Why Counting People, Not Sensing Occupancy Better Optimizes Your Energy Management

According to a [recent report by the U.S. Environmental Protection Agency (EPA)](#), electricity use in buildings generates 6,343 million metric tons of CO2, with 75% of that coming from HVAC systems, lighting, and appliances.

Modern office buildings must—and can—do better. There are also financial factors at play. As energy costs rise, inefficiency can hurt an otherwise healthy fiscal year. Excessive energy consumption leads to higher greenhouse emissions and a larger carbon footprint, which not only harm the environment but also risk damaging your company's reputation.

With a system that counts the number of people using your spaces, you can optimize energy usage by introducing granular, automated control over your HVAC and lighting systems. While occupancy sensing offers basic detection—indicating whether people are present or not—people counting takes it a step further by providing more than a binary "yes, people are here" or "no, no one's here" message. Instead, it indicates how many individuals are in the space. This extra layer of information allows your HVAC and lighting solutions to adjust accordingly, scaling energy use based on real-time needs and, thus, avoiding energy waste.

HVAC systems, lighting, and appliances account for
75% of the electricity use
in buildings, which generates 6,343 million metric tons of CO2.
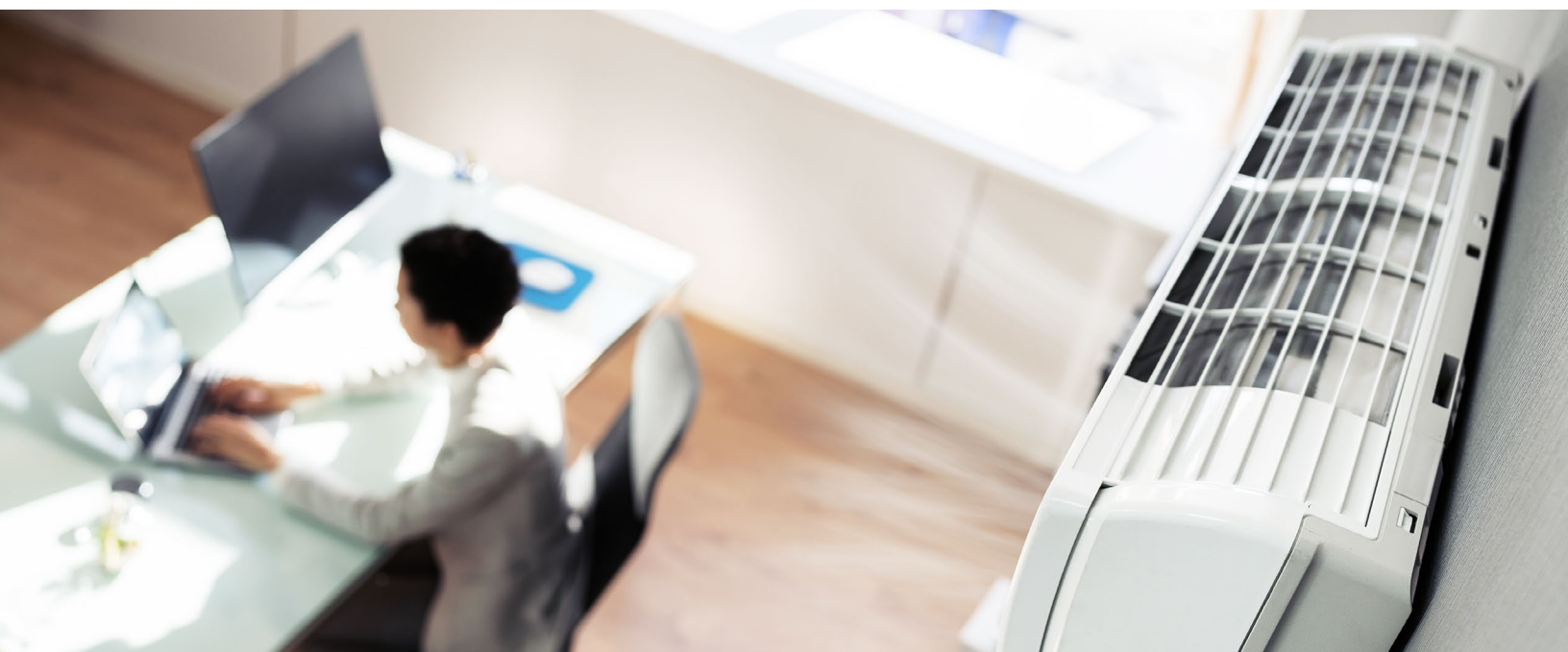
COMMON OBSTACLES TO REDUCING ENERGY CONSUMPTION IN LARGE BUILDINGS

