

Energy Savings Report

Occupancy-driven energy optimization scenarios

Week:

August 1 - October 21, 2022

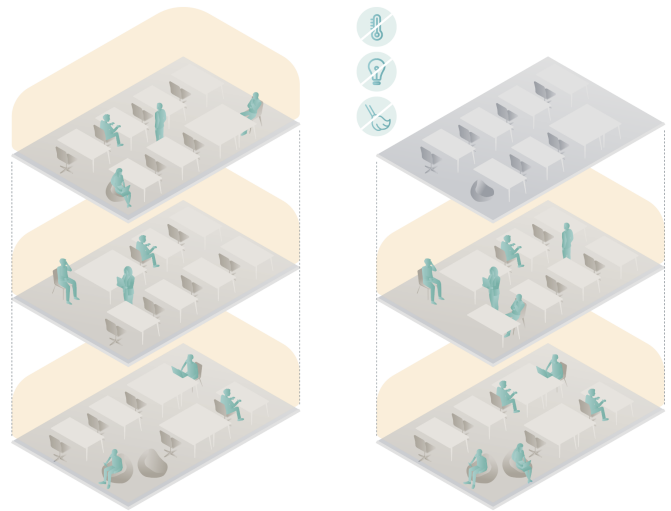


Introduction

Locatee's technology provides workplace leaders with the data clarity and insights they need to manage their office strategy, portfolio, and experience.

Adapting building operations to actual occupancy and space demand offers an important opportunity to rapidly decommission entire floors and, as a consequence, reduce energy usage as much as possible for these areas.

Locatee forecasts the maximum space demand on a weekly or daily basis, allowing for a safe closure of floors, guaranteeing a positive experience for employees and visitors, while enabling energy savings.



Definitions:

Absolute peak

Refers to a point in time, in the analyzed time period, when the number of people in a selected area is at its maximum. It is calculated by selecting the highest occupancy detected.

Average utilization

It is the average of the occupancy levels recorded over a time period. It is calculated by adding all the occupancy levels recorded in a building or in a space within a defined time frame and dividing that value by the count of those readings.

Max #people

Maximum number of distinct people (unique user identities) counted on a given day within the analyzed time period.

Capacity

Maximum number of desk spaces available.

Free at peak

Number of available desks left after subtracting Max #people from Capacity.

General Overview

Data source: Locatee Analytics (Wi-Fi corporate devices)

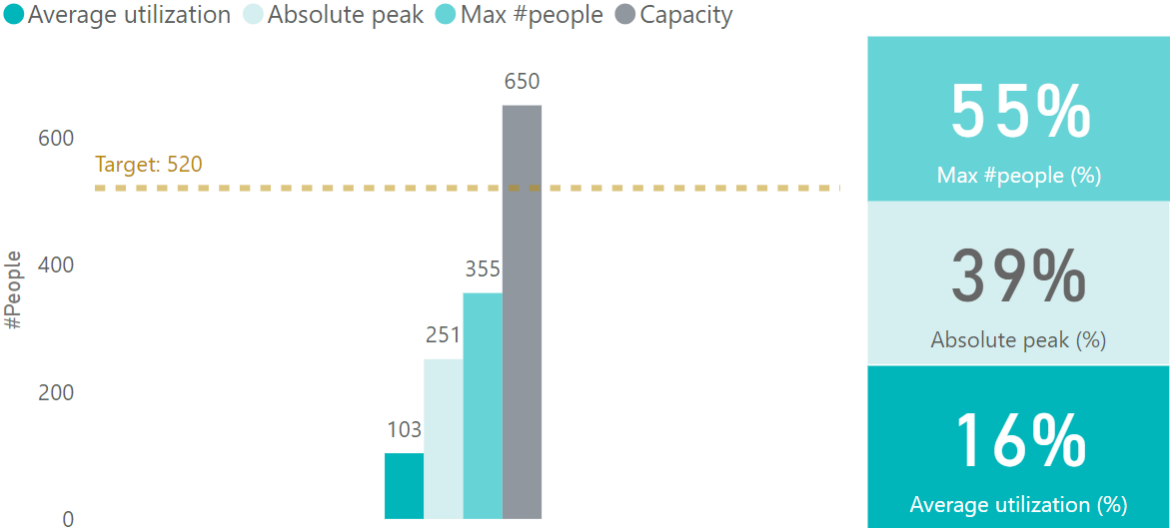
Period: August 1 - October 21, 2022 (12-week period)

