

PUSHING BOUNDARIES APPLYING PHIUS CORE TO INTERNAL LOAD-DOMINATED BUILDINGS

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SPEAKERS



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LEARNING OBJECTIVES

1 AIA LU | HSW

-  Identify how local decarbonization policies and energy codes, such as the Massachusetts Stretch Energy Code, can drive the selection of passive building certification for complex commercial projects.
-  Analyze how envelope design strategies contribute to energy performance and long-term durability in large-scale buildings.
-  Compare the thermal behavior of internal load-dominated buildings versus skin load-dominated buildings in Climate Zone 5A.
-  Evaluate effective strategies for meeting Phius CORE 2021 source energy limits.

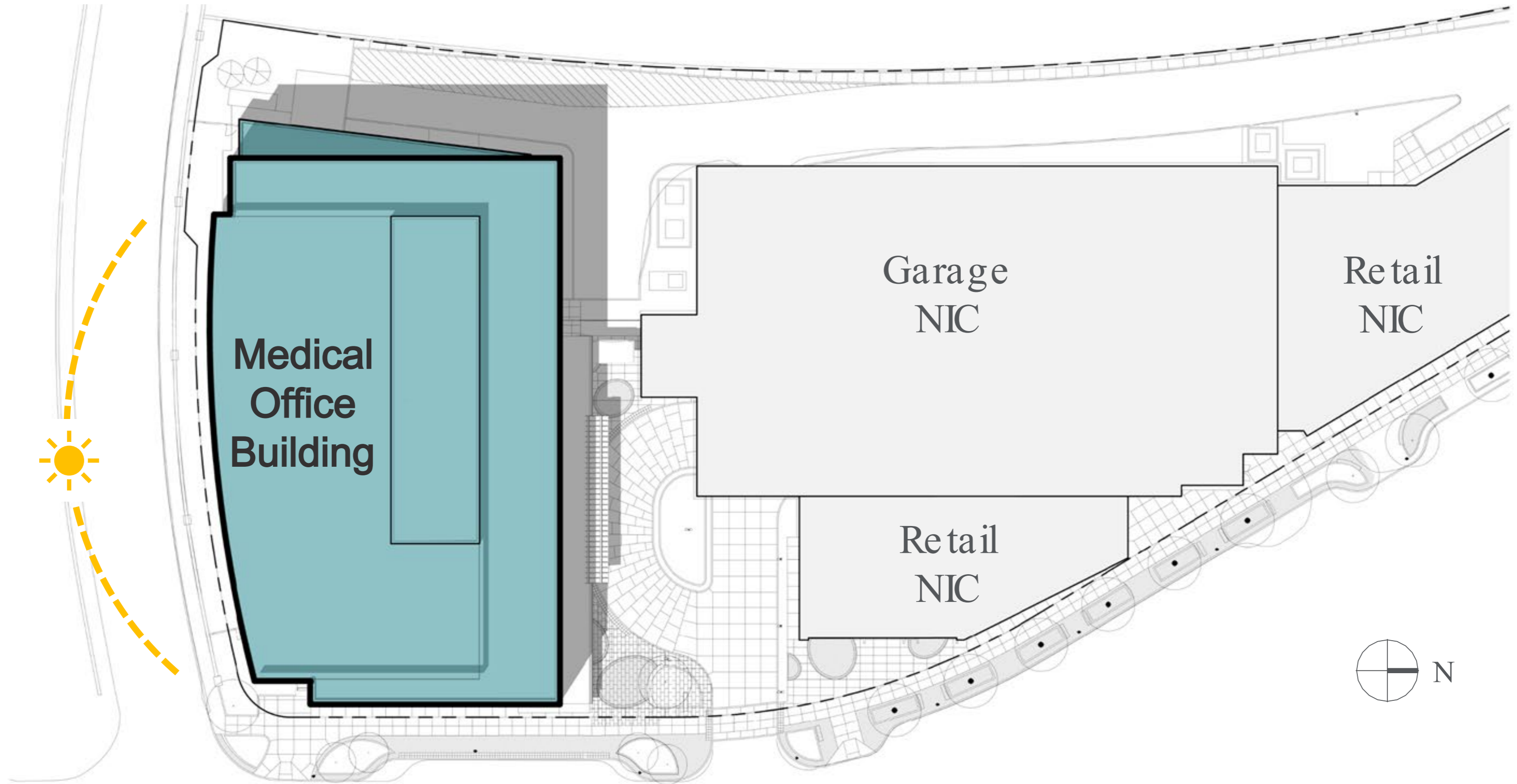
AGENDA

- 1 Policy as a Driver: Massachusetts Energy Codes
- 2 Envelope Optimization
- 3 Passive Building Process
- 4 Mechanical Considerations
- 5 Meeting Source Energy Limit
- 6 Summary

- » 110,000 sf Medical Office
- » 2023/2025 MA Stretch Energy Code
- » 100% Electrification
- » Net Zero Ready
- » Pursuing Phius Certification + LEED



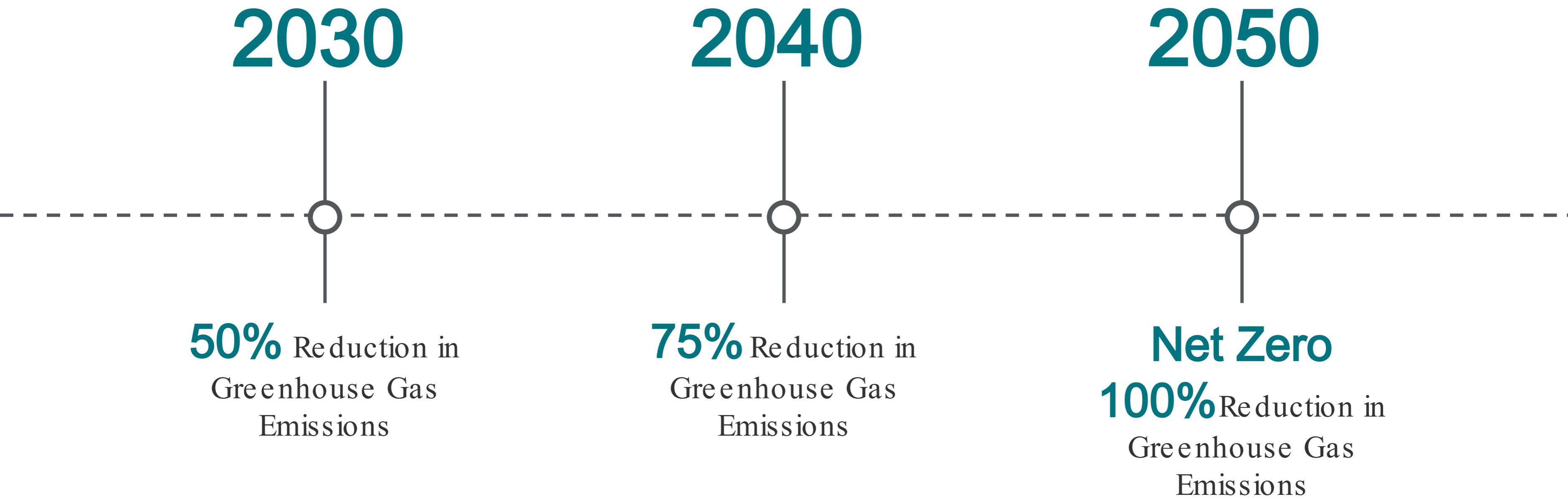
SITE PLAN



1

POLICY AS A DRIVER: MA ENERGY CODES

MA DECARBONIZATION TIMELINE



MA ENERGY CODES

Base Energy Code



- » Minimum Code
- » New Buildings,
Existing Buildings

or

Stretch Code



- » Stricter than Minimum
- » New Buildings,
Existing Buildings
- » Municipal Vote

