Senator House

Property Performance Case Study

> *Demand logic's speed of insight and granularity of data are unique, making it an indispensable tool for optimising building performance*
>
> **Mark Tyson,**
> Project Lead- Real estate, LGIM

Executive Summary

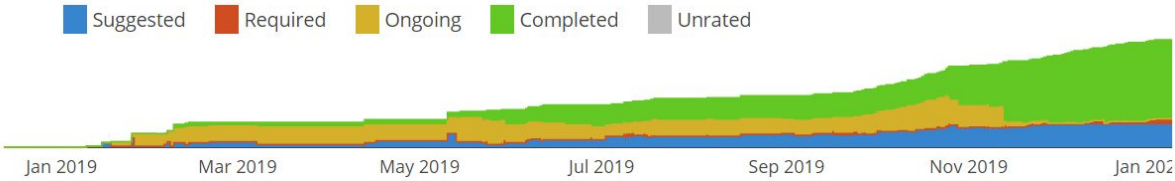
Legal and General Investment Management (LGIM) is one of the UK's most active real estate managers with £23.4 billion of investments under management. Sustainability is at the heart of their investment decision-making processes with the acknowledgement that real assets have a significant impact on society and its ecosystem. LGIM's ESG strategy includes the concept of "continuous commissioning" in which Demand Logic's building systems data analytics play a key role. On the 14th January 2019, Demand Logic was deployed in Senator House, 85 Queen Victoria Street in London. A newly built 110,000 sq ft office building. In an effort to identify efficiencies following on from Practical Completion of the property.

Demand Logic's platform uses data analysis to look at the operational performance of the internal environment, HVAC equipment and the BMS control. In a new building it can identify snags and evaluates if the property is operated as effectively and efficiently as possible, identifying faulty & offline equipment to ensure rectification within the liability period. Demand Logic can also automatically provide an asset list checking completeness and existence of equipment.

Within the first three months, 26 energy saving actions were identified, many of which will also have an impact on the comfort of the buildings occupants, as well as on equipment life-cycle costs. Demand Logic's platform is now serving as the collaboration hub for the building managers & contractors to address the issues identified.

Annual Cost Avoidance identified: £48,000[1]

Summary of actions on Energy, Comfort & Maintenance



1. Saving estimated using a combination of virtual meters and desktop calculations based on live monitored data.

An Overview of the Demand Logic approach

When installed during or post commissioning Demand Logic can provide validation that all elements of commissioning have been completed satisfactorily. It also ensures that the operation of the building is fully optimised. At Senator house this has involved the following:

Performance baseline

The platform produces a baseline Demand Logic score, which assesses a property's performance, measured against several KPIs:

January 2019	Actions				DL Score	Quartile
Senator House	26	96	77.9	63.1	79	3rd

Productivity: Percentage of productivity achieved (100% would indicate that no temperature discomfort is hampering productivity)

Maintenance: Percentage of terminal units controlling to within 3 degrees

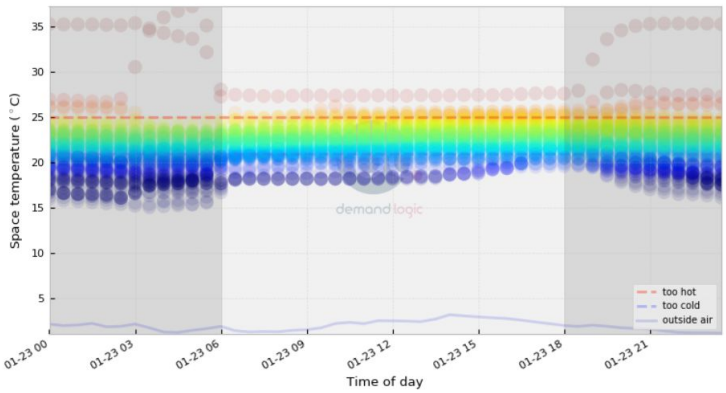
Energy: Percentage of main plant running hours that are during expected hours

As further LGIM buildings are brought online these KPIs allow us to compare the performance of a property against additional properties in the same portfolio. Demand Logic benchmarks the portfolio against all of the property that we are currently installed in. Tracking progress month on month.

Identification of 'offline' or 'faulty' equipment

Faulty and offline sensors - Using our Comfort Tracker view we have identified 32 spaces being controlled by problematic sensors.