Data collection: Data is collected every 5 minutes. If there is a connected device detected at the time of measurement, the space where the device is located is counted as occupied.

The data included in this report is related to the utilization of a building with four floors located in Europe.

Building Overview

Building KPIs: September 2022



This graph shows the most basic KPIs about the people who use your buildings: the average utilization, the absolute peak and the capacity. These KPIs provide you with a simple, but powerful tool to assess what is happening in your real estate portfolio on the highest level. Using these simple insights you can get an instant impression whether some buildings are over-utilized or under-utilized. You can always find these metrics and more by going directly to your Locatee Analytics dashboard.

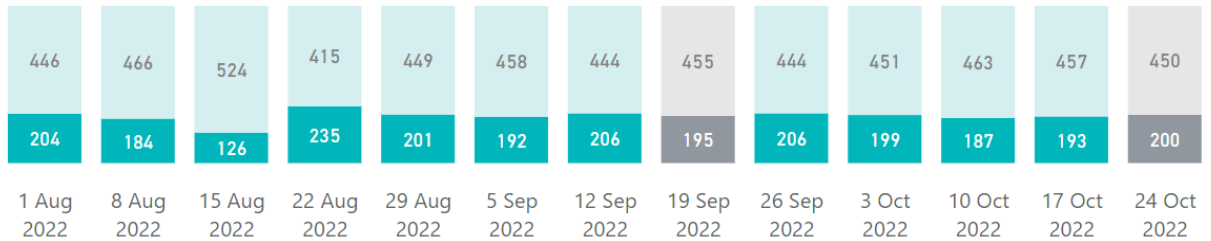
Floors closing scenario

This section details the available energy savings when optimizing the building's operations on a weekly basis, taking the weekly maximum free at peak forecast as a basis for optimization.

Building utilization forecast

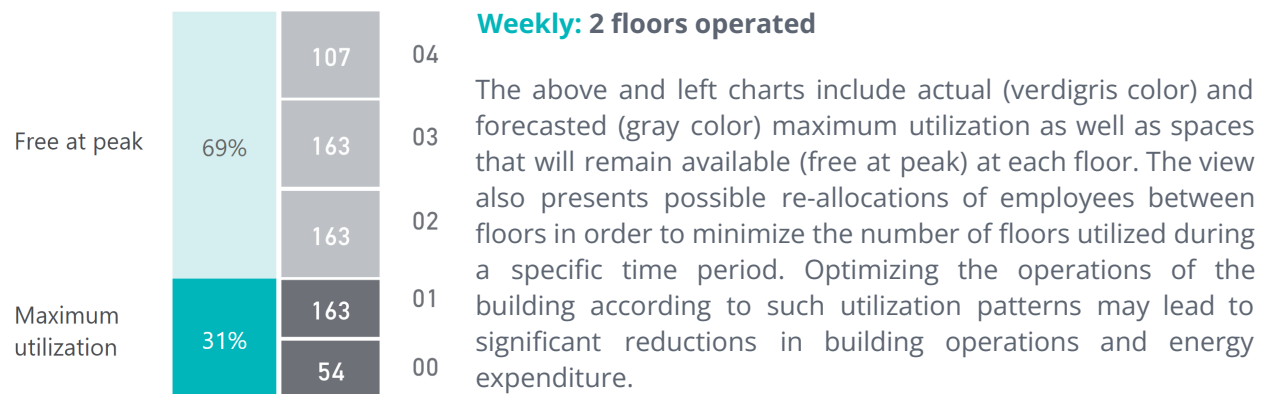
Axis x presents the start dates of each week.

