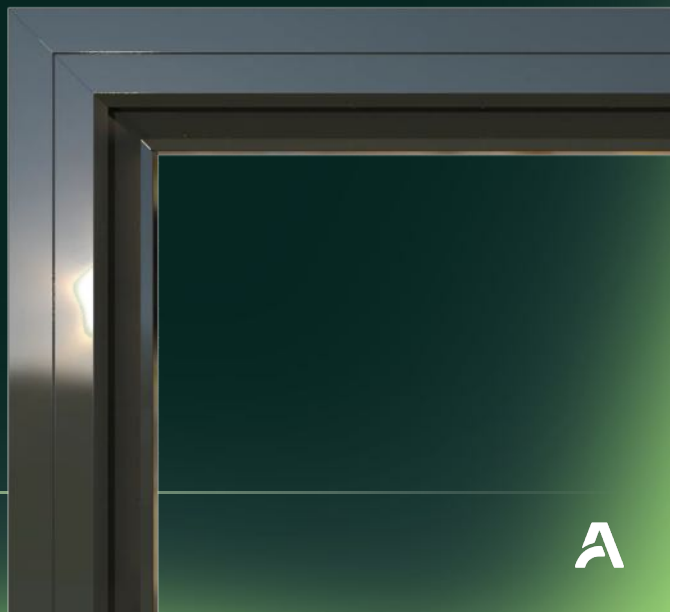
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Energy management starts at the door

Tackling the hidden cost of air infiltration

John O’Brien
AirDoor at VES

Energy Management Theatre | 15 October 2026



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TODAY'S SESSION

From the blind spot to the smart entrance

01
The energy-management blind spot

02
What actually happens at an open entrance

03
It's not just an energy problem

04
From passive to intelligent entrance management

05
The smart entrance

06
The bigger picture

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01 THE ENERGY-MANAGEMENT BLIND SPOT

How smart is your building?

- HVAC
- Lighting
- Occupancy
- CO_2
- Temperature
- Energy metering
- BMS
- Demand-controlled ventilation
- Heat recovery

THE ENTRANCE

But what happens at the entrance?

We've become very good at managing what happens inside the building. The interface with the outside world is much harder to control.

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01 THE ENERGY-MANAGEMENT BLIND SPOT

The building envelope has a weakness

Walls
Insulated

Roof
Insulated

Windows
Designed to limit unwanted heat transfer

The entrance
A large opening, used all day

OPEN DOOR → AIR MOVEMENT → ENERGY TRANSFER

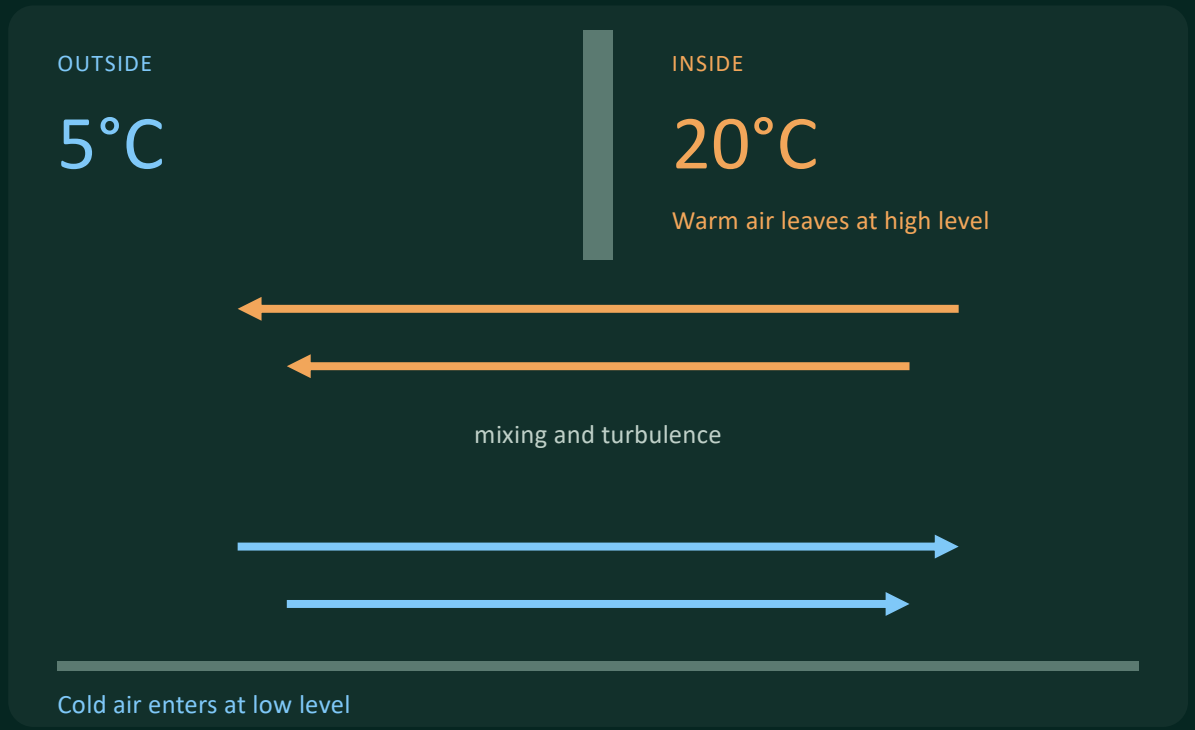
Air infiltration: the uncontrolled movement of air, not simply “heat escaping”. It is driven by:

