Simple, Powerful, Fast.

Visibility on building performance

Demand Logic for a fitter building

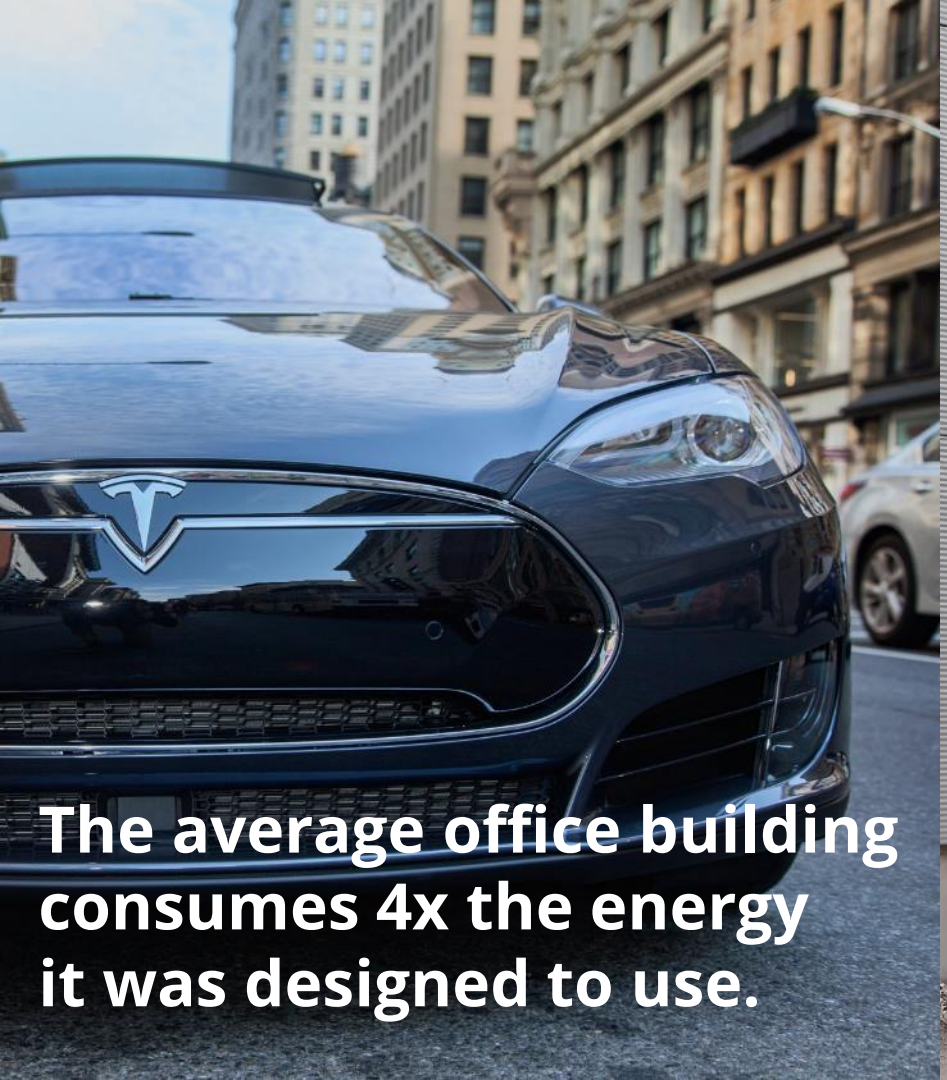
Demand LOGIC

Why Demand Logic? Simple.

- Big buildings are generating vast amounts of data
- Complexity is increasing
- Facilities management is being transformed
- We provide simple, powerful, fast speed to insights
    - Reduce Energy by 10-30%
    - Halve Comfort complaints
    - Use Maintenance time more effectively

A Fitbit for Buildings

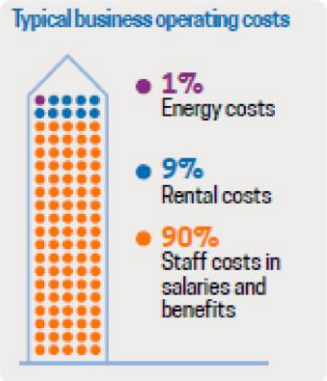
Demand LOGIC



The average office building consumes 4x the energy it was designed to use.

Employee productivity
is heavily affected
by building controls.

Workplace Management



Effective temperature control can improve productivity by 2% for each 1°C too hot and 4.7% for every 1°C too cold.

Air quality can improve productivity by 8-11%

Source:
Health, Wellbeing & Productivity in Offices, UKGBC, 2016
Cost benefit analysis of the night-time ventilative cooling in office building, Lawrence Berkeley National Laboratory & Helsinki University of Technology, 2003

We give you visibility into commissioning performance

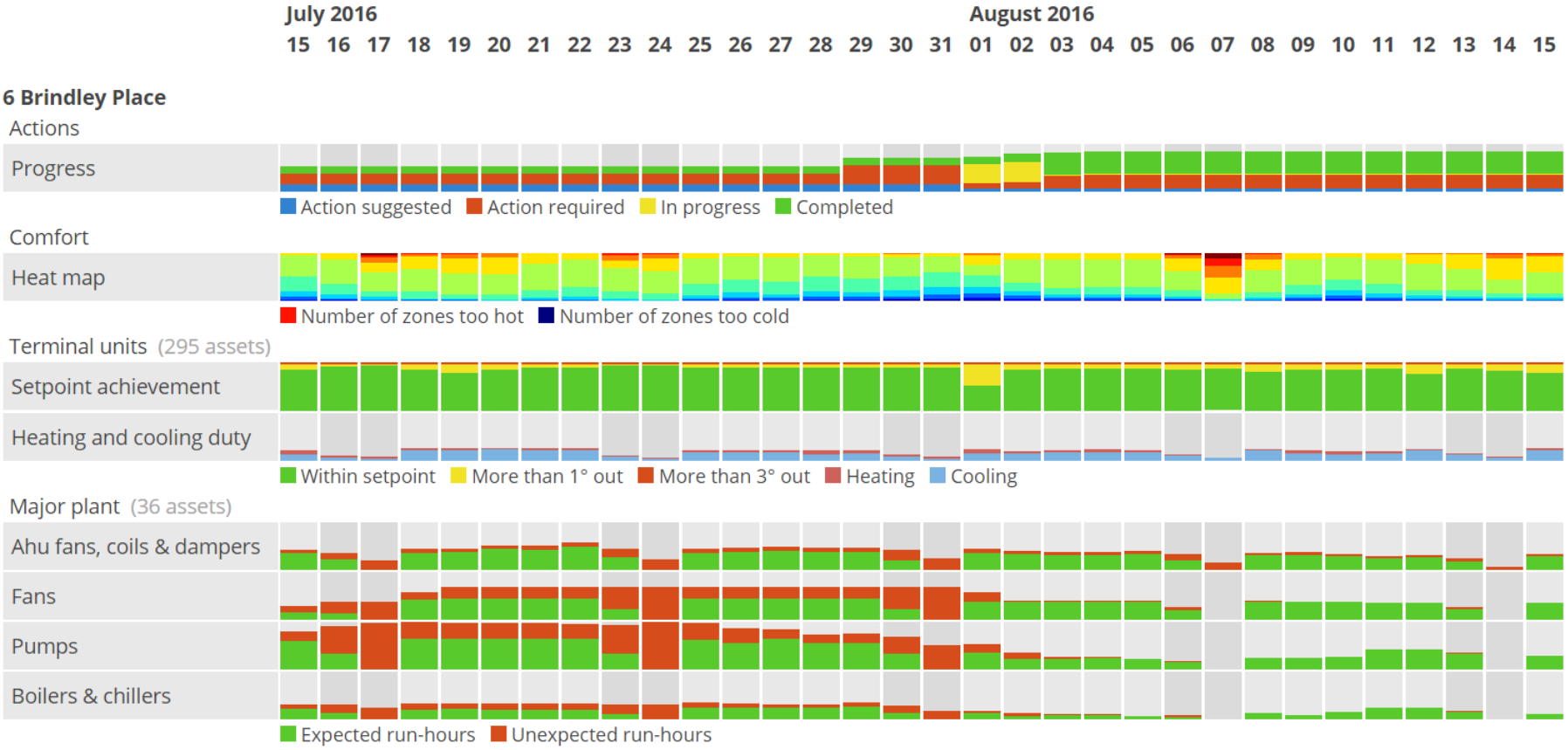
We optimise existing buildings, old and new.

