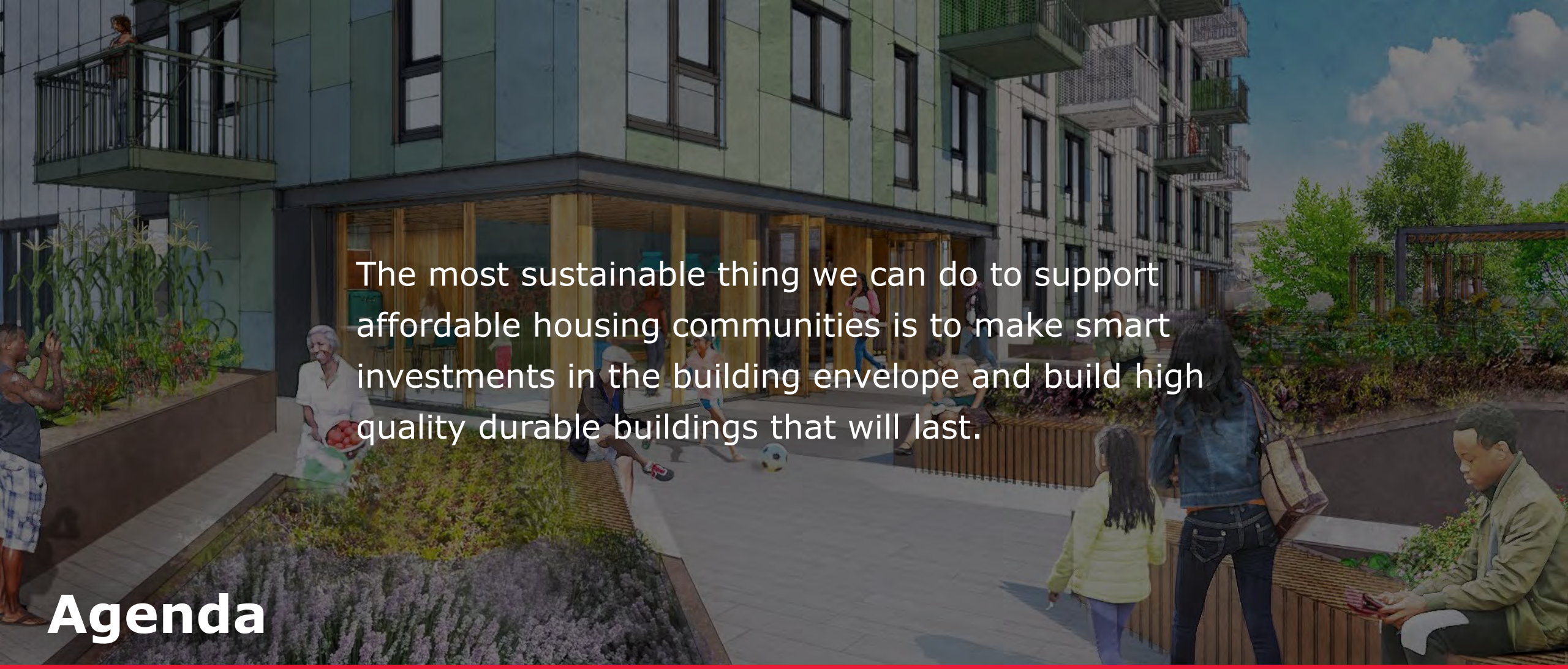
Sustainable & Equitable Affordable Housing Design

McEvoy and Dupont | SERA ARCHITECTS



The most sustainable thing we can do to support affordable housing communities is to make smart investments in the building envelope and build high quality durable buildings that will last.

Agenda

- Sustainable & Equitable Goals
- Step One: Demand Reduction
- Passive House Principals
- Step Two: Electrify
- All-Electric Building Systems
- Case Studies
- Embodied Carbon

PAE VISION

We help solve the planet's energy and water challenges.

CARBON NEUTRAL IN 2008 · CARBON NEGATIVE SINCE 2019

Just.

Certified B Corporation

339 STAFF

4 OFFICES

53 YEARS

OREGON
Portland + Eugene

CALIFORNIA
San Francisco

WASHINGTON
Seattle

Mechanical | **Electrical** | **Plumbing** | **Analysis and Modeling** | **Technology** | **Commissioning** | **Architectural Lighting**

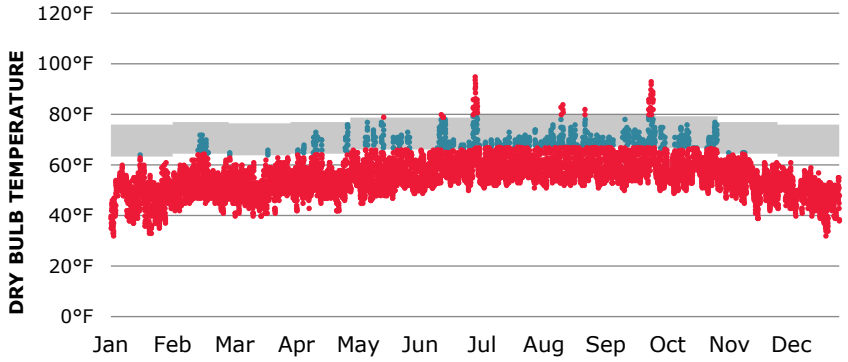
Sustainable & Equitable Affordable Housing

- Thermal Comfort
- Wellness
  INDOOR AIR QUALITY + ACCESS TO OUTDOORS AND NATURE
- High Quality Materials
- Beauty
- Robust
  LONG LIFE
- Resilient
- Low Maintenance
- Affordable