Demand Logic Comfort Tracker

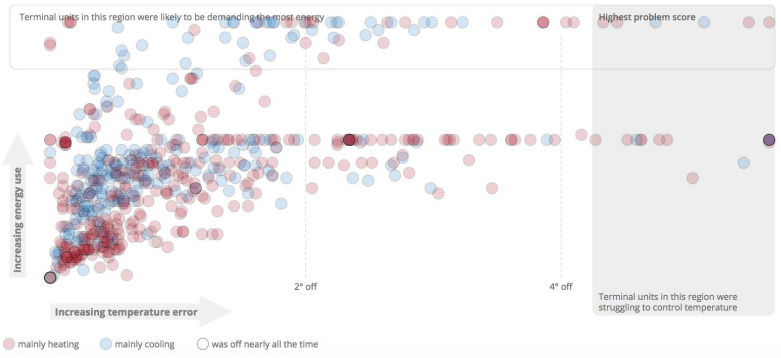


This can indicate a broken sensor, an offline BMS device or a data collection problem. It could be causing unnecessary energy usage as well as thermal discomfort to the occupants in the affected space. Actions regarding these have been raised on a floor by floor basis and are being addressed by onsite engineers.

Underperforming terminal units - Using the Rogue Finder tool Demand Logic are able to identify the Terminal Units with the highest energy demand and those that are struggling to control the temperature of the space they serve.

The Rogue Finder has so far identified 50 terminal units showing a temperature error greater than 3℃. Using the Demand Logic online collaboration tool the onsite team can prioritise their investigation and monitor the progress of subsequent maintenance actions.

Demand Logic Rogue Finder



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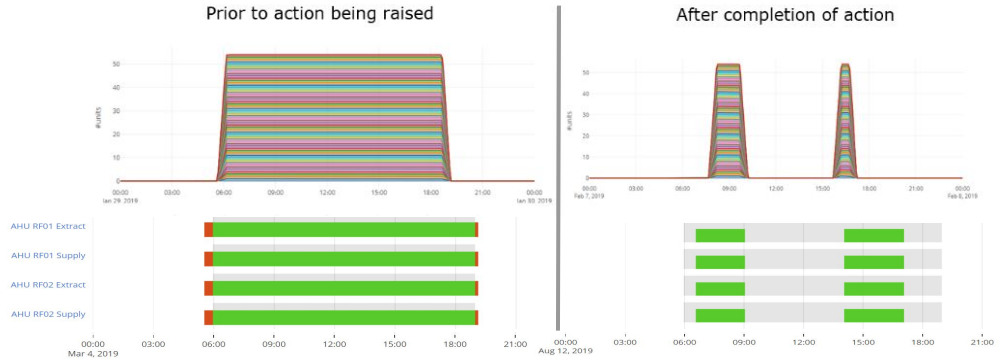
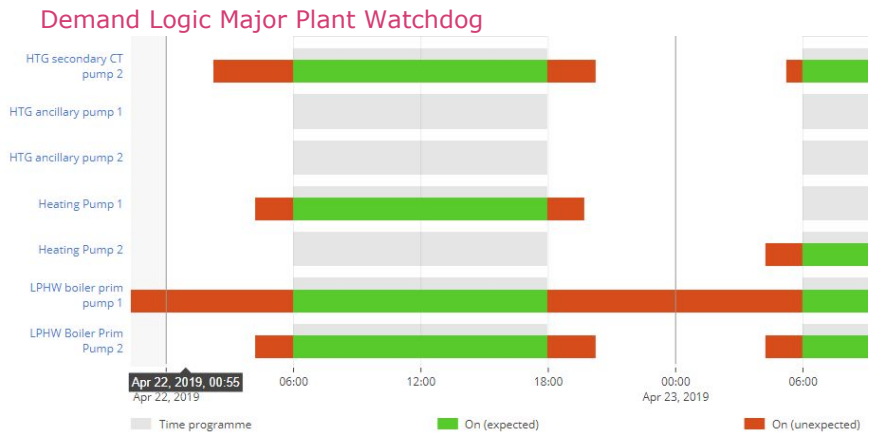
Matching plant activity to operational requirements of the property

Unoccupied floor management - Demand Logic's *LabView* has been used to highlight the run times of the Fan Coil Units (FCUs) on the unoccupied floors, identifying constant running of these units throughout the day. Actions were implemented to reduce operation of the FCUs on unoccupied floors to just a couple of hours a day. This has resulted in an estimated annual saving of approximately £7,000.



Unexpected Major Plant Operation - Demand Logic's *Major Plant Watchdog* has so far identified several incidents of unexpected major plant operation.



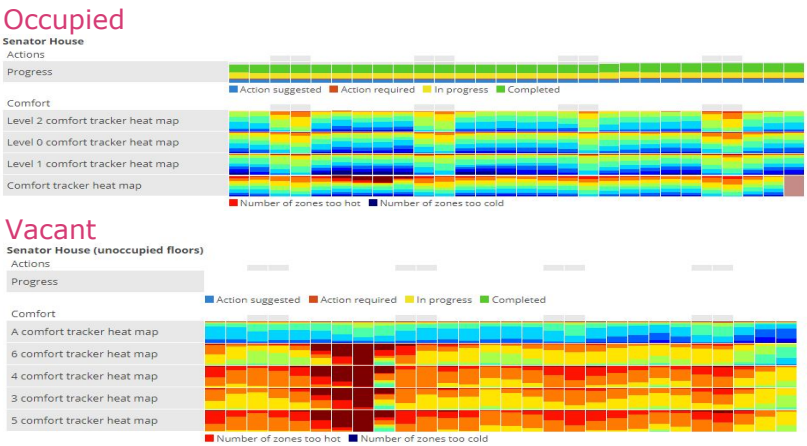
Shown in red, this includes early hour operation and additional overrun of the site's AHUs, fans and pumps.

