22 Gordon Street, The Bartlett School of Architecture

1. Introduction

1.1. Context

22 Gordon Street is one of the main Bartlett buildings catering the Bartlett School of Architecture students and staff members. The building is a refurbishment project of Wates House (original building) in which the concrete frame of the existing structure was retained, and the internal layouts and external façade were changed. The refurbishment was taken up with aspirational goals to implement sustainability by circular economy principles, and best practices associated with the building's operation. With a total building area of 8,454 sq. m. for offices, classrooms, and studios, it also consists of a workshop on its basement level – B-made used for manufacturing and model building by the students which includes a range of different heavy machinery and energy intensive equipment. The highest usage of the buildings is just before the Bartlett's two shows conducted in the Summer and Autumn periods respectively where students showcase their designs. Therefore, the months of May, June, September, and October have increased levels of occupancy and potentially higher energy demand.

1.2. Heating and Cooling systems:

Heating in the building is achieved using Low Temperature Hot Water (LTHW) heating coil on the AHUs. Cooling is achieved by LTHW cooling coil supplied to two separate chilled water circuits – with one supplying to a fan coil unit and AHUs and the other supplying to chilled beams (GOV.UK, n.d.). Fan coil units serve the heating and cooling demand for workshop areas in the basement, ground floor exhibition area, café, and lobby, whereas chilled beam serves lecture theatres, seminar rooms, studios, offices, and tutorial rooms from the 1st to 6th floors. A direct expansion (DX) unit serves the IT and communication room which includes the servers of the building.

1.3. Building performance certificate

The most updated version of the DEC certificate shows a rating of C based on an EPC score of 72 which is above the typical benchmark for public buildings (figure 1). Comparing with ratings from previous years it should be acknowledged that there has been an improvement in the energy performance of the building over the past three years despite having a year of lockdown – 2019-20 (figure 2).

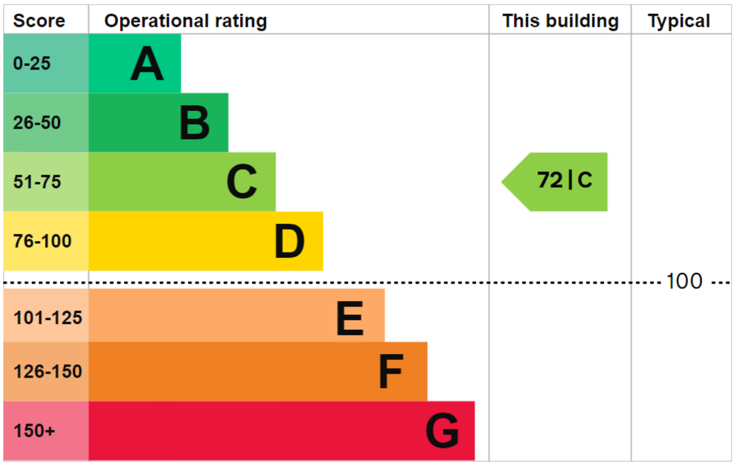

Figure 1 EPC rating for 22 Gordon Street. Source: Energy Certificate GOV.UK

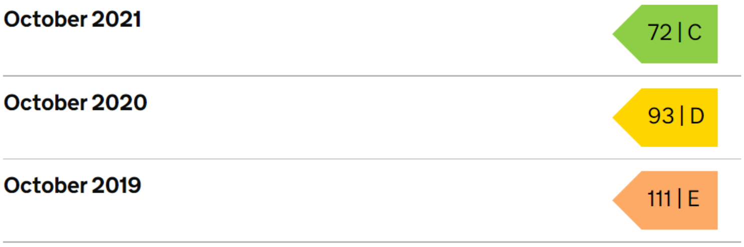

Figure 2 Previous years EPC rating of 22 Gordon Street

The recommendations provided in the DEC report give the highest priority to the heating and cooling systems which have a large potential to further improve the energy performance of the building. Currently there seems to be a simultaneous operation of the heating and cooling system which needs to be improved to reduce unnecessary increase in energy demand, for example heating system being turned on during summers due to excessive cooling of a space. The second highest priority has been given to the controls of the HVAC system and possible suggestion to improve which include better monitoring and automated controls for temperature and humidity.