- Temperature difference
- Pressure difference
- Wind
- Door operation
- Building use

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02 WHAT ACTUALLY HAPPENS AT AN OPEN ENTRANCE

What happens when the door opens?



The amount of infiltration isn't constant.

It changes with:

- Weather
- + Building
- + Door
- + People
- + Operation

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02 WHAT ACTUALLY HAPPENS AT AN OPEN ENTRANCE

It's not just about the door being open

01
Wind
Changes airflow direction and velocity at the opening.

02
Temperature difference
Drives buoyancy and the stack effect, so air moves even on a still day.

03
Door frequency
Determines how often the building is exposed.

04
Door size and open time
Determines the scale of the opening and how long it lasts.

Every entrance behaves differently.

EXAMPLE: A COASTAL HOSPITAL

Open 24/7, with an average wind speed of 11.7 mph and calm conditions only 1% of the time. Several entrances face directly into the prevailing wind for most of the heating season.

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02 WHAT ACTUALLY HAPPENS AT AN OPEN ENTRANCE

The hidden energy demand

01 External air enters → 02 Indoor temperature changes → 03 HVAC responds → 04 Heating or cooling demand increases → 05 Energy consumption increases

The HVAC system may be doing exactly what it was designed to do. The problem is that it is responding to a problem created at the entrance.

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02 WHAT ACTUALLY HAPPENS AT AN OPEN ENTRANCE

It works both ways: heatwaves and refrigeration

WINTER

Cold air in, warm air out

Heating load rises and cold draughts build up around the door.

SUMMER AND HEATWAVES

Hot, humid air in

Cooling load rises at exactly the time chillers and air conditioning are already working hardest.

FOOD RETAIL

Refrigeration feels it too

Warm, moist air reaching refrigerated display cases adds load, condensation and frost, so refrigeration plant works harder.

As summers get hotter, entrance infiltration becomes a year-round energy issue, not just a winter one.

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03 IT'S NOT JUST AN ENERGY PROBLEM

What happens at the entrance doesn't stay there



Heating and cooling plant compensating

Cold draughts, hot and cold spots

External air, dust and noise coming in

Areas near the door people avoid

WHAT THE OCCUPANT EXPERIENCES

Cold draughts, hot and cold spots, uncomfortable waiting areas and an unpleasant first impression of the building.

SPACE AT RISK OF BECOMING DEAD SPACE

Reception seating, waiting areas, retail displays, café seating, patient and visitor areas.

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04 FROM PASSIVE TO INTELLIGENT ENTRANCE MANAGEMENT

There isn't one solution

APPROACH	WHAT IT CAN ACHIEVE	CONSIDERATIONS
Draught lobby / vestibule	Creates physical separation	Requires floor space
Revolving door	Limits open doorway exposure	Accessibility, throughput and installation
Sliding / automatic doors	Controls opening time	Still creates an opening when operating
Air curtains / overdoor heaters	Air barrier, really?	Can require significant energy and overhead space
Active air barrier	Manages airflow dynamically	Requires appropriate design and control

Each has its place. The right answer depends on the building, the entrance and how it is used.