The granularity of Demand Logic's analysis allows the identification of the root cause of over running. This can often be demand led due to a malfunctioning FCU or other terminal unit.

Visualisation of temperature control across the entire property

Demand Logic can create a temperature map of a property by floor. This is useful in Senator House where only certain floors are currently occupied. Changes made to control strategies in order to reduce consumption of vacant floors can be clearly seen.

Building managers can also use these views to visually assess the performance of the building, and identify spaces that are having the most significant impact on occupant comfort and productivity. Thus ensuring all tenants and building users are experiencing comfort without needless energy wastage.



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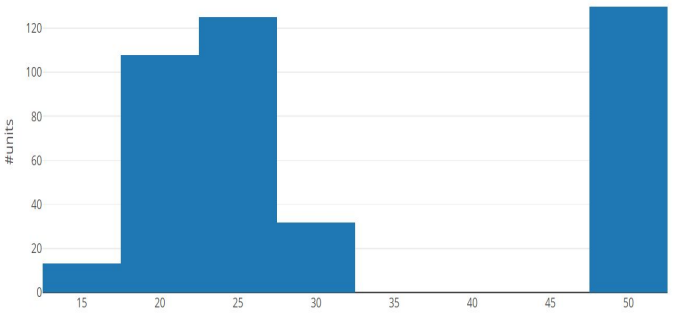
Setpoints

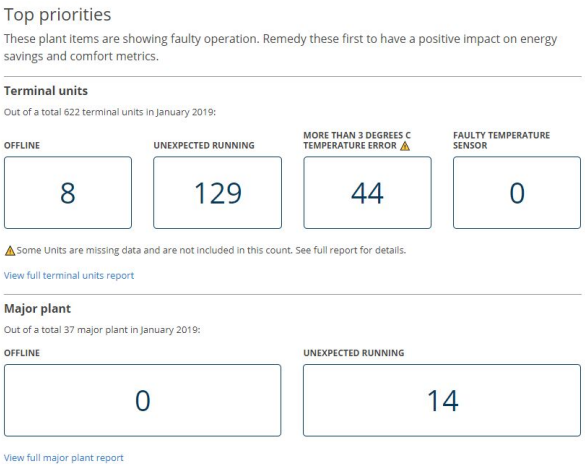
Demand Logic identified approx 150 terminal units with Setpoints set to 50 degC, evidence of a units inability to control a space either because of mechanical issues or design faults. In this case, the majority of these high setpoints were remnants of a commissioning survey and the extreme setpoints had been applied to drive the units into full heating. Without the insight derived from the Demand Logic platform, these high set points would have continued to go unnoticed, resulting in continuous heating Demand from the 150 units.

Using DL, the onsite engineers were able to identify the units with extreme setpoints, and make the necessary changes to reduce these.



Data point	Device	Min	Max
[S2] Setpoint	VAV A/30BN	50.0	50.0
[S2] Setpoint	VAV A/58	50.0	50.0
[S2] Setpoint	VAV A/31N	50.0	50.0
[S2] Setpoint	VAV 1/37	50.0	50.0
[S2] Setpoint	VAV 1/38	50.0	50.0
[S2] Setpoint	VAV 1/42	50.0	50.0

Intuitive tools for onsite teams



Automatic Property Summary and Exception Report analyses month on month trends in asset performance, comparing them to predetermined thresholds. At Senator House this provides on site teams a snapshot of potential issues and the ability to drill down to identify causes using the platforms other tools.

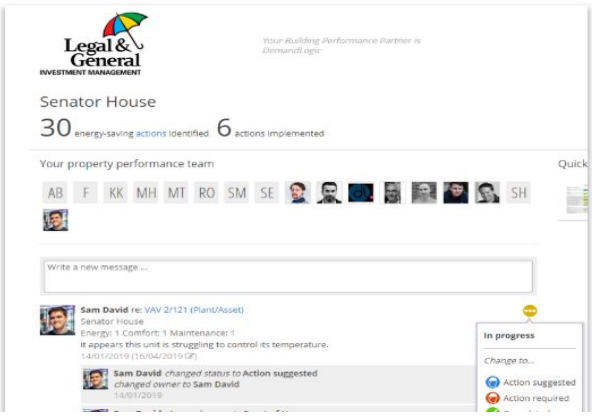
The summary and exception report focuses on Offline assets, unexpected running, temperature errors and sensor functionality to highlight worst offenders.

Continuous monitoring and collaboration

Technical Account Managers (TAMs) are allocated on a building by building basis, working in conjunction with onsite teams using the platform's data visualisation for issue identification.