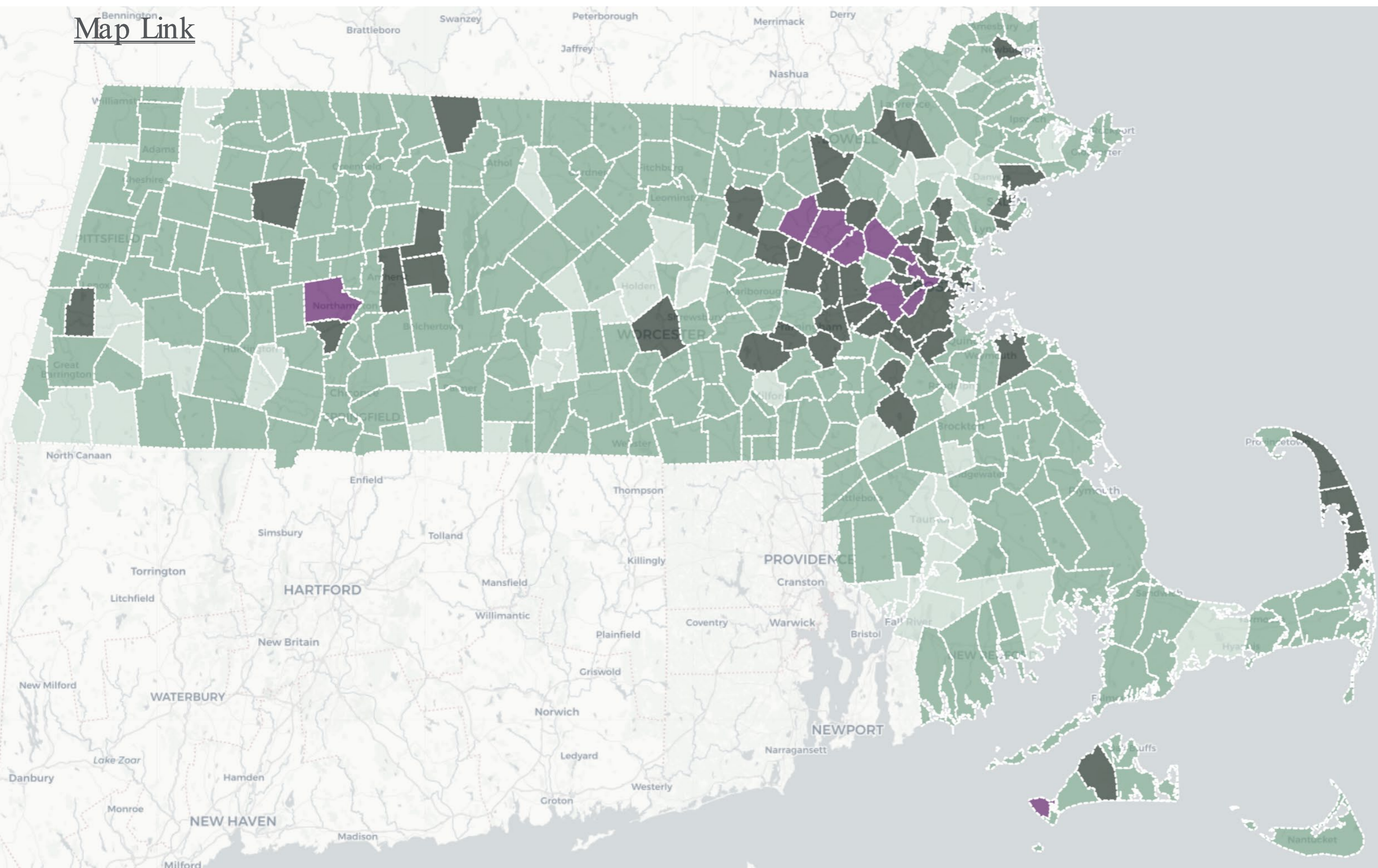
or

Specialized Opt-in Code



- » Most Strict
- » New Buildings Only
- » Municipal Vote

MA ENERGY CODES MAP



245

Stretch Code

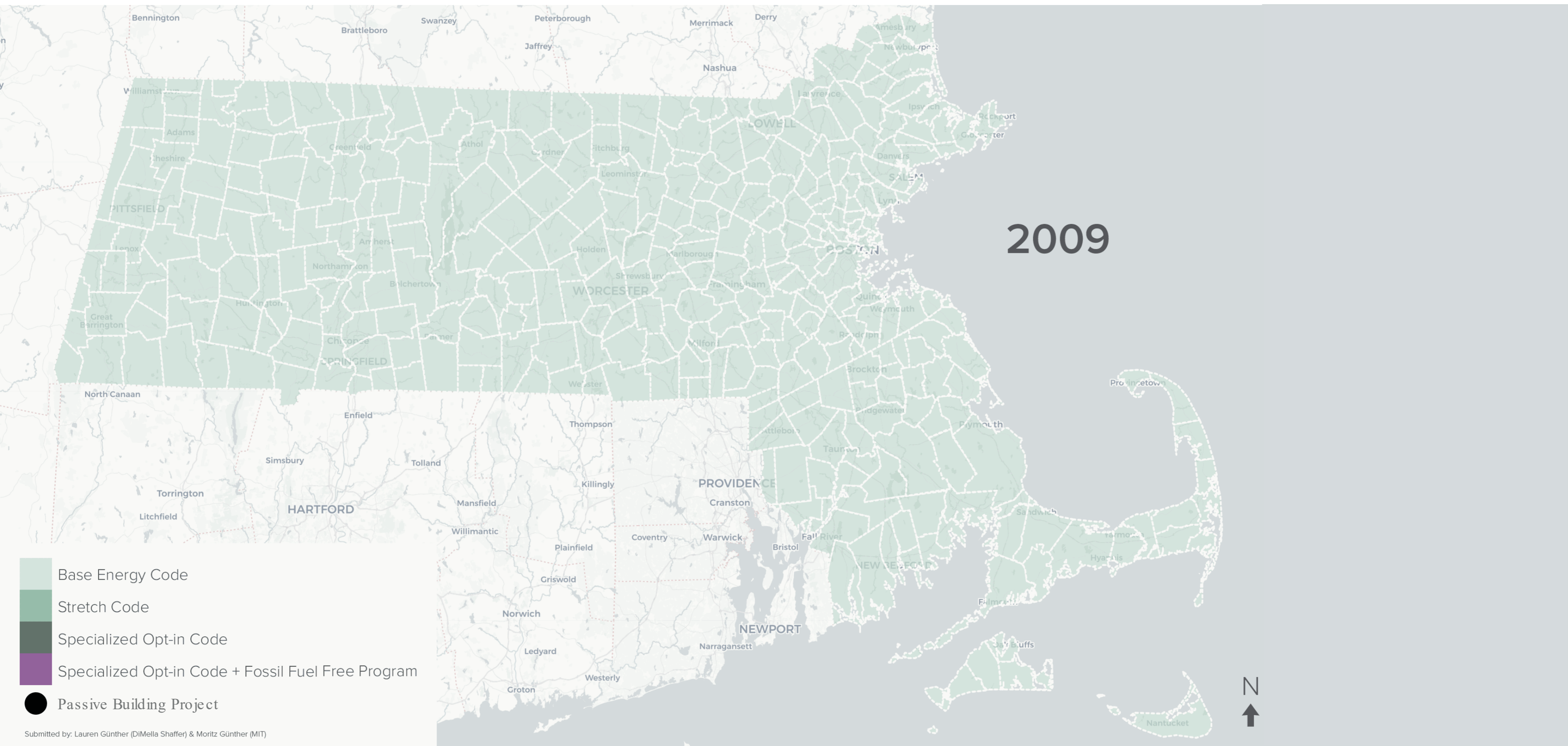
55

Specialized Opt-in

10

Fossil Fuel Free

MA ENERGY CODES + PASSIVE BUILDING MAP



Massachusetts:
Where Passive Building
is **Code Minimum**

2 ENVELOPE OPTIMIZATION

OPTIMAL WWR REALITY

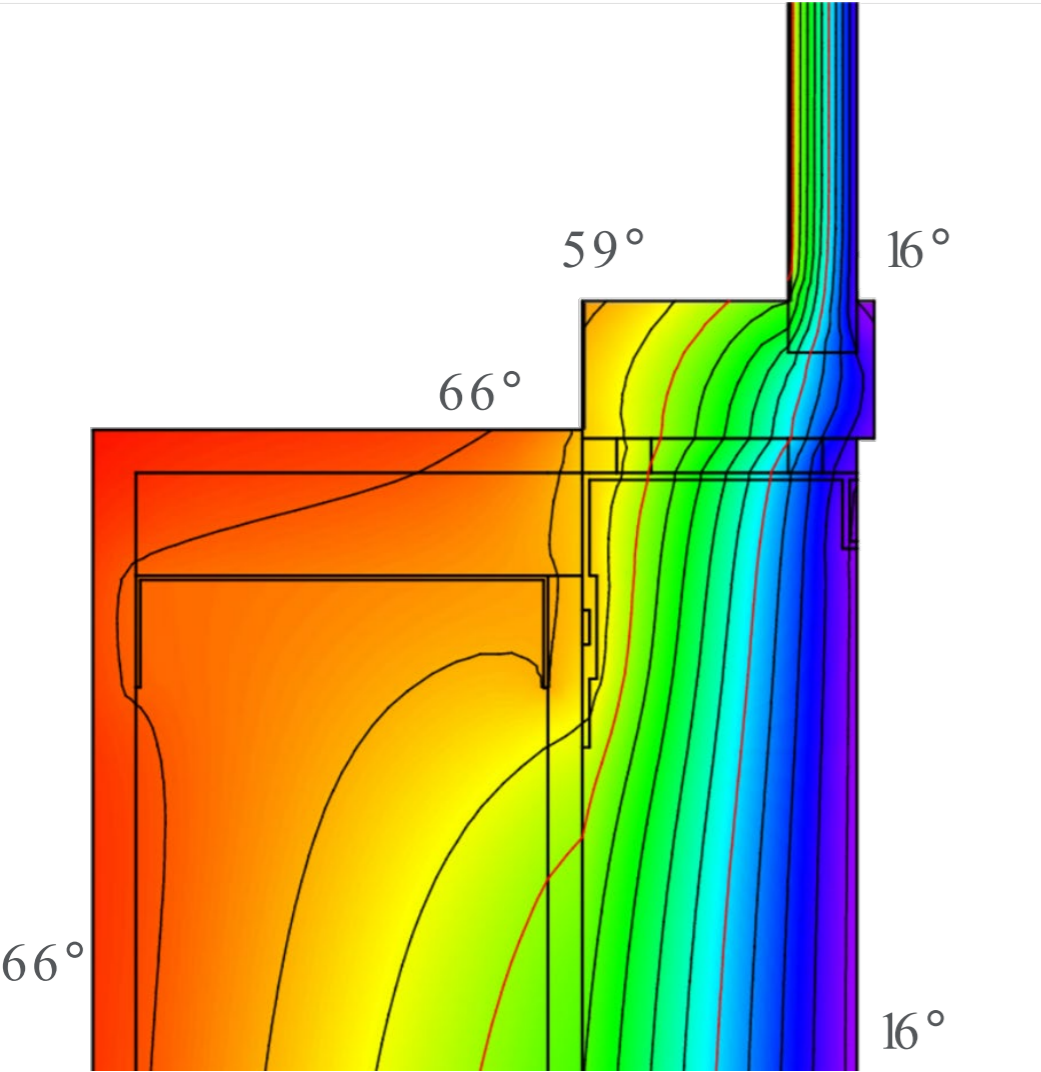


SUB-OPTIMAL WWR EXPRESSION

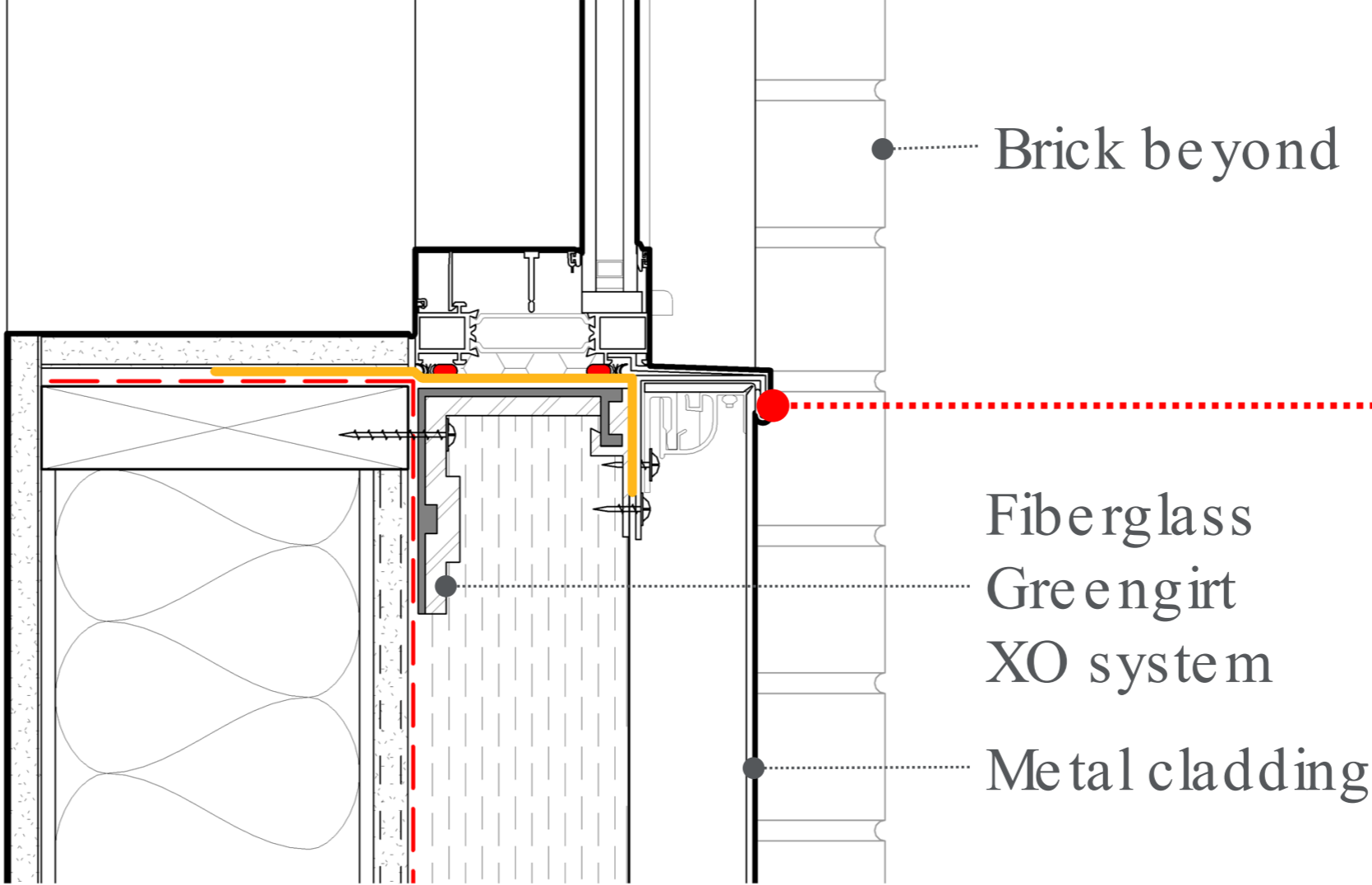
25% WWR if only brick.