We show you how your buildings are performing

		Area	Activity	Actions	Productivity	Maintenance	Energy	DL Score	+/-
1	**Building A**	9,216	6	18	99.2	98.5	88.7	**95.5**	↓0.8
2	**Building B**		0	2	99.9	99.5	85.3	**94.9**	↓0.4
3	**Building C**	10,819	0	39	99.8	99.6	80.3	**93.2**	↑0.7
4	**Building D**	5,873	0	16	99.2	98.2	82.0	**93.1**	↑9.9
5	**Building E**	23,079	11	32	99.6	95.5	83.7	**92.9**	↑2.1
6	**Building F**	25,470	3	16	99.8	96.8	81.2	**92.6**	↑0.5
7	**Building G**	6,534	0	1	99.7	96.0	81.1	**92.3**	→
8	**Building H**	33,369	0	5	99.5	98.5	72.0	**90.0**	↑14.8
9	**Building I**		0	0	87.6	97.5	77.1	**87.4**	↑0.3
10	**Building J**	15,932	0	8	98.4	91.2	71.4	**87.0**	↑1.6

Rapid, Powerful Transparency

Eagle Eye view into a building's performance



Collaboration Platform.

Move from casual chat to formal action log.

Nick MacdonaldSmith re: Blk C AHU 3 Extract (Plant/Asset)
BT
AHU3 extract shows no operation - is this correct?
04/04/2016

Nick MacdonaldSmith *changed status to* **Action suggested**
04/04/2016

Nick MacdonaldSmith *changed owner to* **Ian Shaw**
04/04/2016

Ian Shaw *changed status to* **Action required**
The BEMS On Status (Binary Input): Blk C AHU 3 [46] > Extract Fan Status (--) [I4] is not changing state as would be expected with the operation of the fan. This is most likely a air flow switch which requires attention, or perhaps the unit is switched off.
Last Friday at 11:39

Ian Shaw *changed owner to* **John Houghton**
Last Friday at 11:39

Write a reply ...

Actions

Download Show 10 entries Search:

Subject	Description	Account	Action Status	Last Activity	Owner	Annual Saving (£)
CMK Tesla BMS Optimisation	Tesla BMS optimisation including control investigations into boilers,		Completed	2015-03-27	Tyrone Mawing {DemandLogic}	155,347
PG1 chiller sequencing	The chiller sequencing has been improved. This report gives estimated savings		Completed	2013-11-15		111,575
Triton Square (Gas) Tesla BMS Optimisation	Tesla BMS optimisation including correction of boiler controls, implementation of		Completed	2015-06-18	Tyrone Mawing {DemandLogic}	70,616
Bradford Tesla BMS Optimisation	Tesla BMS optimisation incl. boiler and AHU start review, AHU weekend operation		Completed	2015-04-02	Tyrone Mawing {DemandLogic}	53,302
Shenley Wood Tesla BMS Optimisation	Tesla BMS optimisation incl. review of chiller, AHU and boiler runtimes, and		Completed	2015-05-13	Tyrone Mawing {DemandLogic}	35,177
25 Churchill place - Air Handling Units (MPW)	This view shows a number of AHUs / Fans were enabled through the night		Completed	2015-11-17	Tony Box {Canary Wharf Management - 25 Churchill Place}	26,750

FM team collaboration
with contractors & tenants

Action Tracking
for maintenance, energy and comfort

Rapid insight into occupant comfort.
Sensors & Assets Level Monitoring.

Demand LOGIC

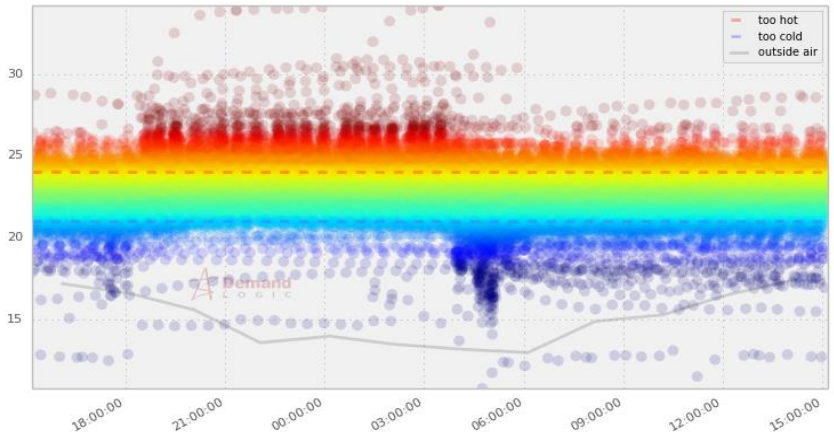
How many spaces are comfortable at the moment?