Collaboration tools allow TAMs and onsite teams to communicate, raise actions and track maintenance progress. A virtual maintenance logbook.

Monthly update calls are used to track maintenance progress and ensure the Demand Logic platform is being used effectively.



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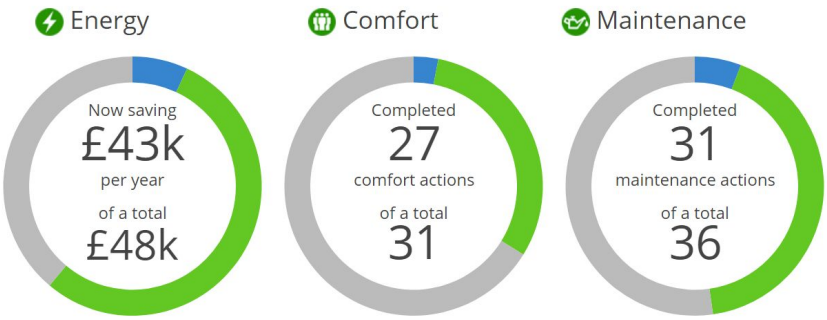
The future for Senator House

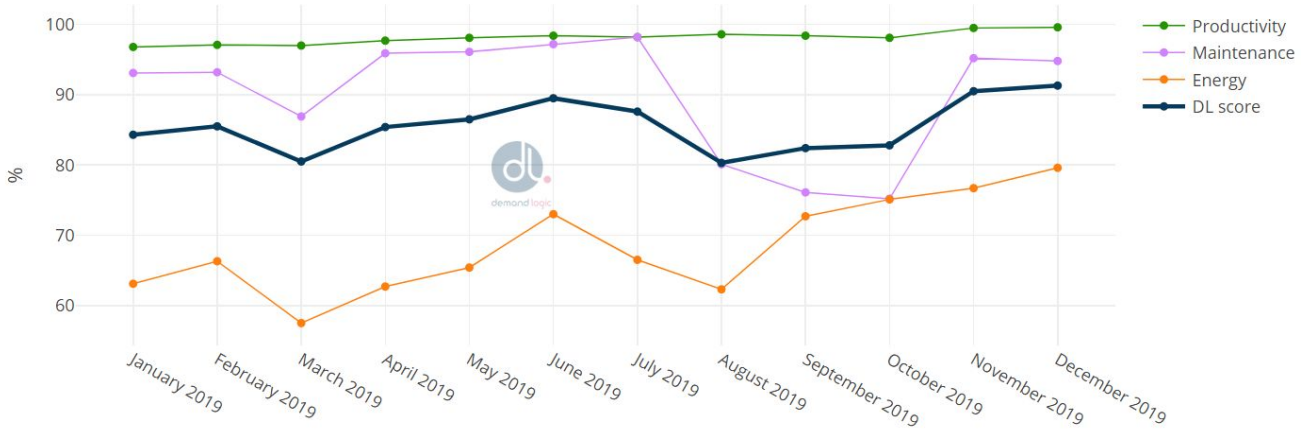
Having already identified significant savings the teams onsite and at Demand Logic are working together, powered by the platform, to ensure the necessary maintenance actions are carried out. Thus ensuring the strategy of "continuous commissioning" is realised.



> *It's very easy to navigate the platform giving me and my team visibility on any maintenance required and a great way to view trends on day to day building performance.*

Ketan Kanani,
Facilities Manager- JLL

At Senator House, Demand Logic has been used to identify and action an estimated cost avoidance of £43,000 per annum. This is equivalent to an estimated 373,913 kWh per annum. Using the Demand Logic Benchmarking metrics, Senator house has also seen improvements in its Maintenance and Comfort performance .



January 2020	Area	Activity	Actions				DL Score	Quartile	+/-
1	Senator House	10,405	45	86	99.6	94.8	79.6	**91.3**	2nd	↑0.8
	Average	10,405	45.0	86.0	99.6	94.8	79.6	91.3		+ 0.8

The implementation of Demand Logic has been a continuous learning process for all parties involved. LGIM have worked very closely with the onsite building manager, the bms contractor and M&E engineers, providing guidance on the development of an agreed workflow with defined roles and responsibilities. This structure, and the collaborative nature of the platform has ensured that the platform is being utilised by all involved and constructive dialog has driven the buildings performance improvement.

