



**TITLE 24, PART 6**

**2025 CODE CYCLE**



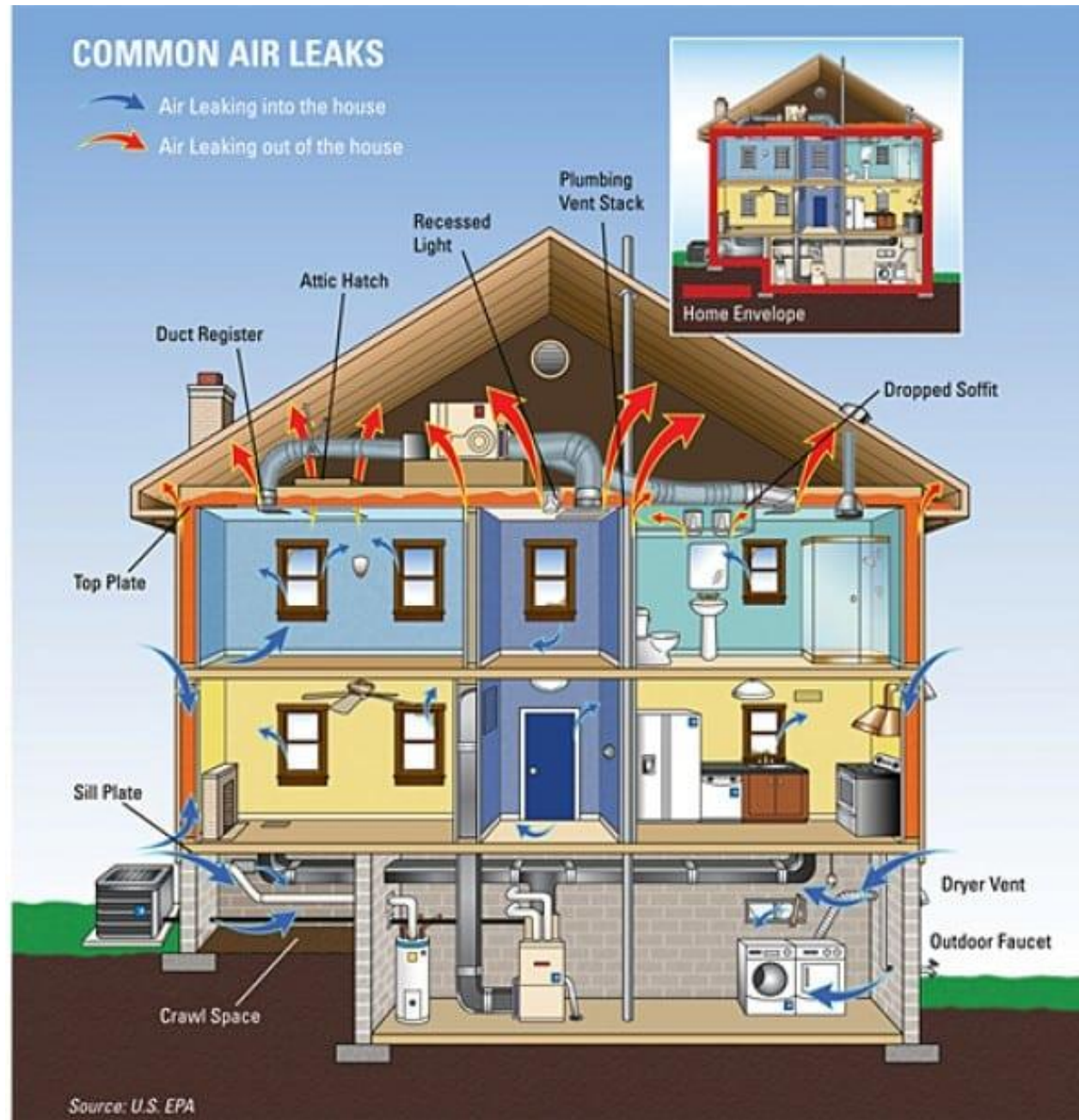
# Simulate and Measured Air Infiltration Rates

Discussion with CEC and PG&E  
March, 2024



# Agenda

- Background
- Previous field studies
- Simulation results
- CBECC-Res
- Future work



# Background

Mandatory airtightness requirements for single family homes has been brought up for consideration in multiple code cycles. During the 2025 code cycle, several industry stakeholders reached out to the Statewide CASE Team to support a mandatory airtightness requirement in California. Even passive house organizations are concerned of no mandatory blower door requirement in place.

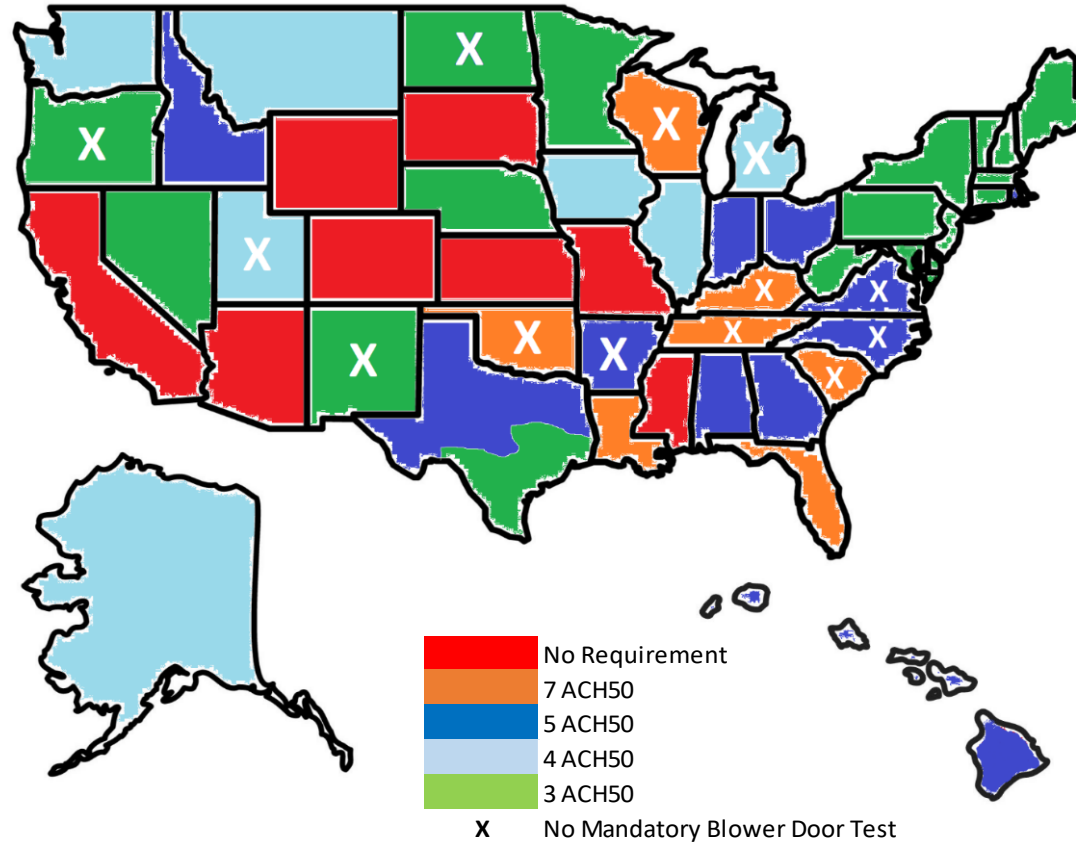
For those advocating for airtightness requirement, the main concerns are:

- Air leakage cause unintentional air infiltration and exfiltration, resulting in energy losses. More specifically, infiltration of outdoor air causes the HVAC system to run longer and more frequently. Unintentional air leakage jeopardizes the expected performance of the HVAC system, which calls for “Build tight, ventilate right”. In other words, the envelope should not serve as a means of providing fresh intake, but instead fresh air should be handled mechanically.
- Air leakage may cause moisture problems such as mold growth or condensation issues, which may lead to wooden decay of structural components.
- Air leakage may negatively impact indoor air quality if the outdoor air is contaminated, such as for the event of wildfires.

