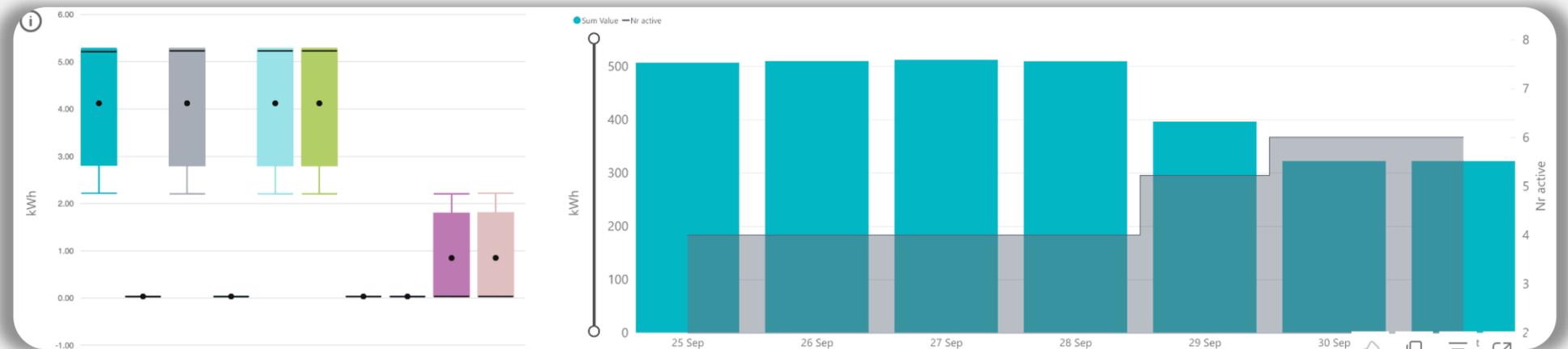
ASSET OPTIMIZATION

SPECS

Location	North European
Size	15 MW
Cooling plant	Chiller, Dry cooler, CRAH, well cooling
Build	2015