245 Hammersmith Road

Property Performance Case Study

Legal & General
INVESTMENT MANAGEMENT

Demand logic's speed of insight and granularity of data are unique, making it an indispensable tool for optimising building performance

Mark Tyson,
Head of Occupier Engagement & Service Delivery
Legal & General - Real Assets

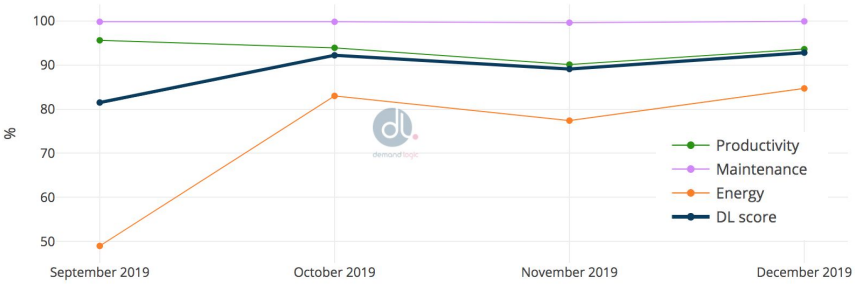
Executive Summary

Legal and General Investment Management (LGIM) is one of the UK's most active real estate managers with £23.4 billion of investments under management. Sustainability is at the heart of their investment decision-making processes with the acknowledgement that real assets have a significant impact on society and its ecosystem. LGIM's ESG strategy includes the concept of "continuous commissioning" in which Demand Logic's building systems data analytics play a key role.

Demand Logic was deployed at 245 Hammersmith Road, 242,000 sqft of newly refurbished flexible office space, in August 2019 as part of the early stages of a joint initiative. Given the buildings phase of development Demand Logic's brief has been to provide visibility and identify issues during the commissioning phase.

Annual cost avoidance identified: **£52,000**[1]

Demand Logic's platform uses data analysis to illustrate the operational performance of the internal environment, HVAC equipment and the BMS control. In a new building it can identify snags and evaluate if the property is operated as effectively and efficiently as possible, identifying faulty & offline equipment to ensure rectification within the liability period. Demand Logic can also automatically provide an asset list checking completeness and existence of equipment.



Within the first three months, 100 "actions" were identified on the Demand Logic platform. Each of these will have an impact on energy, maintenance or occupier comfort, as well equipment life-cycle costs and specifically snagging/lagging costs for post-PC rectifications. Building stakeholders can monitor live building performance scoring on the platform.

Demand Logic's platform is now serving as the collaboration hub for LGIM, the building managers & contractors to address and rectify the issues identified.

property performance **simplified**

1. *Saving estimated using a combination of virtual meters and desktop calculations based on live monitored data.*

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An Overview of the Demand Logic approach

When deployed during or post commissioning Demand Logic can provide validation that all elements of commissioning have been completed satisfactorily. It also ensures that the operation of the building is fully optimised prior to occupancy. At 245 Hammersmith Road this has involved the following:

Performance baseline

The platform produces a baseline Demand Logic score, which assesses a property's performance, measured against several KPIs:

	Actions				DL Score	Quartile	+/-
245 Hammersmith Road	99	93.6	99.9	84.7	**92.8**	2nd	13.7

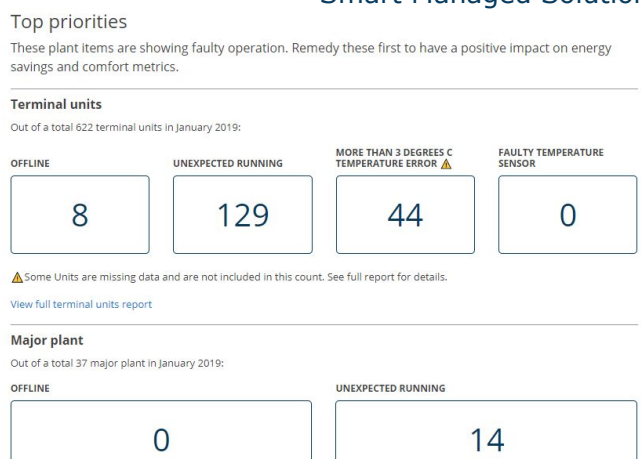
Productivity: Percentage of productivity achieved (100% would indicate that no temperature discomfort is hampering productivity)

Maintenance: Percentage of terminal units controlling to within 3 degrees

Energy: Percentage of main plant running hours that are during expected hours

As further LGIM buildings are brought online these KPIs allow us to compare the performance of a property against additional properties in the same portfolio. Demand Logic benchmarks the portfolio against all of the property that we are currently installed in. Tracking progress month on month.

> *"The experience I've had with demand logic has been very positive and is making our job easier in solving and finding issues in the building. I am looking forward to working with demand logic when the building is fully occupied as I believe demand logic will "be used to its full potential."*
>
> **Jack Upcraft**
> M&E Supervisor,
> Smart Managed Solutions



The summary and exception report focuses on Offline assets, unexpected running, temperature errors and sensor functionality to highlight worst offenders.

Defect detection

Automatic Property Summary and Exception Report analyses month on month trends in asset performance, comparing them to predetermined thresholds. At 245 Hammersmith Road this provides on site teams a snapshot of potential issues and the ability to drill down to identify causes using the platforms other tools.

Faulty and offline sensors - Demand Logic's platform automatically identifies offline and problematic space sensors. Using the platforms collaboration and communication tools, the Building Manager was able to assign an action to the Site Supervisor to investigate the issue further. This resulted in decisive action being taken quickly and efficiently, while the whole process is evidenced throughout.