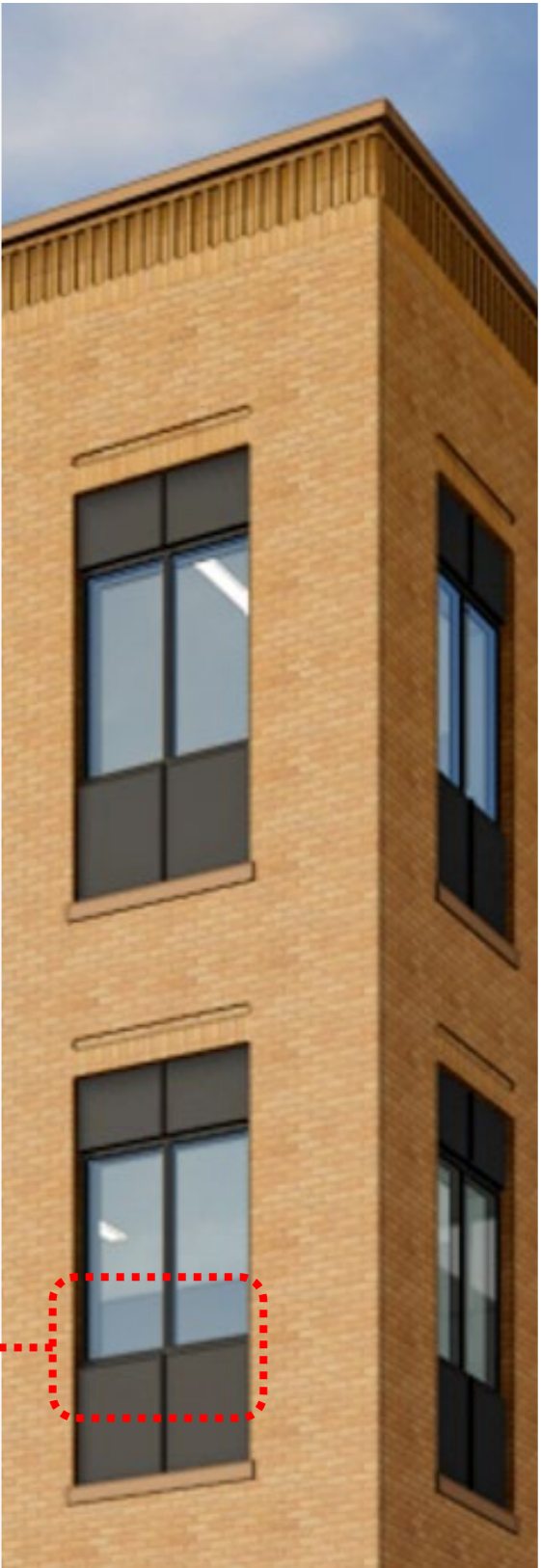
25% WWR AND DESIGN INTENT



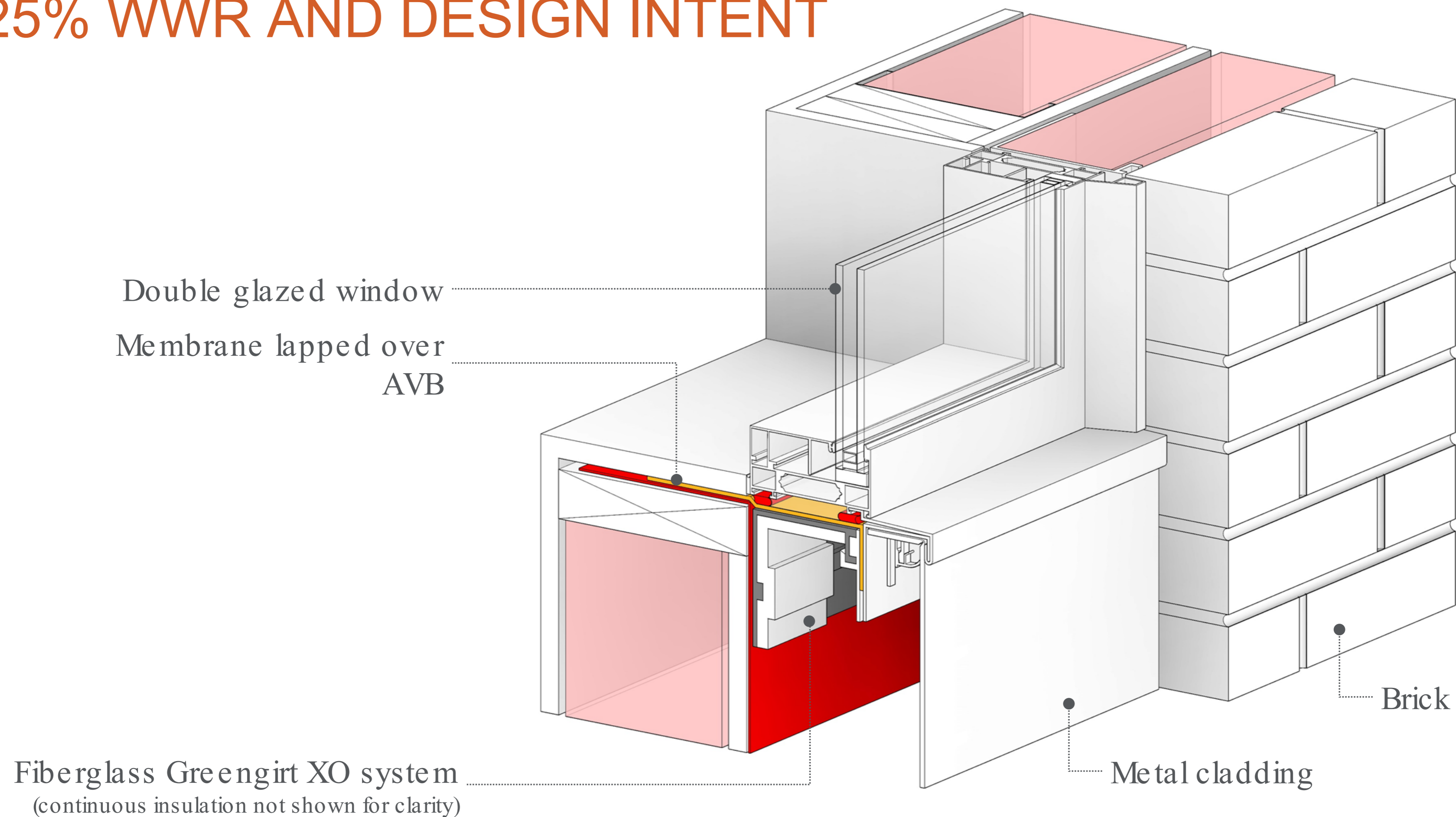
Window Thermal
Bridge Model



Window Detail

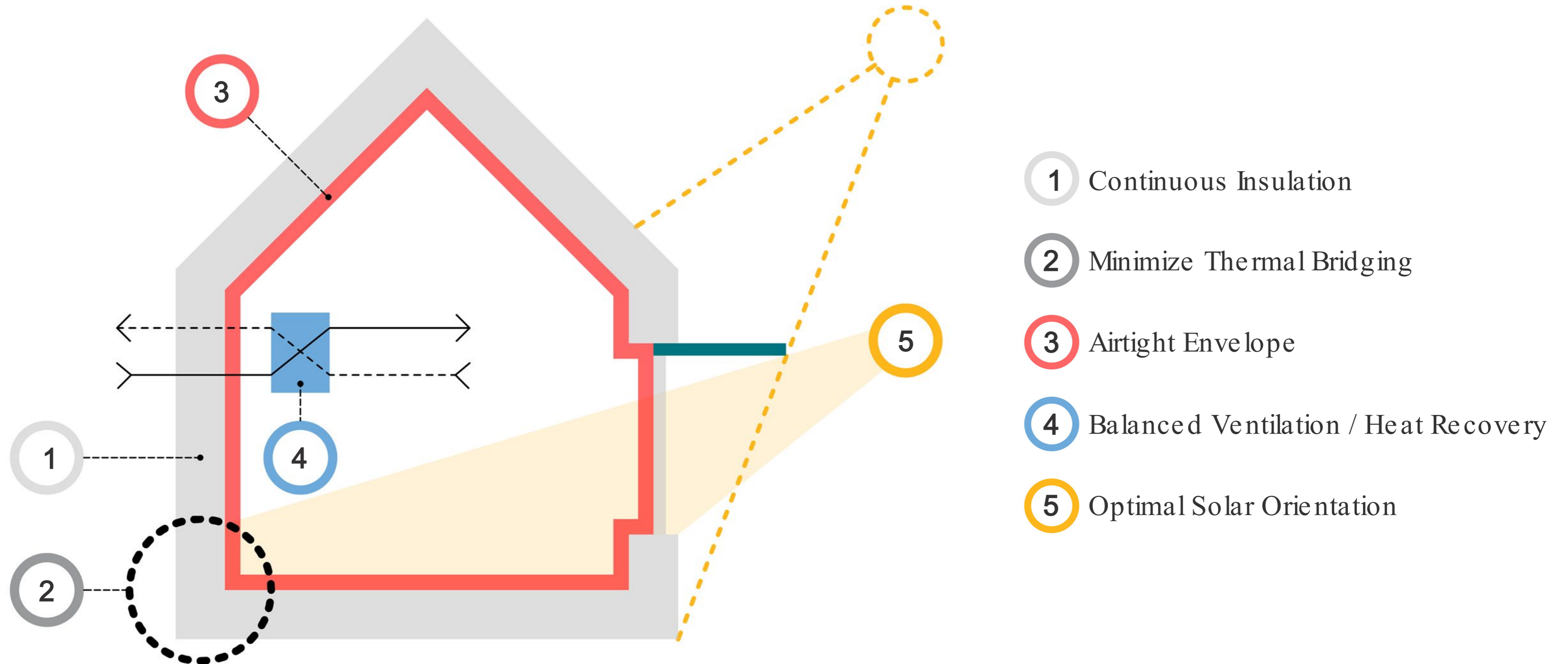


25% WWR AND DESIGN INTENT



3 PASSIVE BUILDING PROCESS

PASSIVE BUILDING PRINCIPLES



COMMERCIAL PASSIVE BUILDING CERTIFIED PROJECTS



Cornell University | Related Companies



Becker + Becker

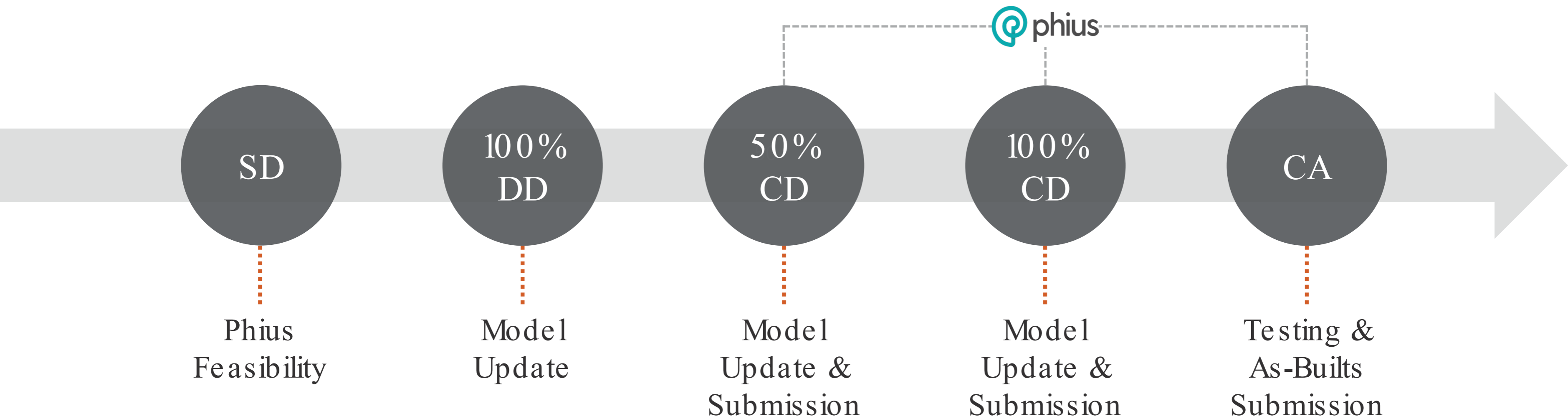


Star Garment Group

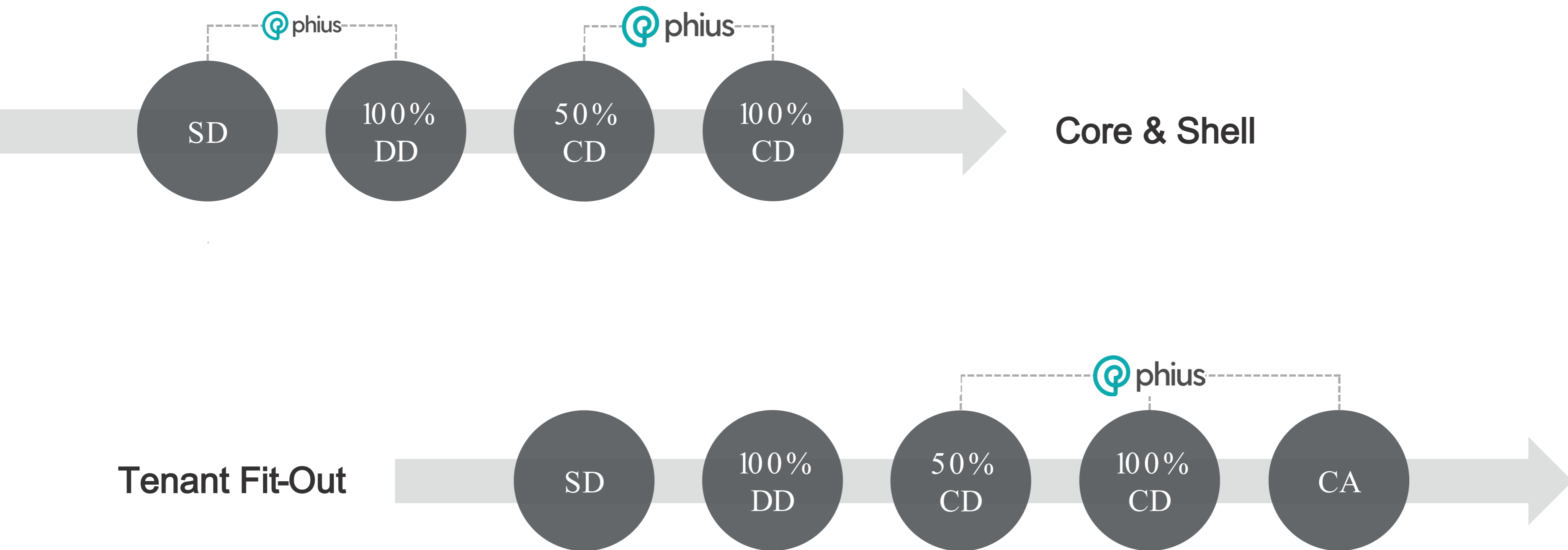


MP Boston

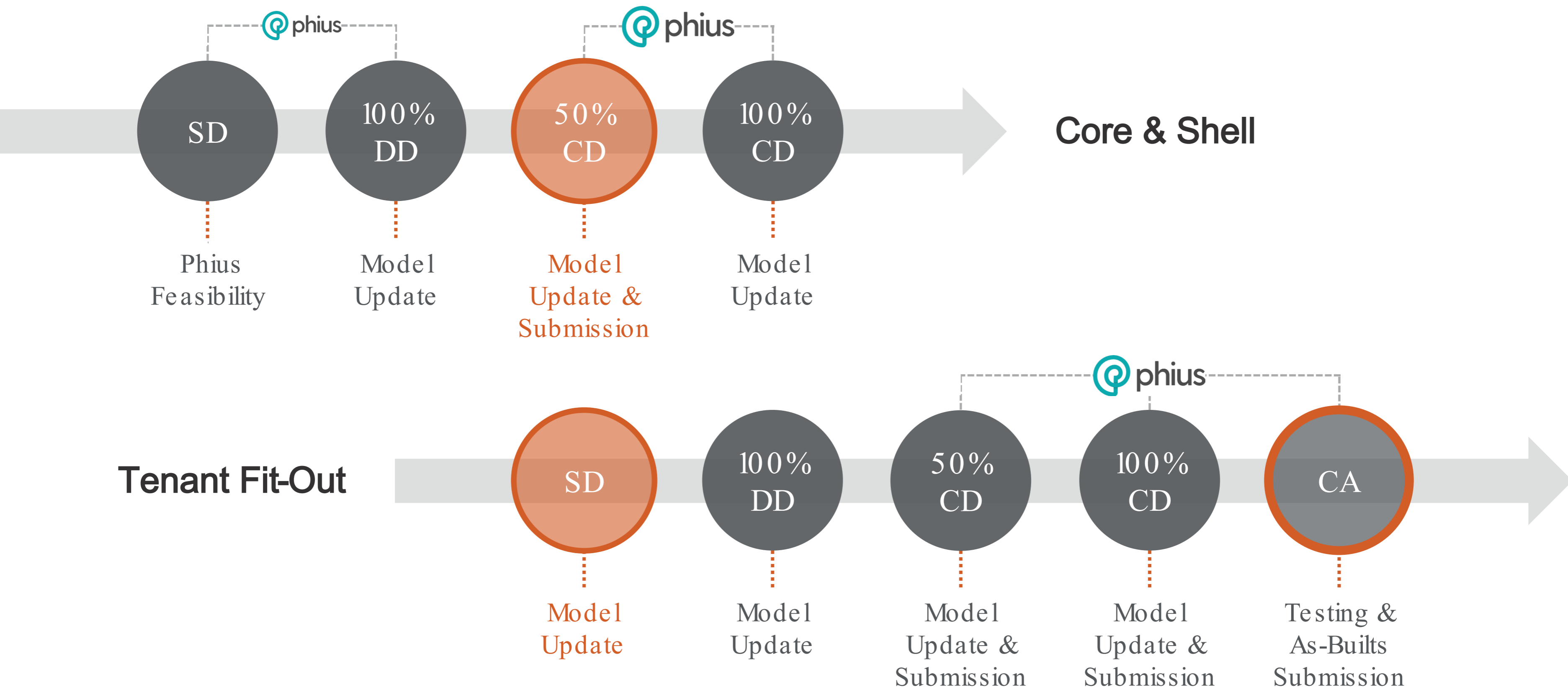
TYPICAL PHIUS TIMELINE



SEPARATE TIMELINES



SEPARATE TIMELINE CHALLENGES



DEMYSTIFY THE UNKNOWNNS



MEDICAL OFFICE PROGRAM



INTERNAL LOADS vs. PROCESS LOADS