2. Fabriq Tool Analysis

The aim of this report is to analyse the data in the Fabriq tool to develop a deeper understanding of energy performance of the building and if any minor or major improvements and recommendations can be suggested based on the data collected by the tool.

2.1.Electricity

The analysis period for electricity has been chosen as the academic year 2021-22 as it has the most recent data of building functioning in a non-lockdown period. However, it is also important to consider that there could be significant difference in energy consumption just through the implementation of hybrid classes which started at UCL, post lockdown phase.

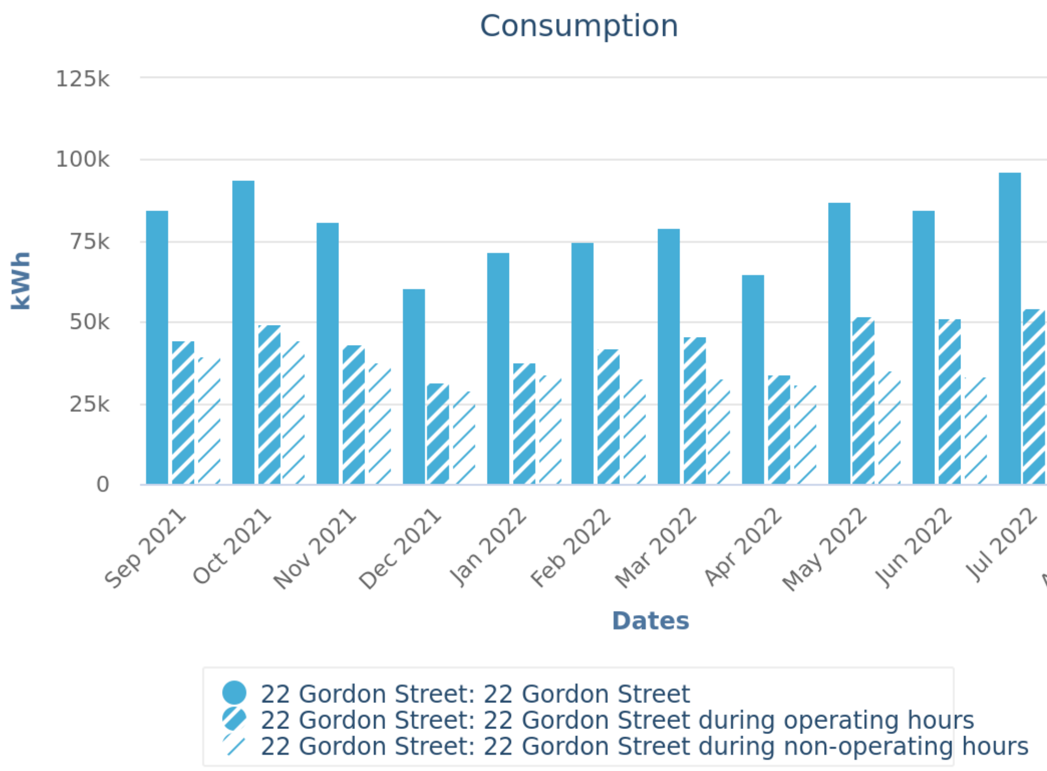

Figure 3 Monthly electricity consumption for 2021-22 academic year

Figure 3 shows the energy consumption of the building within operating and non-operating hours. It is interesting to observe that the lowest energy consumption within non-operating hours per month is as high as 30MWh. As compared to other months it can also be observed that the lowest values are in the months of December and April (55-60 MWh) which are also months indicating end of academic terms 1 and 2 respectively. The highest peak in the month of July can also be attributed mainly to the increased levels of workshop use and overall higher usage of appliances within the building for the Bartlett Summer Show.