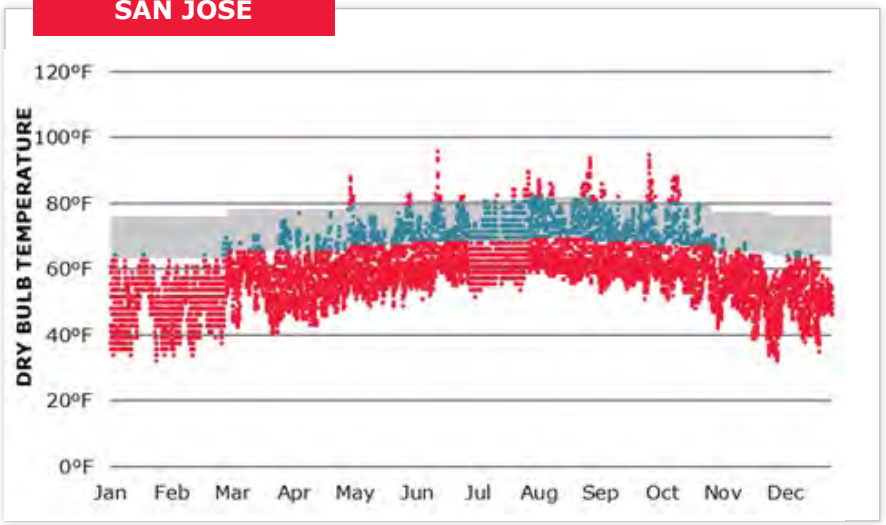
STEP ONE: DEMAND REDUCTION

Climate Responsive Design

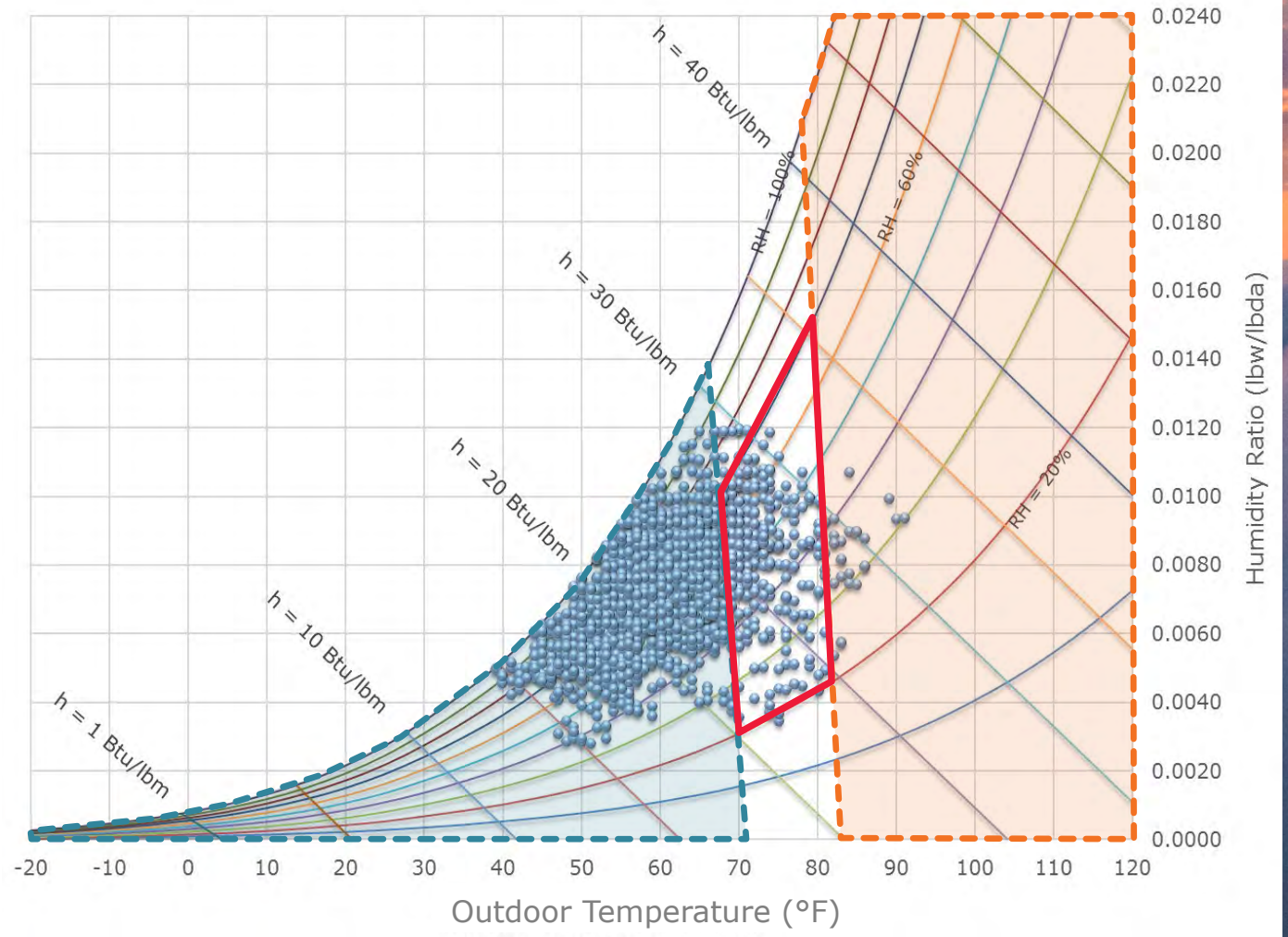
SAN FRANCISCO



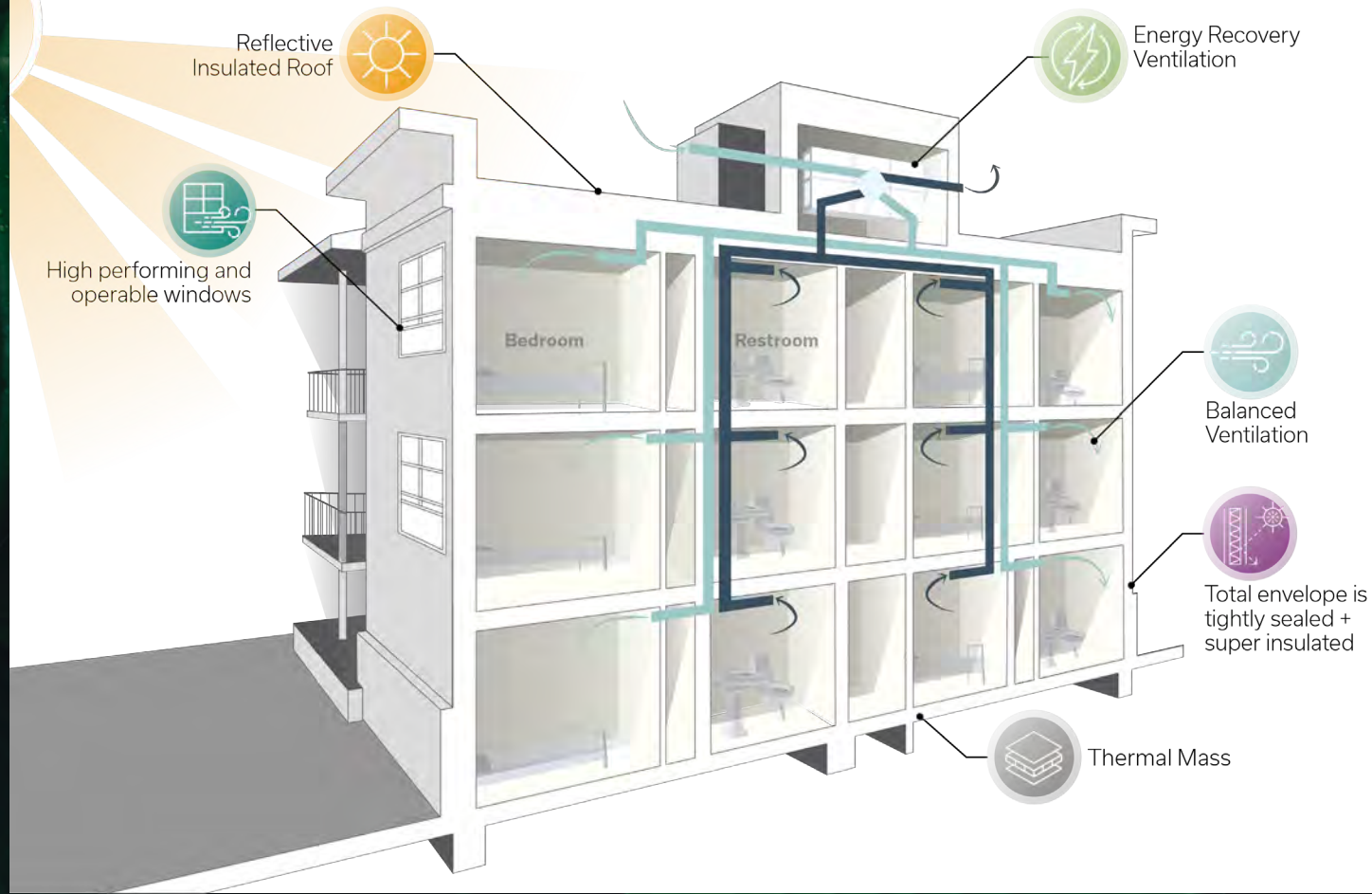
SAN JOSE



80% Acceptability Range • Within Comfort Range • Outside Comfort Range



Benefits of Passive House Strategies



APPROACH

Peak Demand Reduction

Annual Energy Reduction

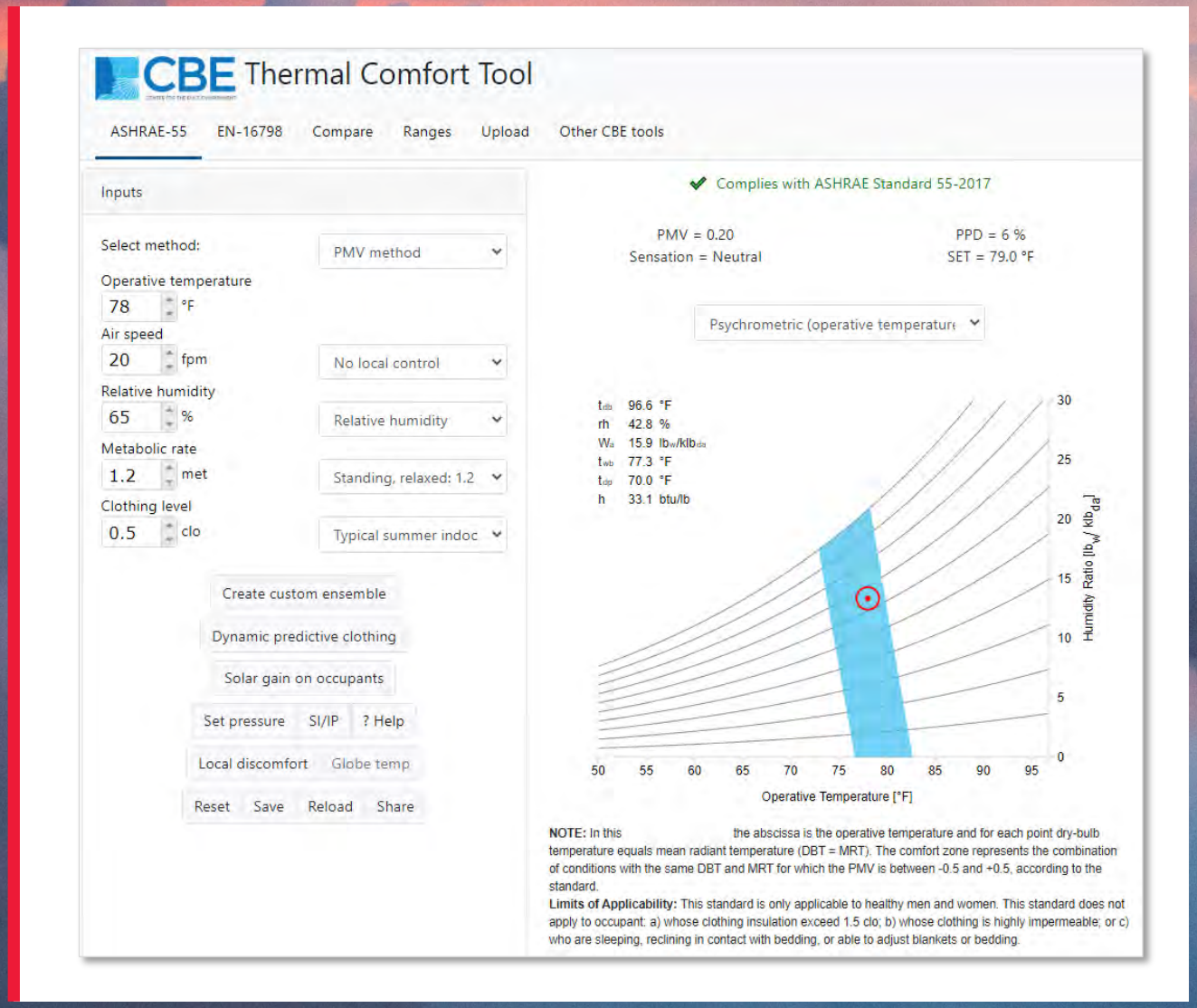
BENEFITS

Analyze Opportunities to Improve Envelope

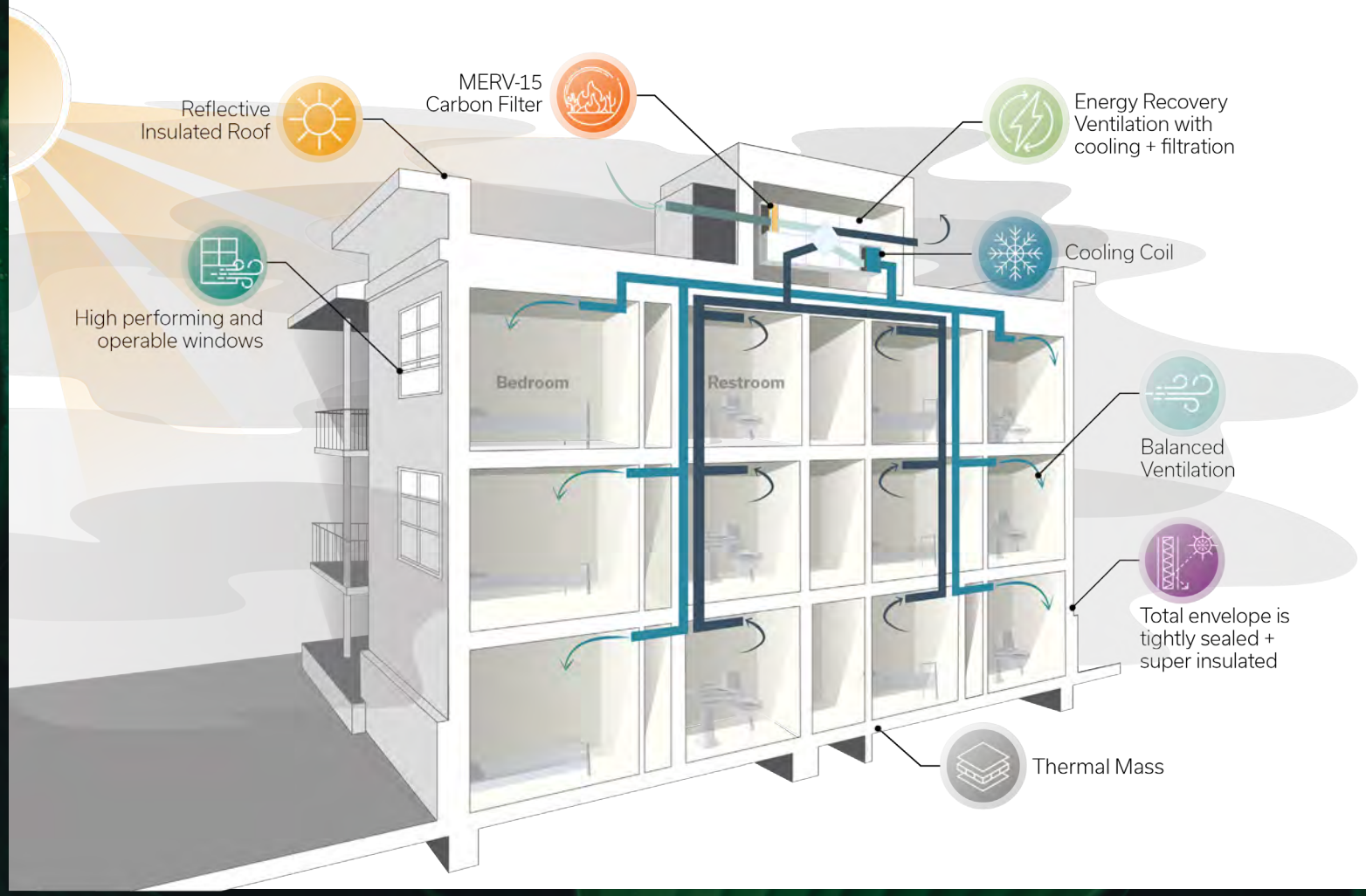
Invest in Longest Life Components

Minimize HVAC Systems