Because of small, estimated savings, but yet a great push from some building industry actors, it's of value to confirm that CBECC-Res simulates air infiltration realistically and correctly predicts impact on overall energy demand.

# Background

Many jurisdictions, states and countries across the world have recognized the importance of building airtight and many energy codes require a minimum overall building airtightness. Typically, an airtightness requirement is stated as a maximum ACH50 (air changes per hour at 50 Pascals pressure difference) value, or maximum flow rate per building envelope surface area (cfm/ft<sup>2</sup>).



# Background – Airtightness of California homes

*Indoor Air Quality in California Homes with Code-Required Mechanical Ventilation* - Brett et.al. 2020

103 Homes tested

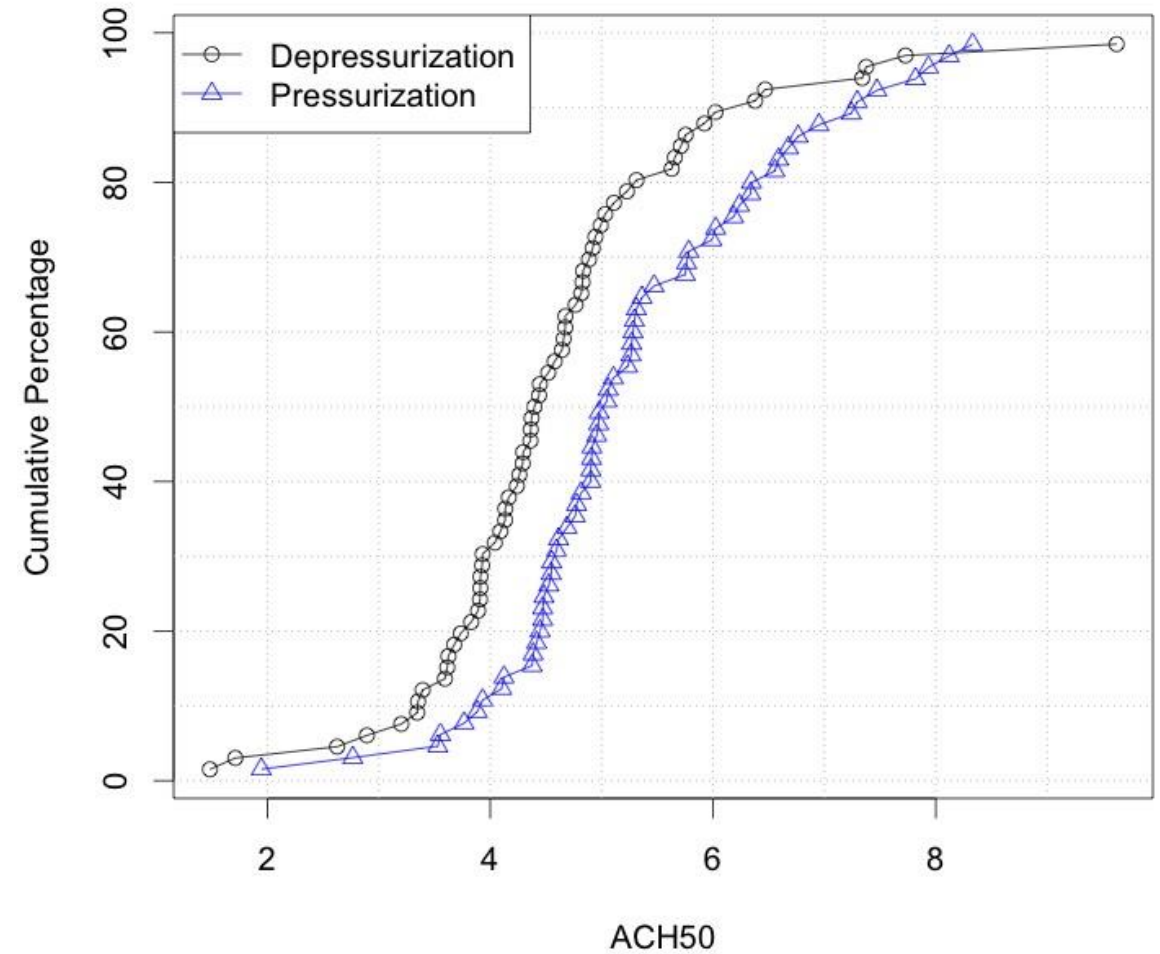

**Healthy Efficient New California Homes Study**

Lawrence Berkeley National Lab

We are looking for participants for a research study of single-family homes built in 2011 or later, with gas appliances and mechanical ventilation.

Participants will receive up to \$350 in Lowe's gift card for completing in-home sampling for one week.

For more information, please contact:  
Rengie Chan wrchan@lbl.gov 510.486.6570  
<https://hengh.lbl.gov/key-activities/field-monitoring-new-homes>





