We will be starting soon!

Thanks for joining us

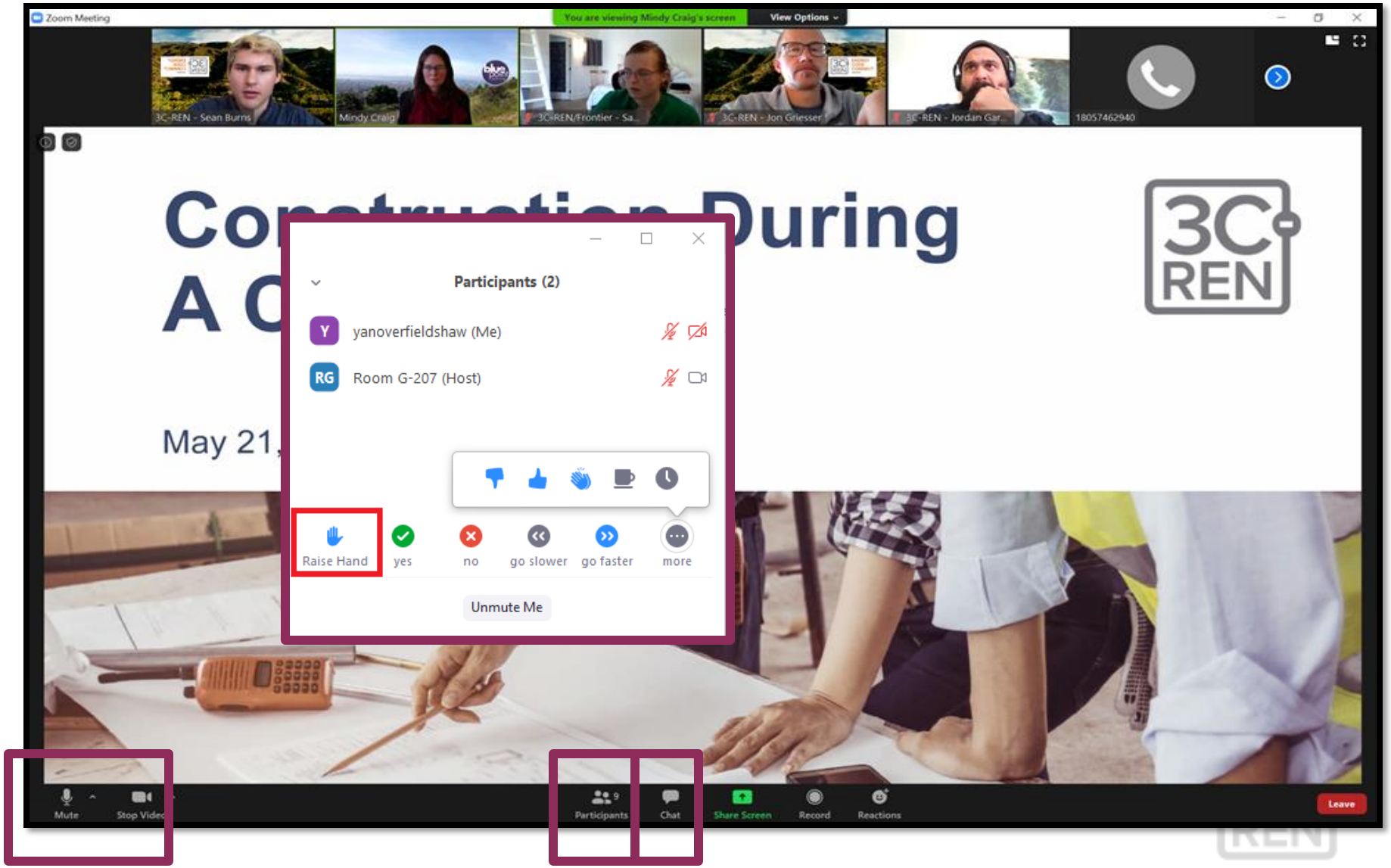
The Building Blocks of Passive House Performance