Adaptive Thermal Comfort



Enhanced Passive House Design



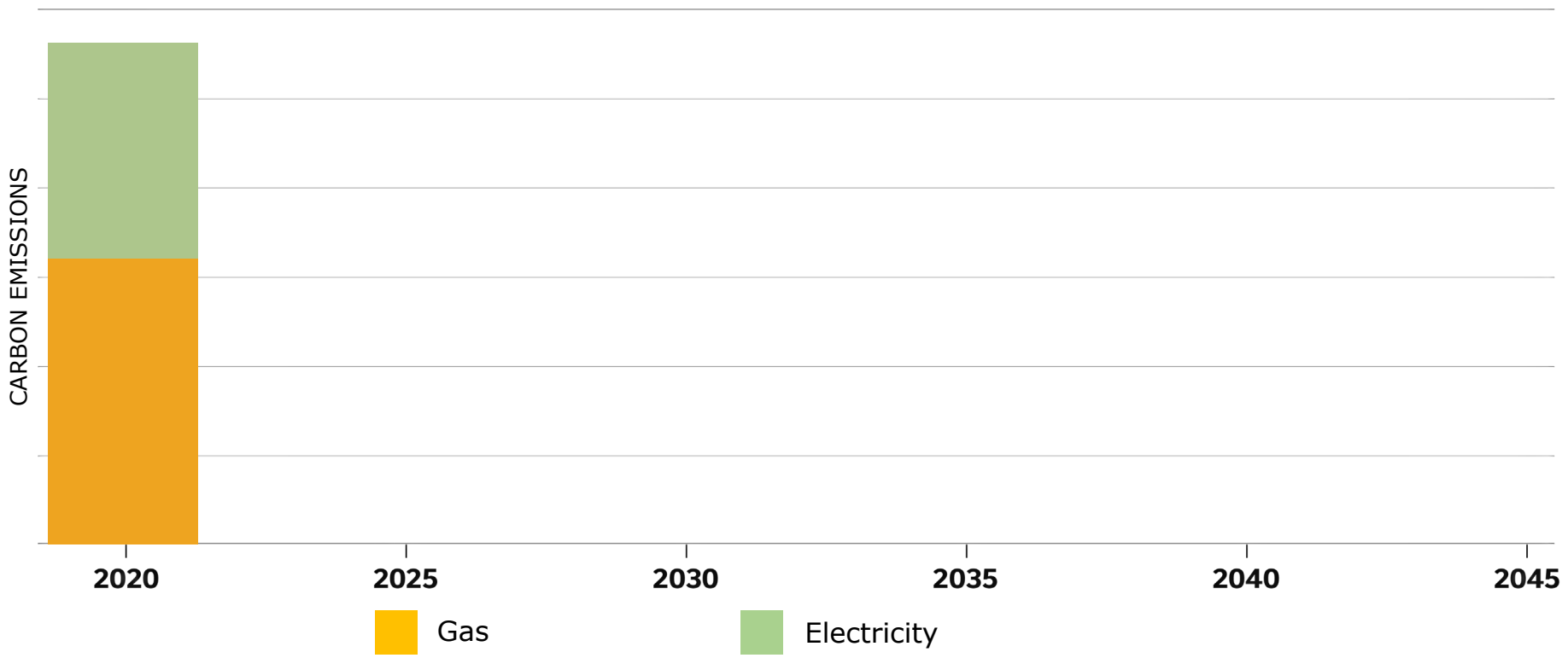
Improved Thermal Comfort

Enhanced Filtration and Improved IAQ

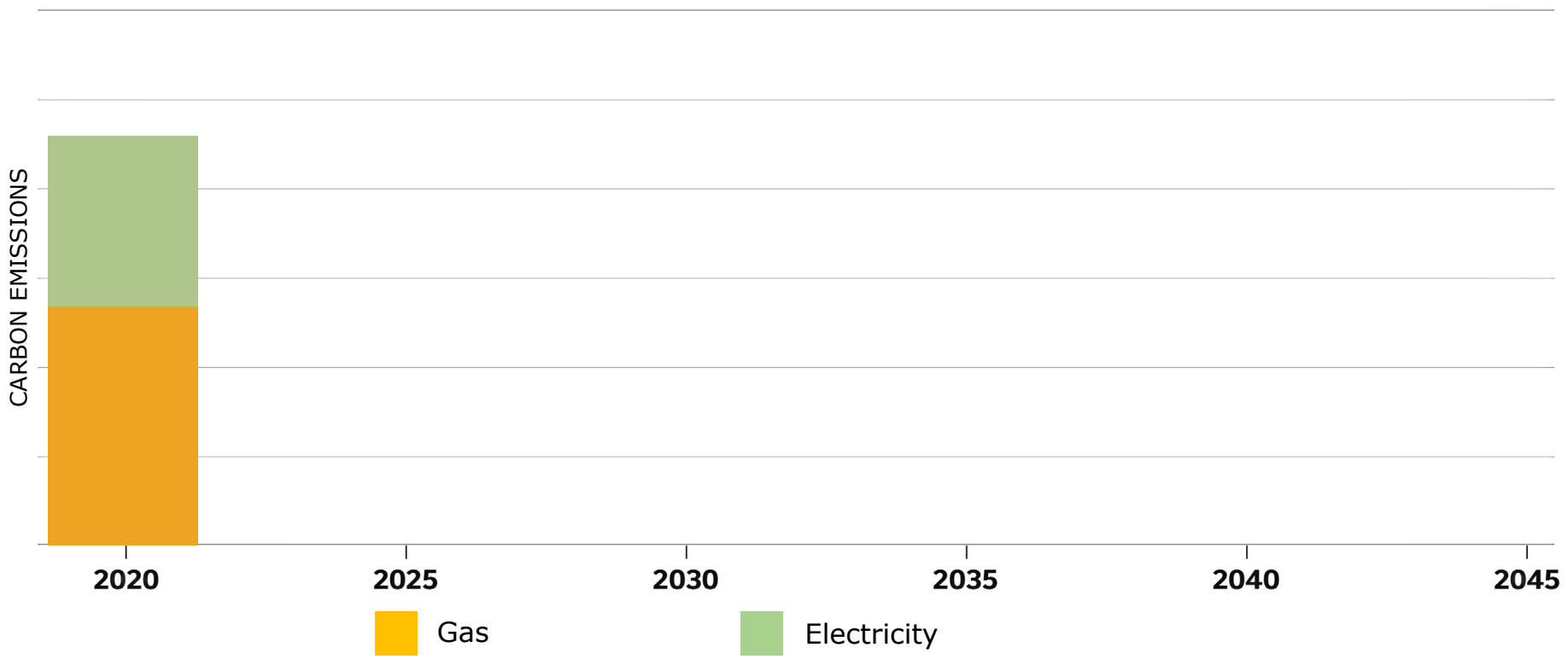
Reduced Ambient Noise


STEP TWO: ELECTRIFY

Path to Carbon Neutrality

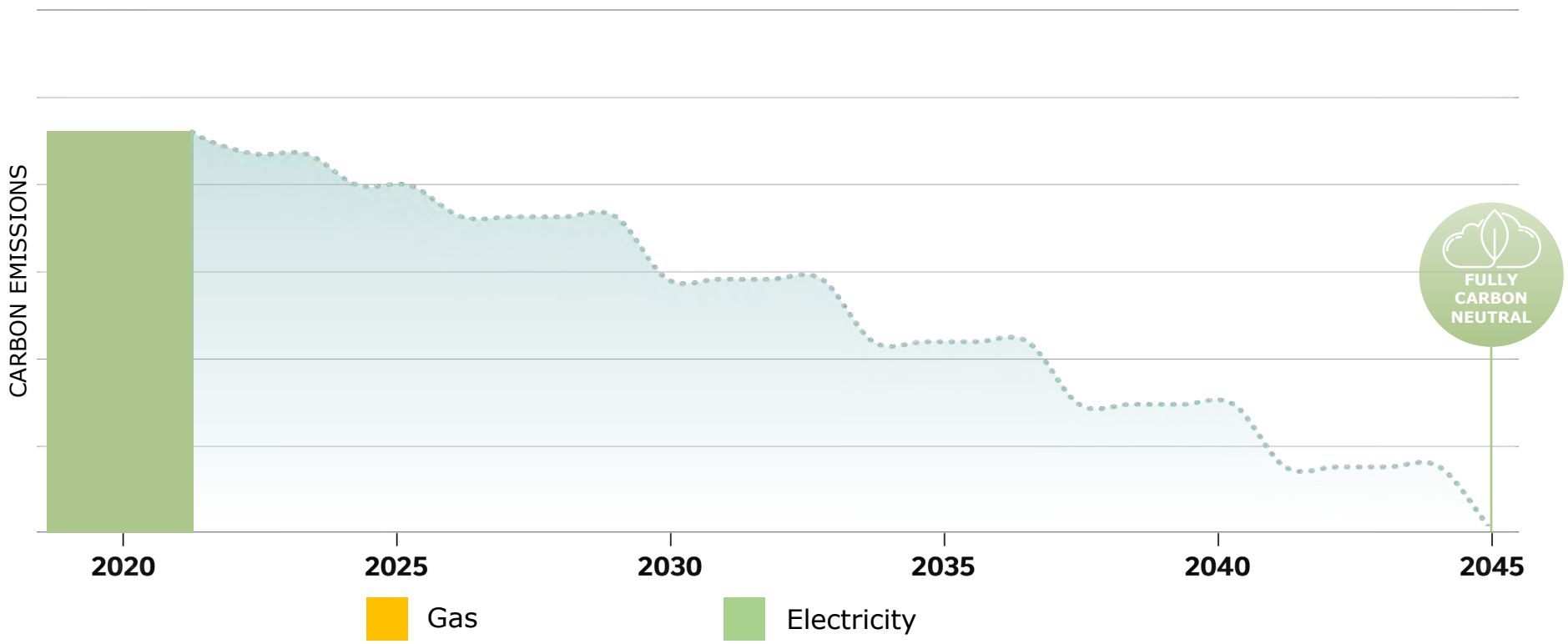


Path to Carbon Neutrality



Step 1:
Demand
Reduction

Path to Carbon Neutrality



Step 1:
Demand Reduction

Step 2:
Electrify Buildings

Step 3:
Decarbonize the Grid

ALL-ELECTRIC BUILDING SYSTEMS

Traditional Gas Fueled

Space Heating

Gas Boiler

Domestic Hot Water