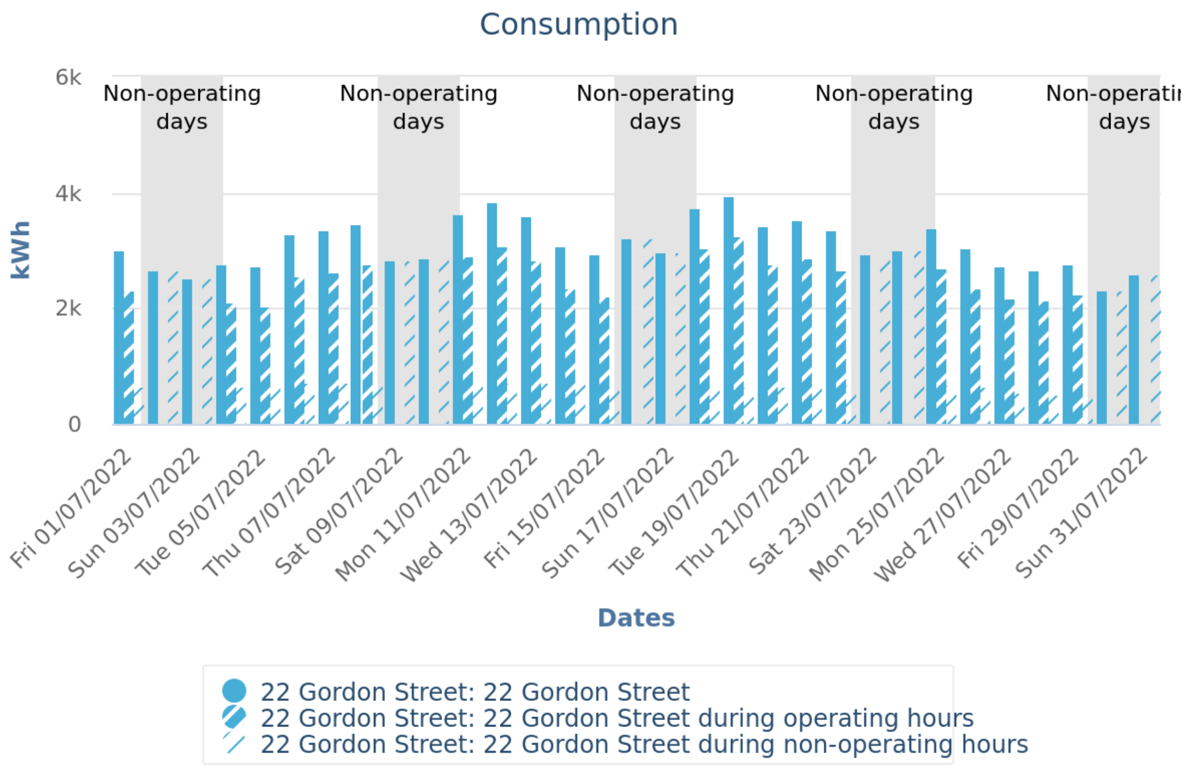

Figure 4 Weekly energy consumption data of July - highest energy consumption for 2021-22

A detailed analysis of the month with the highest energy consumption levels – July was also done (figure 4). It is interesting to observe the differences in non-operating hours energy levels during weekdays (where the building is set on unoccupied mode) and weekdays (operating mode) source - (UCL, n.d.). The higher energy levels during non-operating days shows the building was still being used during those days and a better analysis and monitoring of people occupancy is needed. Swipe card access is a suggestion however, it only gives an accurate number of entries within the building and does not provide a number for when people exit as there is no need to swipe the card while exiting the building. The building was awarded a BREEAM excellence award at design stage however, its current electricity performance (2021-22 academic year) goes above the ECON 19 benchmarks for public buildings (figure 5). There are certainly more improvements that can be made and better analysis that can be performed for the building.