# Background – Lack of Cost Effectiveness

2025 Prescriptive Home, Reduce ACH50 from 5 to 3, 2,700ft<sup>2</sup> prototype.

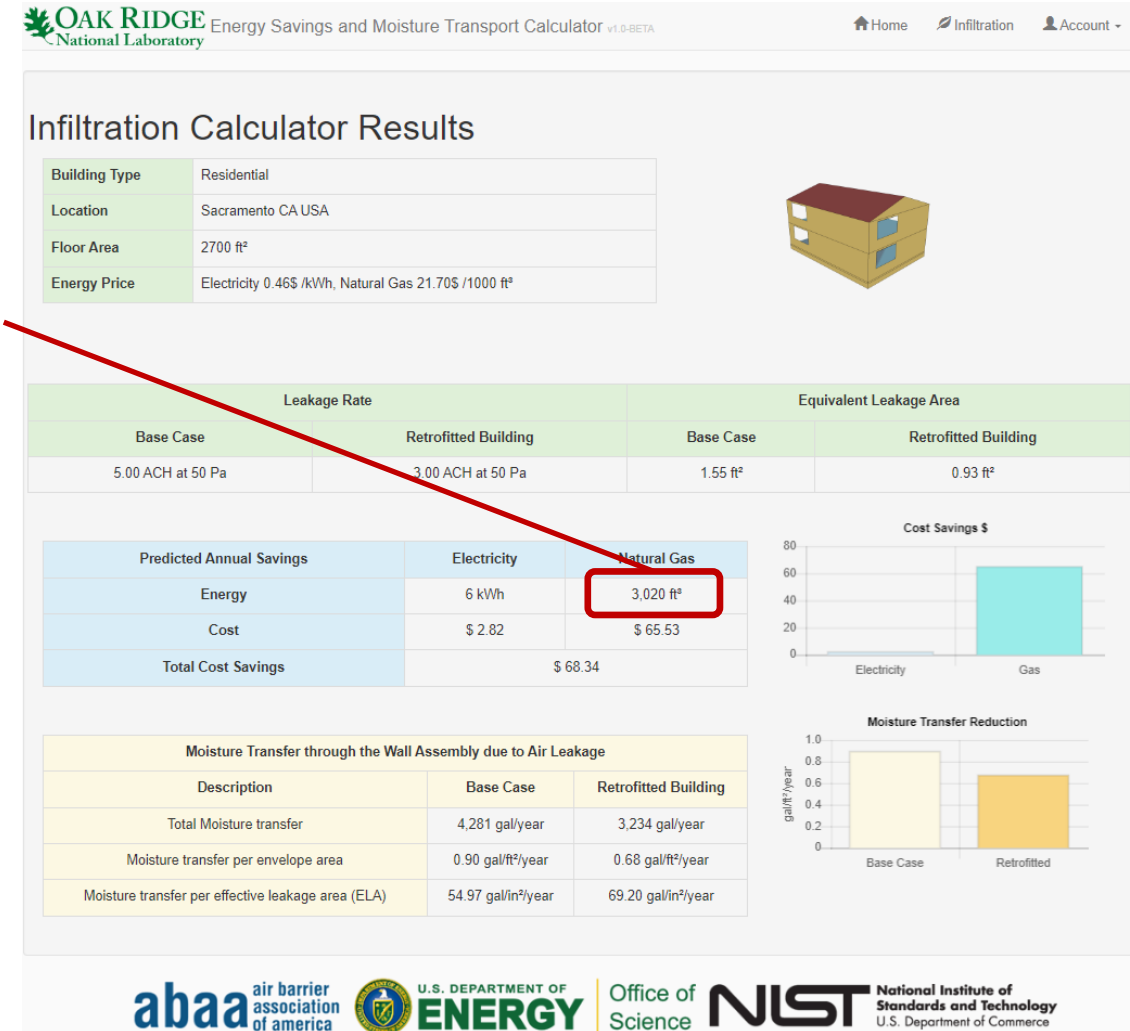
## HP – All Electric

Climate Zone	Annual Electricity Savings (kWh)	LSC Savings (\$)	LSC Heating Savings (\$)	LSC Cooling Savings (\$)
1	43.3	\$294	\$294	\$0
2	29.8	\$252	\$252	\$0
3	18.4	\$168	\$168	\$0
4	42.8	\$315	\$315	\$0
5	22.8	\$168	\$168	\$0
6	5.1	\$42	\$42	\$0
7	2.8	\$21	\$42	(\$21)
8	28.2	\$189	\$105	\$84
9	22.8	\$147	\$105	\$42
10	30.6	\$231	\$147	\$84
11	52.1	\$357	\$315	\$42
12	40.6	\$294	\$252	\$42
13	38.4	\$273	\$231	\$42
14	68.2	\$483	\$420	\$63
15	5.3	\$42	\$21	\$21
16	44.6	\$315	\$336	(\$21)

## Mixed-Fuel

31.2 therms annually  
(3.3 therms CBECC-Res)