IDENTIFY

Inefficient and non-optimal use of CRAHs



USECASE 3

ASSET OPTIMIZATION

SCALING

EFFORTLESSLY

Location

North European

Size

15 MW

Cooling plant

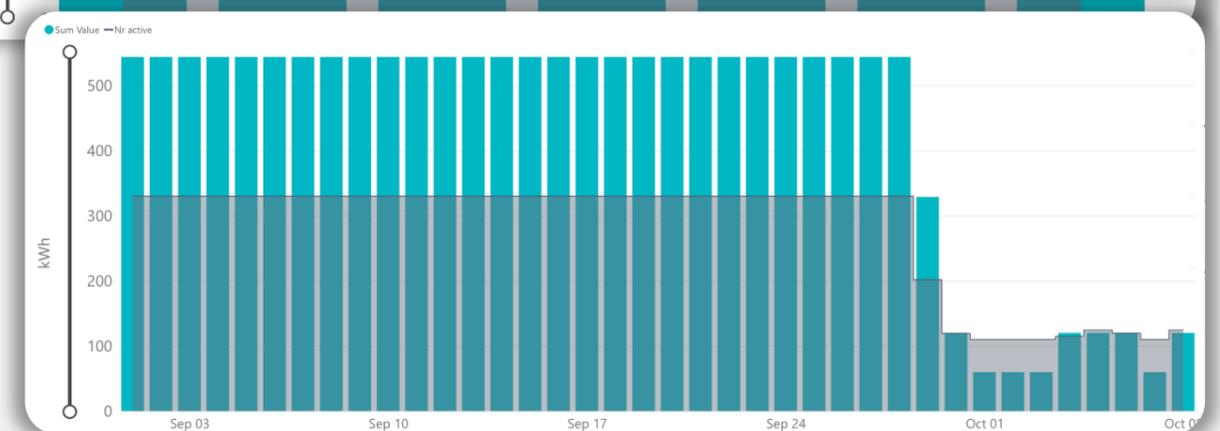
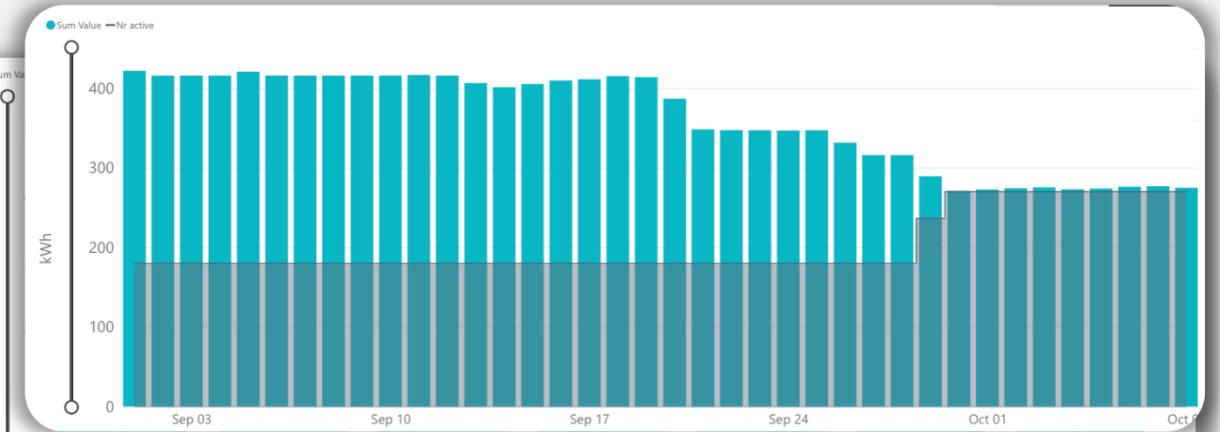
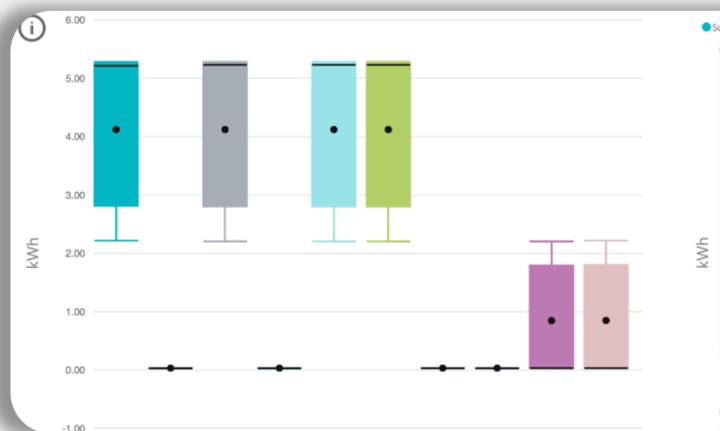
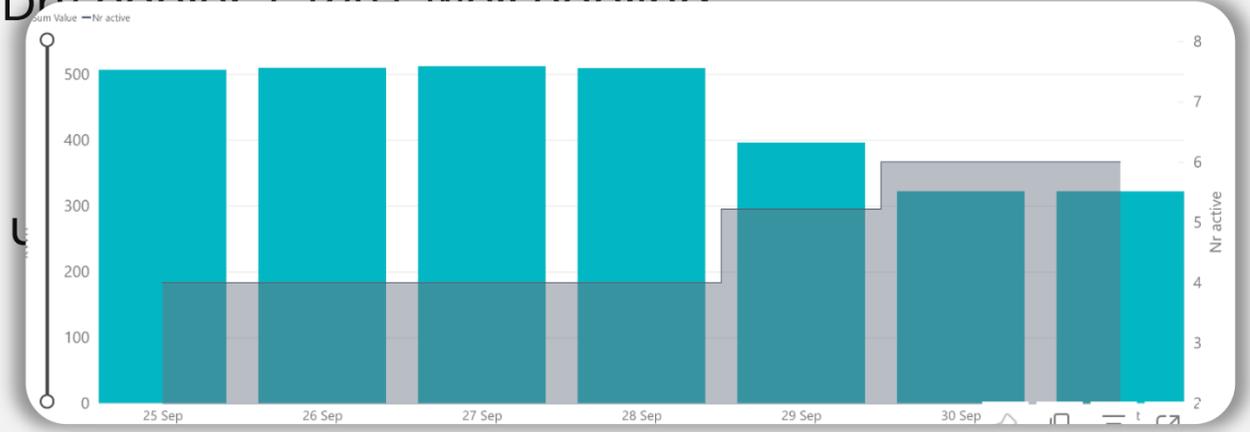
Chiller, Dry cooler, CRAC, well cooling