Too hot	Too cold	Comfortable
173 spaces	104 spaces	717 spaces

Snapshot taken at 2015-07-28 15:10:02+00:00

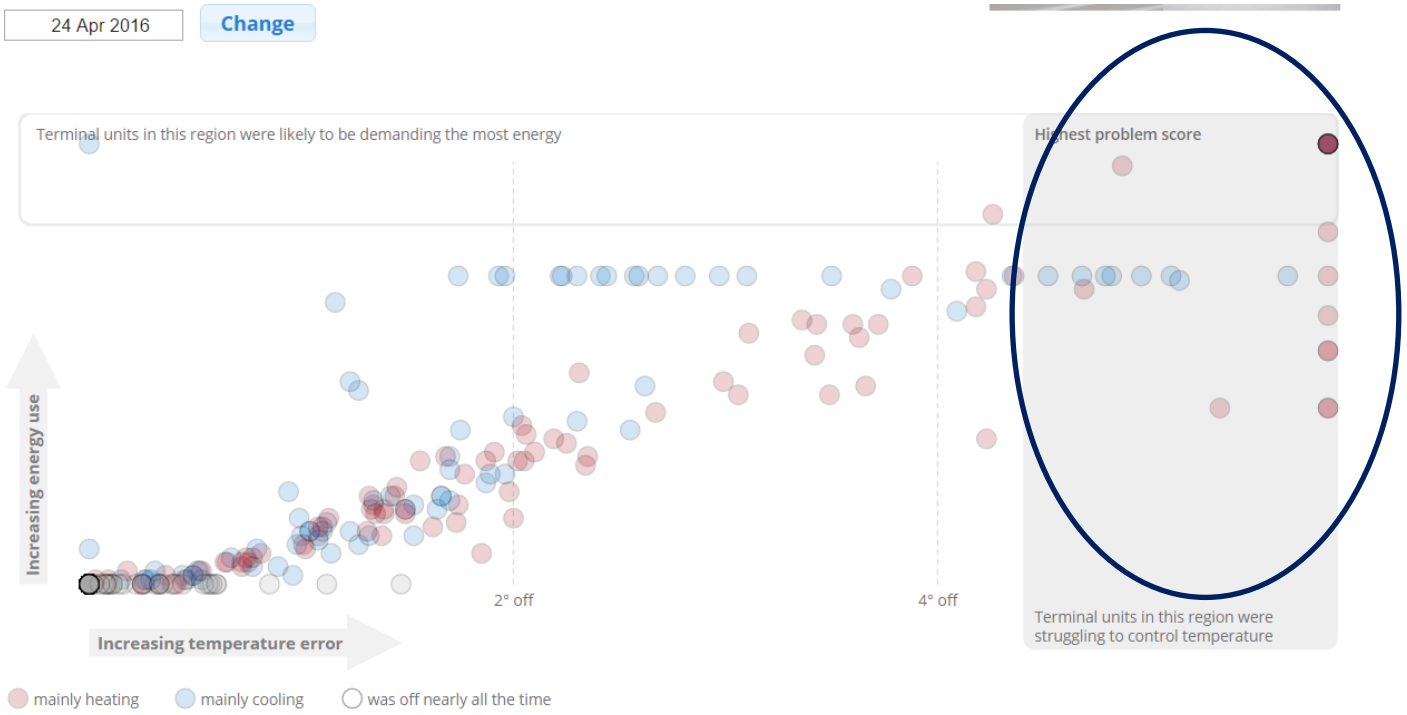
Thermal profile over time

Look for excessive dark red or blue areas above or below the dotted lines. These indicate times when many spaces were at an uncomfortable temperature. Each temperature sample is shown as a pale circle in a hot or cold colour, depending on the temperature.



Measure comfort and productivity
in the workplace

Rapid insight into exceptions.
Sensors & Assets Level Monitoring.



VAV boxes Results (Total: 561 assets)

Equipment monitoring
for validation, maintenance and optimisation

Surface energy wastage

Visibility into out of hours operation

Energy wastage
from major and minor plant

Plant

- Chillers
- Boilers
- Ventilation plant / AHUs
- Terminal units / FCUs
- Pumps
- Meters
- Lighting
- UPS / Battery

Users

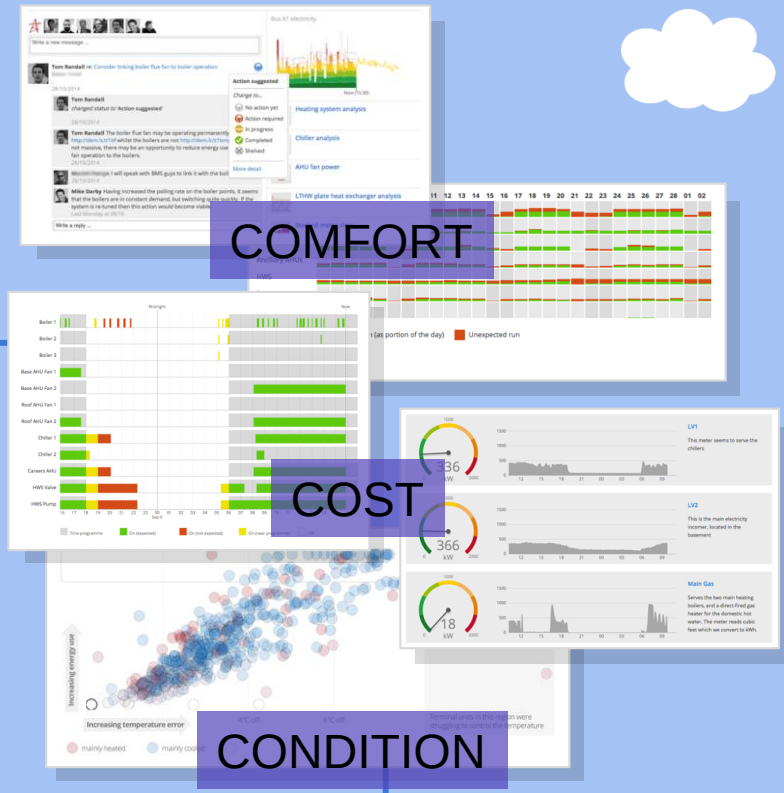
Owner
Occupants
Facility Manager
Energy Manager
Building Services

Insights

Building Management System (BMS)