Per 30 years



# Previous field studies - Airtightness

Tracer gas tests in 21 homes in the UK



Dwelling 2



Dwelling 3



Dwelling 6



Dwelling 10



Dwelling 11



Dwelling 12



Dwelling 13



Dwelling 14



Dwelling 15



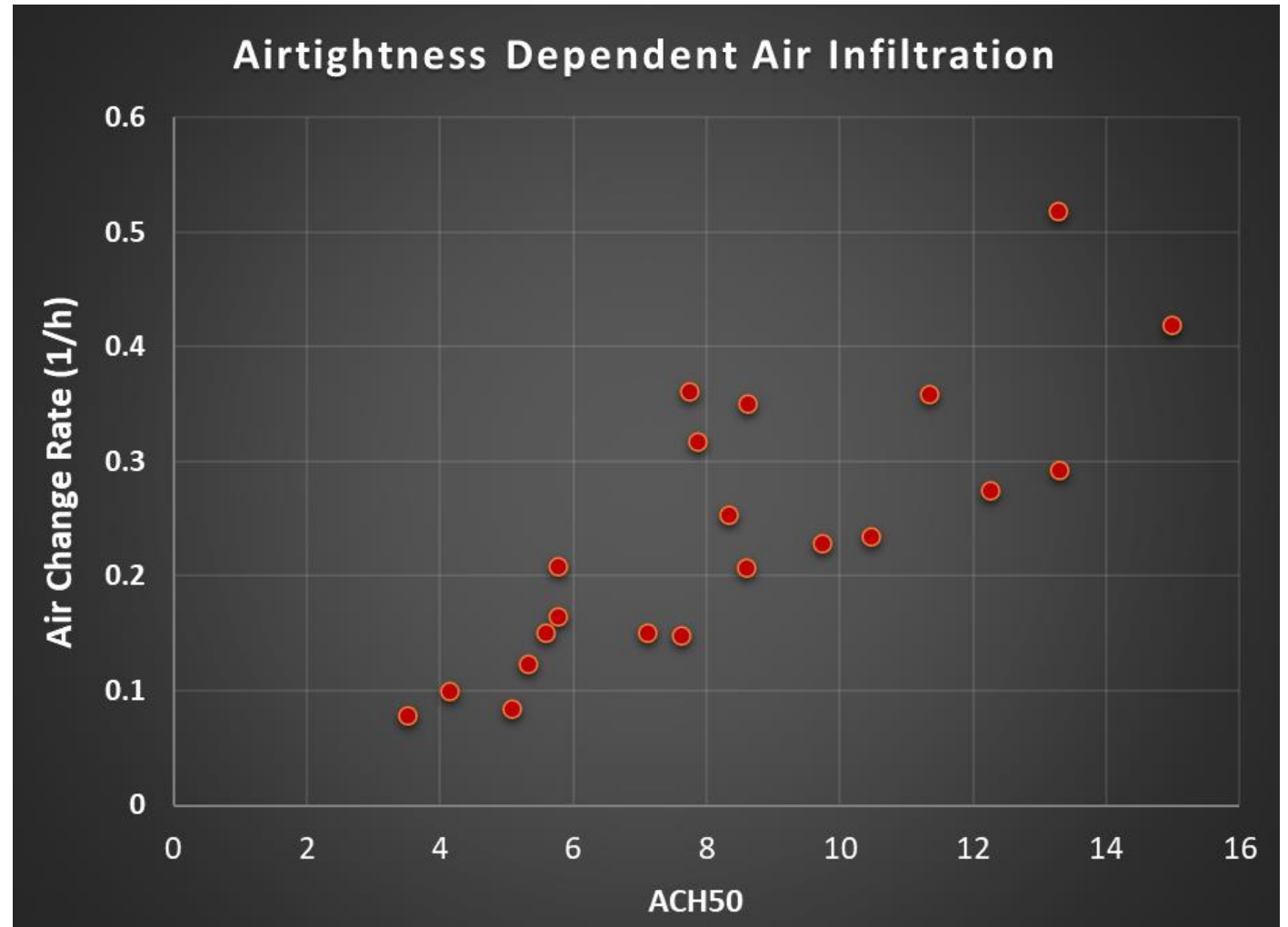
Dwelling 16



Dwelling 17



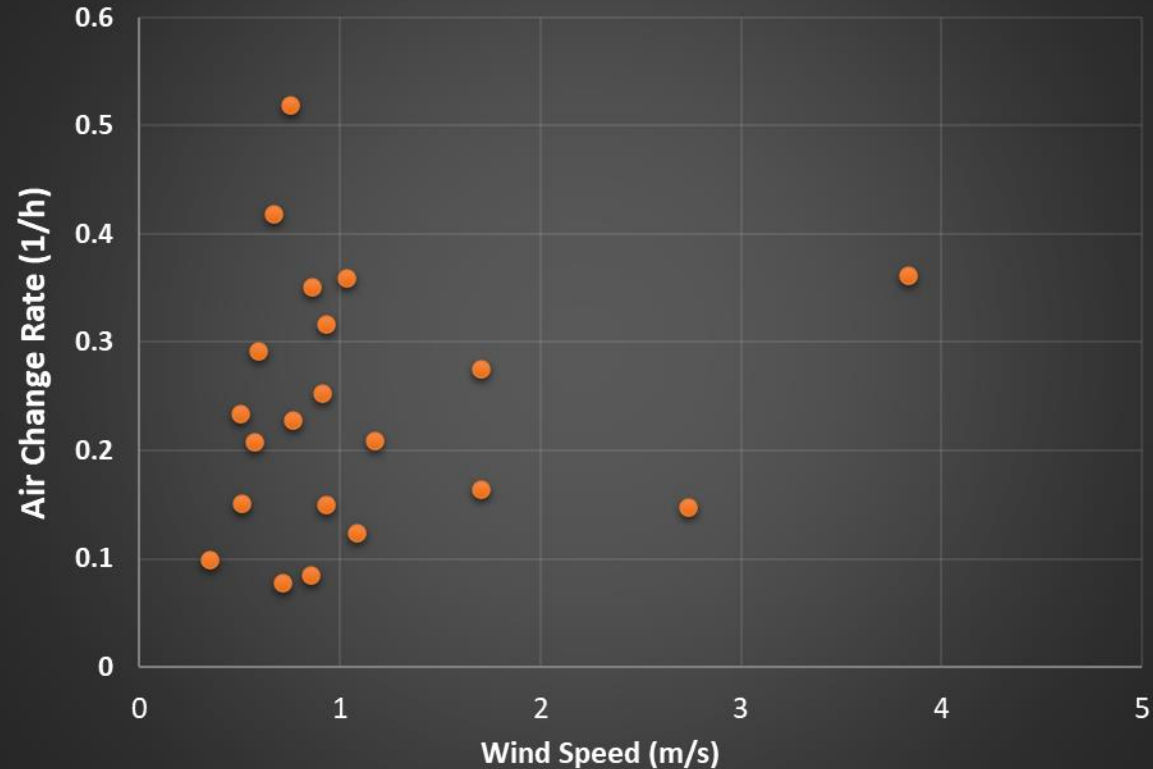
Dwelling 19



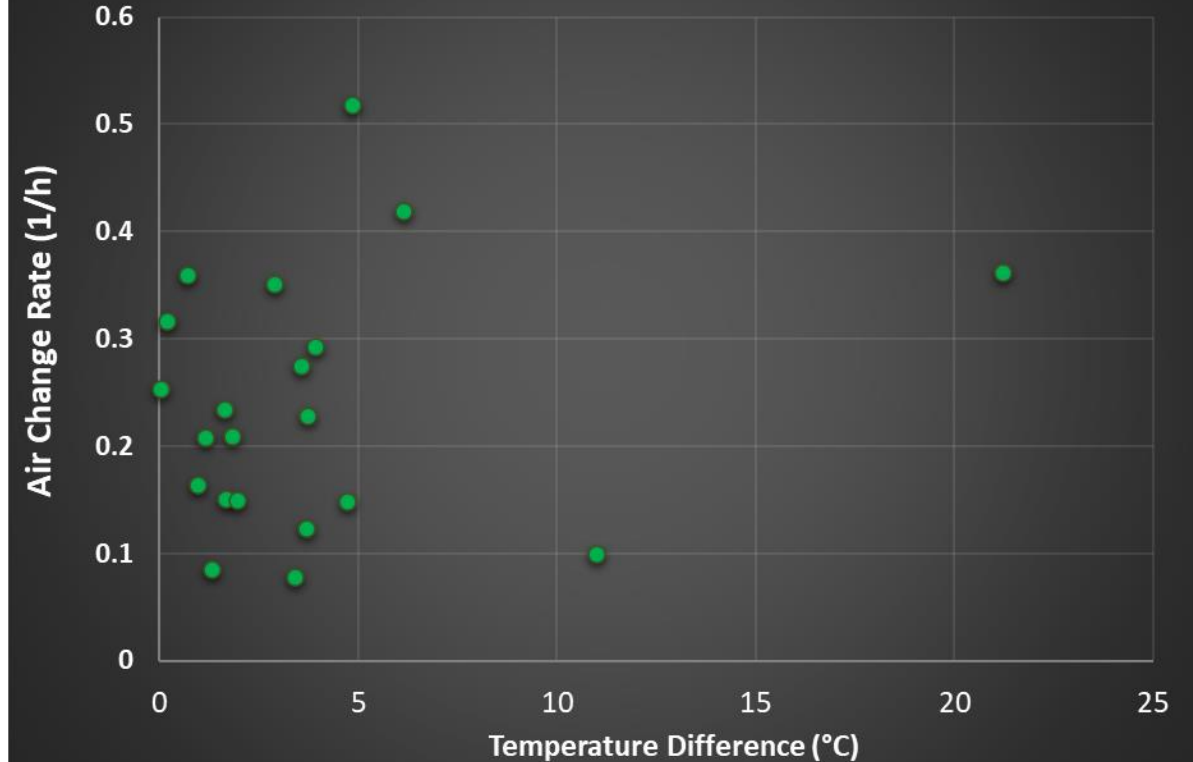
# Previous field studies – Wind and Temperature