Improved Visibility - Demand Logic's platform allows users to comparatively view the performance of related plant over extended periods of time. This results in the identification of performance issues that may not be apparent when observing a single plant asset for snapshot of time.

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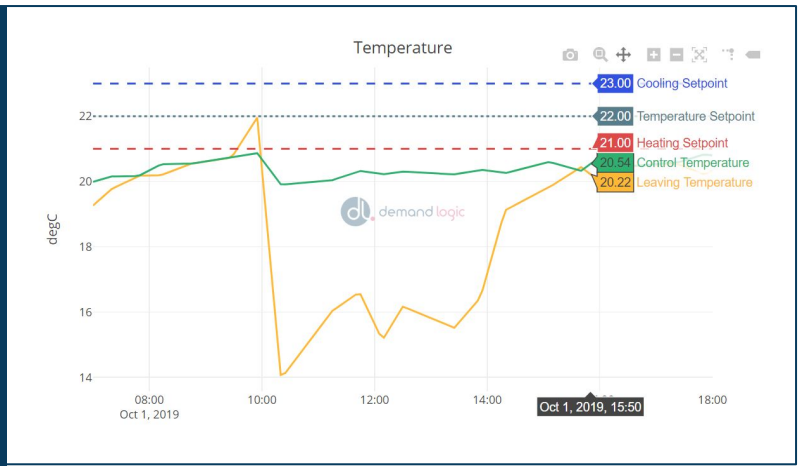
Continuous Commissioning - select examples

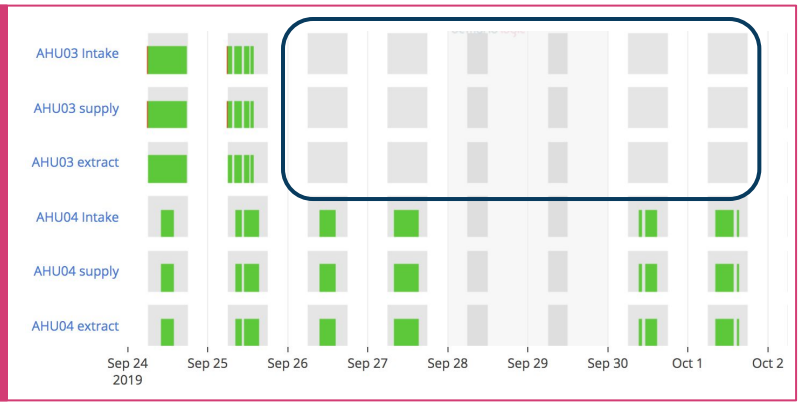
FCU 2_20 - problematic sensors

Despite full heating demand, this Fan Coil Unit was identified to be delivering maximum cooling to the space.
An action was raised on the Demand Logic Platform, and an investigation by the onsite Engineering team revealed that the unit's Heating and Cooling actuators had been configured the wrong way round during commission. This issue was subsequently addressed by the relevant contractors.



AHU03 - operational faults

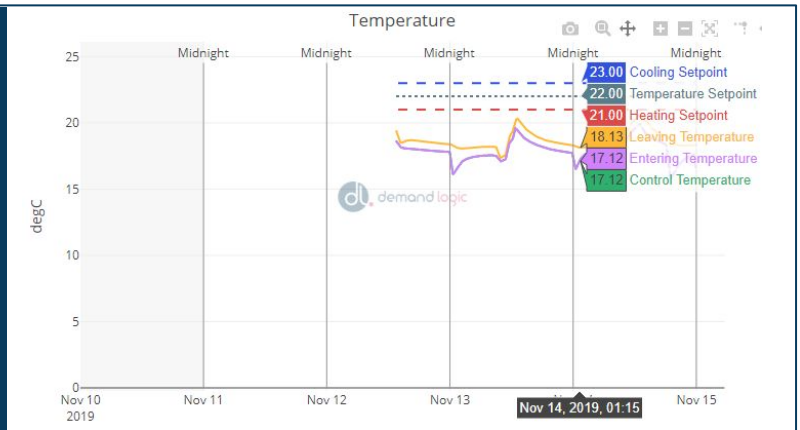
Whilst this plant item was not identified as operating at unexpected times, users of Demand Logic were able to recognise that AHU03 failed to operate inline with the rest of the Ventilation plant. Further investigation revealed that this plant asset was continually failing. This issue was passed on to the relevant contractors to resolve.



FCU 3_57 - communication offline

Using the Demand Logic fault detection tools, the team onsite are able to continuously monitor the performance of the building and pinpoint any plant items that may be experiencing communications issues.