Gas-Fired Water Heater

Cooking

Gas Oven

Electric

Traditional Gas Fueled

Electric

Space Heating

Gas Boiler

Air-Source Heat Pump

Variable Refrigerant Flow

Domestic Hot Water

Gas-Fired Water Heater

Air-Source Heat Pump

Water-Source Heat Pump DHWH

Cooking

Gas Oven

Electric Heat

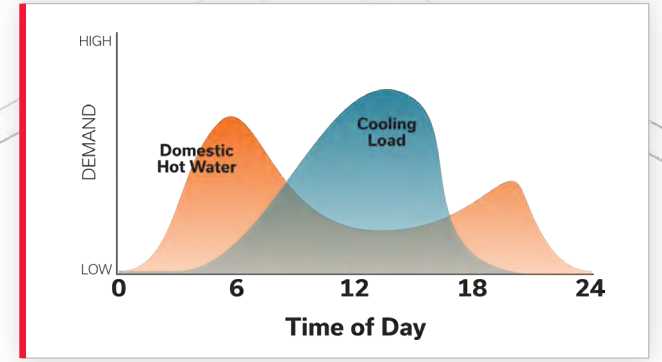
Induction Cooking

Sharing the Exchange

COEFFICIENT OF PERFORMANCE

~7

Heat Recovery Application | SIMULTANEOUS HEATING + COOLING



CASE STUDY

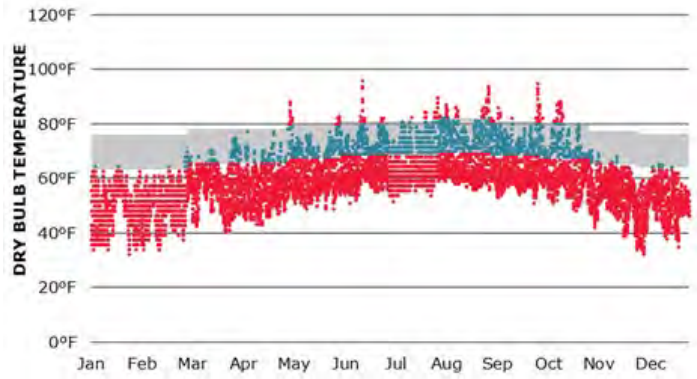
McEvoy & Dupont | SERA ARCHITECTS

SERA

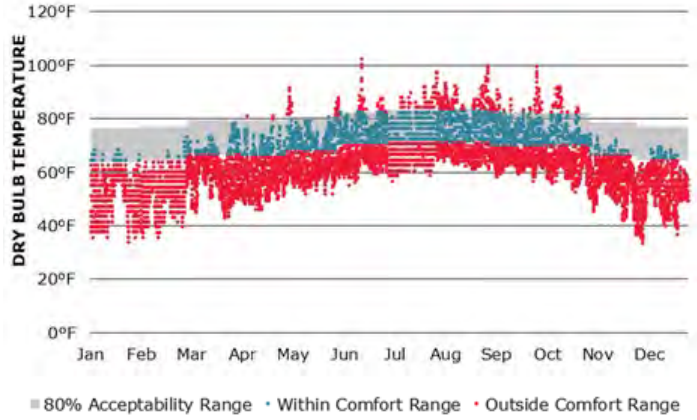