Tracer gas tests in 21 homes in the UK

Wind Dependent Air Infiltration



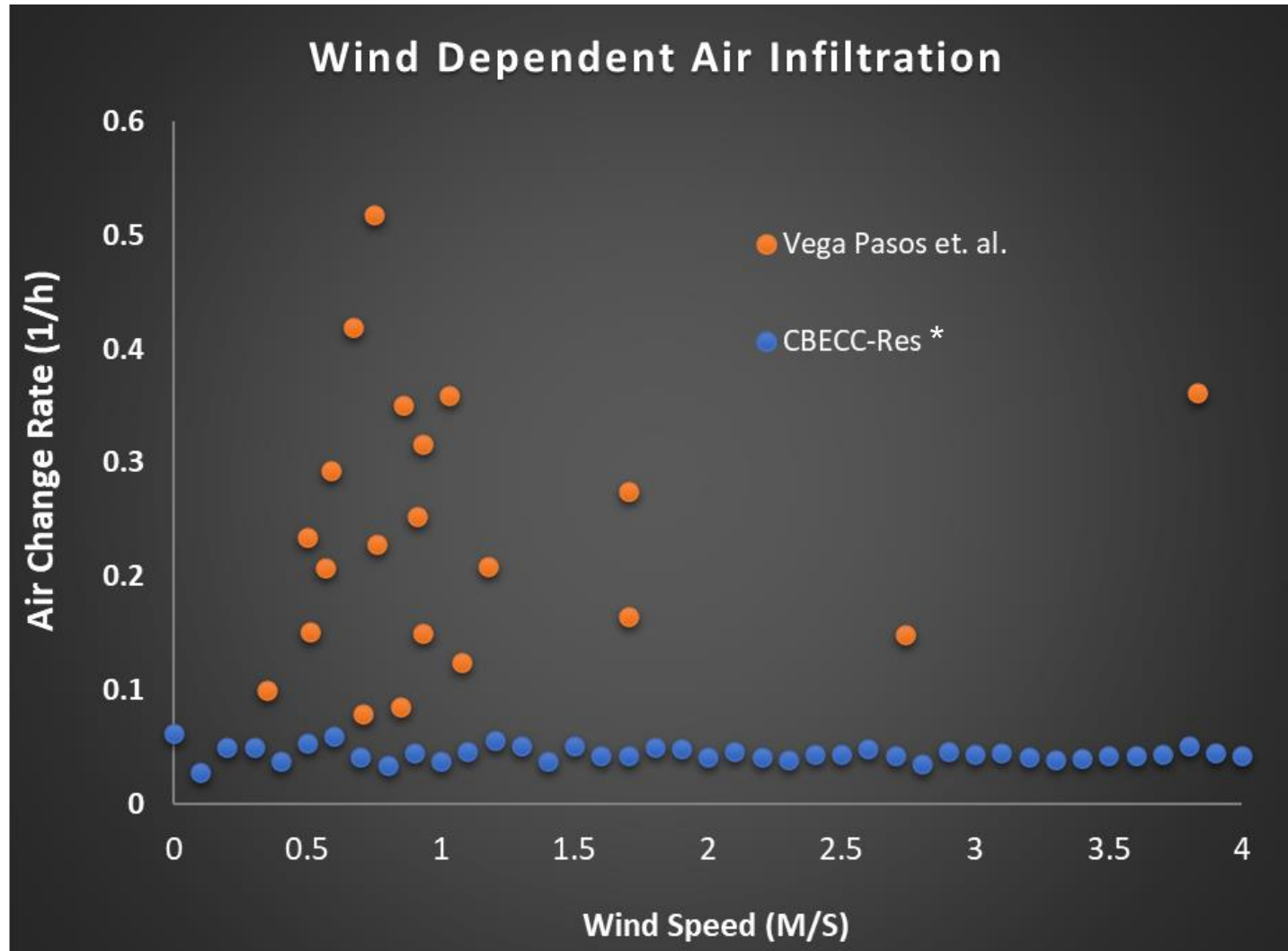
Temperature Dependent Air Infiltration





# Previous field studies - Simulated

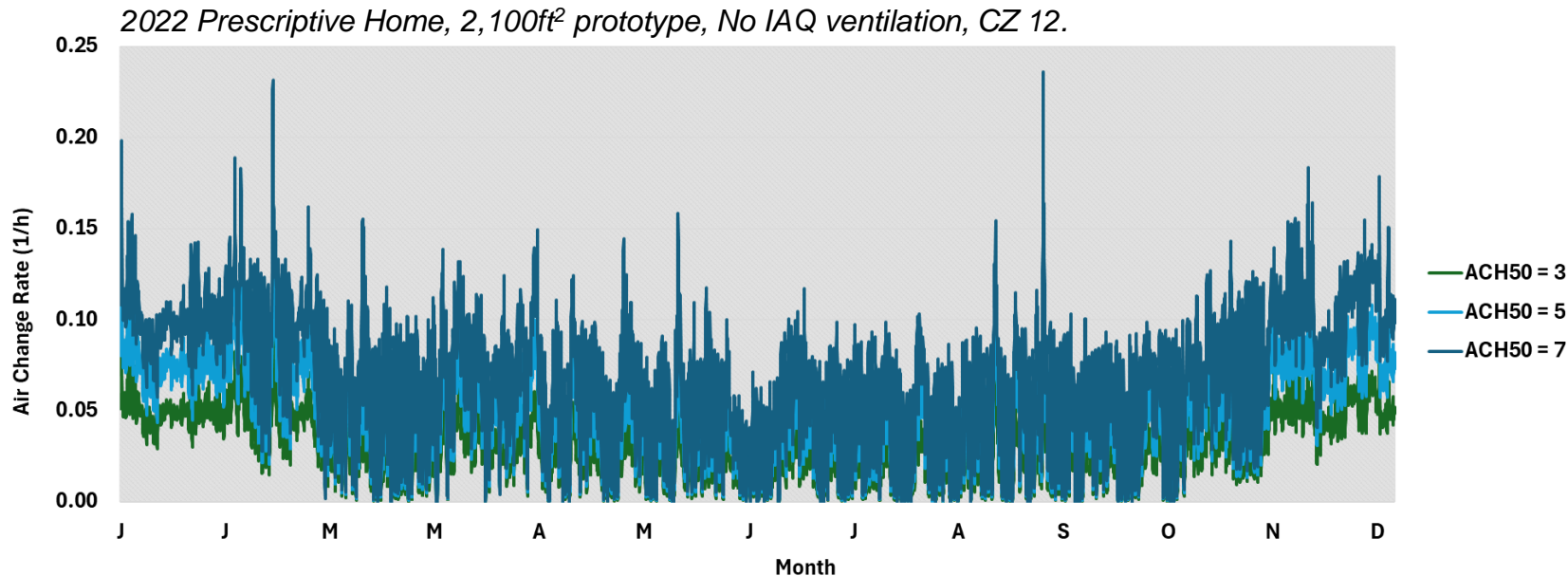
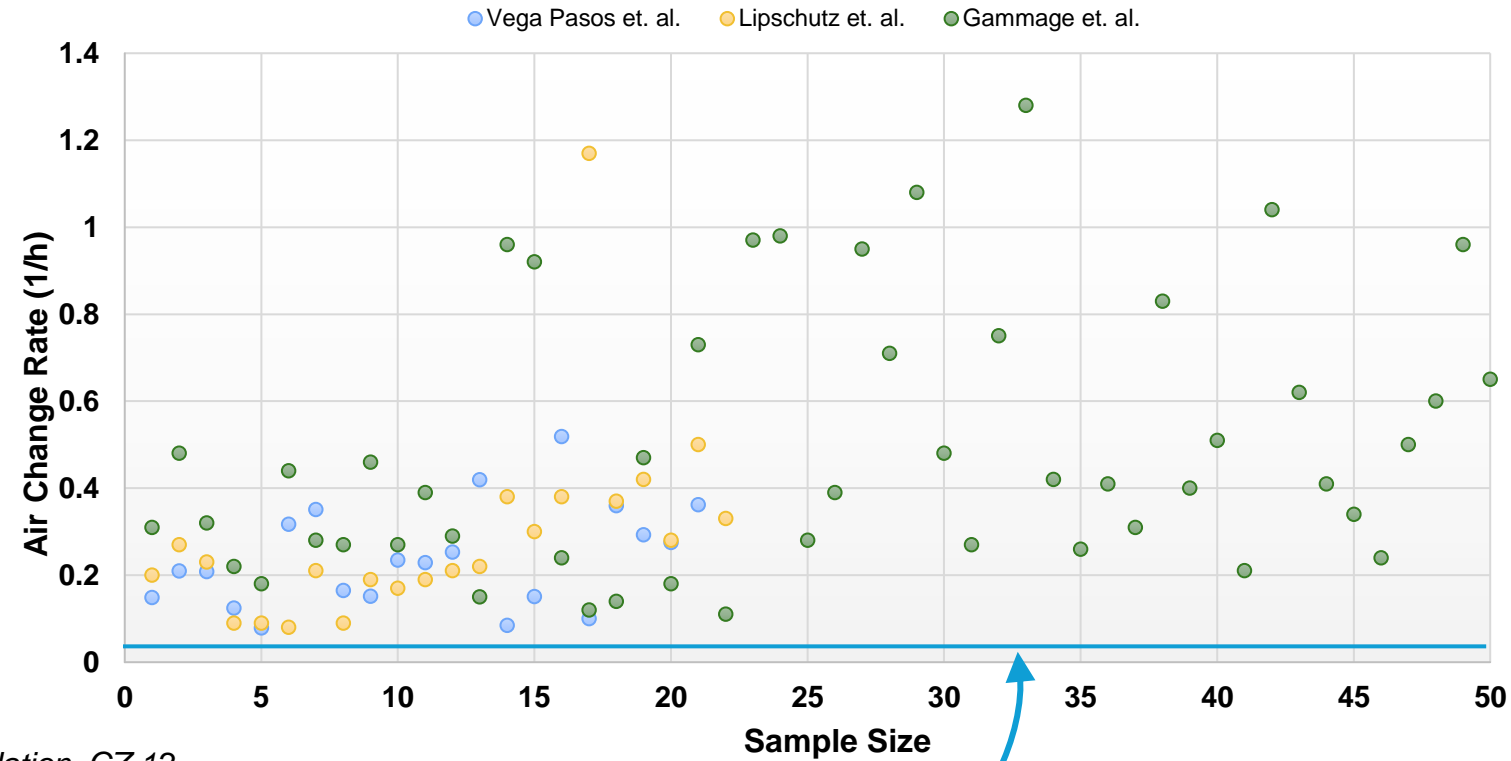
Tracer gas tests in 21 homes in the UK