Build

2015

IDENTIFY

Inefficient and non-optimal u



USECASE 3

ASSET OPTIMIZATION SCALING EFFORTLESSLY

QUANTIFY 175MWh/year

IDENTIFY

QUANTIFY

VALIDATE

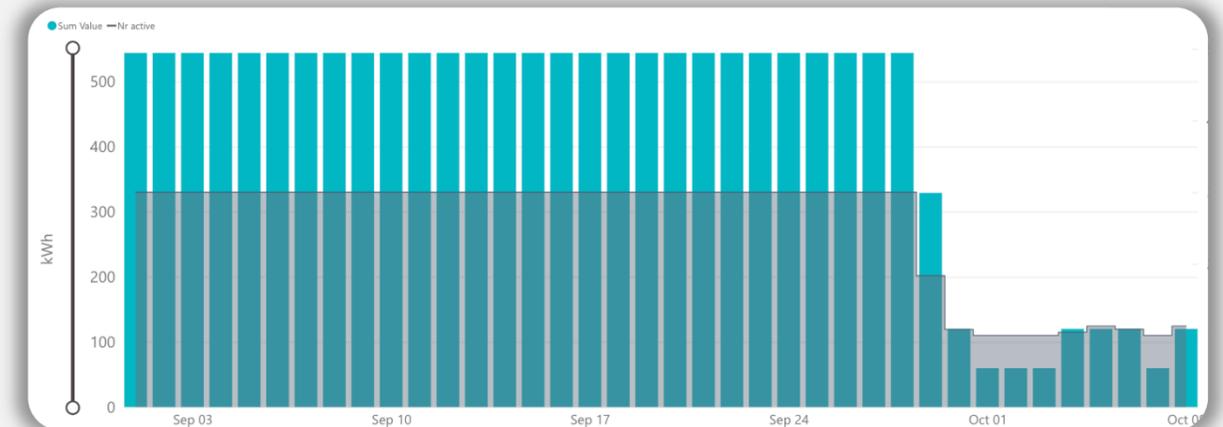
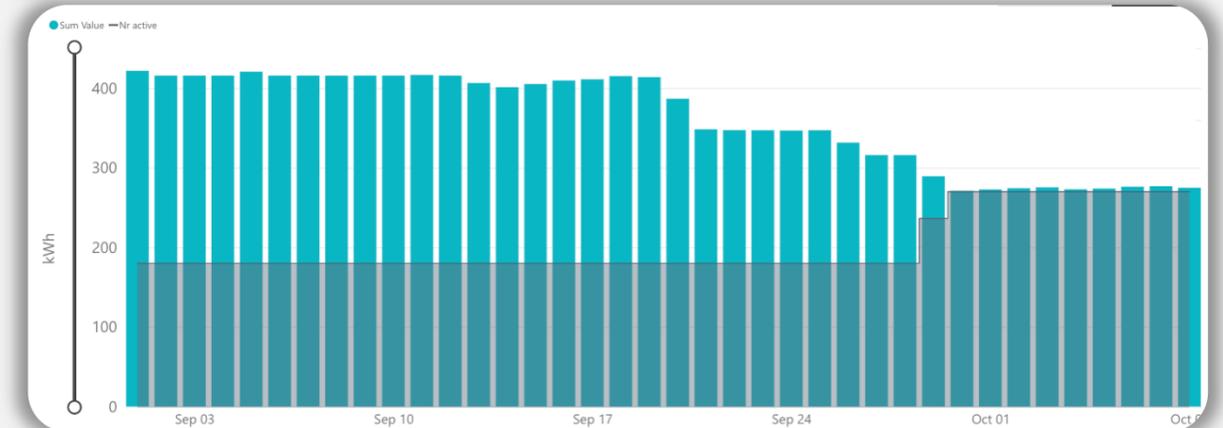
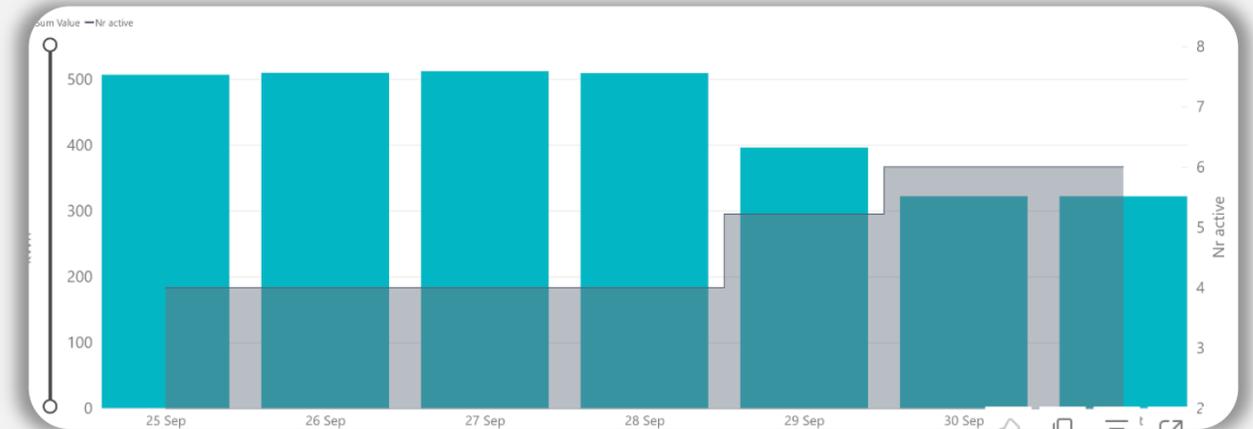
IMPLEMENT