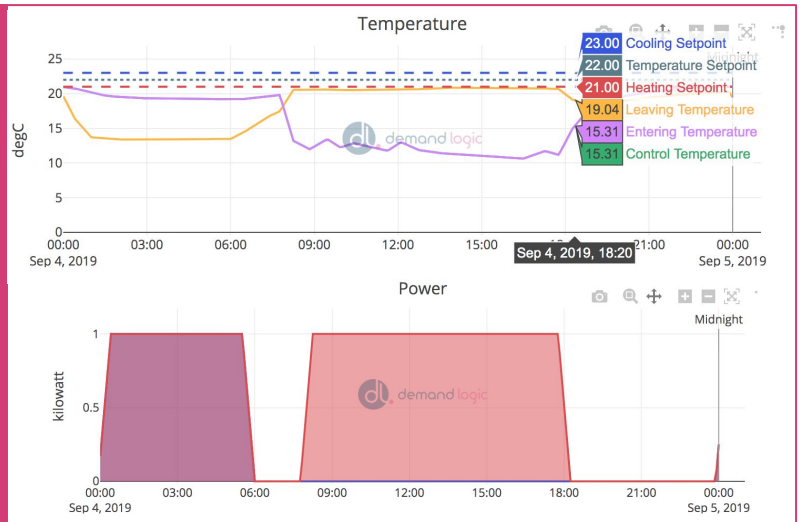
FCU_3_57 was found to have been switched off manually. The onsite team were able to rectify this and reinstate the units operation.



FCU 4_66 - commissioning fault

Demand Logic were able to identify a Fan Coil Unit control temperature sensor that dropped away from the setpoint during operation. Demand Logic suggested the onsite team investigate the position of the sensor and whether the Supply and Return sensors had been configured correctly.

Investigation revealed that both the Supply and Return Sensors were incorrectly configured as well as having the heating and cooling actuators reversed.

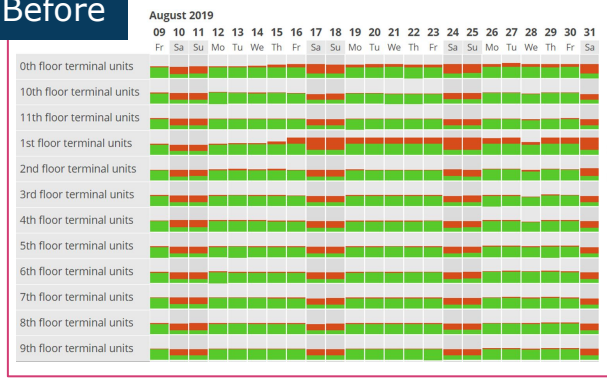


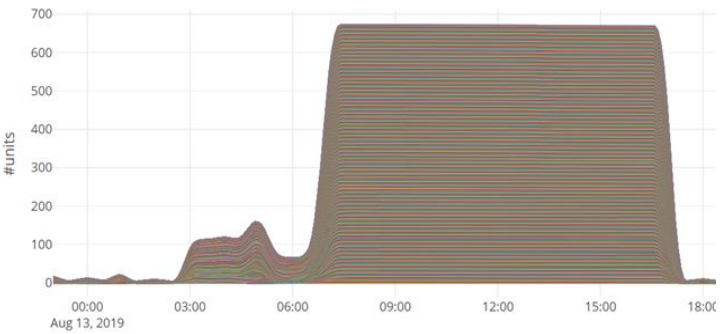
Matching plant activity to operational requirements of the property

Unexpected operation of building services is a common issue and one that is disproportionately difficult to identify at the BMS head end. Overrunning of major plant and ancillary HVAC systems is not only a leading cause of energy wastage but also reduces the useful lifetime of this costly equipment.

Unexpected terminal unit operation - Upon initial assessment, Demand Logic identified that the terminal units across all floors were operating from 0800-1800 Monday-sunday. Liaising with the onsite team all floors were identified as unoccupied and this operation was reduced from 10 hours a day to 3-4 hours Mon-Friday with no operation on weekends.