*\*Average simulated infiltration rate at given wind speed, 2,100ft<sup>2</sup> prototype, No IAQ ventilation, CZ 12.*

# Previous field studies

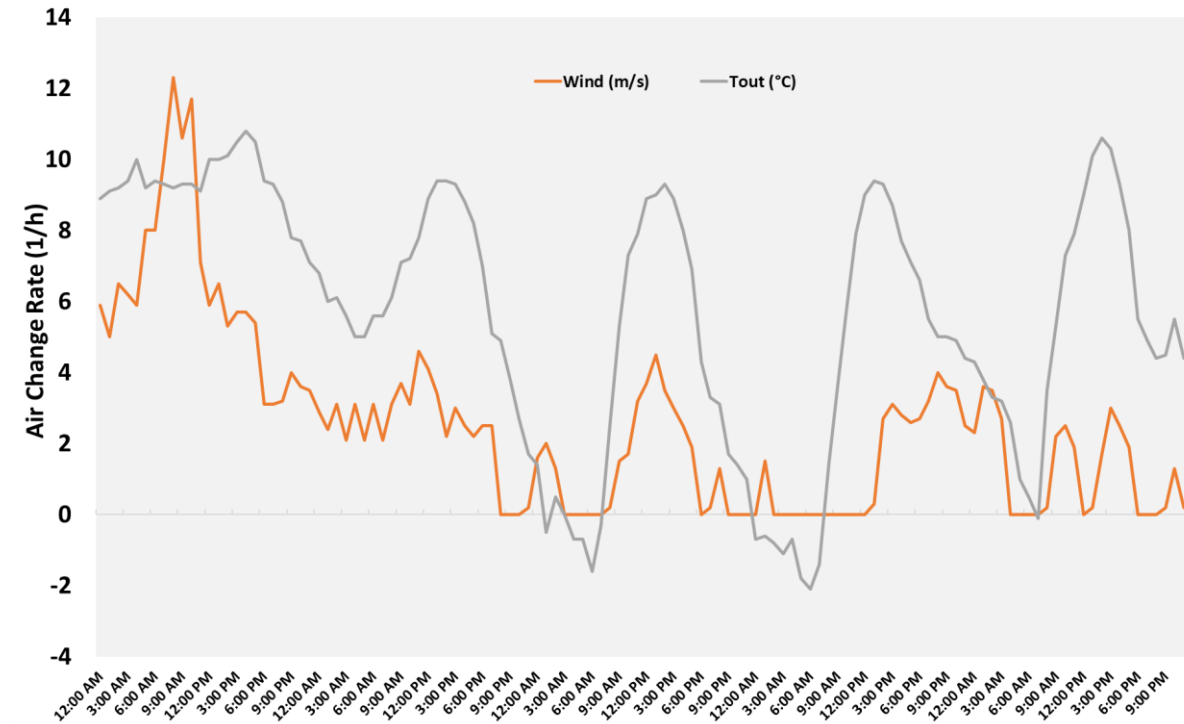
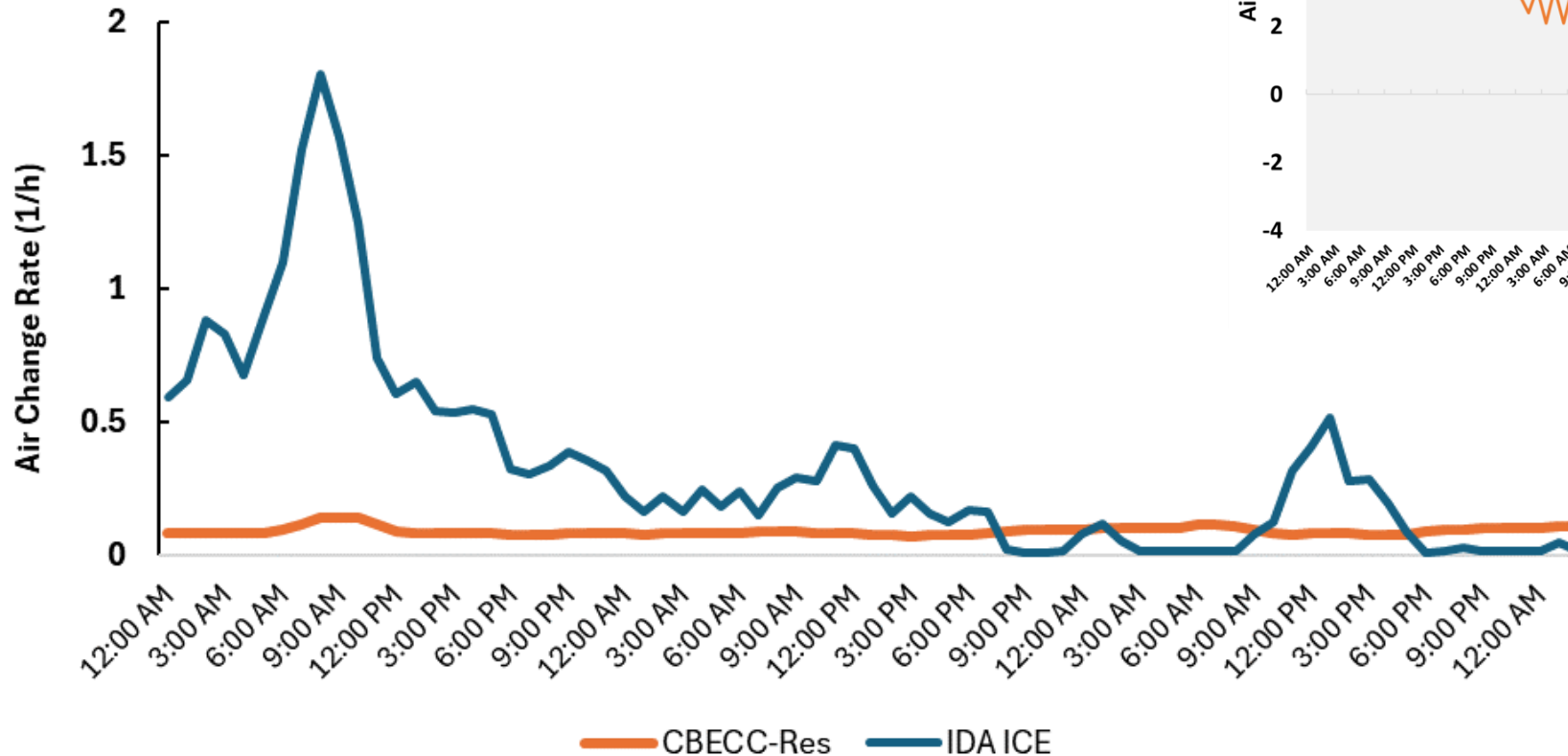
- UK Study
- Tracer Gas tests in 31 TN homes ([link](#))
- LBL Study 22 homes ([link](#))