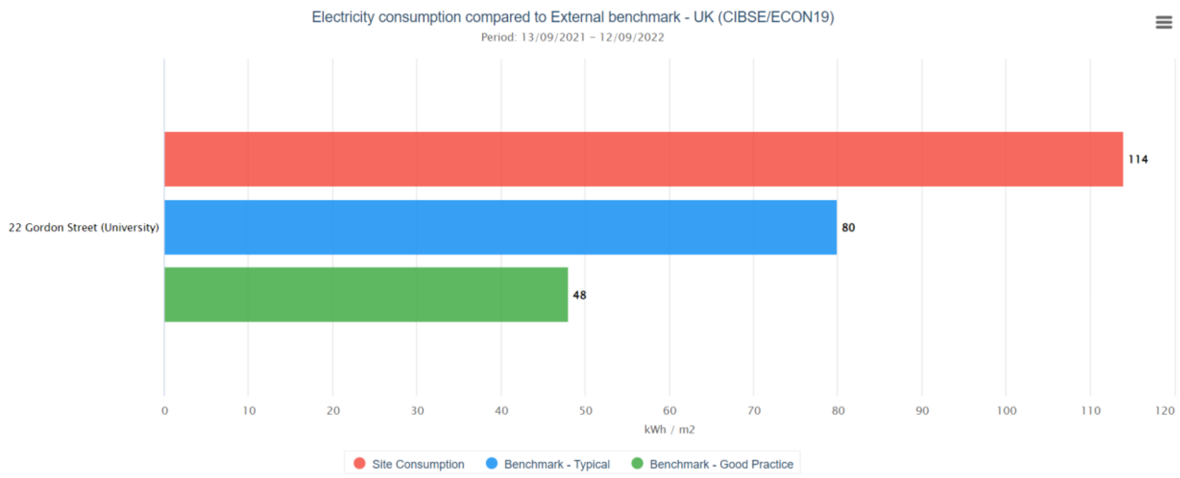

Figure 5 Electricity benchmark comparison: ECON 19

2.2. Fuel and Heat:

The analysis in Fabriq tool considered for fuel and heat consists of three academic years – 2018-19 – pre lockdown, 2019-20 (lock down from March to August), and 2020-21 which was mostly remote studying (figure 6). This analysis was done to understand trends in heating over the three years and to identify any differences due to the impact of shifting to remote studying.