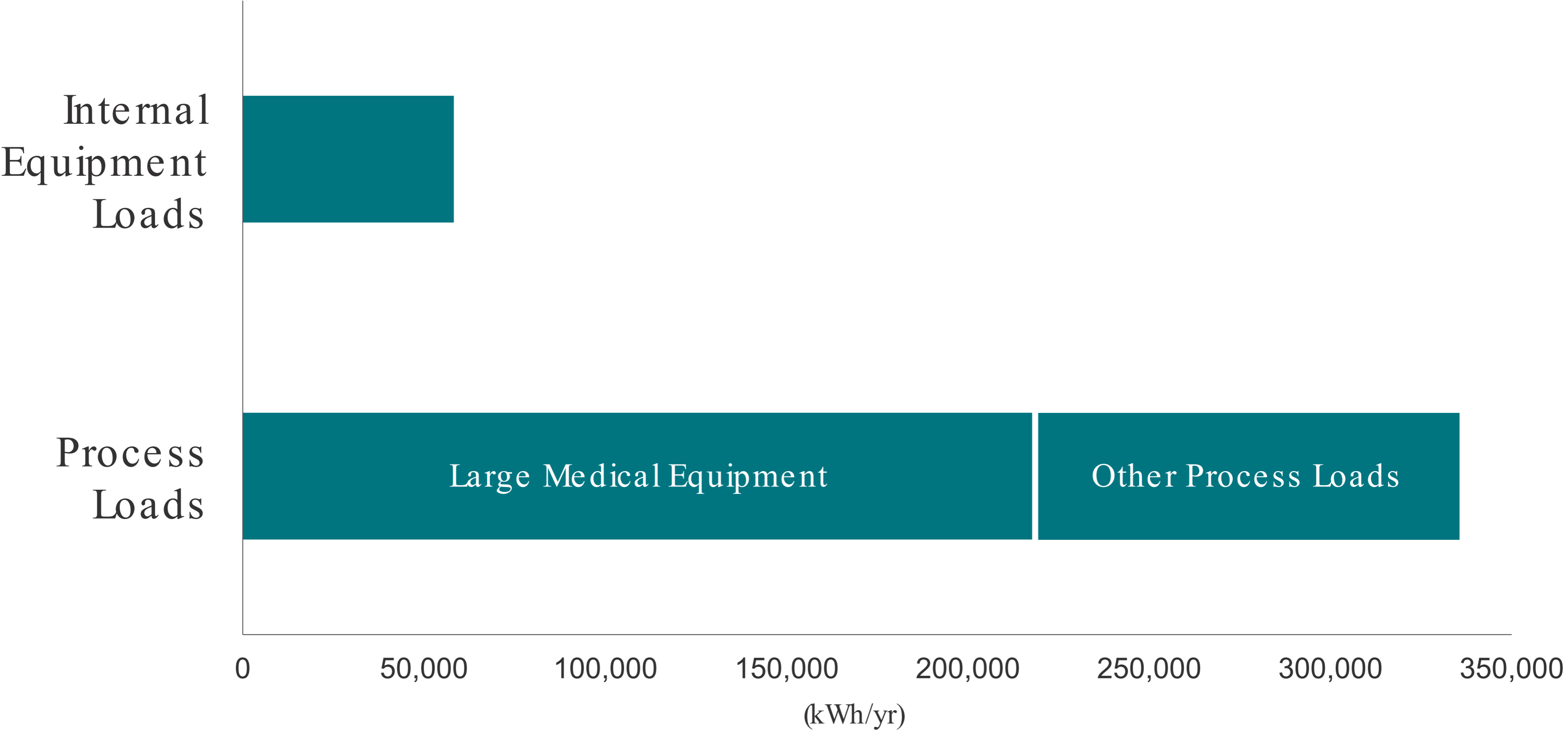


Internal Loads



Process Loads

INTERNAL LOADS vs. PROCESS LOADS



INTERNAL HEAT GAIN COMPARISON

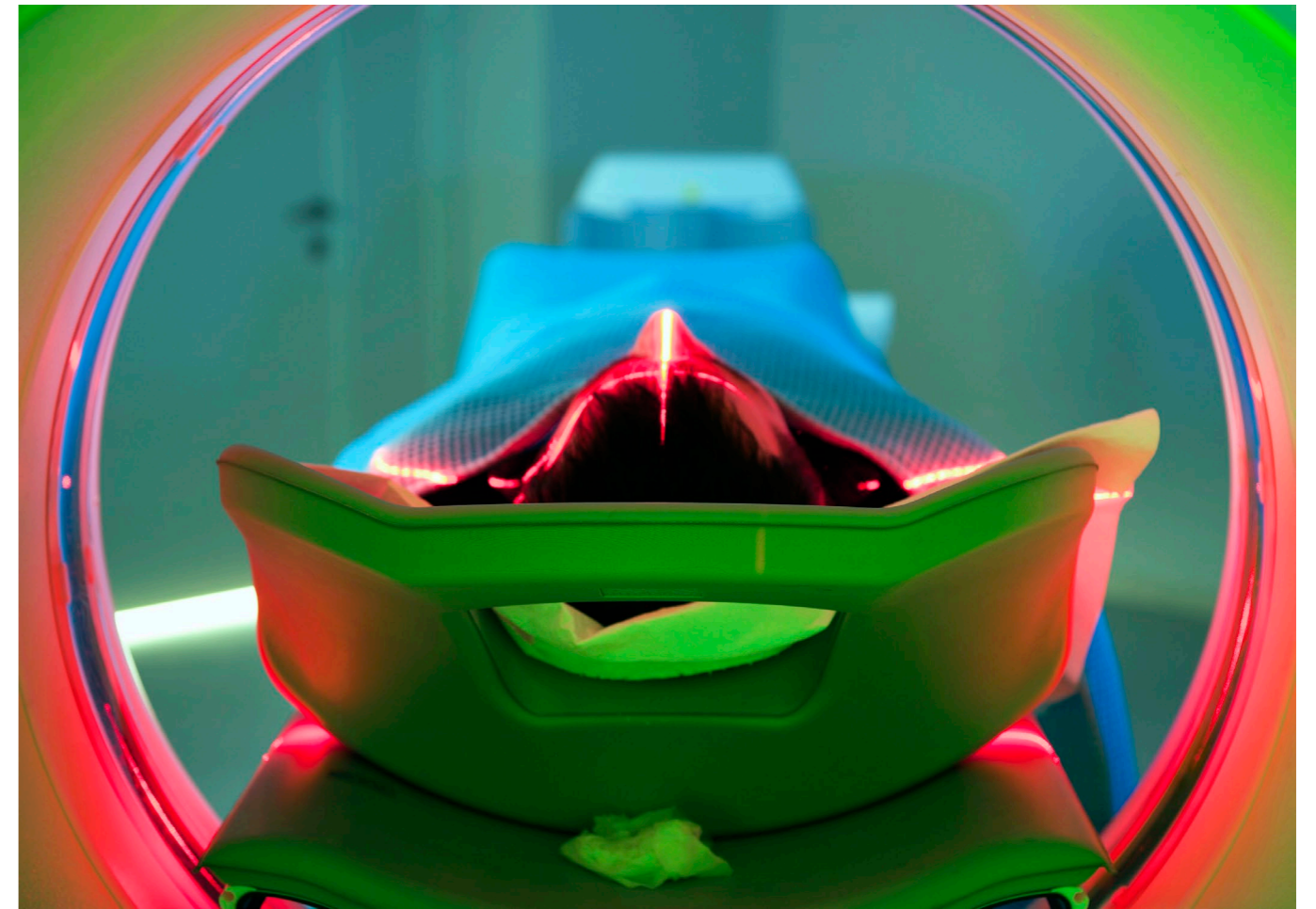
Single-Family
Passive Building
0.6 – 1 Btu/hr/sf



Multi-Family
Passive Building
1.2 Btu/hr/sf



Medical Office
Passive Building
2.5 Btu/hr/sf



SKIN LOAD DOMINATED vs. INTERNAL LOAD ENVELOPES

	Single-Family Passive Building	Multi-Family Passive Building	Medical Office Passive Building
Wall	R-35 - R-40	R-25 - R-30	R-24
Roof	R-70	R-40 - R-60	R-40
Punched Windows	U-0.15 TripleGlazed	U-0.17- U-0.23	U-0.24 Double-Glazed
Slab-on-Grade	R-22	R-10	R-10
Airtightness	0.04 - 0.06	0.06 - 0.08	0.08
WWR	12- 17%	25 - 30%	20 - 25%