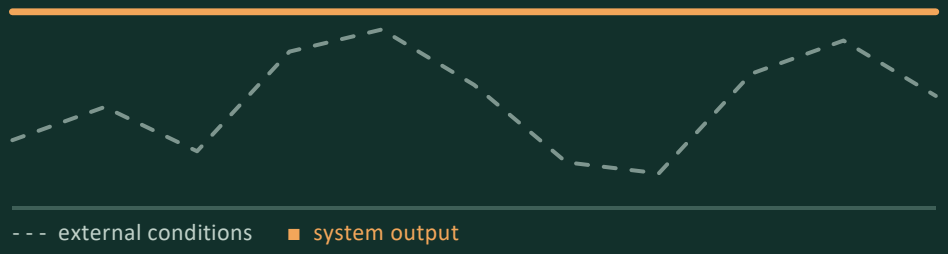
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05 THE SMART ENTRANCE

From passive protection to active management

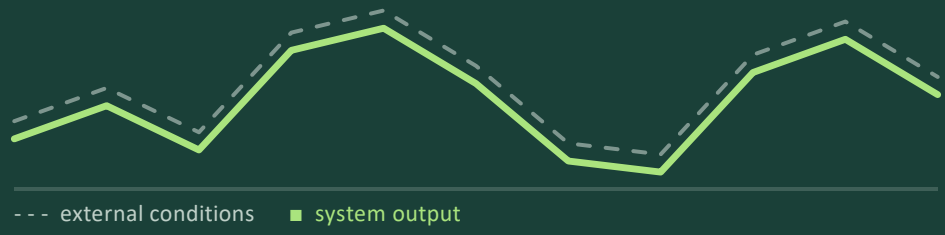
FIXED OUTPUT

Apply a fixed solution to an opening



RESPONSIVE CONTROL

Sense conditions, respond, manage airflow



SENSE → DECIDE → RESPOND

Why use more energy than necessary?

Illustrative only

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05 THE SMART ENTRANCE | CASE STUDY

AirDoor: an active air barrier for busy entrances



Sensor-driven
Measures the pressure difference across the entrance, a direct indicator of infiltration.

Variable-speed fans
Output goes up or down to match the infiltration detected.

No heating or cooling
Moves air rather than conditioning it. Rated at about 0.4 kW.

Floor-mounted
Free-standing inside the doorway. No crossbeam or work at height.

Standalone, BMS-ready
Runs on its own and can report to the BMS or cloud monitoring.

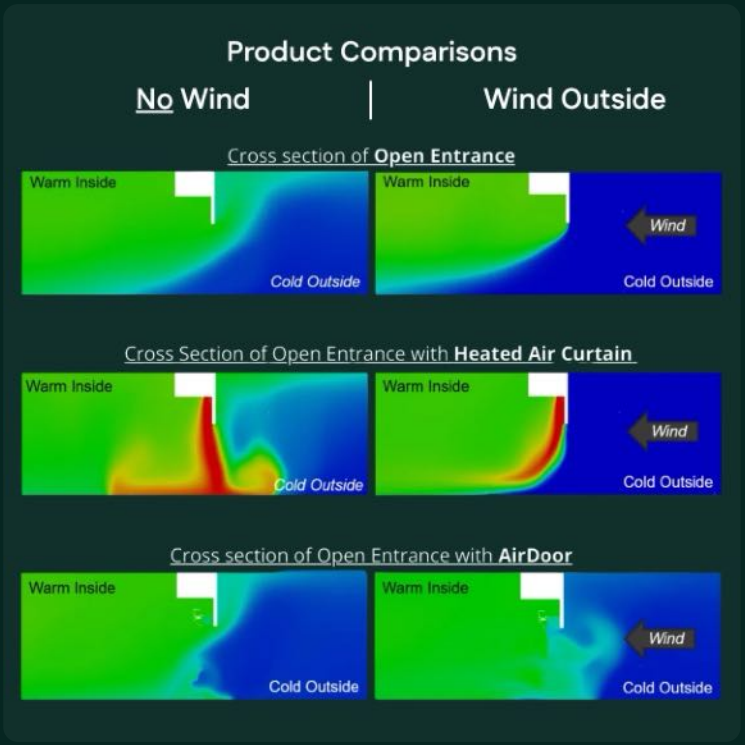
Developed by aerodynamic experts
AirDoor is an innovative alternative to traditional overhead air curtains..

“The point isn't that the fans are variable speed. It's that we match the system's response to what is actually happening at the entrance.”

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05 THE SMART ENTRANCE

Seeing the airflow



CFD cross-sections of an open entrance, warm inside and cold outside, with no wind (left) and with wind (right).

Open entrance

Warm air escapes at high level while cold air floods in at low level. Wind makes it worse.

Heated overhead air curtain

Can hold temperature at the door in still air, but loses heated air outside. Wind can overpower it, particularly at low level.

Active air barrier (AirDoor)

Opposes the low-level infiltration in still air. With wind, infiltration is stopped at both high and low level.

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REAL BUILDINGS, REAL ENTRANCES

Different buildings. The same fundamental challenge.

SUPERMARKETS

High footfall, open-door policies, refrigeration near the entrance.

15,199 kWh

Total annual energy use of 27 AirDoor units across 11 stores of a national supermarket chain.