San Jose Local Weather

OUTDOOR TEMPERATURE

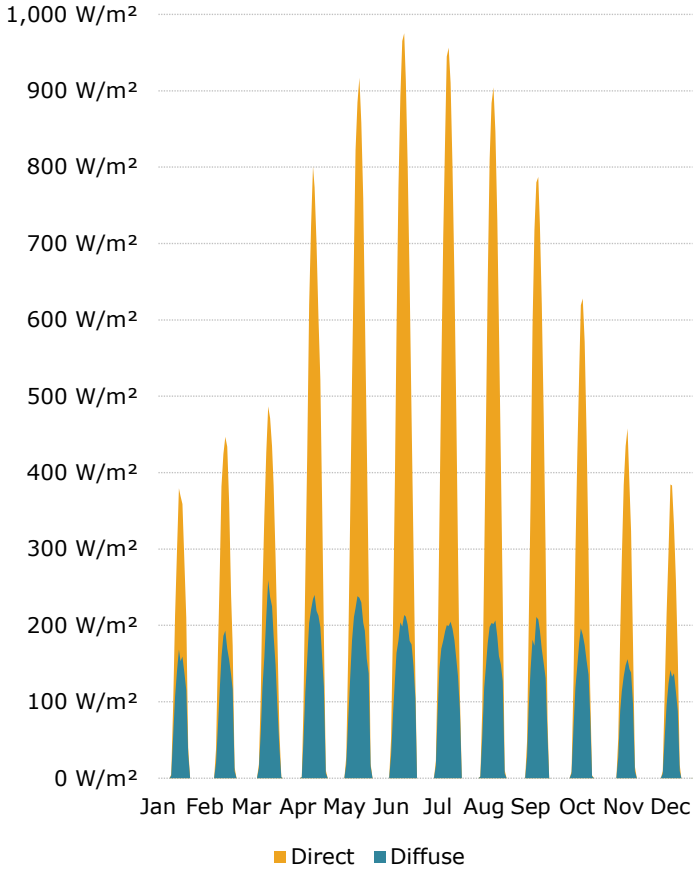
1991 – 2005



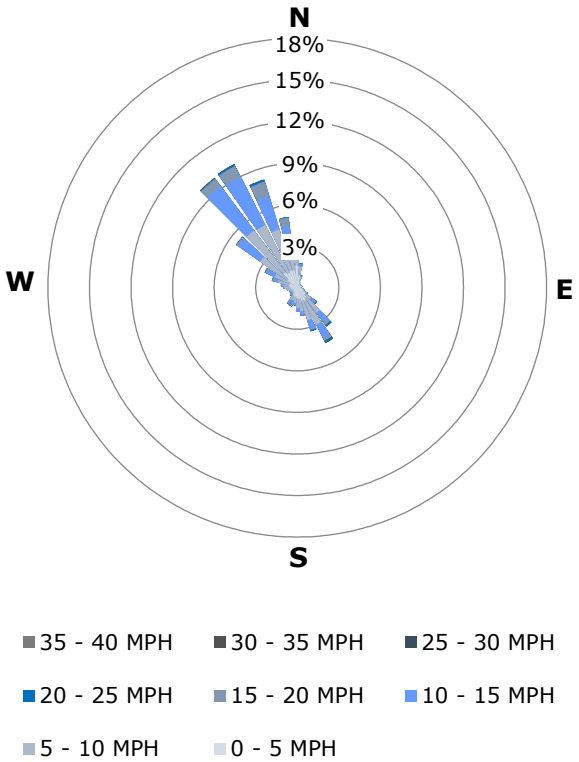
2050



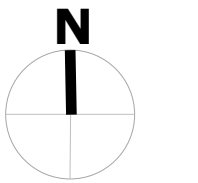
SOLAR RADIATION



WIND ROSE

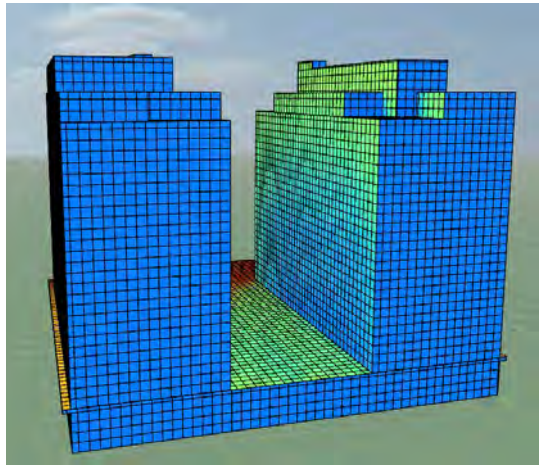


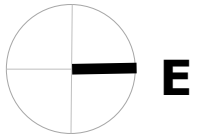
Annual Solar Exposure



North

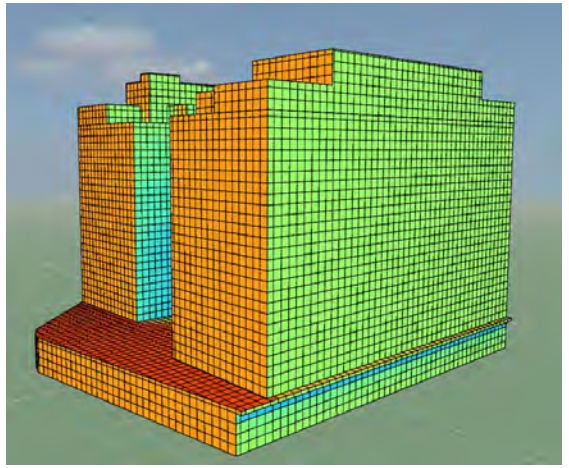
FACING FACADE

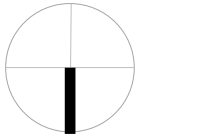




East

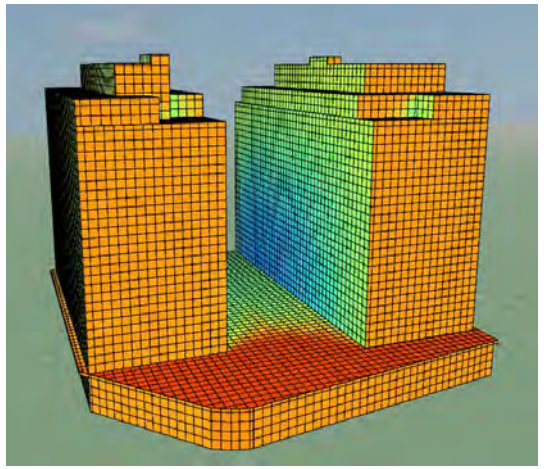
FACING FACADE

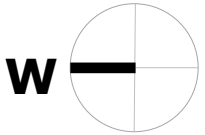




South