Jay Gentry – Passive House California

March 16, 2021

Zoom Orientation

- Please be sure your full name is displayed
- Please mute upon joining
- Use "Chat“ box to share questions or comments
- Under "Participant" select "Raise Hand" to share a question or comment verbally



3C-REN
Staff Online

Thank you for the Opportunity

Jay Gentry

- Graduate of UCLA Business School
- USAF Instructor Pilot
- Marketing and Sales Consultant
- Passive House California Board of Directors
- Passive House – A Workable Solution Initiative

Passive House California

Our mission is to promote awareness, understanding, and application of the Passive House standard through education, events, and advocacy - focused on professionals, policy makers, and the general public throughout California.

PASSIVE HOUSE CALIFORNIA

naphn North American Passive House Network

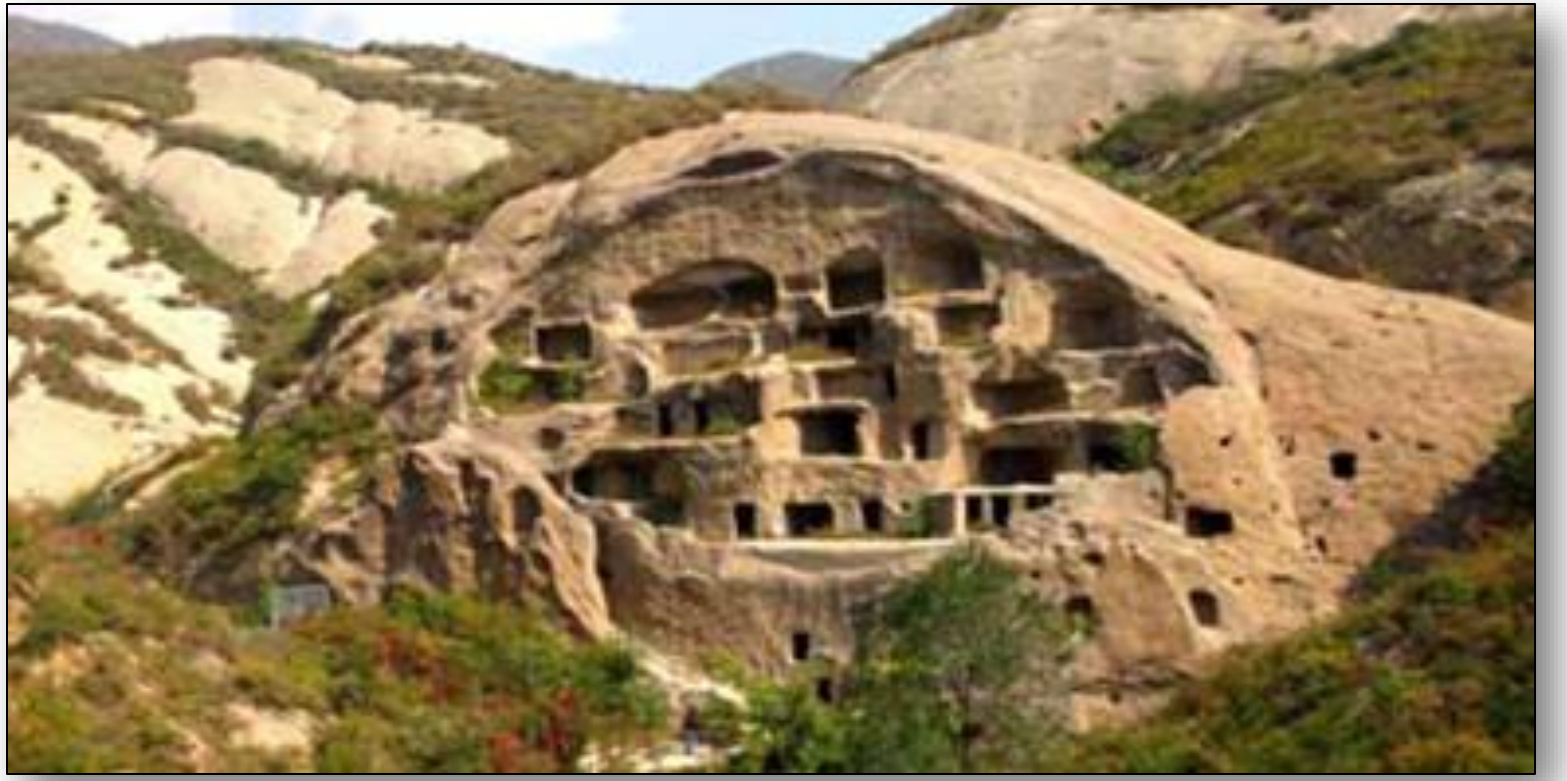
Passive House Institute

3C REN

Passive House for Laypersons

"…for ~~**dummies**~~ '**laypersons**' means something that has been laid out for laypersons in simple terms…
with the intent that anyone can follow them easily even without an in-depth knowledge on the subject."

Intelligent and Purposeful Choices