● Max #people ● Free desks ● Forecast: max #people ● Forecast: free desks



*23rd Sep was identified as an outlier due to unusually high utilization, therefore Week 38 (19th-23rd Sep) has been replaced with a forecast

Building capacity optimization scenario



*ground floor cannot be closed

Space savings

Estimated area of the building: **7,600 sqm**

5 identical floors with area per floor: **1,520 sqm**

Based on the forecasted peak floor utilization, a maximum of 3 of out 5 floors may be closed on a weekly basis. This translates into **4,560 m2 space excluded** from operations.

This translates to: 60% of space savings

Electricity savings

Public sources ([Commercial Buildings Energy Consumption Survey \(CBECS\)](#), [Managing Energy Costs in Office Buildings](#)) point to a range of 17% to 43% share of lighting in electricity consumption in office buildings (2018, U.S. market). Based on the building

location's climate and the fact that the majority of heating is coming from the district as opposed to electricity, we assumed a value of **25% share of lighting** in electricity for the building.

The below formula explains the electricity savings that can be achieved with the aforementioned assumptions:

$$\text{Electricity savings} = \text{share of lighting (\%)} * \text{space savings (\%)}$$

This translates to: 15.0% in electricity savings

Heating savings

According to a number of studies, e.g., by the [Technische Universität Berlin](#), reducing room temperature by 1°C saves on average 6% of the overall heating energy consumed. Considering an average operating room temperature of 23°C and an average un-operated room temperature of 18°C, the heating energy savings in an unoperated space would amount to **30%** (5°C * 6%).

The below formula explains the heating savings that can be achieved with the aforementioned assumptions:

$$\text{Heating savings} = \text{heating savings (\%)} * \text{space savings (\%)}$$

This translates to: 18.0% in heating energy savings

Other savings

We assume that within the electricity consumption value, there are other items that could be optimized in order to achieve savings (e.g. cooling, certain systems or devices that can be switched off in unoperated space, like a canteen and a printer room). As we do not have detailed knowledge as to the electricity split by end-use in the building and solutions used to steer systems contributing to the energy consumption, we assumed an additional **5% of electricity consumption can be saved due to optimization**.

The below formula explains the energy savings that can be achieved with the aforementioned assumptions:

$$\text{Additional electricity savings} = \text{electricity savings (\%)} * \text{space savings (\%)}$$