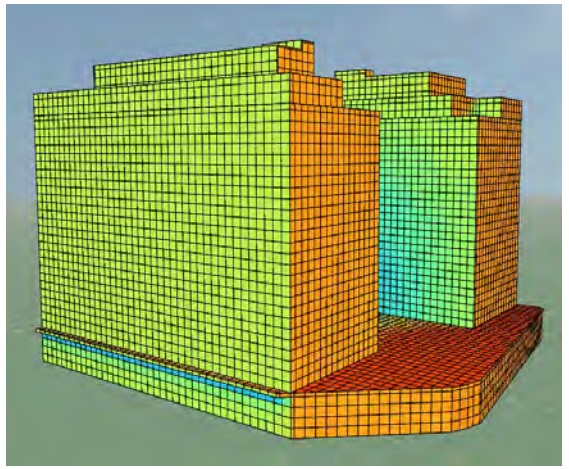
FACING FACADE

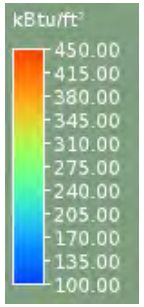




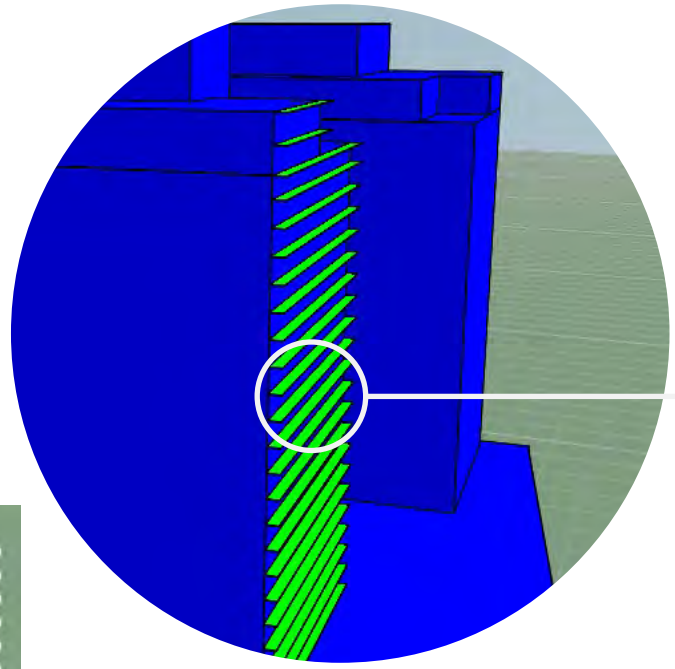
West

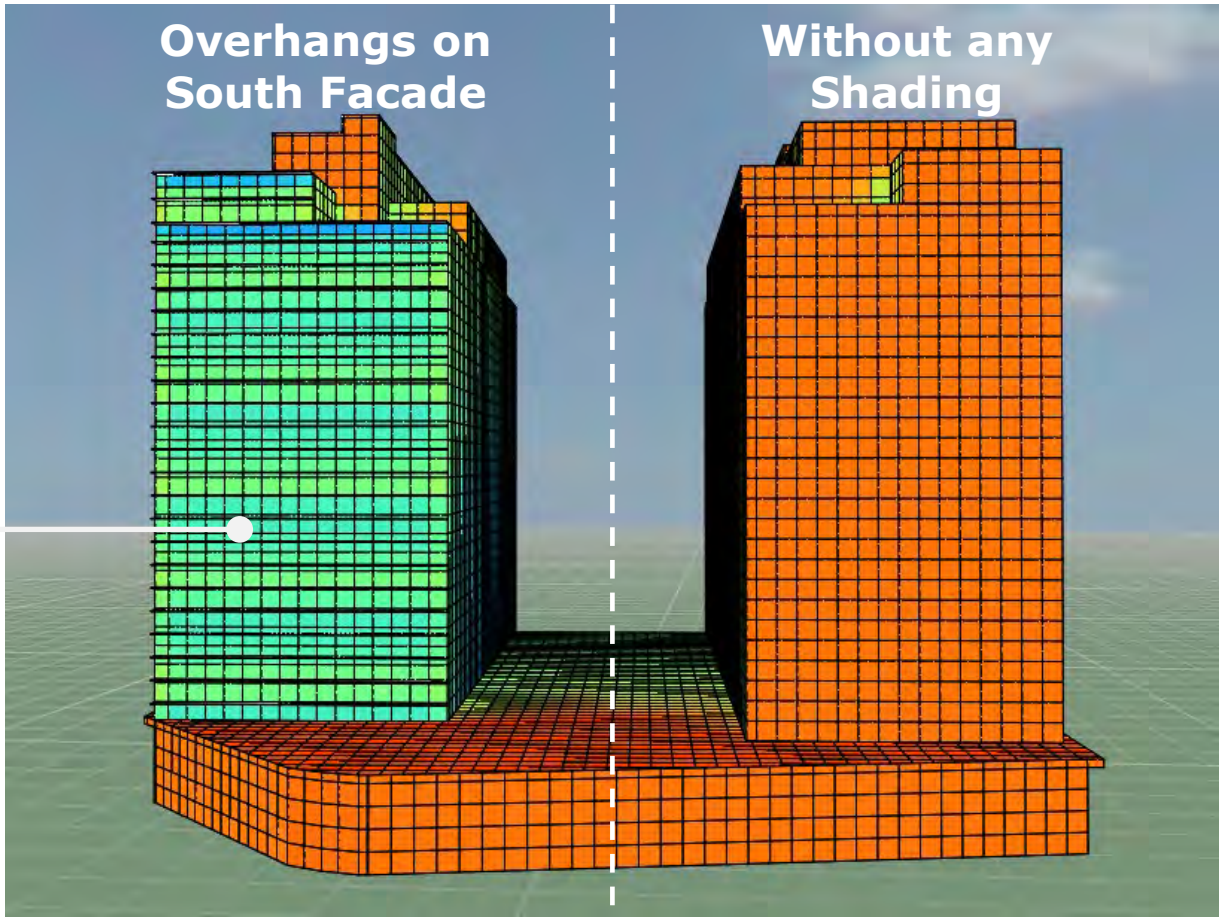
FACING FACADE

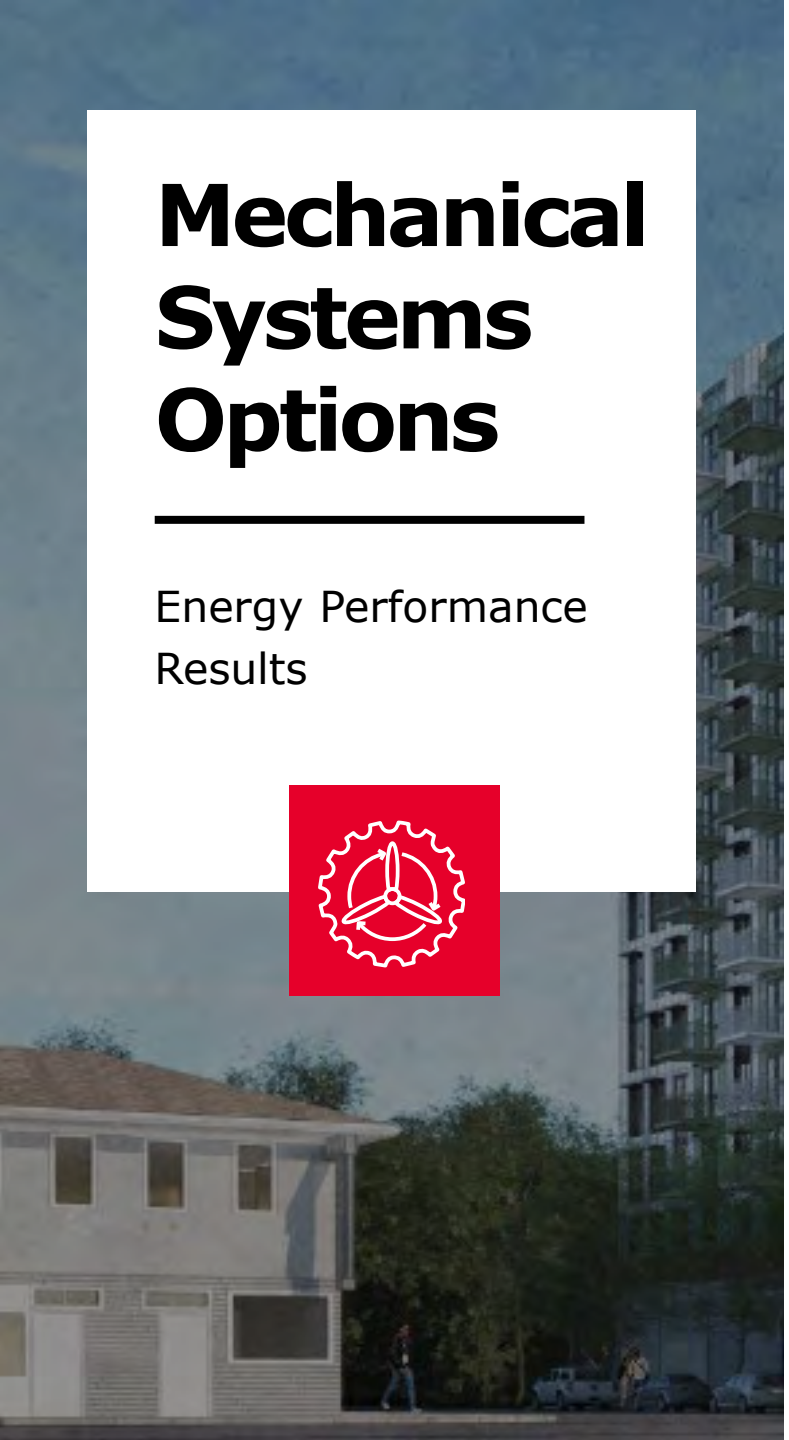




Horizontal Overhangs on South Facing Façade





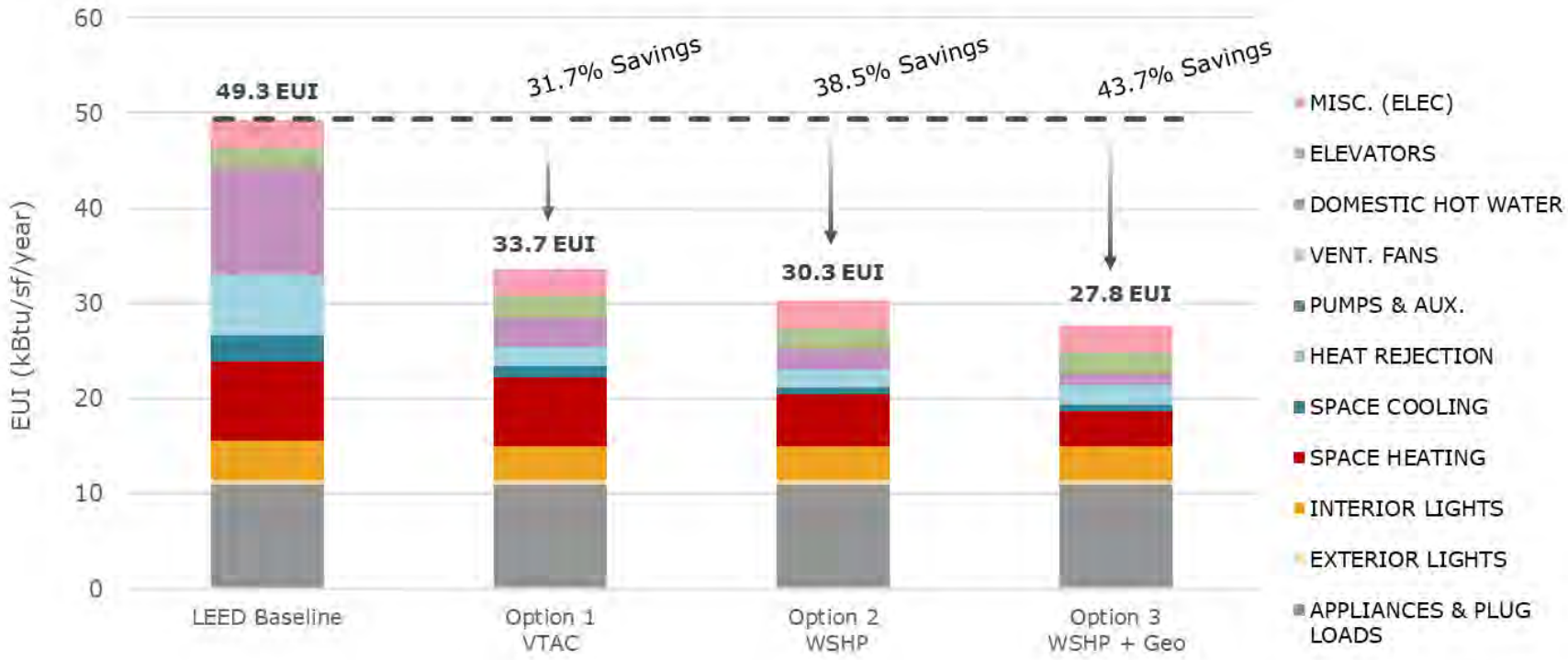


Mechanical Systems Options

Energy Performance Results

Site Energy Use Breakdown

WITHOUT SOLAR PV



Lifecycle Cost Analysis

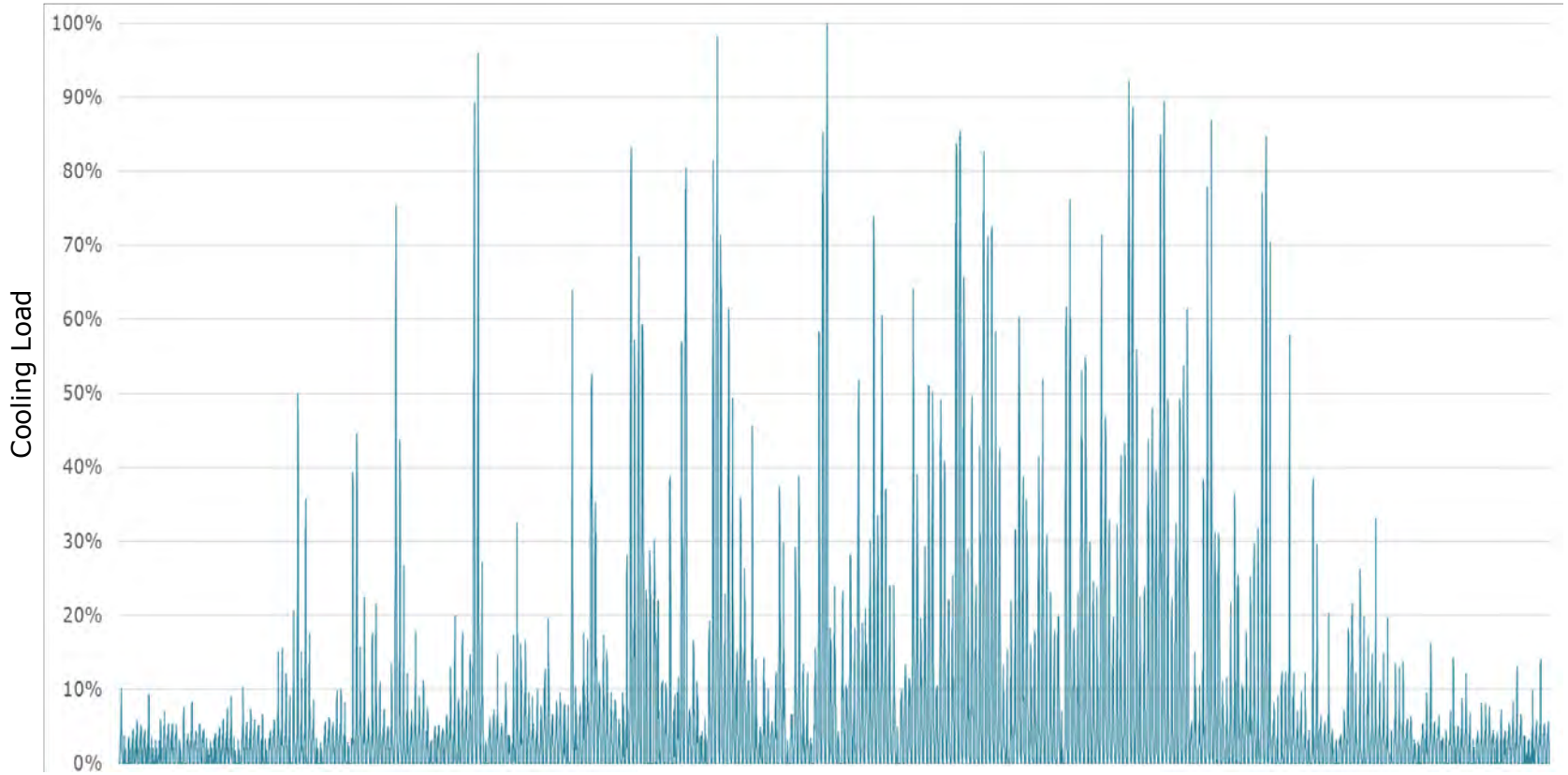
Option	Ventilation System	Space Conditioning System	% Energy Savings AGAINST LEED BASELINE	