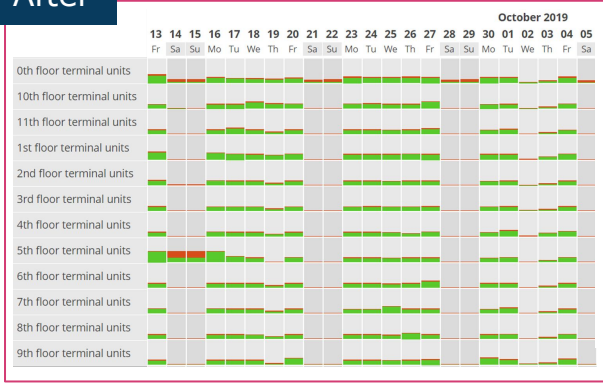
Before

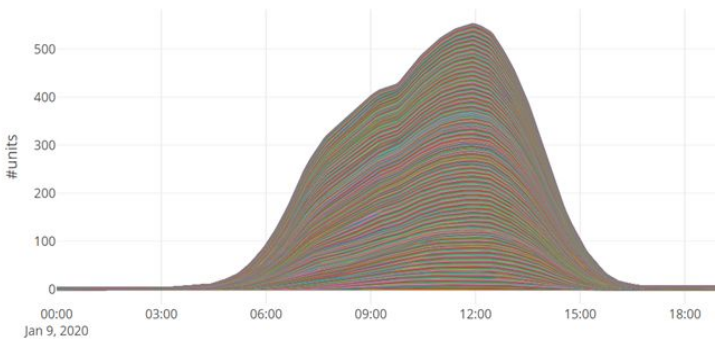




FCU Fan Status

After

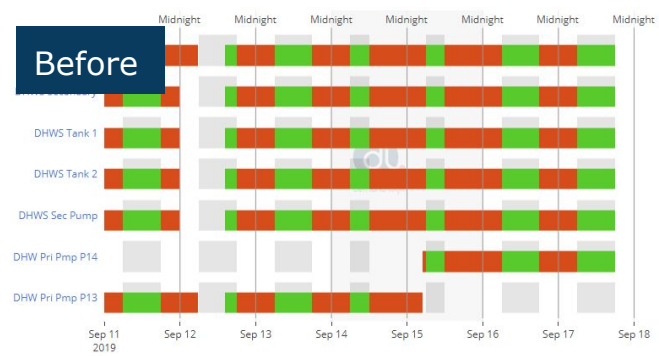




FCU Fan Status

Unexpected Major Plant Operation - Demand Logic's *Major Plant Watchdog* has so far identified several incidents of unexpected major plant operation. During the initial performance assessment, Demand Logic identified a large proportion of HWS plant operating continuously, including overnight and weekends. This was raised with the Technical Services Manager, who reduced this operation to within expected hours whilst still allowing for the necessary water quality treatment.

Before



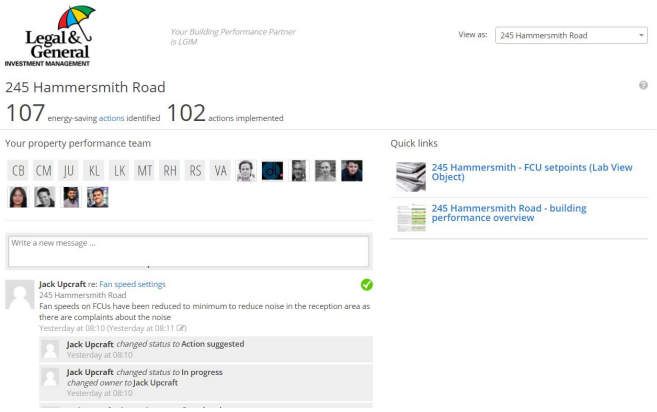
After

Continuous monitoring and collaboration

Technical Account Managers (TAMs) are allocated on a building by building basis, working in conjunction with onsite teams using the platform's data visualisation for issue identification.

Collaboration tools allow TAMs and onsite teams to communicate, raise actions and track maintenance progress. A maintenance logbook accessible from anywhere.

Monthly update calls are used to track maintenance progress and ensure the Demand Logic platform is being used effectively.



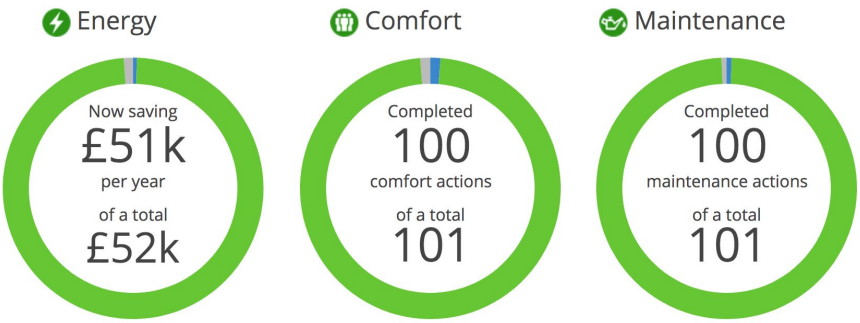
> *The Demand Logic system has been invaluable to the commissioning and defect management process here onsite and the DL team have been exceptional. The platform enables different building teams to raise and communicate on actions to enable a swifter, more efficient, resolution and provides the insight for us to challenge the developer in certain defect management issues. The system also allows us to be proactive and ensure issues are identified before the tenant is aware that there is a any problem.*

Russell Hookway,
Technical Services Manager,
BNPP Real Estate

The future for 245 Hammersmith Road

Having already identified significant savings and cost avoidance at the property; the onsite team and Demand Logic are working collaboratively, powered by the platform, to ensure further maintenance actions are identified and carried out.

Demand Logic's involvement from an early stage has meant that the property is increasingly optimised and through continued use of the platform, as the building transitions from commissioning to occupation, on-site teams will ensure that LGIM's customers are occupying more energy efficient and productive spaces. The platform will be used throughout the occupation of the property to ensure that optimisation can be continued whilst fit-outs and additional occupiers utilise the space.



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demand logic