# Simulated infiltration – Response to weather

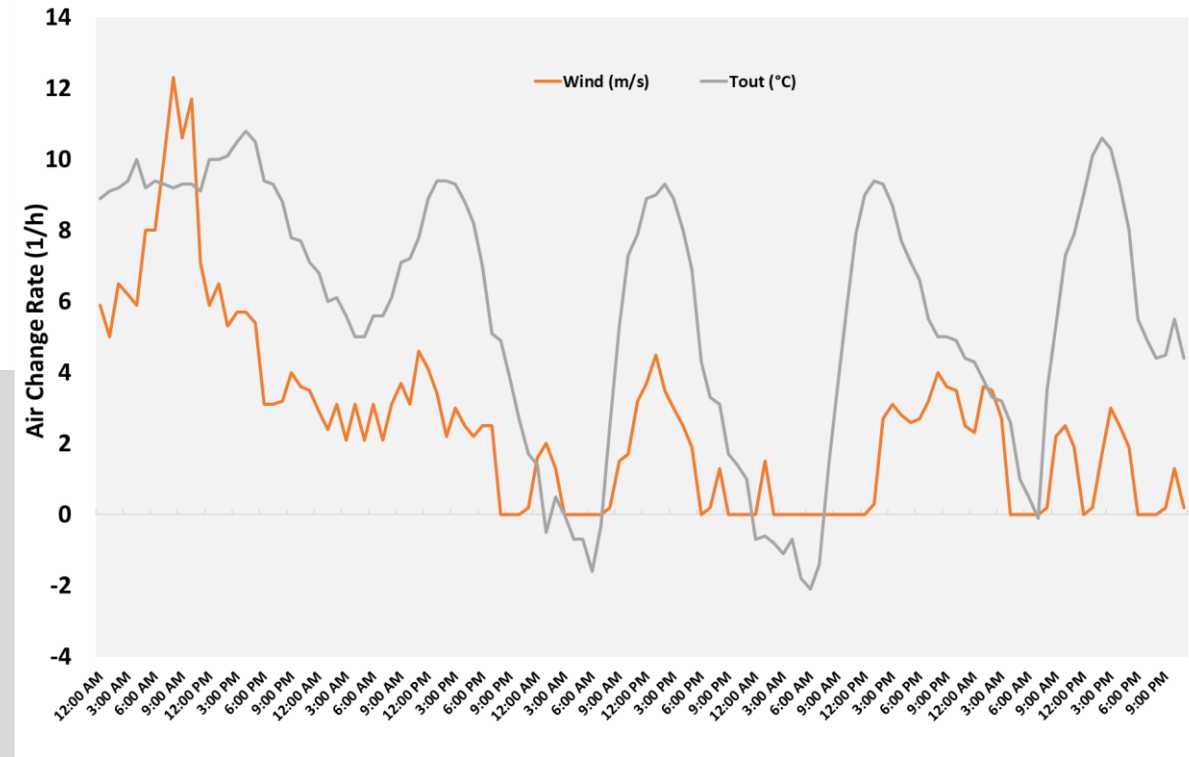
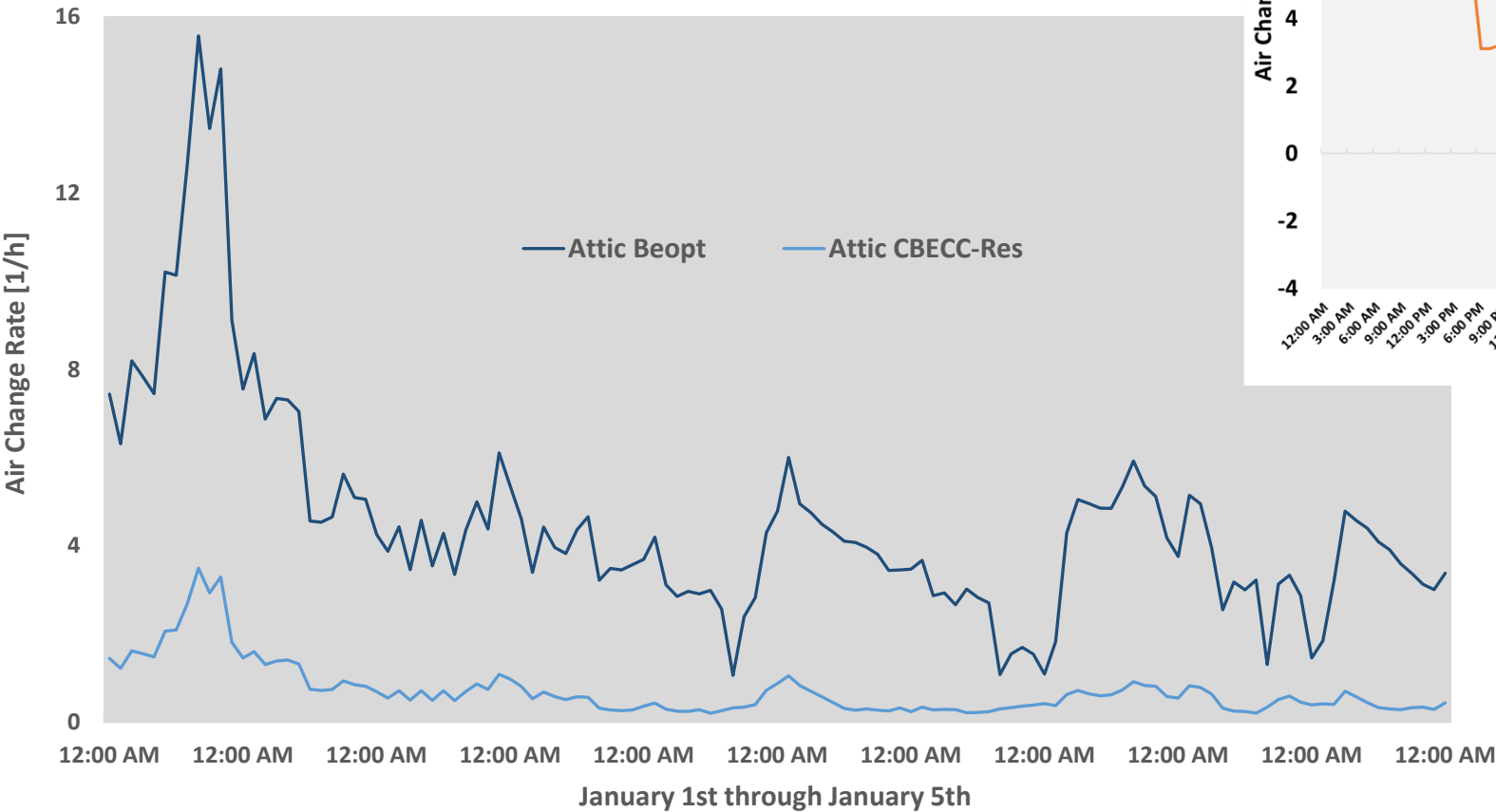
Comparing software: IDA ICE ([link](#))