Thermal/ Acoustic Comfort	EUI kBtu/SF/YR	System First Cost ALL BUILDING ESTIMATE	Simple Payback YEARS	System Net Present Cost
1	**Localized Apartment Outside Air Fan**	**VTAC**	**31.7%**		**33.7**	**$11.8M**	**-**	**$59.3M*** $81.7M**
2	**Localized Apartment Outside Air Fan**	**WSHP**	**38.5%**		**30.3**	**$12.0M**	**8.9**	**$53.2M*** $73.2M**
3	**Localized Apartment Outside Air Fan**	**WSHP + Geo-Exchange**	**43.7%**		**27.8**	**$12.9M**	**12.8**	**$51.2M*** $70.8M**

NOTES

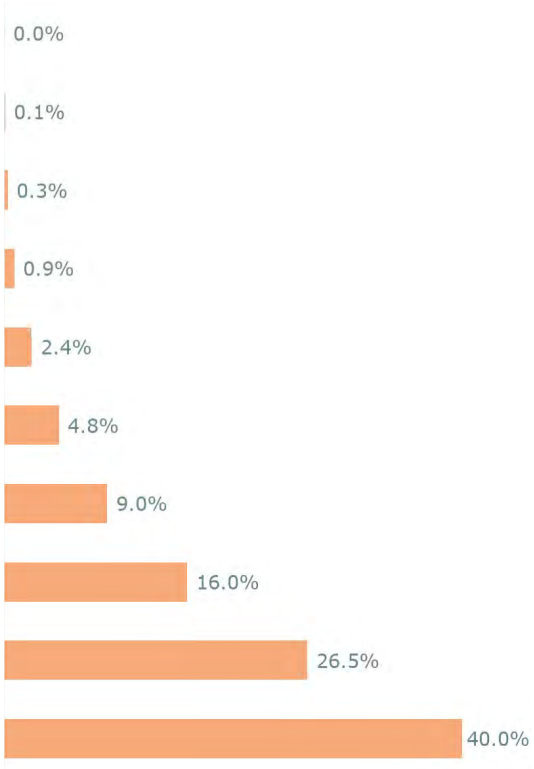
* Dollar amount excludes the impact on tenant utility bills