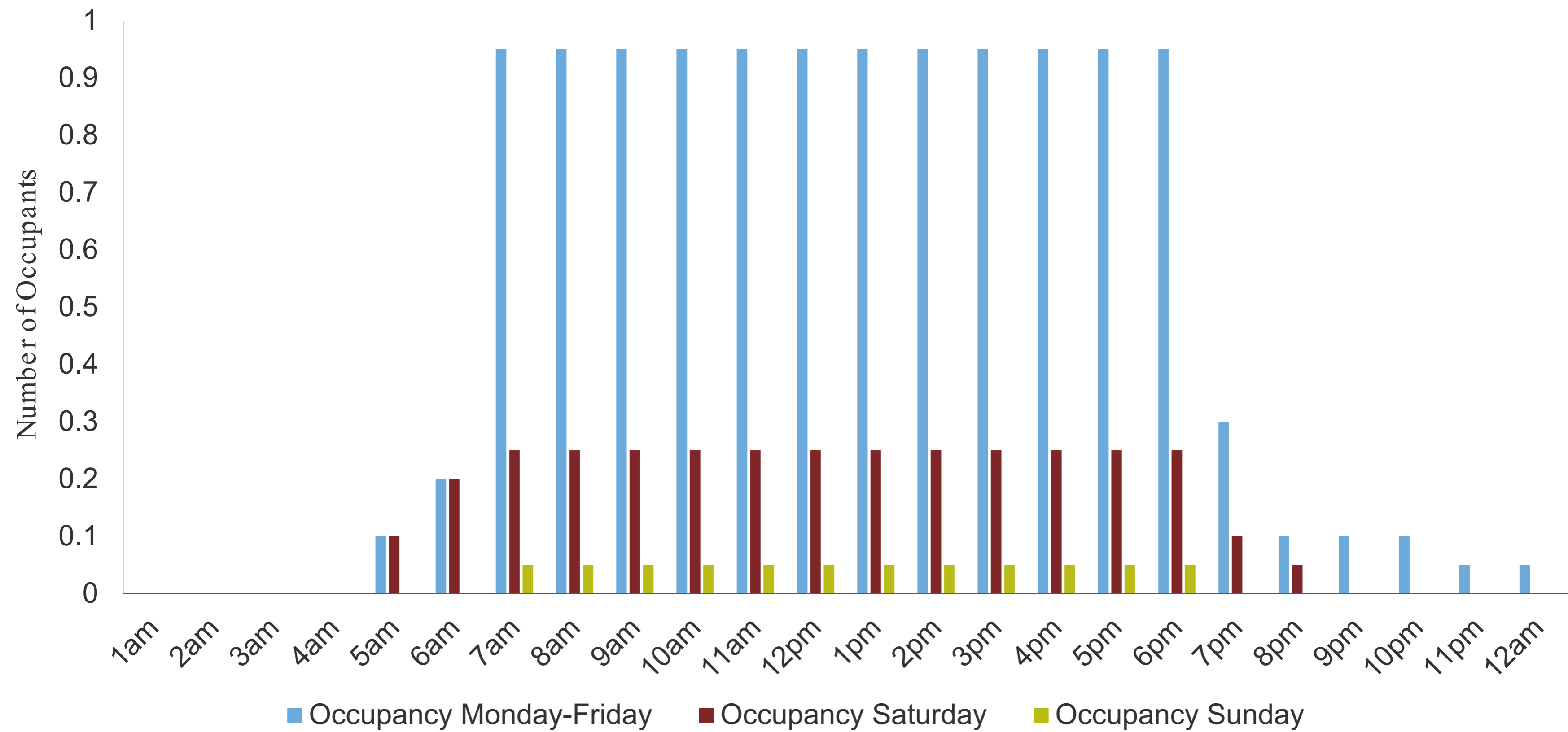
OCCUPANCY



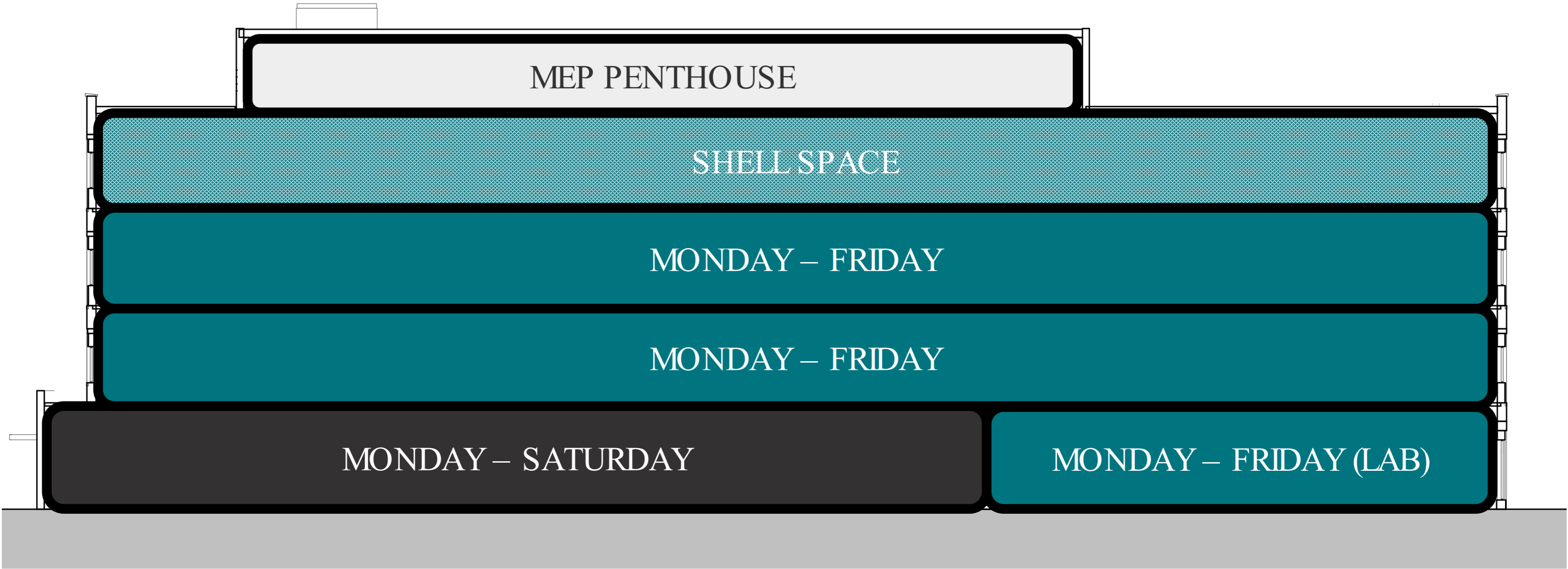
330 Staff

600,000
Patients
Per Year

OCCUPANCY SCHEDULE 24 Hours

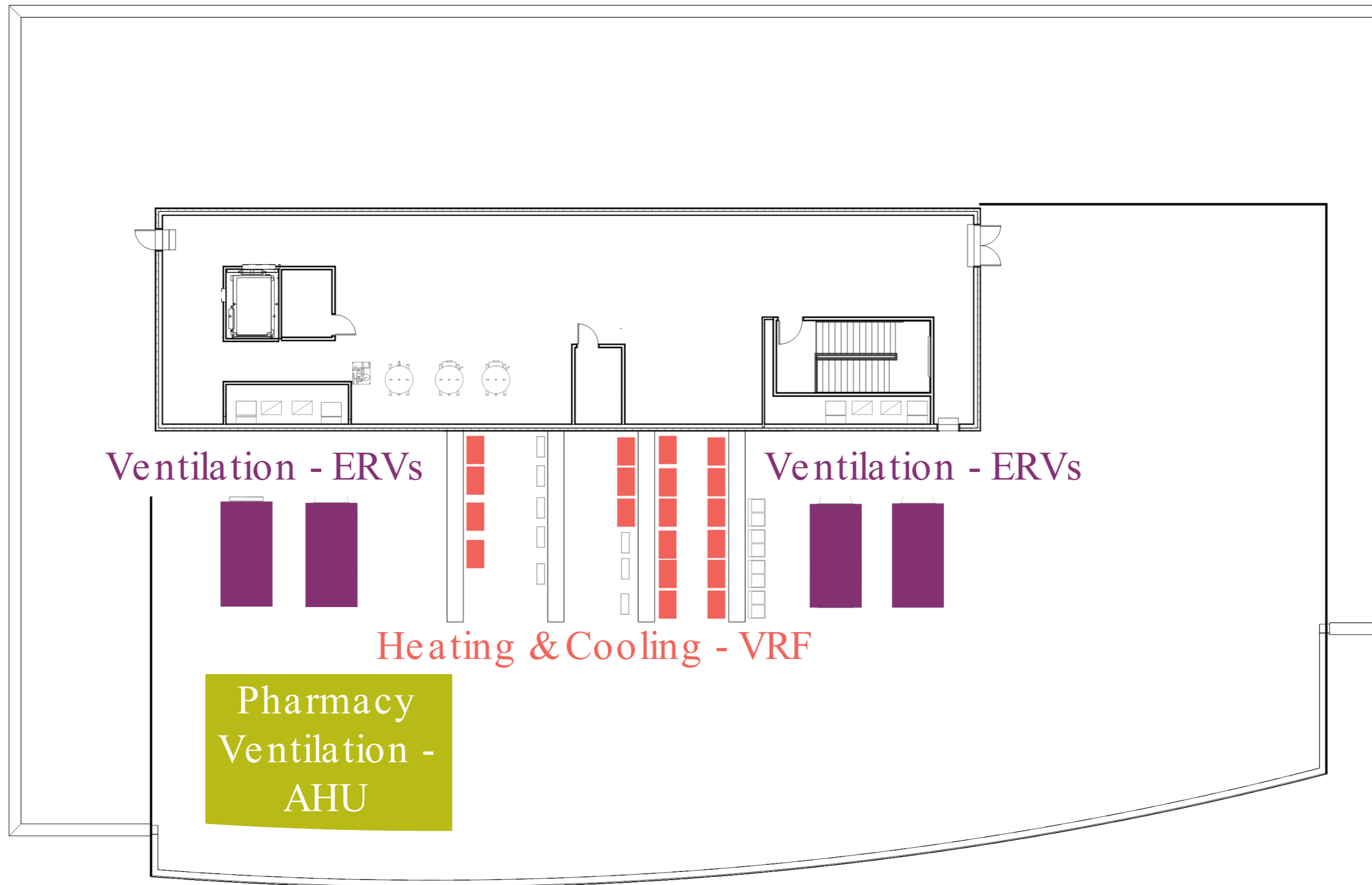


OCCUPANCY SCHEDULE

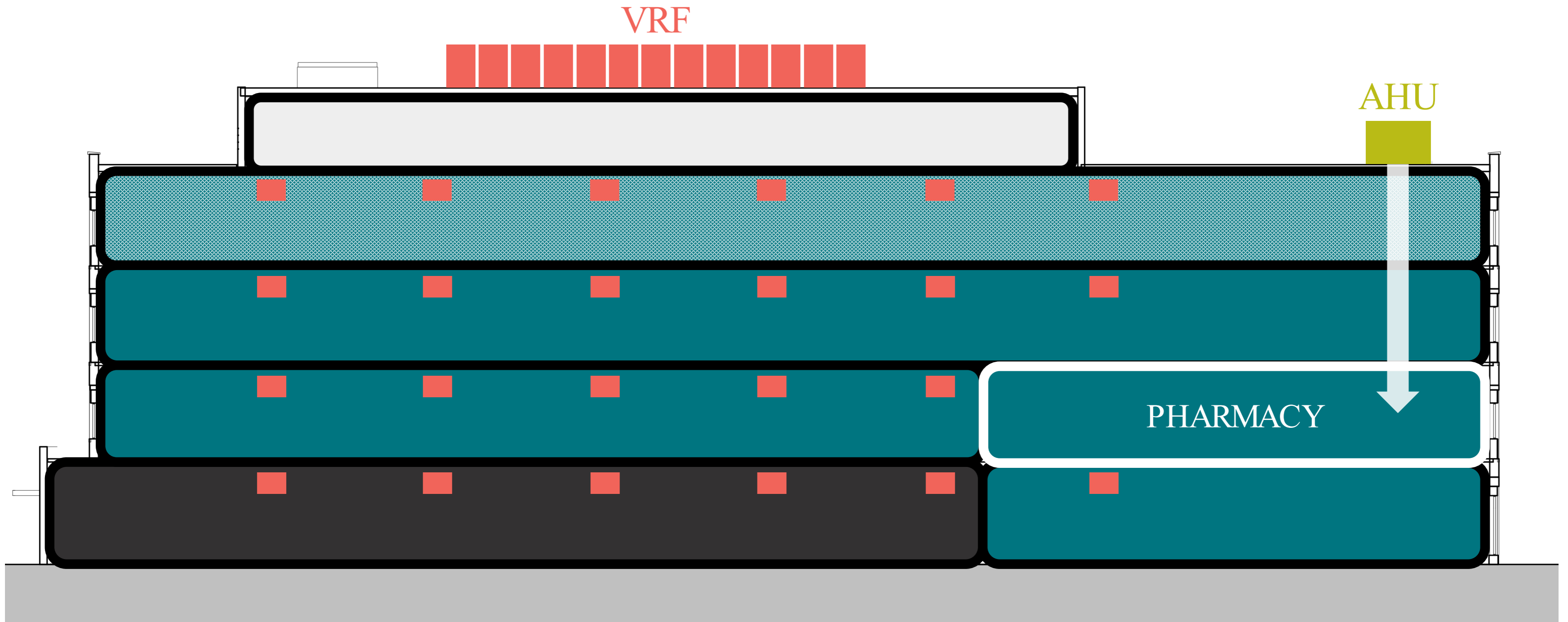


4 MECHANICAL CONSIDERATIONS

MECHANICAL PENTHOUSE ROOF PLAN



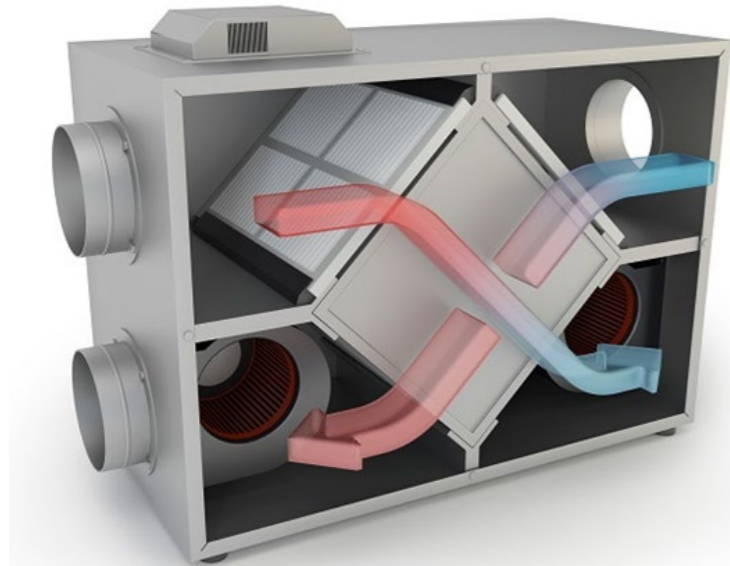
HEATING AND COOLING



VENTILATION COMPARISON

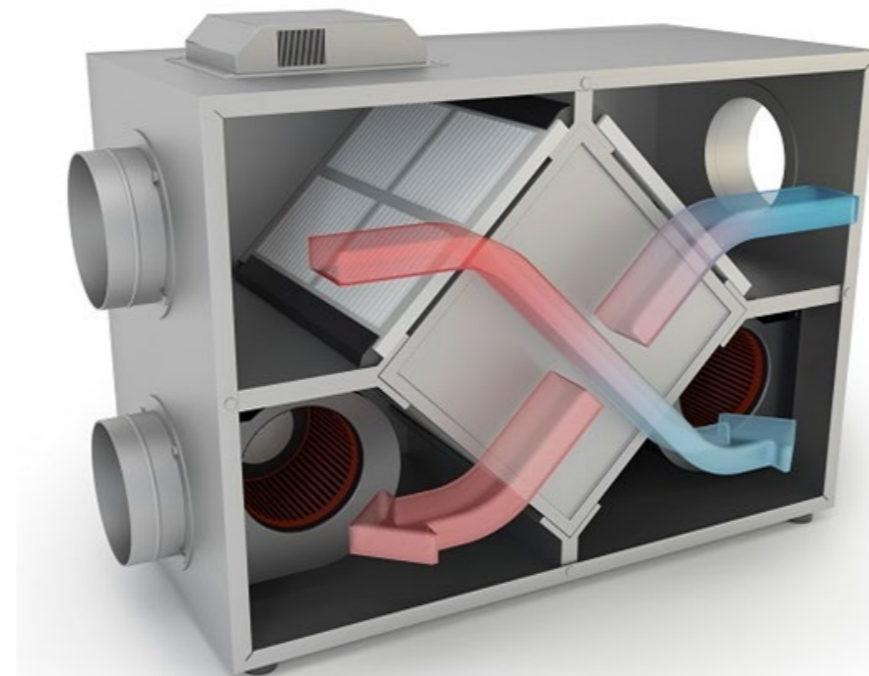
Single-Family
Passive Building

0.06 cfm/sf



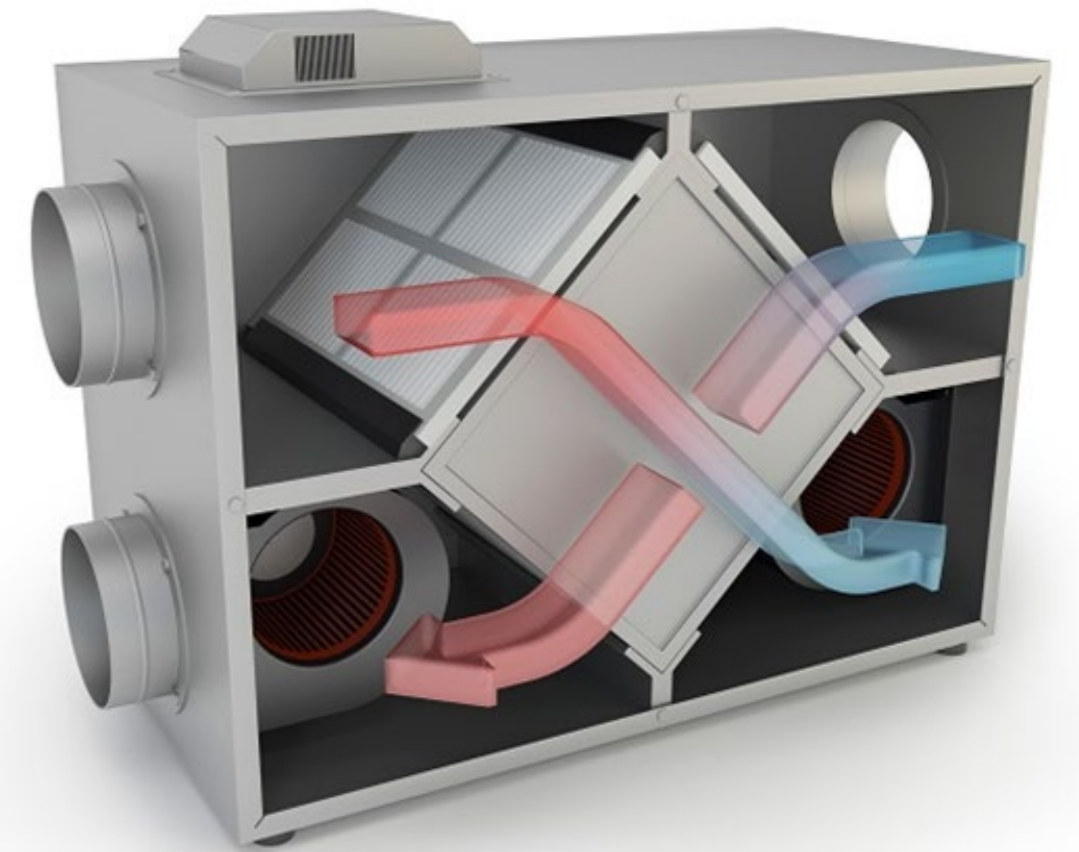
Multi-Family