2022 Prescriptive Home, 2,100ft<sup>2</sup> prototype, No IAQ ventilation, CZ 12, ACH50=5.



# Simulated infiltration in attic – Response to weather

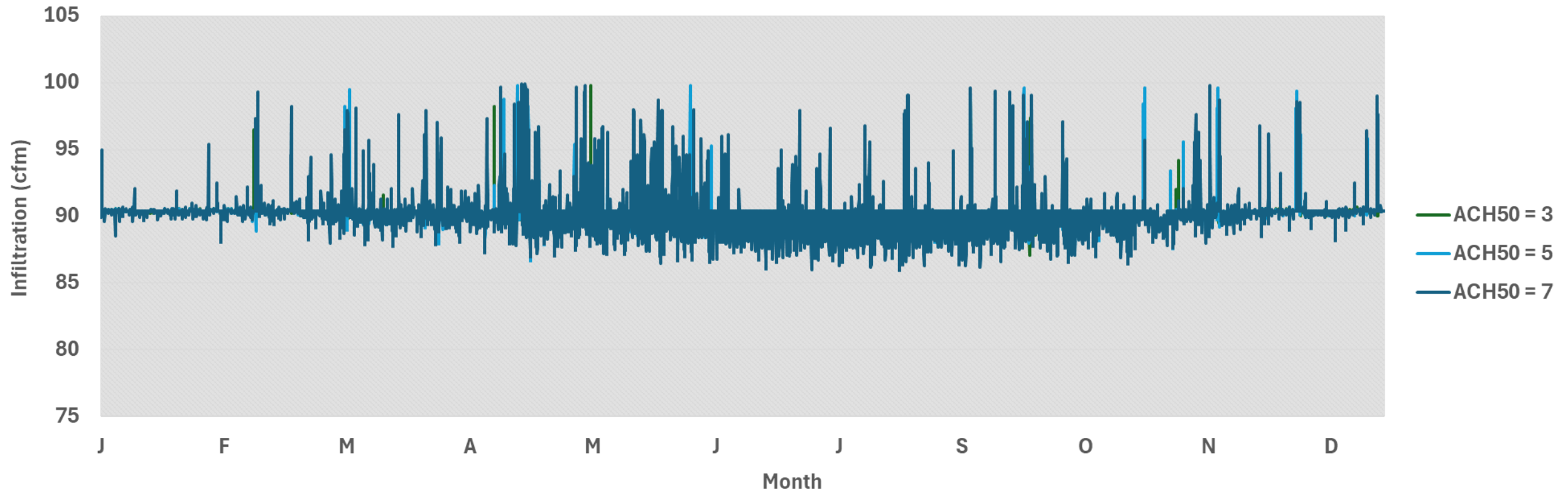
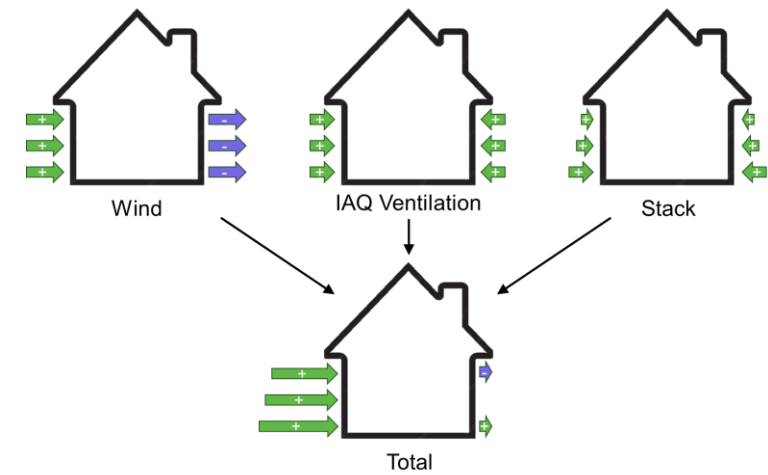
2022 Prescriptive Home, 2,100ft<sup>2</sup> prototype, HPA, CZ 12.



# Simulated infiltration – IAQ Ventilation

Infiltration Air Network (InfX+).

*2022 Prescriptive Home, 2,100ft<sup>2</sup> prototype, IAQ ventilation, CZ 12, ACH50=5.*





# Future Work?

- Validate and update software as necessary
- Field studies in California using Tracer Gas
- Air tightness measure for the 2028 code cycle