This translates to: 3.0% in electricity savings

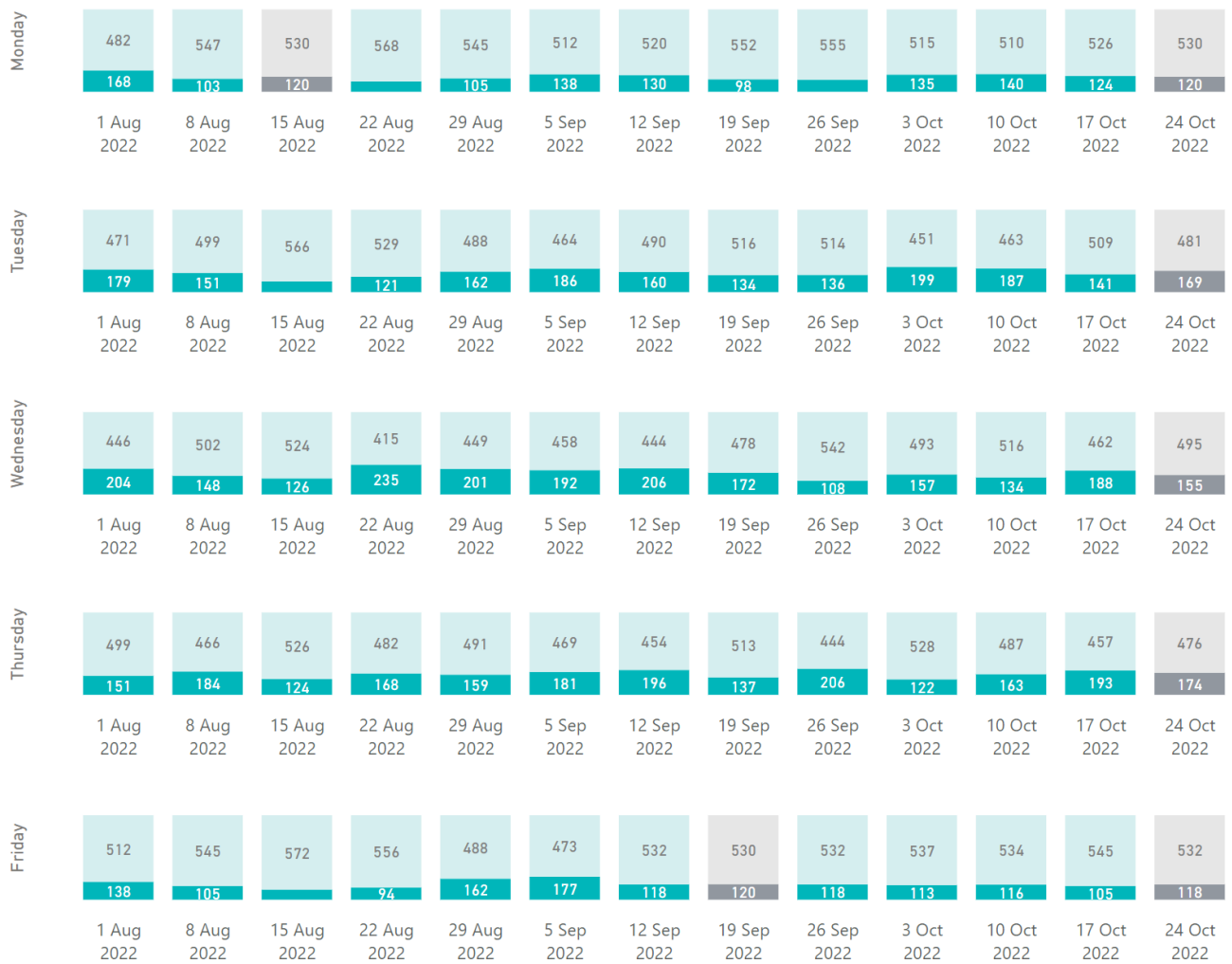
Building closing scenario

This section details the available energy savings when we consider closing down the whole building on specific days during the week.

Building utilization forecast: day of week

Axis x presents the start dates of each week.

● Max #people ● Free desks ● Forecast: max #people ● Forecast: free desks



*15th August was included as a forecast due to the fact that it was a public holiday. 23rd September was identified as an outlier and replaced with a forecast due to unusually high utilization values

The above graph shows the forecasted utilization for the following week (first week without the historical data) broken down by day of week. Mondays and Fridays are characterized by significantly lower office attendance than other days of the week. Therefore, what could be considered is to shut down the office completely on these days.

Space savings

The assumption is to close down the Building on **2 days with lower attendance** during the week out of 5 working days.

This translates to: Average space savings of 40%

Should the space savings in the 'Building closing' scenario be equal to the space savings in the 'Floors closing' scenario, this would not automatically translate into the same electricity and heating savings. That can be explained by different actions that can be taken in order to save energy in the two scenarios, as each action translates into different energy saving outcomes.

Electricity savings

Since the lights can be fully turned off either in the whole building or on selected floors, the approach to calculating electricity savings is the same in both scenarios ('Building closing' and 'Floors closing').