The cost of HVAC and lighting has pushed energy expenditures in the U.S. to new heights. Through the end of 2022, for example, $482 billion was spent on electricity alone. This equates to [28% of overall energy spending](#)—and almost triple the amount spent on natural gas ($179 billion).

Reducing the costs of electricity can be challenging for several reasons:

Inaccurate Data for Decision-Making

Inaccurate data is a primary pain point. Without knowing exactly how many people need HVAC and lighting, businesses are often forced to run these systems as if they were serving full occupancy whenever people are present.

In a modern business environment, this can result in tremendous energy waste and excessive CO_2 emissions. For instance, if 30% of your employees are hybrid workers, you may know when they come and go, but your HVAC and lighting systems don't. Without real-time data on how many people are in each space, there's no way to intelligently scale your energy use.

> ## *$482 billion*
> *was spent on electricity alone through the end of 2022.*

Aging Infrastructure

As HVAC systems age, their energy efficiency tends to decline. Additionally, older lighting systems may still rely on outdated bulbs that consume far more energy than modern LEDs and other low-wattage alternatives. When aging HVAC units are running at full capacity and inefficient lighting is used at the same time, your energy costs steadily rise.

Ensuring Occupant Comfort

When it comes to ensuring the comfort of building occupants, many managers prefer to err on the side of caution. This makes sense. You can't risk harming productivity or reducing employee satisfaction by subjecting people to environments that are either too hot or too cold.

Unless you have accurate data on how many people are in each space, the safest approach is to assume full occupancy. This often results in running your systems at full capacity, even when unnecessary.

HOW PEOPLE COUNTING OPTIMIZES HVAC SYSTEMS AND LIGHTING CONTROLS

Calumino's thermal sensing technology enables you to count the exact number of people in each space and use that data to exercise granular control over your HVAC and lighting systems.

What Makes Calumino's Solution Unique

Calumino delivers reliable energy-saving data without sacrificing privacy and accuracy. Our AI system uses low-resolution images to detect people and objects. This complies with GDPR, as the resolution is too low to identify who someone is. At the same time, despite the low resolution, the AI can still accurately distinguish between humans and other objects that generate heat, such as laptops or a cup of coffee, based on their heat signatures.

To illustrate the privacy benefits, imagine managing a commercial building where an employee enters a room wearing sunglasses and carrying a purse. At a higher resolution, the outline of these items might be clear enough to identify that individual, especially if they're the only one who regularly wears sunglasses or carries a purse. This could raise GDPR compliance concerns because the individual could be identifiable. However, with Calumino technology, the person appears as a collection of indistinct blocks, without enough definition to reveal apparel details—but there is enough heat signature data for the system to tell there's a human in the room.

Calumino's solution not only counts the number of people in a space but does so with greater accuracy compared to other systems, such as those that use near-infrared (NIR) wave detection. NIR detection, often found in complementary metal oxide semiconductor (CMOS) cameras and night vision equipment, can detect heat but struggles with distinguishing between humans and the background. This lack of clarity can make it difficult for NIR-based systems to accurately detect individual people in a space. Calumino's solution, on the other hand, operates in the long-wave infrared (LWIR) spectrum, which more accurately identifies humans within their environment.