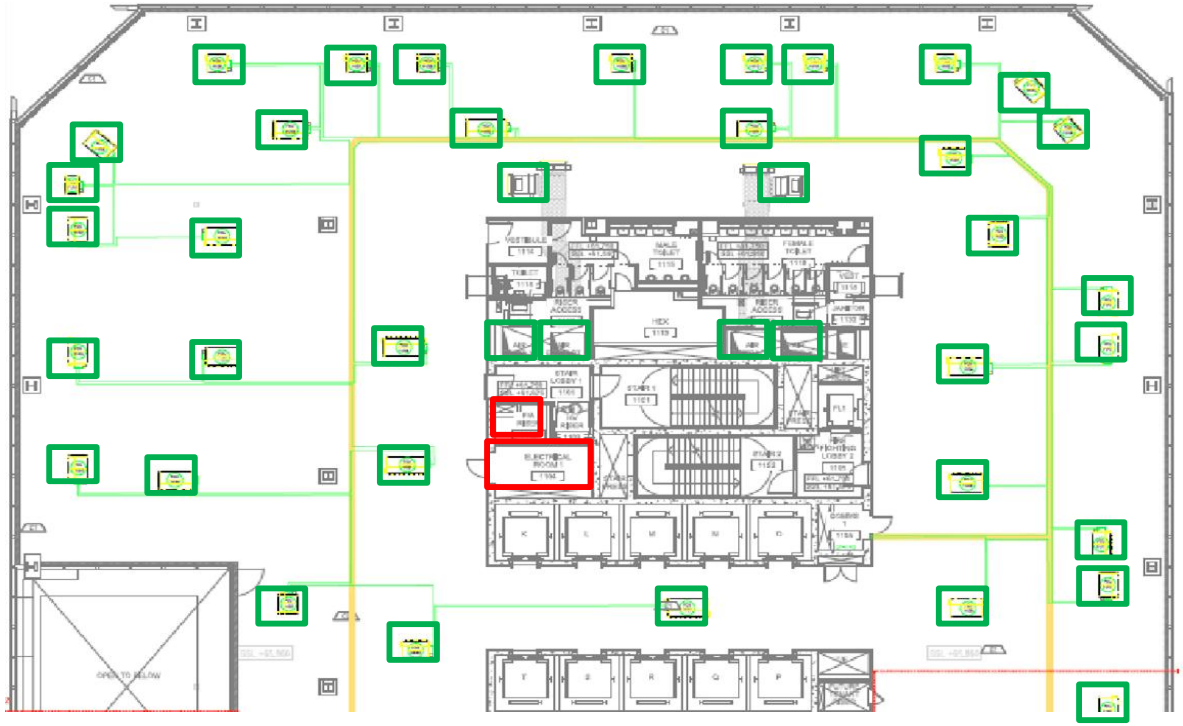
Single Data Acquisition Device (DAD)
~20 min. install

Data



Demand LOGIC

We use what you have to give you a better view

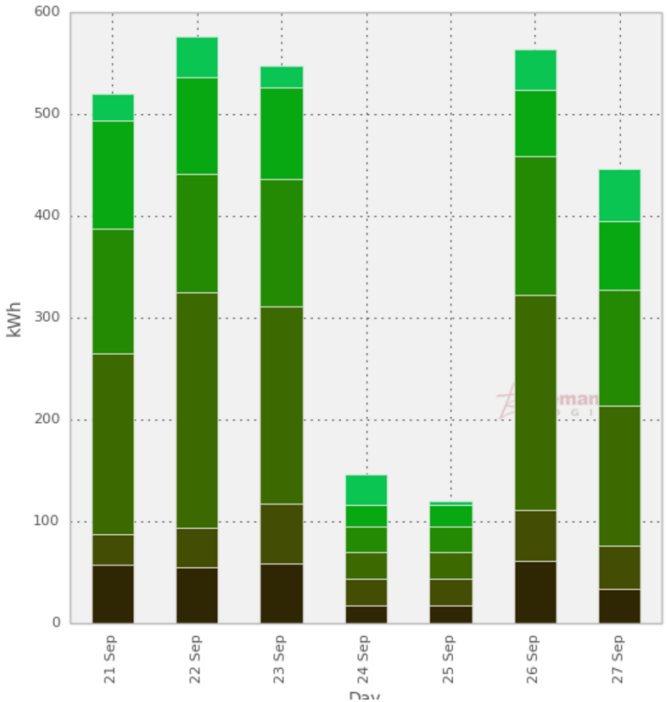


HVAC equipment

Sub meters

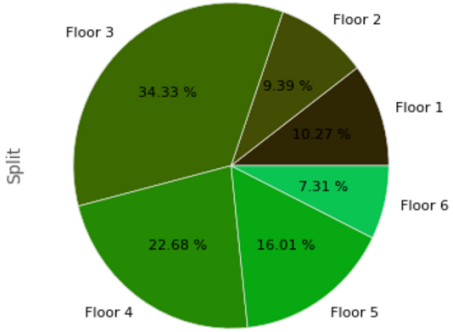
No capital metering

Total by floor



Metering resources

virtual metering of equipment and bespoke views



Awards:

Ashden Awards for sustainable energy

2015 winner

Canary Wharf Cognicity Challenge

Winner of 'cohort 2' on building management

Clean and Cool Mission 2015

Selected as one of UK’s most promising and innovative cleantech SMEs

Technology Strategy Board

Future energy management for buildings - winners

Demand LOGIC

“50% reduction in comfort complaints”

Corporate HQ

“2 month payback from energy savings”

UK bank

“Change the way we manage our buildings”

Property Company

“Speed of deployment was overnight”

FM contractor

“Reduce maintenance time by up to 50%”

Market uptake

Demand LOGIC

Corporate

BT, Capgemini, EY, FT, RBS The Royal Bank of Scotland, ROTHSCHILD, Santander

Property

CANARY WHARF GROUP PLC, THE CROWN ESTATE, LandSecurities, M&G REAL ESTATE, TH Real Estate

Public Sector

UNIVERSITY OF CAMBRIDGE, UCL, UNIVERSITY OF OXFORD, RA Royal Academy of Arts, Salford Royal NHS Foundation Trust, Transport for London

Managing Agents

CUSHMAN & WAKEFIELD, BNP PARIBAS, CBRE, JLL, savills, Colliers INTERNATIONAL

Other Partners

ARUP, mace, Optimum., sse Enterprise, TREND, Verco, VITAL EFFICIENCI

Customer quotes

- “**Simple** but Powerful”
- “Beauty of the platform is the visibility”
- “Does what it says on the tin”
- “It gives you the ability to go off and ask those questions”
- "The speed of deployment on one of our sites was overnight. Compared to other providers, the system is **simple, effective and straightforward** and it makes both us and our tenants feel more comfortable that our building systems are being run properly.“