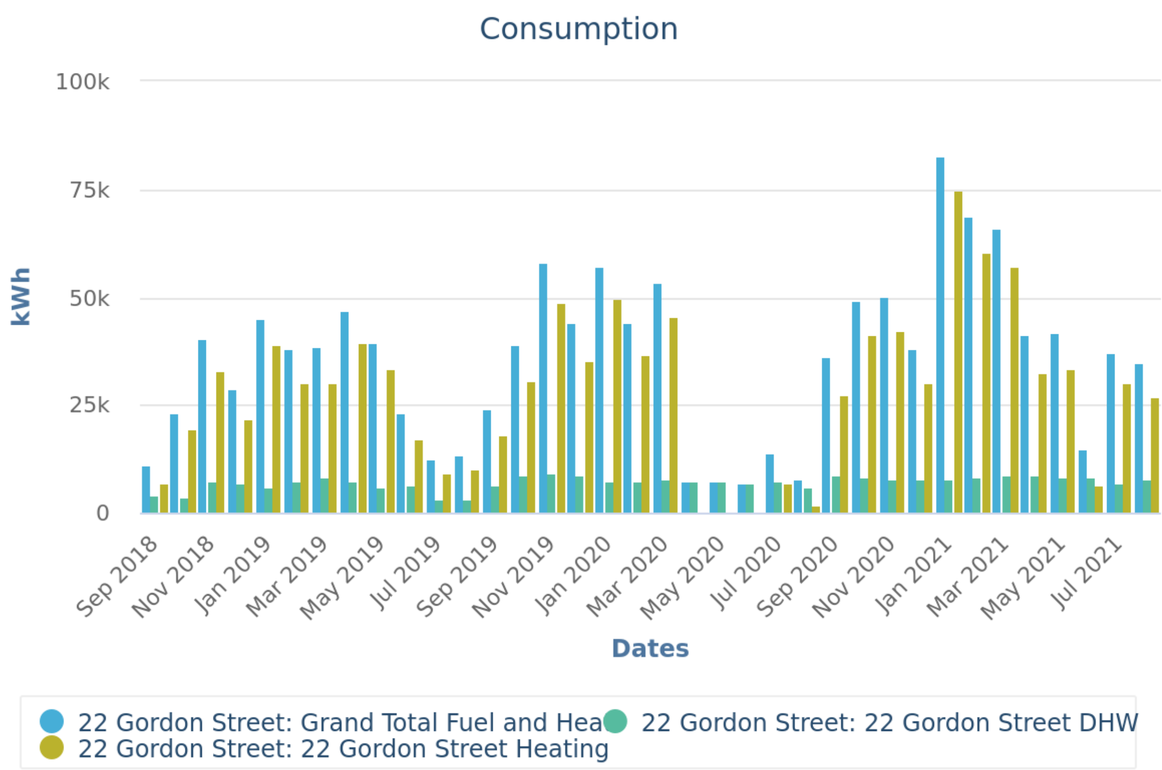

Figure 6 Heating and domestic hot water consumption of three academic years from 2018 -2021

The heating demand for the academic year 2019-20 has seen a complete drop for the months of April – July which is possibly due to a period of complete lockdown period. There is still some DHW consumption during this period. It can also be observed that the peak in academic year of 2020-21 is quite high despite being a year with remote classes being conducted as compared to the pre COVID academic year of 2018-19. Further analysis by concentrating on the month of January 2021 was done (figure 7).

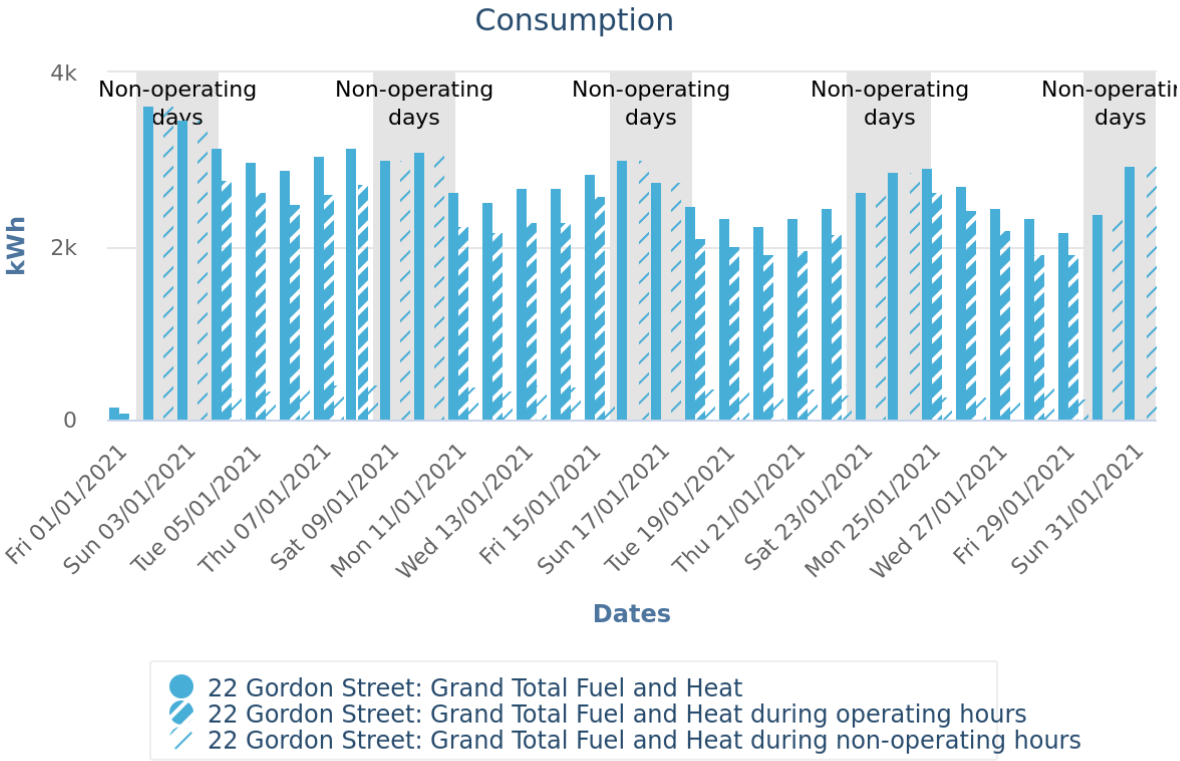

Figure 7 Fuel and heat consumption for the highest monthly demand of January 2021.