HOW CALUMINO'S SOLUTION BENEFITS YOUR ENERGY MANAGEMENT STRATEGY

Because Calumino technology can provide more accurate temperature readings, you can generate a true thermal map of each space.

As a result, you can:

- **Adjust temperatures based on spatial details:** By taking accurate readings, Calumino can identify areas, like spots near sunlit windows, that are warmer than others and adjust HVAC settings accordingly. You can use Calumino's evaluation kit to assess the performance of our thermal sensors.

- **Reduce and optimize air flow:** Many buildings require outside air based on occupancy levels. With Calumino, you can get a precise count of the number of people inside a space and provide the necessary amount of outside air. This can result in significant savings, since outside air requires the most energy to cool or heat. For example, according to ANSI/ASHRAE standards, in a restaurant dining area, you need 10 cubic feet per minute of outside air per person. If Calumino detects that a dining room only has a few people, your system can use that data to adjust the speed of your fans accordingly.
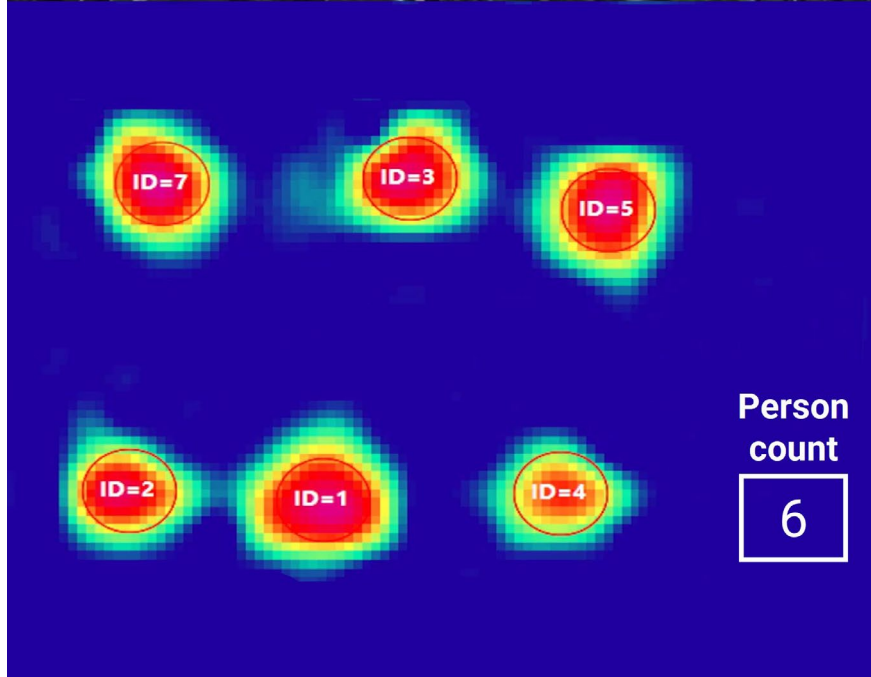
CUTTING COSTS WITH CALUMINO: HOW COUNTING PEOPLE SAVES ENERGY

Reducing energy consumption in large buildings can be tough, especially with inaccurate data, aging infrastructure, and the need to keep occupants comfortable. But with Calumino's solution, you can count individual people in a space and use that data to adjust your HVAC and lighting systems to match. The result? Significant savings.

Take BAM Facilities Management (BAM FM) for example. They recently installed 15 Calumino sensors to optimize energy use at their Bower House office in Oldham, England. The move was in response to The Guinness Partnership's Net Zero 2050 strategy. Even though the building already had occupancy sensors, using Calumino helped BAM FM reduce energy consumption by an *additional* 40%.

*To see how your organization can start saving energy with Calumino, **contact us** to learn more.*