Case Study http://dem.lc/bbp

Demand LOGIC

CANARY WHARF GROUP PLC

THE CROWN ESTATE

LandSecurities

M&G REAL ESTATE

TH Real Estate

Transport for London

Case Study:
Building Analytics
Effect on Facilities Management

Trial summary

3 months of service during winter period

Savings estimated at £16,000 or 6% of annual energy consumption

Meter data verifies estimated savings

Additional savings expected during summer months

Maintenance prioritised based on plant condition

Well-being and productivity benefits also realised

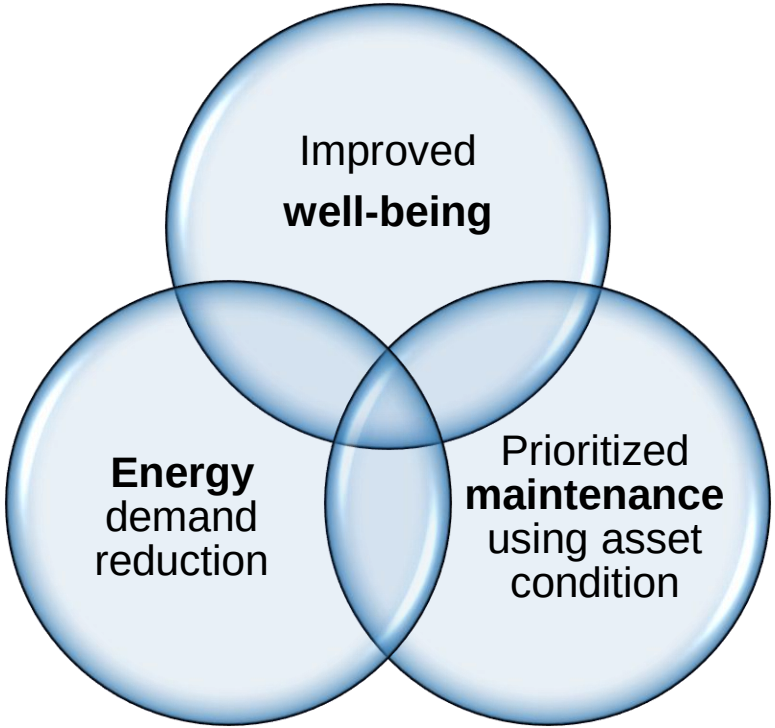
Building Management Transition

Present		Future
Opaque		Transparent
Antagonistic		Collaborative
Complaints driven		Data driven
Reactive		Proactive
Silo		Accountable
Rigid		Flexible
Disparate		Connected

Building Analytics

Benefits of Building Analytics

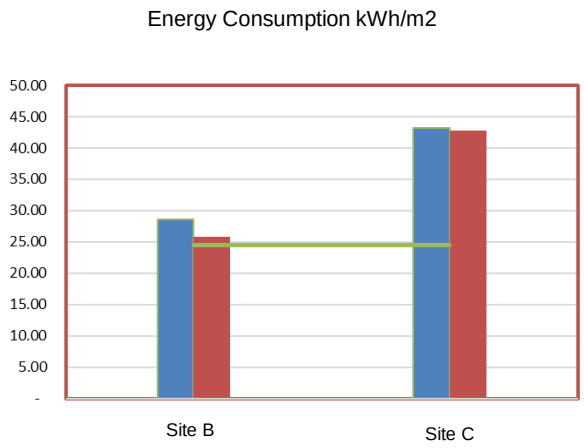
- Reduced operating costs
- Better customer service
- Increased staff productivity
- Better use of engineers' time

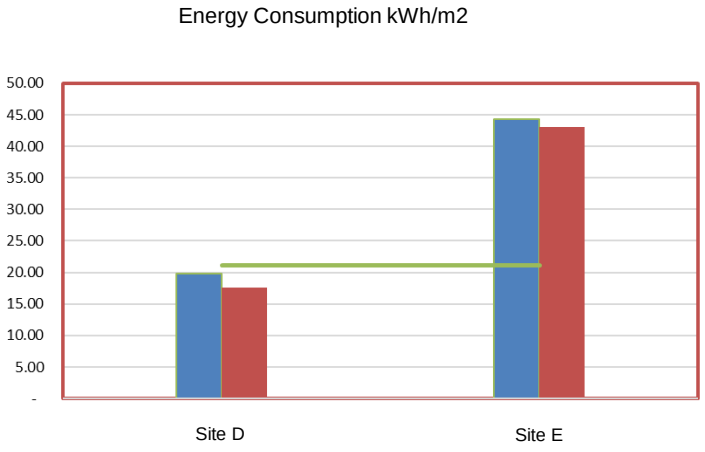


- Better visibility of asset condition
- Tackle defects early
- No operational energy audits
- Identify capacity constraints

Building analytics also used for **commissioning validation** for new buildings and retrofits.
Due diligence and dilapidation reporting for property acquisitions.

Site A vs Additional Sites

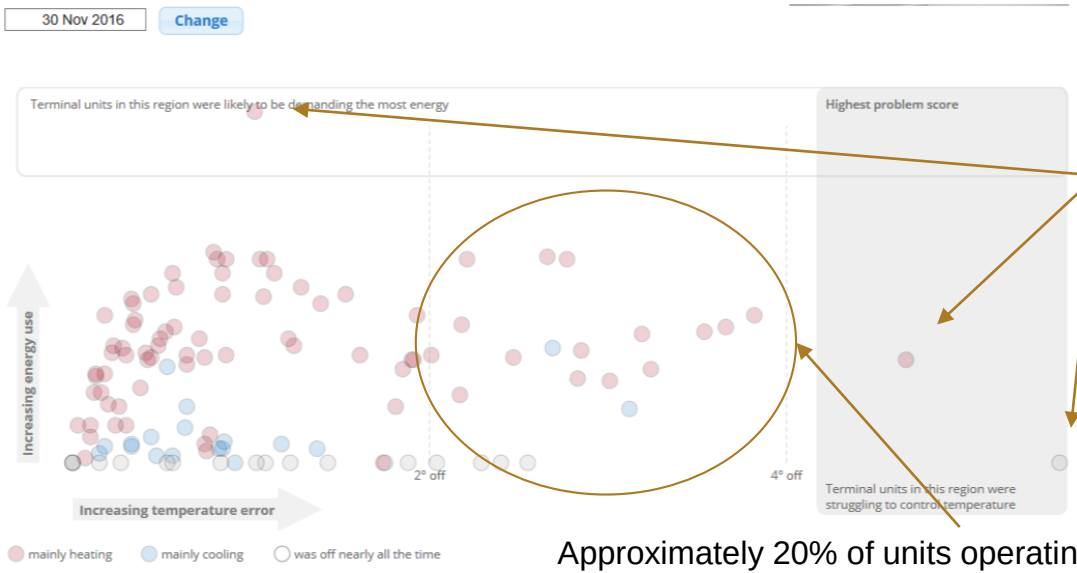




Feb-16 Feb-17 Benchmark

- Site A energy consumption is similar to a *typical* benchmark office.
- FM anticipated finding further energy savings would be a challenge for any analytics product.
- The Demand Logic trial has identified a 6% reduction in energy with the further potential to identify more seasonal savings over the summer months when some plant would be expected to run harder, likely to double savings to over 12%.
- Site A represents 14% of total energy consumption of Portfolio Y's key sites.
- FM has also encouraged a cultural change to a proactive approach to maintenance.