** Dollar amount includes the impact on tenant utility bills

Sizing Geothermal Systems

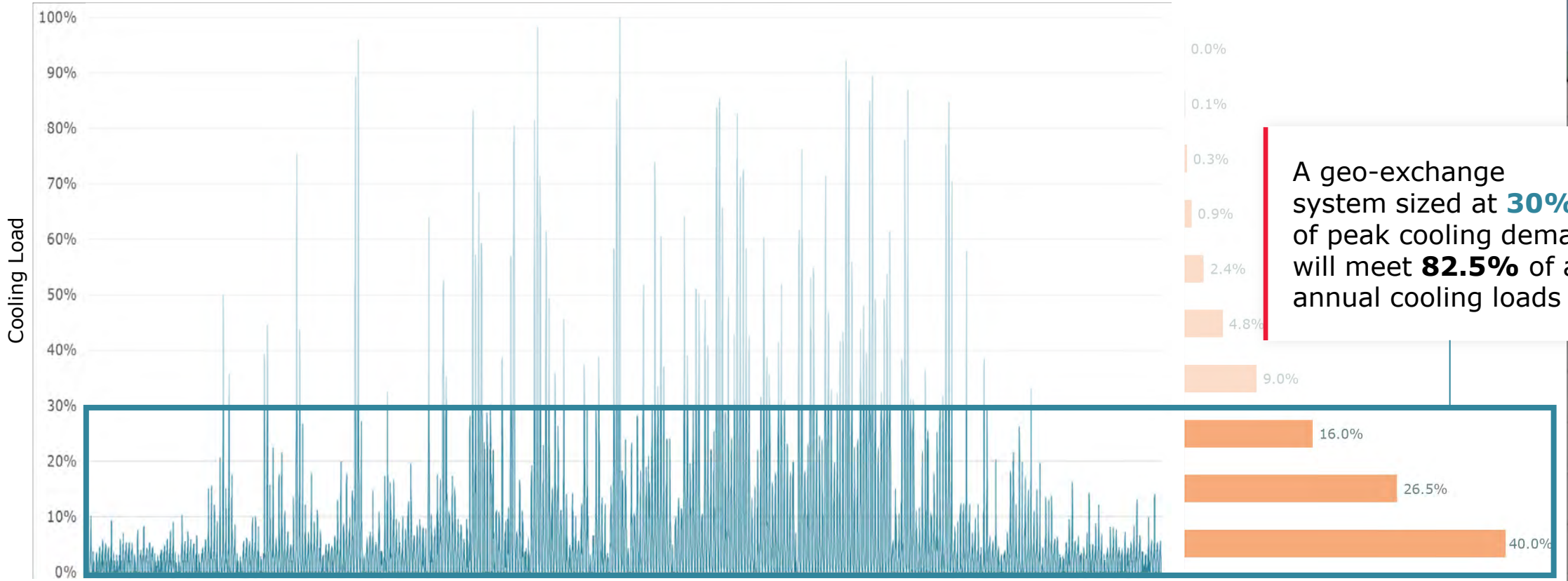


Annual Hourly Load Profile



Cooling Distribution

Sizing Geothermal Systems



LEED Platinum

Net Zero Energy

Pursuing EPIC Grant

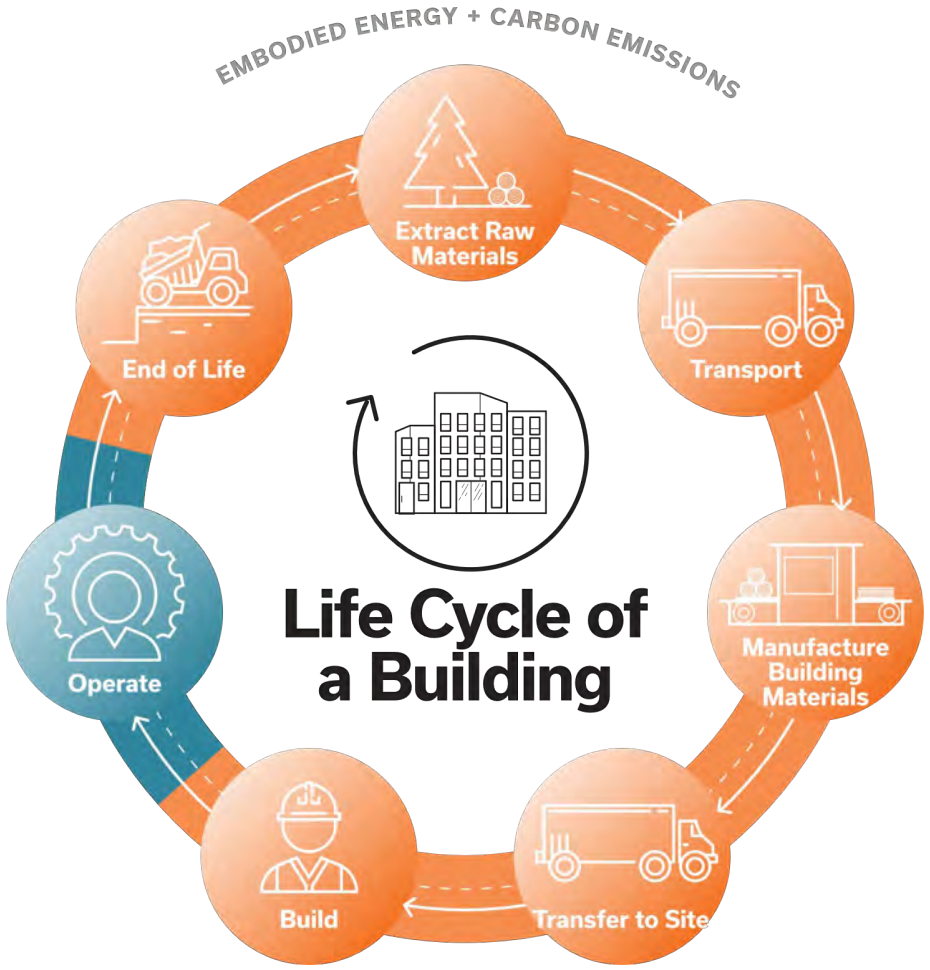
Santa Cruz Metro Pacific North Affordable Housing | MITHUN

MITHUN

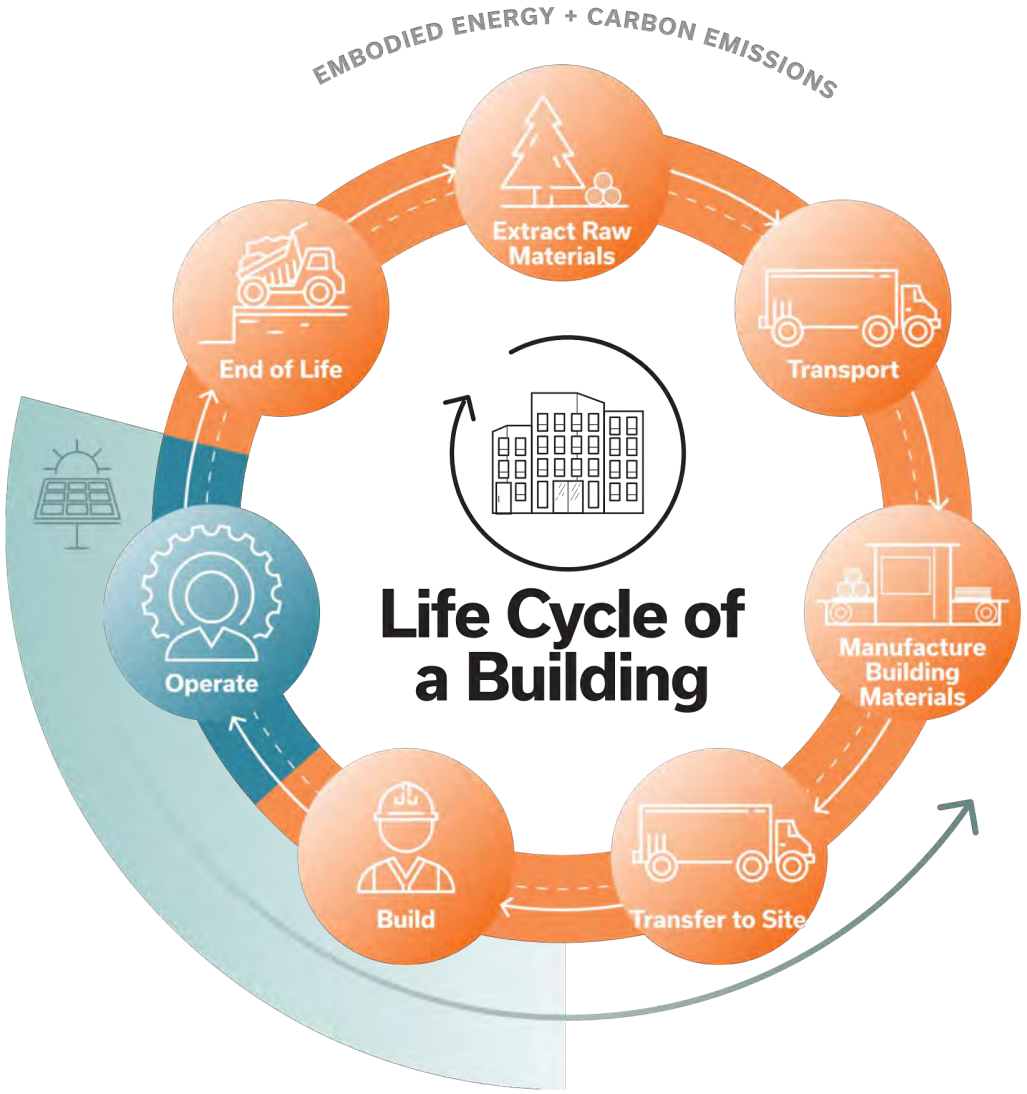
FIRST COMMUNITY HOUSING


CO_2
EMBODIED CARBON

Lifecycle Carbon Offset



Lifecycle Carbon Offset

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