It can be observed that there is a significant amount of fuel and heating consumption during non-occupied hours of the building in a remote learning period – specifically on weekend days (non-operating) which seem to be higher. It is crucial to determine and conduct further analysis of this as the difference between heating demand for the 2018-19 and 2020-21 academic years is quite high – almost 25 MWh difference. However, these values are still less than the benchmark values of public buildings provided by CIBSE (figure 8). It is also important to mention here that on interacting with the buildings occupant, it was found that the building is usually cold in the winters, and a better heating control needs to be established which could potentially increase the levels that are currently reflected in the benchmark values.

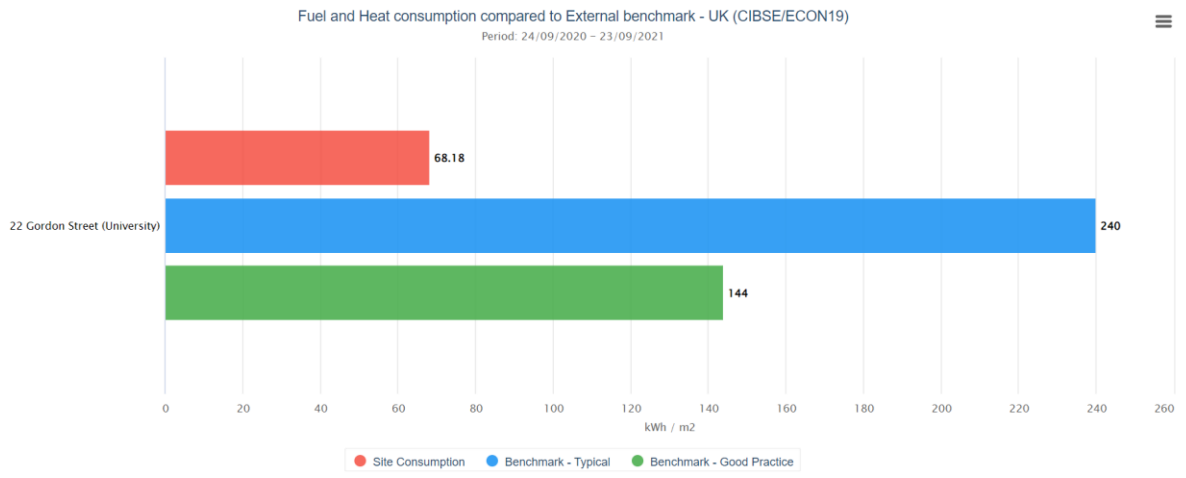

Figure 8 Fuel and heat benchmark comparison

3. Conclusion

This report provides an analysis of electricity and fuel consumption and helps highlight the areas that might need more monitoring and evaluation to correctly determine the overall energy demand of 22 Gordon Street using the fabriq tool. The tool has helped in determining energy consumption patterns at a far detailed level than simply electricity bills and meter reading and helps in analysing levels during occupied and unoccupied hours. Although, the occupancy hours can be modelled to suit a more accurate functioning of the building, it helps in providing a basic understanding of the building performance during these hours.

The benchmark tab in the Fabrique tool compares the performance of the case building with the values provided in ECON 19. However, these benchmark values are based on the building operations as per office use and assumption of building performance based on the occupancy profiles and energy demands of a typical office building might not be the best way to compare. Since the building has very specific functions and performs not only as a university building but also as a workshop with heavy machinery tools, it creates a specific niche of its own. For such kind of buildings, it is important to monitor the case specific energy consumption to fully understand the saving potential.

References

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