Passive Building

0.09 cfm/sf

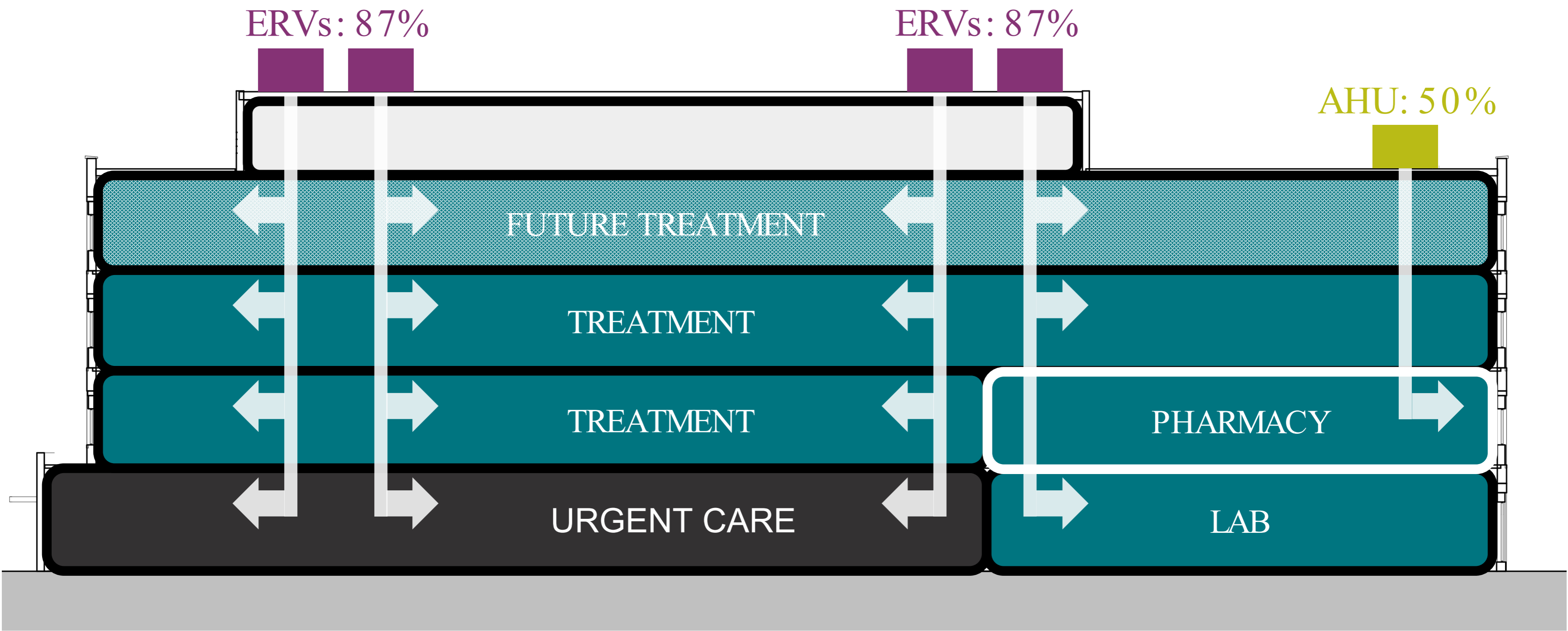


Medical Office
Passive Building

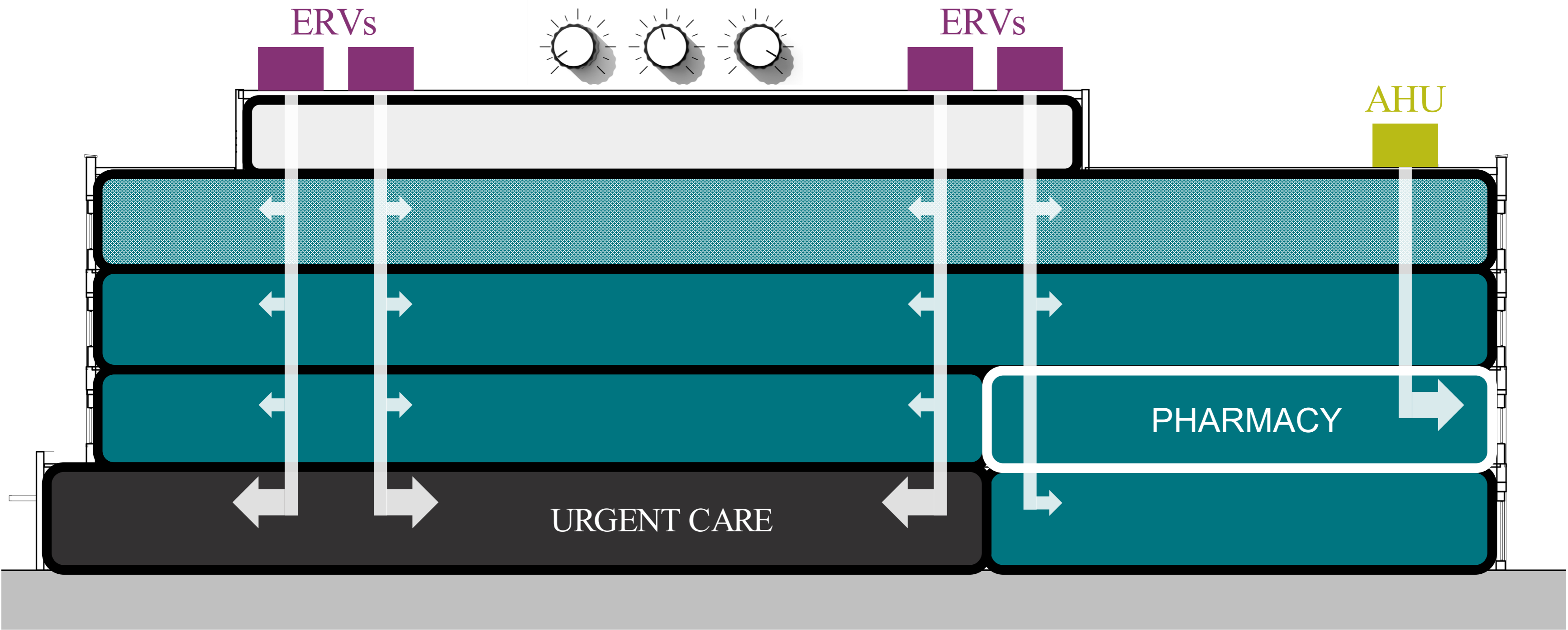
0.29 cfm/sf



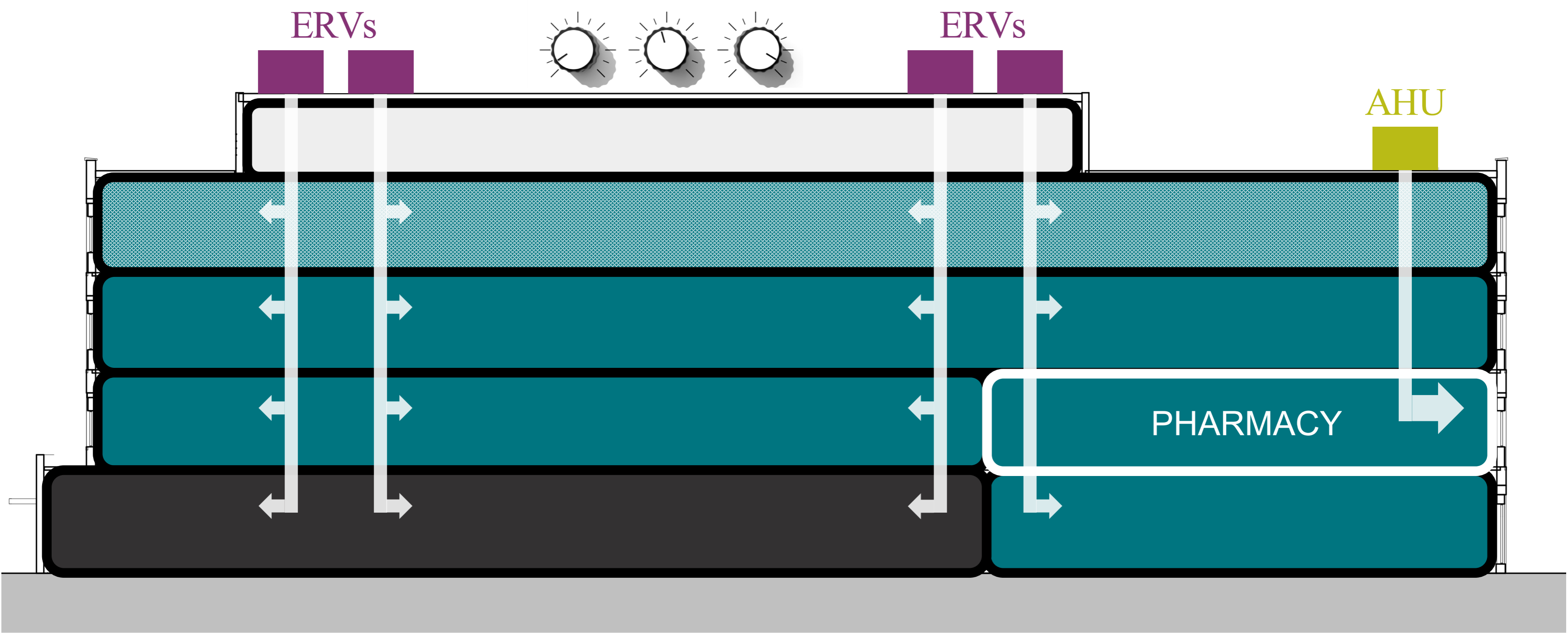
VENTILATION – Weekday



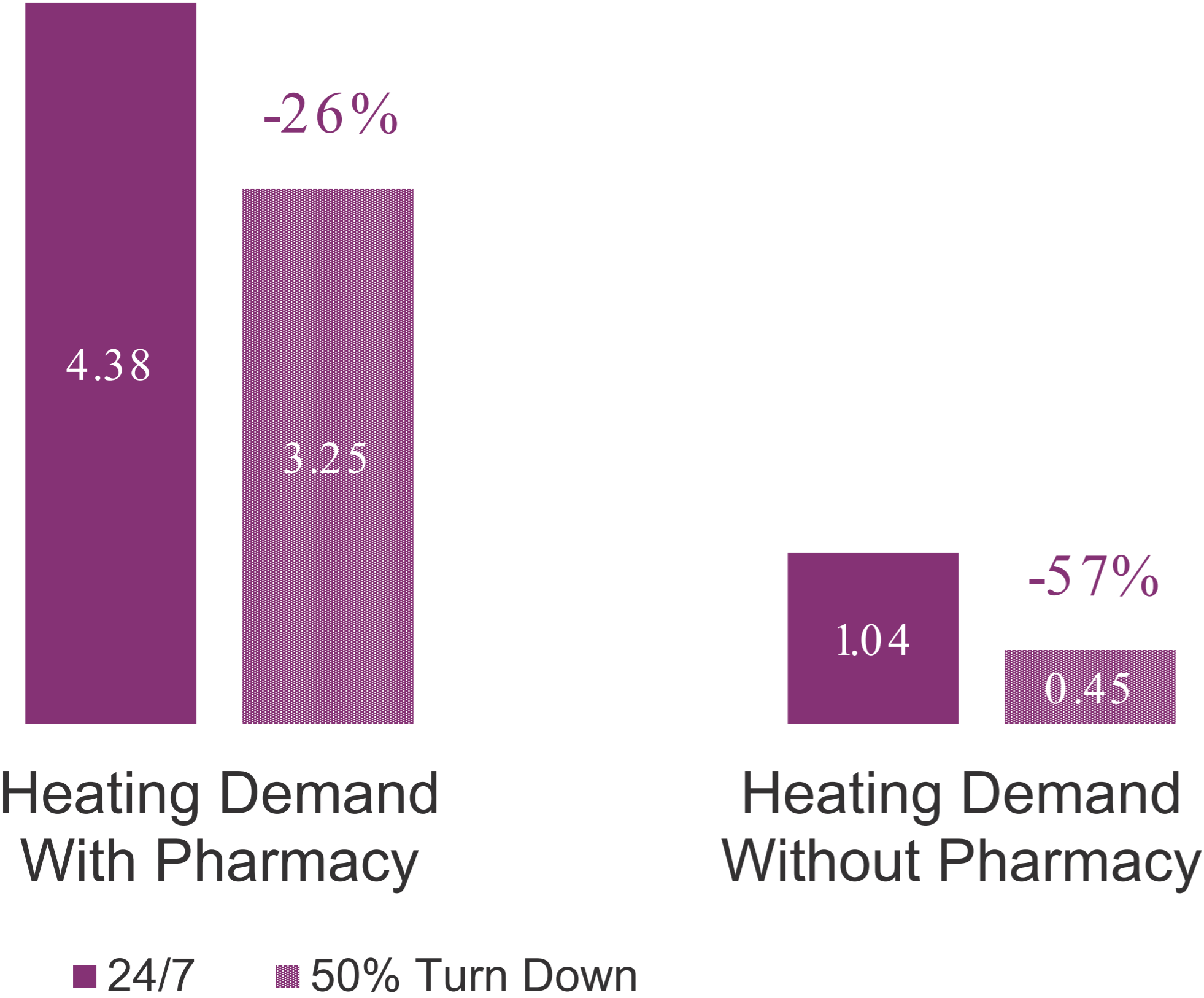
VENTILATION – Saturday



VENTILATION – Sunday



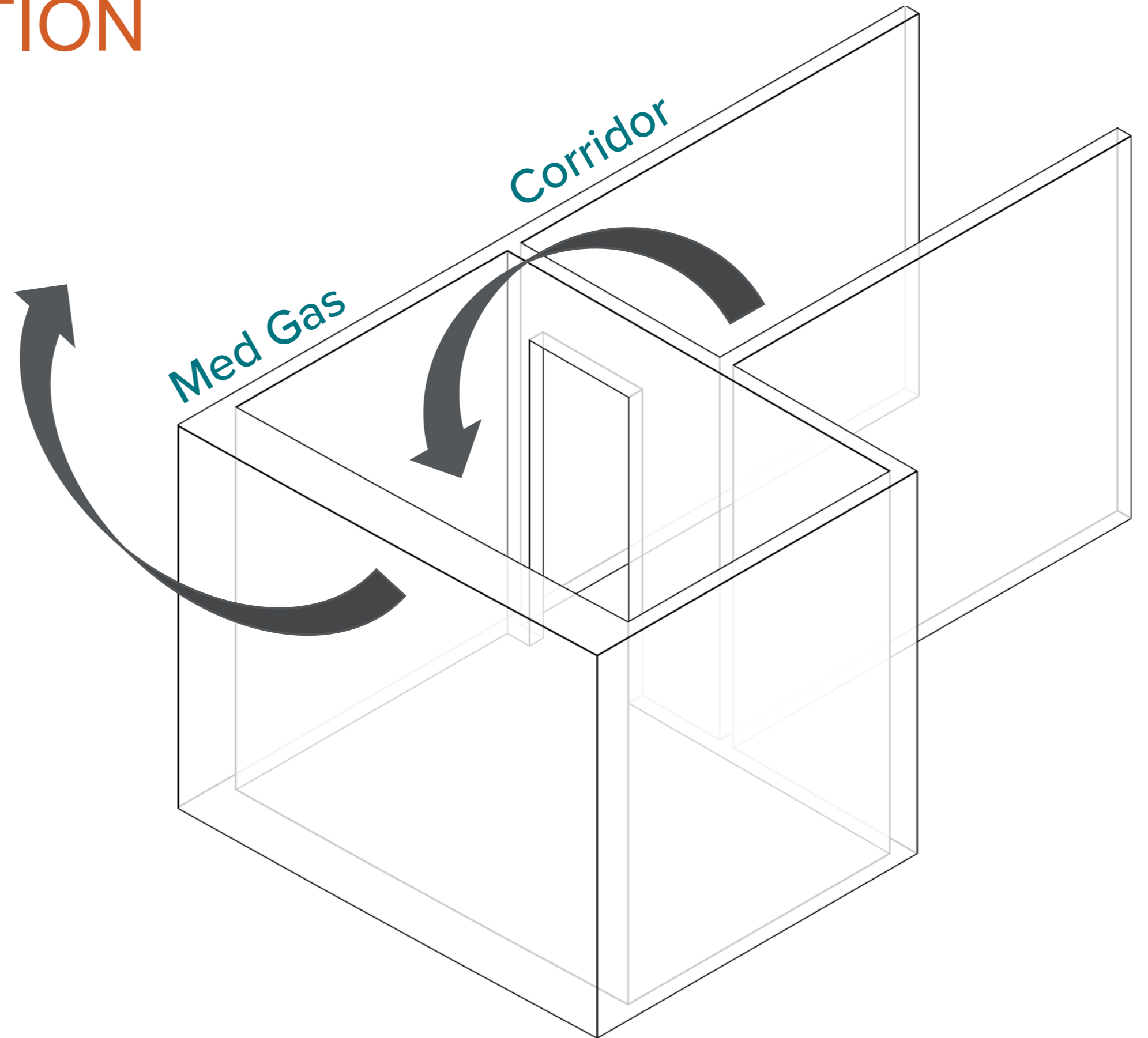
VENTILATION After Hours Reduction



Swegon
React Damper

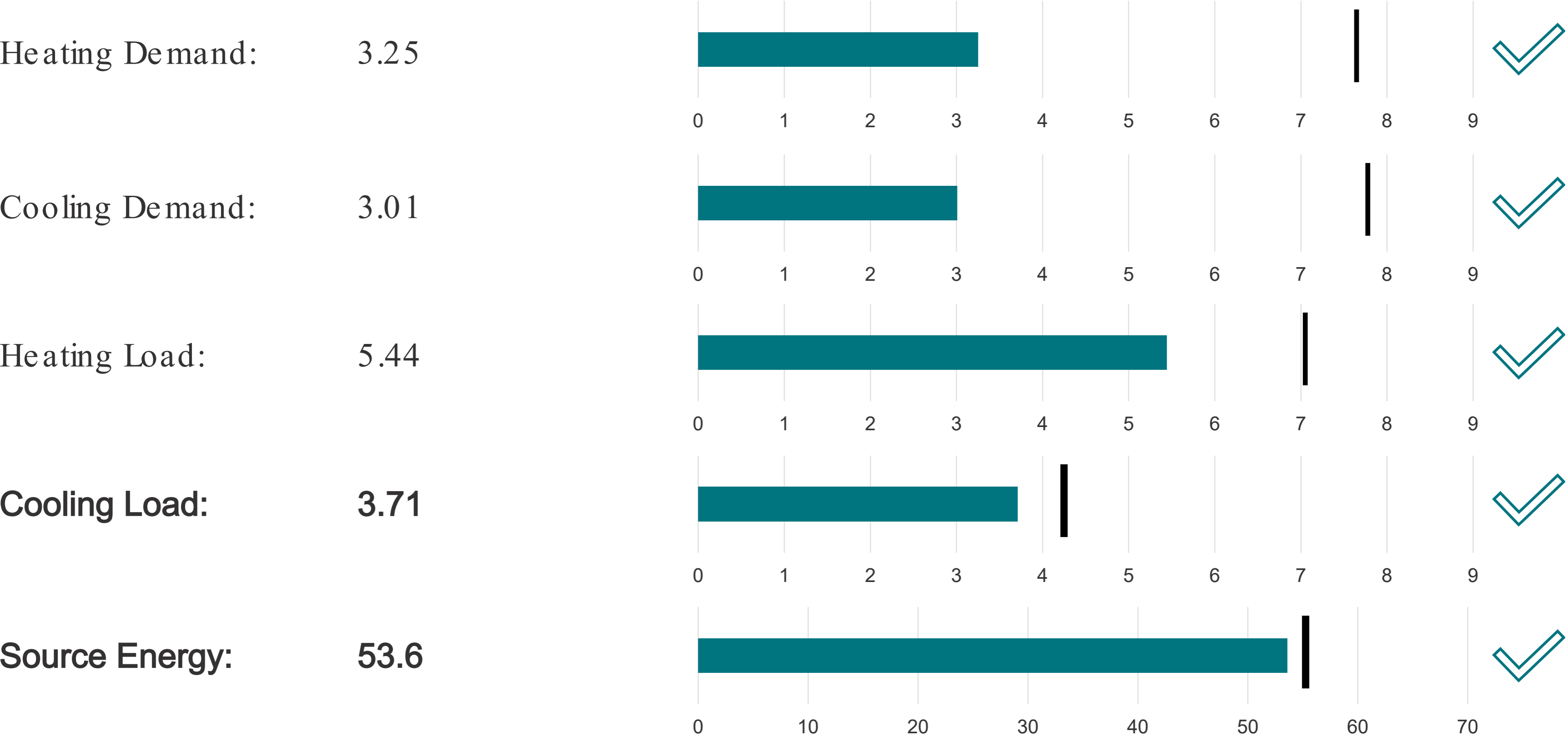
UNBALANCED VENTILATION

+7%
unbalanced
ventilation

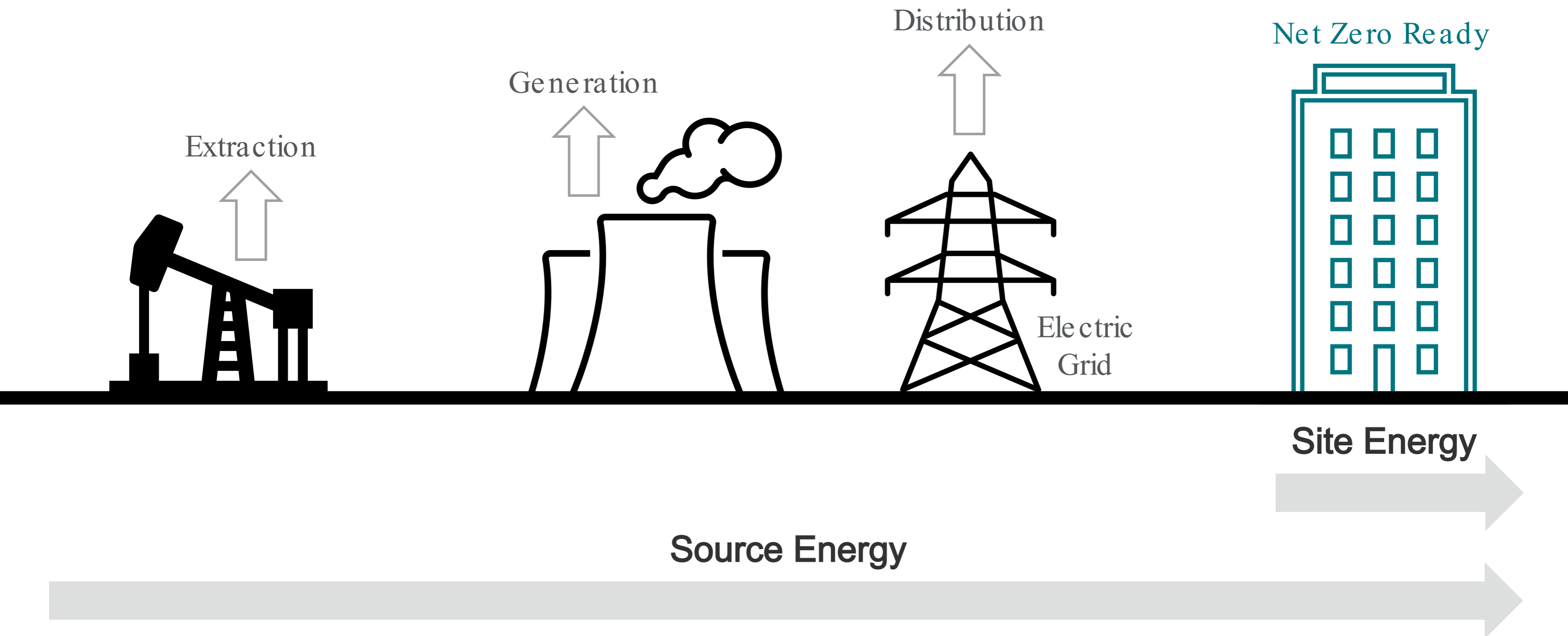