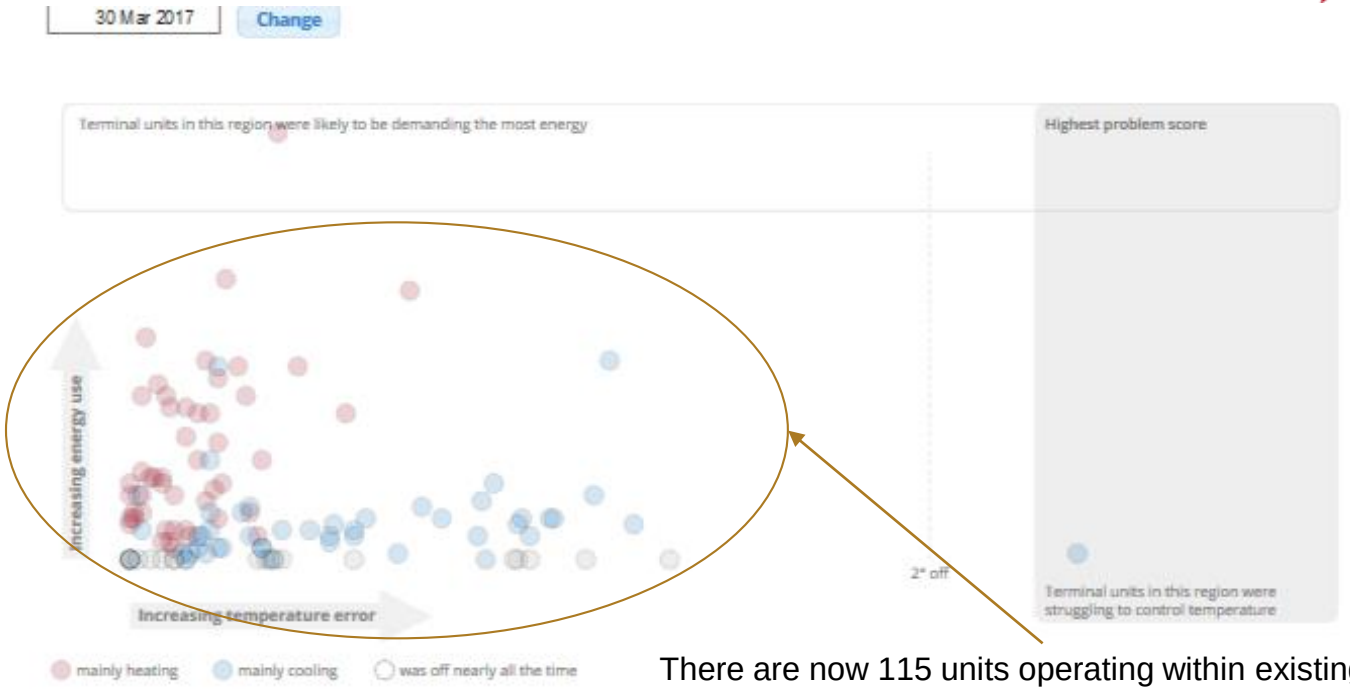
Site A – Before trial in Nov 2016



Most units are performing well and these are three exceptions requiring maintenance – each circle represents a terminal unit and these are poorly performing units based on temp control and energy use.

Approximately 20% of units operating between 2-4 degrees off of their control temperature which is on the border of an acceptable norm for control thresholds.

Site A – after trial in March 2017



There are now 115 units operating within existing parameters with only 2 exceptions, down from 23, resulting in both comfort and energy savings.

Comfort Tracking

Comfort - 121 King's Road - block C comfort

The date range for this view is limited to 14 days

Start 15 Mar 2017 00:00 End 16 Mar 2017 00:00 Change Load last 24 hours

Wednesday 15 March 2017

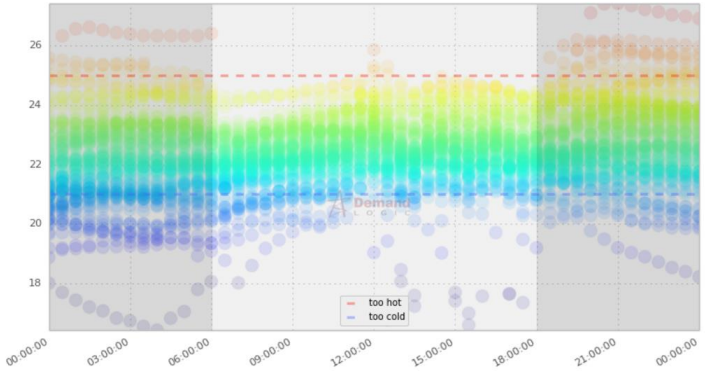
How many spaces were comfortable on average?

Too hot	Too cold	Comfortable
0	7	108
spaces (0%)	spaces (6%)	spaces (93%)

(Average number of spaces during **occupied** times)

Thermal profile over time

Look for excessive dark red or blue areas above or below the dotted lines. These indicate times when many spaces were at an uncomfortable temperature. Each temperature sample is shown as a pale circle in a hot or cold colour, depending on the temperature.



Site A Trial findings

1. 7,632m^2 NIA across blocks B & C with 1119 staff

2. >16,000 data points including temp, humidity & air quality were used in the trial to cover energy, maintenance & comfort

3. All plant data logged in real-time & accessible online for collaboration between Client, FM, specialist suppliers and Demand Logic

4. 61 opportunities for improvement were identified & addressed in first 3 months. Examples include:
    - Plant running out of normal hours
    - Simultaneous heating and cooling
    - Legacy & comfort issues identified
    - Damper faults (i.e. stuck open)
    - Prioritising terminal unit maintenance based on condition and impact

The following example is a proactive Fix during trial

1. On the next page is an actual example of a repair from the trial involving FM, Demand Logic & Contractor
2. The issue was out of hours operation of two large AHU supply & extract fans
3. On the next page the green/red bars show the plant operating out of hours and the conversation thread on the right shows the collaboration between the different users
4. Demand Logic analysis was used by FM to identify this plant operating for extended hours
5. This was assigned via the Demand Logic platform to the BMS controls specialist who made a change to the BMS programming
6. An estimate of savings has also been calculated based on this monitoring and plant rating information

Jeremy Smith re: Block C - AHUs (MPW)
121 Kings Road
Energy: 2 Maintenance: 2
Site team to review running hours of block C plant. Entrance hall fan and CZ4 VAV supply fan appear to be running outside of normal running hours.
12/12/2016 (Last Friday at 11:35)

Jeremy Smith *changed status to* **Action suggested**
12/12/2016

Jeremy Smith *changed status to* **Action required**
changed owner to **Alan Hall**
28/02/2017 (28/02/2017)

Alan Hall *changed status to* **Action suggested**
changed owner to **Marc Baker**
06/03/2017