The below formula is used:

$$\text{Electricity savings} = \text{share of lighting (\%)} * \text{space savings (\%)}$$

This translates to: 10.0% in electricity savings

Heating savings

We assumed the approach to achieving energy savings could potentially be different when shutting down the whole building as compared to shutting down selected floors. We assumed the inflow of heat can be controlled more easily by switching it on and off for the whole building, especially in case when it comes from district heating. Therefore, we assumed that in the 'Building closing' scenario, heating could be turned off completely on days when the office is closed.

The above approach would mean we could assume **100% heating savings** (as opposed to 18% in the 'Floors closed' scenario) in the following formula:

$$\text{Heating savings} = \text{heating savings (\%)} * \text{space savings (\%)}$$

This translates to: 40.0% in heating savings

Other savings

As in the 'Floors closing' scenario, we assumed an additional **5% of electricity consumption can be saved due to optimization.**

The below formula is used:

$$\text{Additional electricity savings} = \text{electricity savings (\%)} * \text{space savings (\%)}$$

This translates to: 2.0% in electricity savings

Financial savings

The data received and used for calculations encompasses:

- Electricity and heat usage (Jan 2019 - Sep 2022)
- Electricity prices (Jan - Sep 2022)

As the data did not detail the building's energy consumption structure and technical feasibility of controlling the electricity and heating systems, we also incorporated in our analysis benchmarks and assumptions based on publicly available studies and expert knowledge.

Since some of the assumptions are based on market benchmarks, they may not be entirely aligned with your actual energy usage, the energy and heating prices specified in your contracts with vendors and the capabilities to steer energy and heating systems in the building in scope.

The financial model was developed to simulate annual financial savings for 2023. We implemented a simplified approach for this purpose, assuming that the same number of floors / days per week can be excluded from operations throughout the whole year. In practice, this could change, as needed.

Assumptions for the financial model:

Floors closing scenario	Savings calculated based on an assumption that the same number of floors is closed for the week (as per forecast included in previous sections).
Building closing scenario	Savings calculated based on an assumption that the Building remains closed for 2 days during a week.
Electricity savings	30% per unoccupied area: <ul style="list-style-type: none">- 25% lighting share- 5% other electricity end-uses that could be turned off
Heating savings	Floor closing scenario: 30% per unoccupied area Building closing scenario: 100% per unoccupied area
Electricity and heating forecast	We applied average monthly consumption for the years of 2019 and 2021 to extrapolate the forecast for the remaining months of 2022 (October to December). 2020 was excluded due to extreme circumstances related to COVID-19. 2023 usage forecast was assumed to be equal to 2022 usage.
Price of electricity (EUR / kWh)	We assumed two scenarios: <ul style="list-style-type: none">- Basic (price remains at the level of Sep 2022 values)- Price increase (increase by 100% with the beginning of 2023)
Price of heating (EUR/GJ)	We assumed the price to remain at the current level (Sep 2022) of 11.3 EUR/GJ. Source: current average heat pricing for the region

The assumptions are the same for both scenarios unless stated otherwise.

Results of the analysis:

The below table presents projected financial savings for 2023:

Category	Values
2023 annual electricity consumption	491 MWh
2023 annual heating consumption	1,722 GJ
Floors closing scenario <ul style="list-style-type: none">- Heating turned down by 3°C on unoperated floors- Lighting turned off on unoperated floors	
Electricity financial savings	Basic scenario: 17,206 EUR Price increase scenario: 34,411 EUR
Heating financial savings	3,515 EUR
Total financial savings	Basic scenario: 20,720 EUR Price increase scenario: 37,926 EUR
Building closing scenario <ul style="list-style-type: none">- Heating turned off- Lighting turned off	
Electricity financial savings	Basic scenario: 11,470 EUR Price increase scenario: 22,941 EUR
Heating financial savings	7,810 EUR
Total financial savings	Basic scenario: 19,281 EUR Price increase scenario: 30,751 EUR

With the current building utilization forecast, the highest total financial savings could be achieved by closing down floors.