5 MEETING SOURCE ENERGY LIMIT

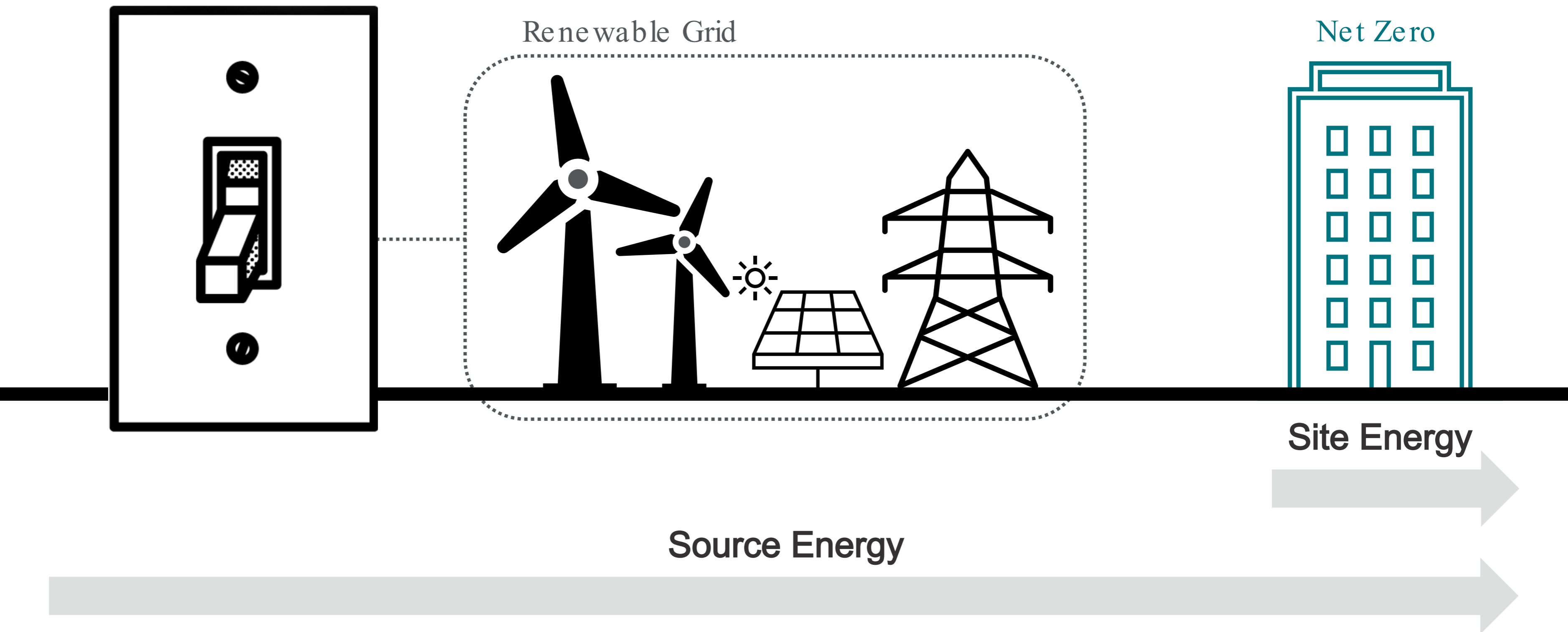
PHIUS RESULTS With Pharmacy



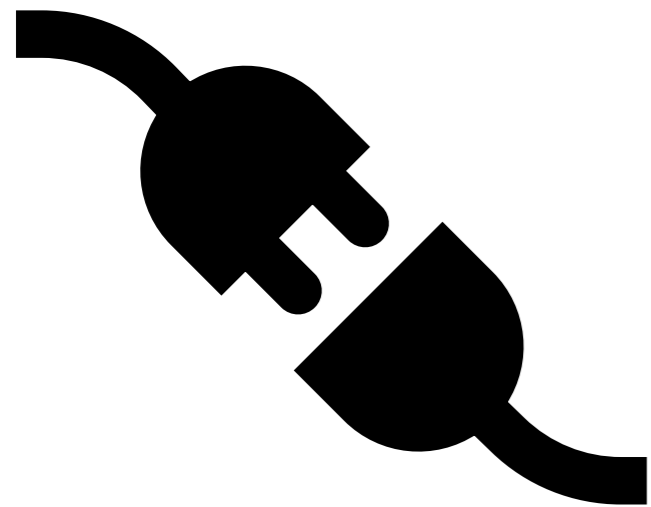
SOURCE ENERGY ~~Y~~ Current Grid



SOURCE ENERGY ~~Y~~ Future Grid



PHIUS SOURCE ENERGY LIMIT



Phius
Commercial

24.5 kBtu/sf/yr

+



Process
Loads

20.5 kBtu/sf/yr

+



Pharmacy
Ventilation

10.7 kBtu/sf/yr

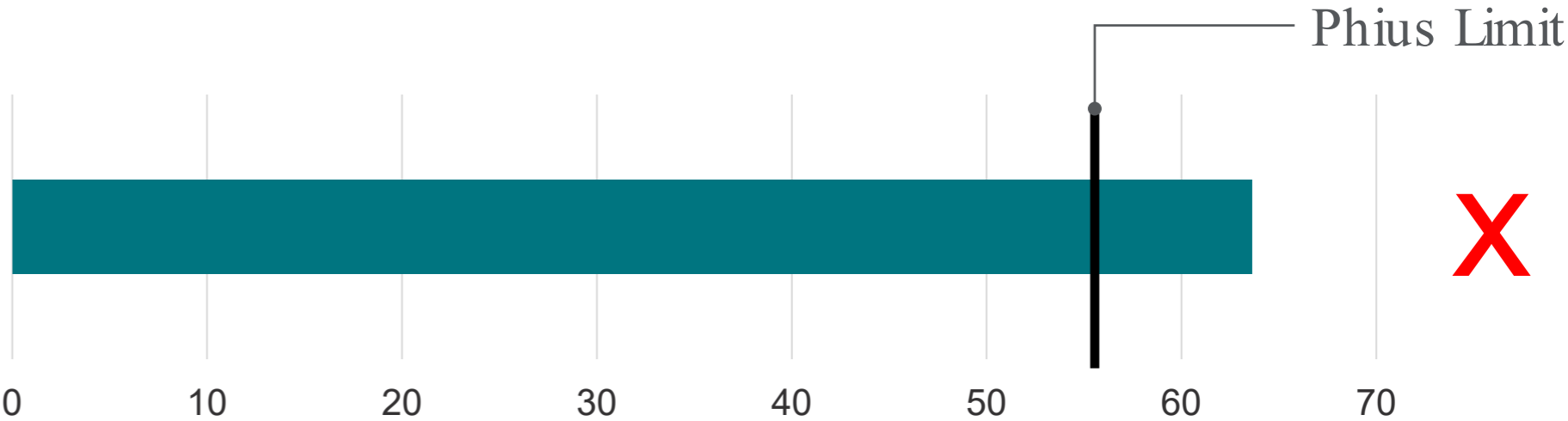
=

55.7
kBtu/sf/yr
Source Energy Limit

SOURCE ENERGY Before and After

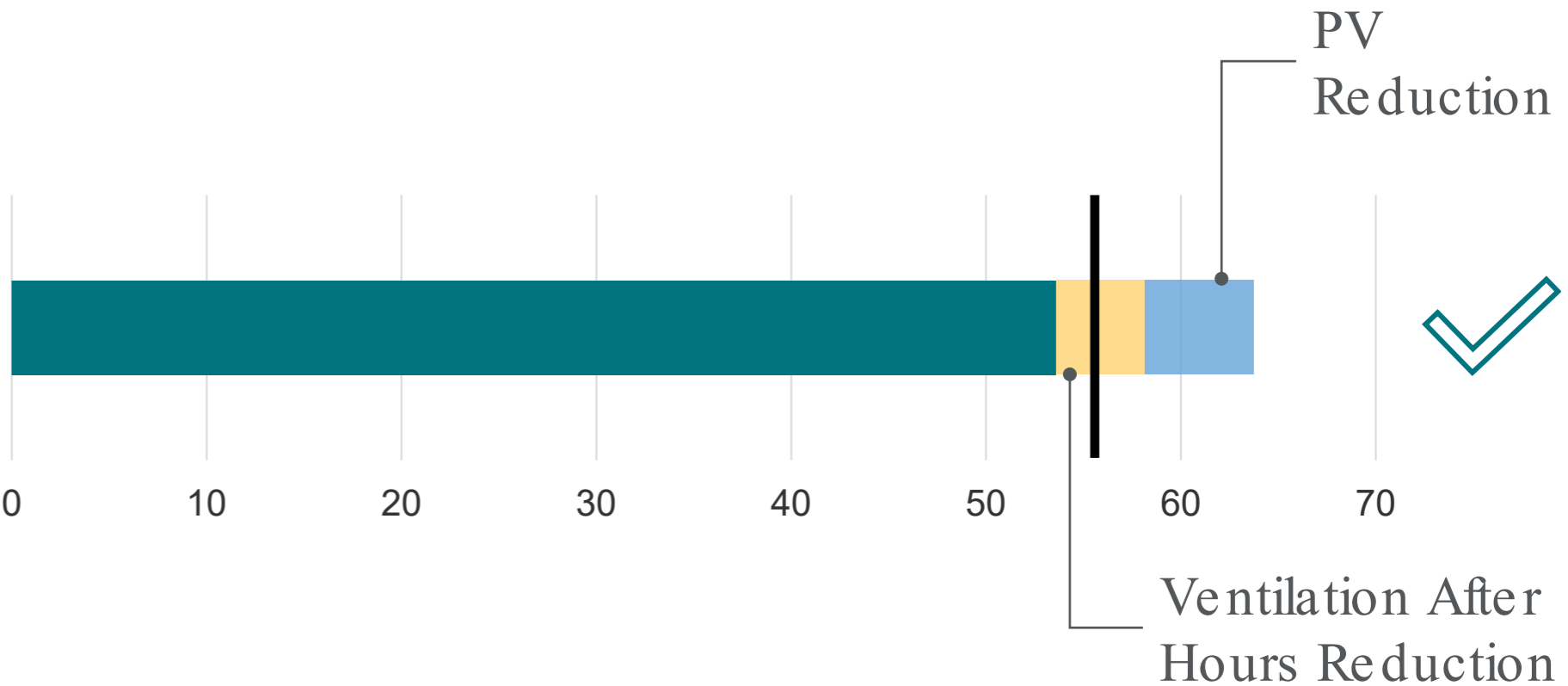
Source Energy – Before