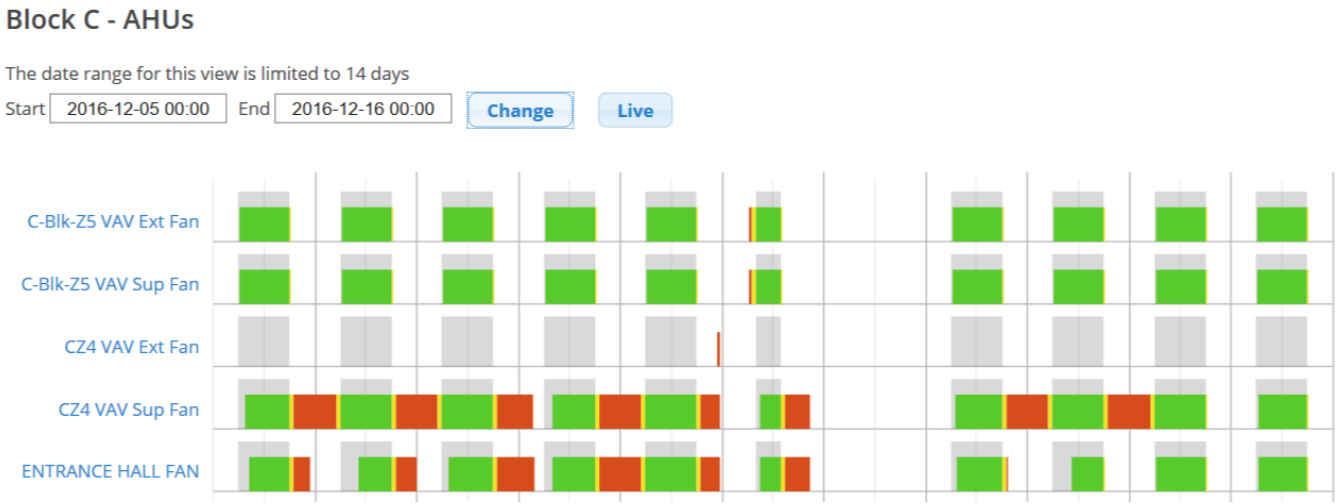
Jeremy Smith *changed status to* **Action required**
changed owner to **Alan Hall**
Some of the AHU fans are running outside their normal operating hours. Please can you check and adjust
07/03/2017 (08/03/2017)

Alan Hall *changed owner to* **Marc Baker**
17/03/2017 (17/03/2017)

Marc Baker *changed status to* **Completed**
Investigated issue Identified that all controllers in Zone 4 had been removed from their diary groups and had mismatching time schedules collated and re-added controlees to diary groups as appropriate downloaded correct time schedules issue resolved
Last Wednesday at 13:47 (Last Wednesday at 13:47)

Write a reply ...

Collaboration Example



- The dashboard above shows the VAV Supply Fan in Block C Zone 4 is running for extended hours. The Extract Fan is also running.
- The two fan ratings of 75kW and 37kW.
- Reduction in operational time of 70 hours per week.

- Saving calculated at £8,500 per annum from this single example.

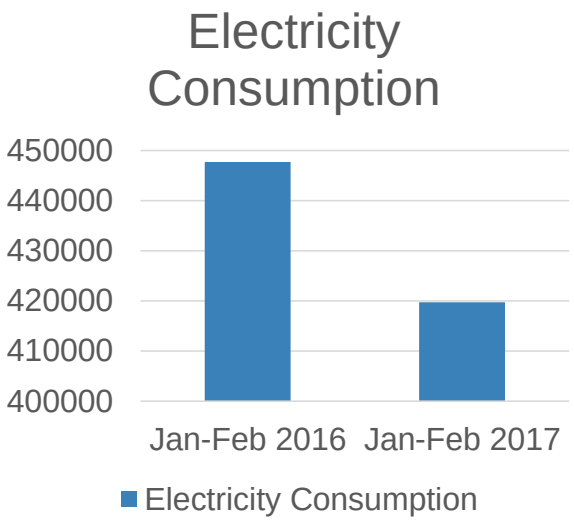
Results for Energy reduction

- Estimated value of identified actions c. £16,000 per annum (c. 6%)
  - Completed actions value of c. £13,000 per annum
  - February metered consumption down by ~£500/month on same period last year.

- Future improvements to be expected during spring and summer when operating conditions are different and more demanding for electricity.

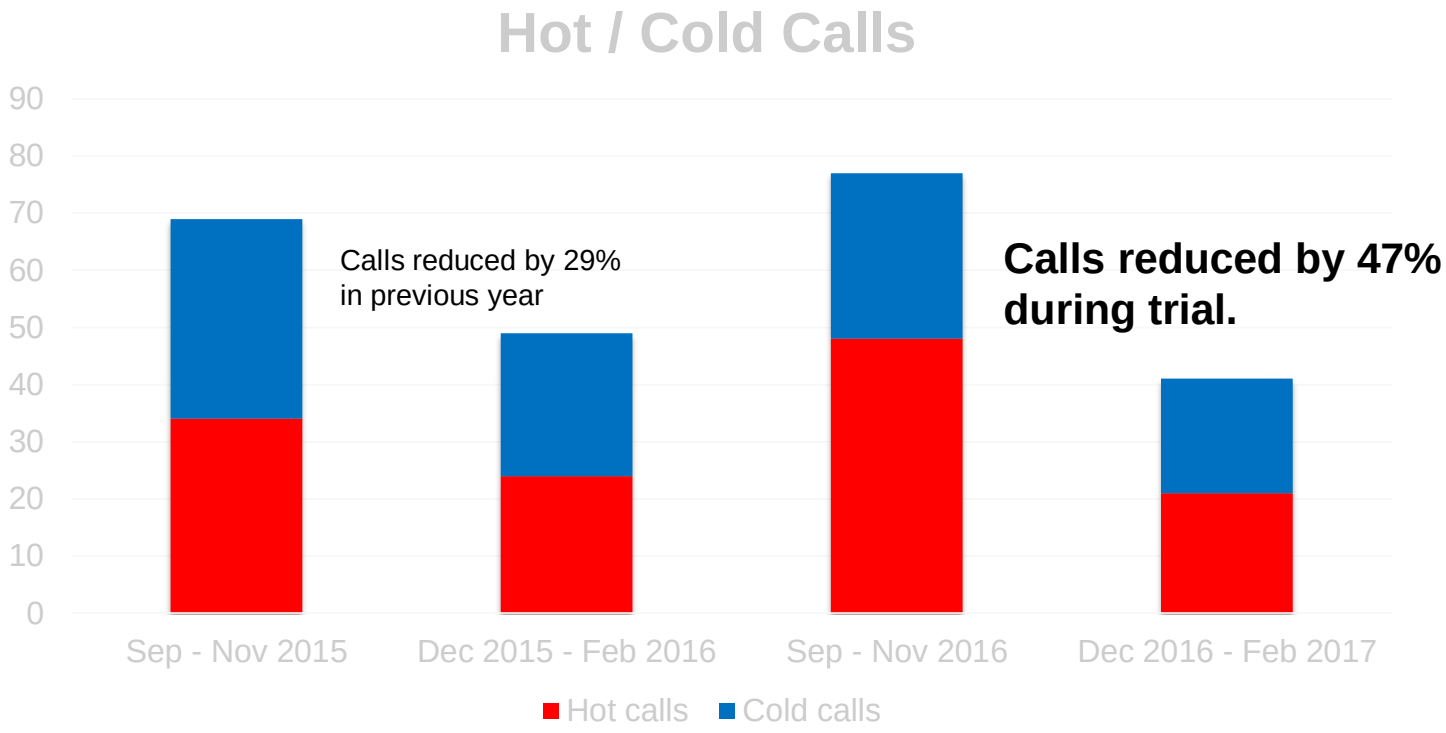
- All operational improvements, no capital works required

- Full list of 61 Actions included in Appendix.