HIGH STREET RETAIL

Frequent door operation, staff complaints of cold near the entrance.

796 kWh

AirDoor energy over 10 months at one store, against an estimated 37,107 kWh for an 18 kW heated overhead curtain.

HEALTHCARE

24/7 operation, automatic doors, patient and visitor comfort.

102,794 kWh

Estimated maximum annual reduction per entrance against an 18 kW electric heated air curtain at a coastal hospital (desktop study).

COMMERCIAL AND EDUCATION

Reception areas, staff and visitor movement, high-volume peaks at set times.

300+

Places worldwide already using AirDoor, across retail, commercial and public buildings.

Supermarket and high street figures from customer energy data. Healthcare figure is a desktop-study estimate based on public weather data and site survey.

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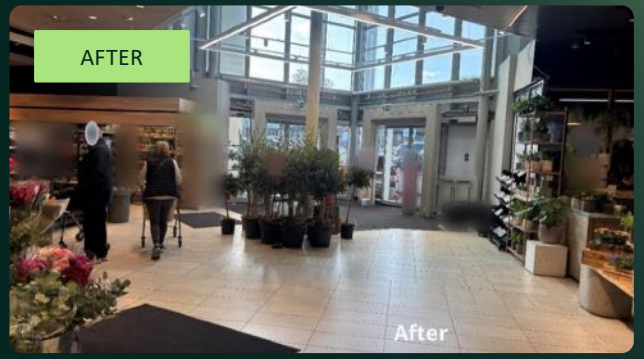
USABLE SPACE

Giving the entrance back to the building

Where a draught lobby or porch exists mainly to manage infiltration, an active air barrier can allow it to come out.

That floor area goes back to trading, seating or circulation, and the entrance becomes more open and accessible.









Top: grocery store, lobby removed and replaced with AirDoor.
Bottom: supermarket, glazed porch removed for an open entrance.

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NEW BUILDS AND REFURBS

Design the entrance in, size the plant down

Heating and cooling plant is sized for peak winter and peak summer loads, and external air at busy entrances is part of that peak.

Sealing the heavily used entrances reduces the capacity the plant needs to provide, as one retail customer found when AirDoor was fitted at all the busy entrances of a store.





300 → 200 kW

Heat pump capacity for a 25,000 sq ft (2,300 m²) store

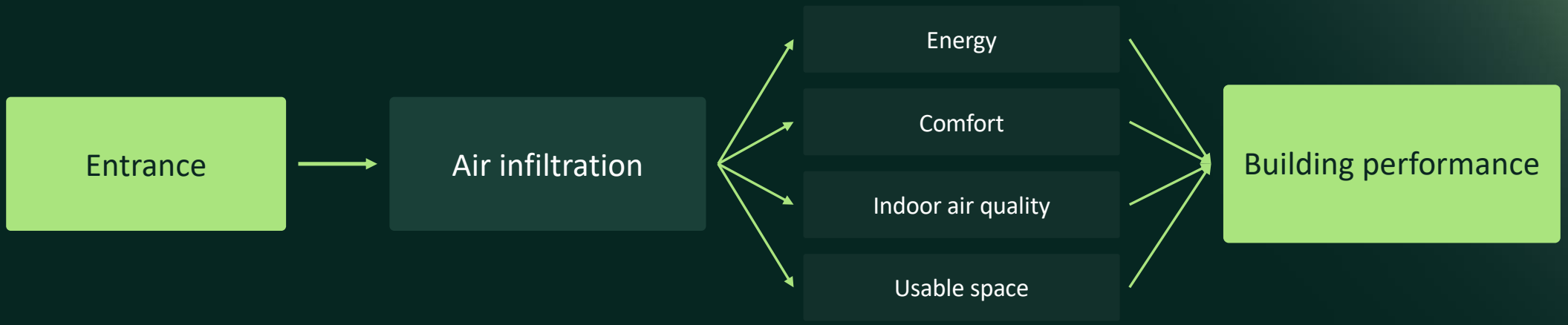
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Capital cost saved on the heat pump

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06 THE BIGGER PICTURE

Make the entrance part of the energy strategy



If a building can sense, control and optimise almost everything else, why should the entrance be different?

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FIVE QUESTIONS TO TAKE AWAY

Five questions for your building

1	How often is the entrance actually open?
2	What are the external conditions doing to airflow?
3	Is the HVAC system compensating for uncontrolled infiltration?
4	What is happening to comfort and usable space around the entrance?
5	Can entrance management become part of the building's wider control strategy?

Energy management doesn't stop at the building envelope.

It starts at the door.

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Thank you. Questions?

Energy management starts at the door

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