Predicted Source Energy: 63.6
Source Energy Limit: 55.7



Source Energy – After

Predicted Source Energy: 53.6
Source Energy Limit: 55.7

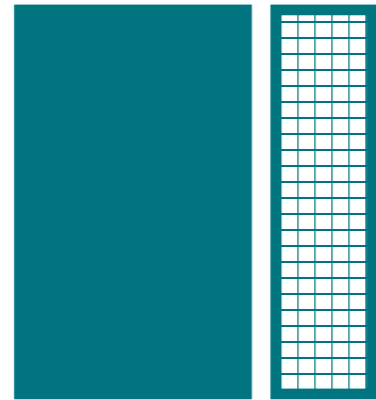


6 SUMMARY

LESSONS LEARNED



Separate
Time lines



Exterior Wall
Insulation



Ventilation
Redundancy

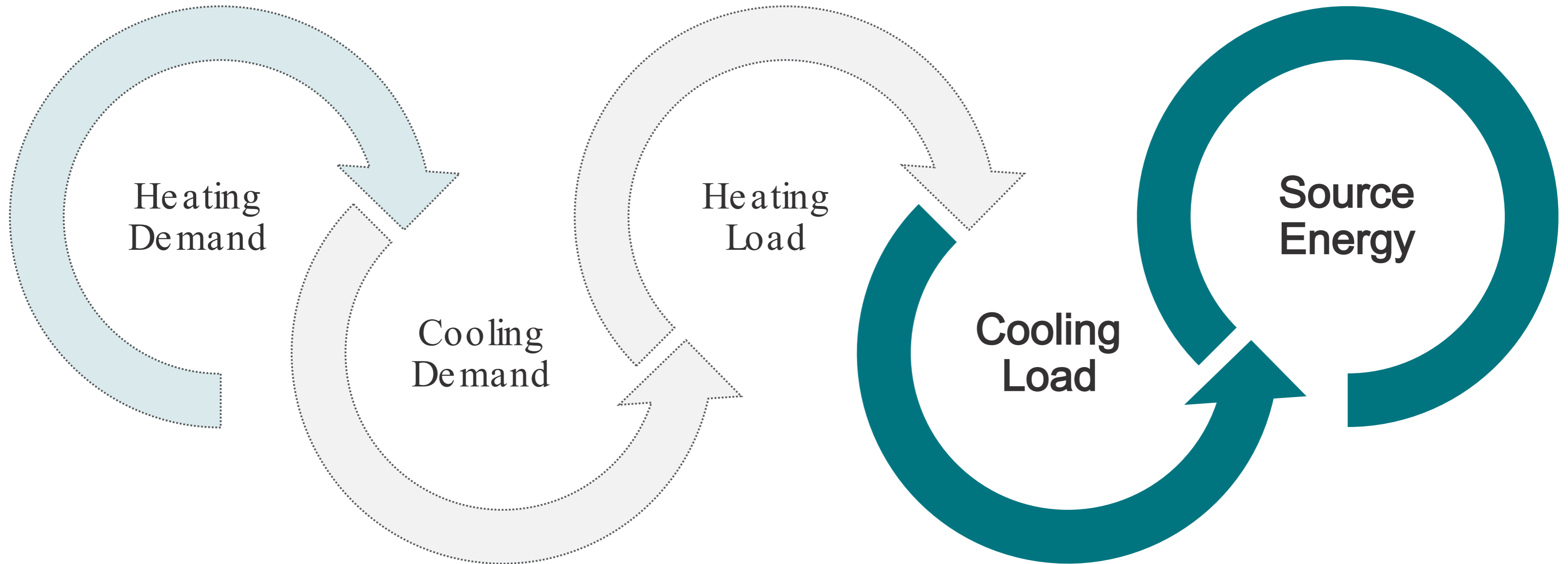


Unbalanced
Ventilation

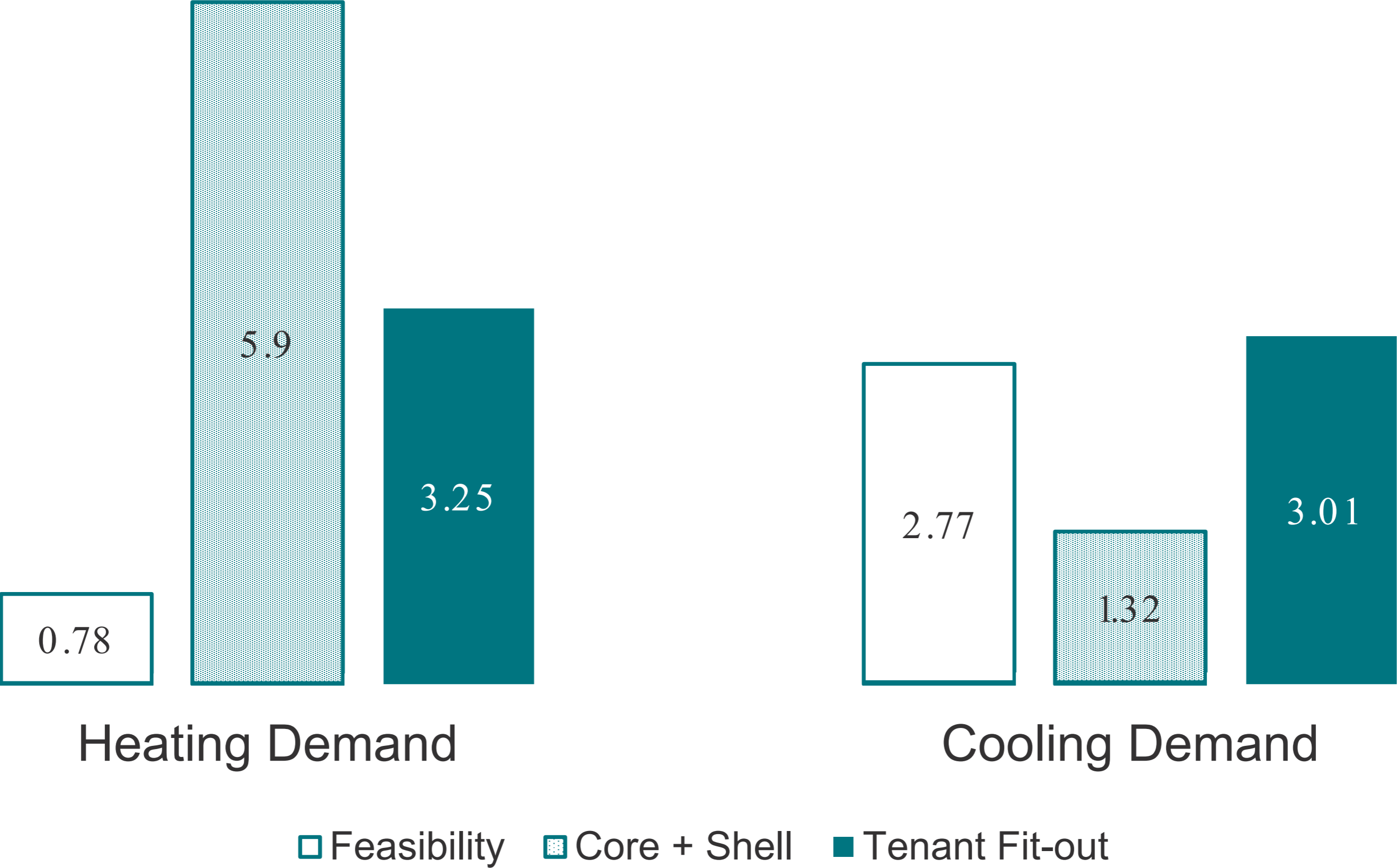


Early Dialogue
with Phius

PHIUS THRESHOLDS



PHIUS RESULTS TIMELINE COMPARISON



MRI REMOVABLE PANEL



THANK YOU!



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