A comparison of meter data from Jan-Feb 2016 and Jan-Feb 2017 supports estimated reduction of 6% during winter period.

Effect of Building Analytics on Comfort calls



FM has shifted maintenance from reactive to proactive action which has resulted in a reduction in staff complaints and lower energy consumption.

Lost Productivity – Before Trial

Demand Logic measures productivity based on actual space temperatures during operational hours. Using the staff numbers and an average salary Demand Logic calculates an *order of magnitude* estimate of business cost from lost productivity due to comfort control.

What was the impact on productivity?

Recent research is clarifying the impact of temperature on **productivity** of staff. Using this research, we estimate that the total loss of productivity during the above day was **1.16%**. By using average salaries and occupancy, we estimate the total lost value for the day was **£1606**. If this is typical, the annual lost value due to occupants being too hot or too cold is approximately:

£587,000 *estimated annual productivity loss due to temperature discomfort*

Read more on this calculation...

Our productivity model assumes that for each degree above 25.0 degrees, productivity decreases by 2.0%. And for each degree below 21.0 degrees, it decreases by 4.7%. (This model is based on a 'meta-study' of 9 investigations into the effects of temperature, conducted at Berkeley Lab in the US. Read more here)

By analysing average half-hourly temperatures for each zone (not counting unoccupied times), and using the above model, we calculate the total effect on productivity as **1.16%**

Assuming there are 1119 staff members in all the above spaces, that the average salary is £30,000, and that the average combined tax and office overhead is 1.5, then the total annual staff spend for the above spaces is approximately:

1,119 × £30,000 × 1.5 = **£50,355,000**

This means the estimated total annual loss due to temperature-related discomfort is:

0.0116 × £50,355,000 = **£586,500.31** (which rounds to £587,000.00)

Lost Productivity – After Trial

In Demand Logic's experience a productivity score below 0.5% is good practice. On-going monitoring will be required to maintain this good performance.

What was the impact on productivity?

Recent research is clarifying the impact of temperature on **productivity** of staff. Using this research, we estimate that the total loss of productivity during the above day was **0.49%**. By using average salaries and occupancy, we estimate the total lost value for the day was **£676**. If this is typical, the annual lost value due to occupants being too hot or too cold is approximately:

£247,000 *estimated annual productivity loss due to temperature discomfort*

Read more on this calculation...

Our productivity model assumes that for each degree above 25.0 degrees, productivity decreases by 2.0%. And for each degree below 21.0 degrees, it decreases by 4.7%. (This model is based on a 'meta-study' of 9 investigations into the effects of temperature, conducted at Berkeley Lab in the US. Read more here)

By analysing average half-hourly temperatures for each zone (not counting unoccupied times), and using the above model, we calculate the total effect on productivity as **0.49%**

Assuming there are 1119 staff members in all the above spaces, that the average salary is £30,000, and that the average combined tax and office overhead is 1.5, then the total annual staff spend for the above spaces is approximately:

1,119 × £30,000 × 1.5 = **£50,355,000**

This means the estimated total annual loss due to temperature-related discomfort is:

0.0049 × £50,355,000 = **£246,961.92** (which rounds to £247,000.00)

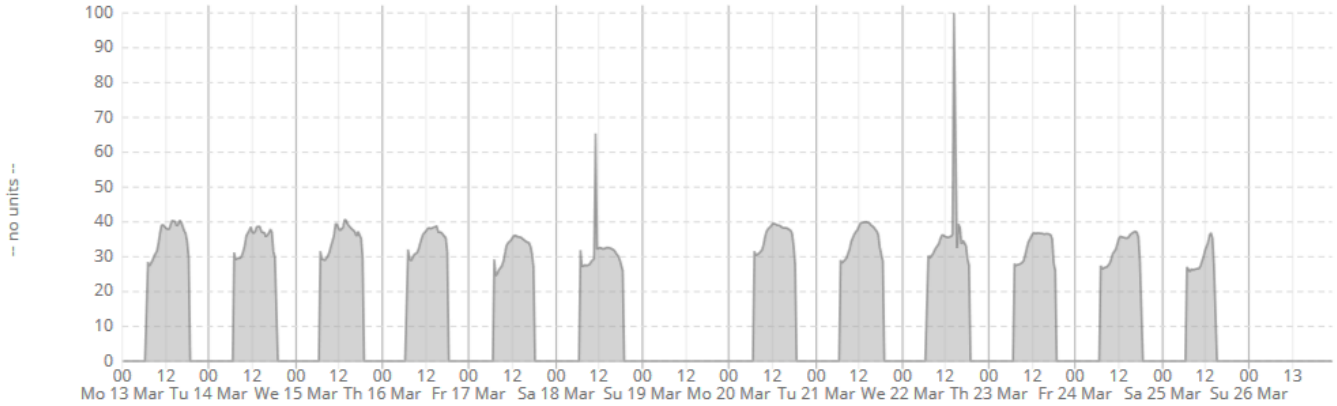
Building New Mindsets

- Clarity on how buildings are currently managed
- Digital Awareness of how every space is performing
- Understanding into how teams are performing
- Planned preventative to condition based maintenance
- Collaboration
- Contractors performance exposed
- Shift in the way contracts are structured
- Key Performance Indicators such as increased customer satisfaction tracked with real time data

DATA CAN BE USED FOR CAPACITY PLANNING

- Data is available from Demand Logic on heating/cooling plant and system capacity, such as the demand on AHU fans shown below.
- This information could be used to assess the number of people who can be comfortably accommodated with the present building services plant capacity.
- Any assessment should consider data during different seasons, particularly the summer when capacity demand is expected to be at its maximum.

BEMS Command (Analog Output): B-Blk-Z3 [11] > VAV Sup Fan Speed (-- no units --) [D10]



Results from Trial

1. Reduced energy consumption 6-14% £16,000 – £35,000 (need full year data)
2. Prioritised maintenance based on the condition of plant
3. Better FM Contracts based on output
4. Increased Collaboration
5. Reduced hot/cold calls by 18%
6. Staff productivity improvements of £ 340,000
7. Data can be used for capacity planning

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