 **Facility energy savings**

 **Improved reliability**

 **Employee productivity**

 **Benchmarking & PUE compliance**



USE CASE 4 - ASSET RATIONALIZATION

ASSESSING CHILLER PERFORMANCE FOR REPLACEMENT INVESTMENT DECISION



SPECS

Location	North European
Size	12 MW
Cooling plant	Chiller, Dry cooler, CRAH
Build	2012

IDENTIFY

Chiller performance given their operating context and physical location on the roof.

ASSESSING CHILLER PERFORMANCE FOR REPLACEMENT INVESTMENT DECISION

OUTCOME

Table with all Chillers (y-axis) and their **performance rank** through time, from 2018 to 2022 (x-axis)



1

This Chiller's performance shows a **clear decline in ranking** over time (despite maintenance) and *could* be **replaced**.

2

The performance of this Chiller is **not very good, but quite stable**. This Chiller is actually in the middle and confirms its performance is **related to its physical location**. The impact of Replacement could be limited.

3

The performance of this Chiller actually **improved after maintenance**. Because of its impact, this **maintenance** could qualify as a **best practice measure**.

HOW TO START

IT ALL STARTS WITH DATA

1 Understand

2 Match

3 Identify

4 Collect

FLEXIBLE AND ADAPTIVE AI MODELS

PLATFORM WORKS IN ANY DATA CENTER

NEW → **LEGACY** → **RETROFIT**

300,000 DATA POINTS → **8,000 DATA POINTS**

CHILLERS → **COOLING TOWERS** → **RIVER COOLING** → **DX** → ...

“ AI is well-suited for the data center environment given the complexity of plant operations and the abundance of existing monitoring data. ”

THE TESTIMONIALS

“This is the future of data center design and operations”

Current users are raving about the possibilities of this platform.

ENERGY & SUSTAINABILITY DIRECTOR

“It's really impressive what you have made, I can't wait to get to work with these tools.”



COUNTRY DIRECTOR OPERATIONS

“This is what I wanted years ago.”



SENIOR MECHANICAL ENGINEER

“The findings can be used in the *design of new data centers as well as in optimization of old designs*. In new data centers floating set points can be implemented and optimized with AI.”



DC OPERATIONS PROJECT DIRECTOR

“When can we have this?!”



PUE MANAGER

“For new site managers, it *would be good to train them from day one* with the recommendations we see here.”



SR. DIRECTOR CAPACITY & ENERGY

“I really like it!”





Coolgradient.com



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