Early humans learned to take advantage of what nature offers by choosing locations that provided access to water, comfort, safety, and light with minimal effort… conserving human energy

Intelligent and Purposeful Choices

Over time we shifted from human energy to electrical energy — largely produced by burning fossil fuels

Intelligent and Purposeful Choices

Today's challenges: Maintain and enhance the benefits with dramatically less energy — (and shift the reduced demand to renewable energy)

Intelligent and Purposeful Approach

"Passive Design"— Maximize benefits and minimize energy requirements by taking advantage of nature and building science

Intelligent and Purposeful Approach

Passive Design protocols to achieve comfortable, healthy, and extremely efficient buildings — with no aesthetic compromise

Evidence Based Reality

- The Climate Crisis is real
- Driven by GHGs from human activities
- Operational carbon from the built environment is a major contributor
- Unprecedented action is required… now, and into the future
- We must minimize the energy required and shift the source of that energy to renewables
- Passive House protocols are part of the solution

Passive House

Passive House Multifamily

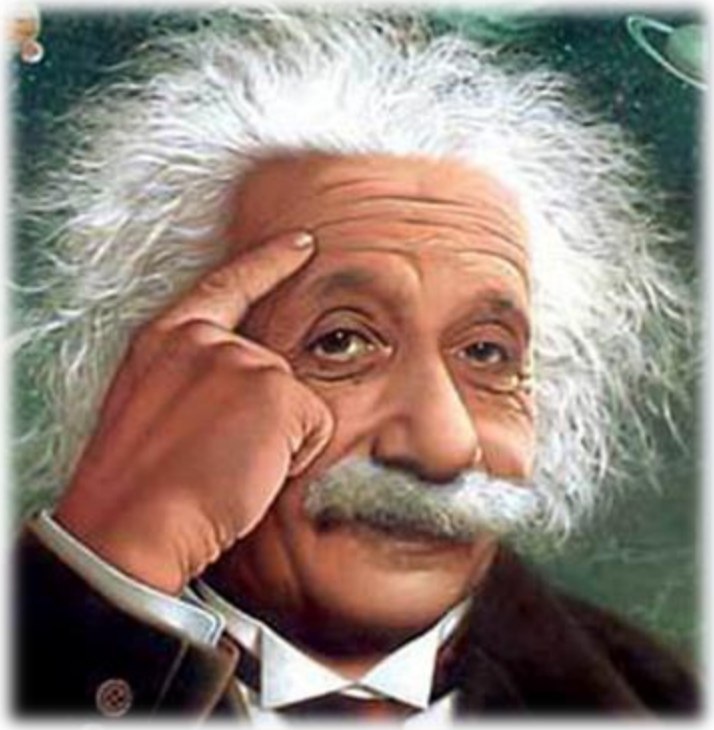
Passive House City Block

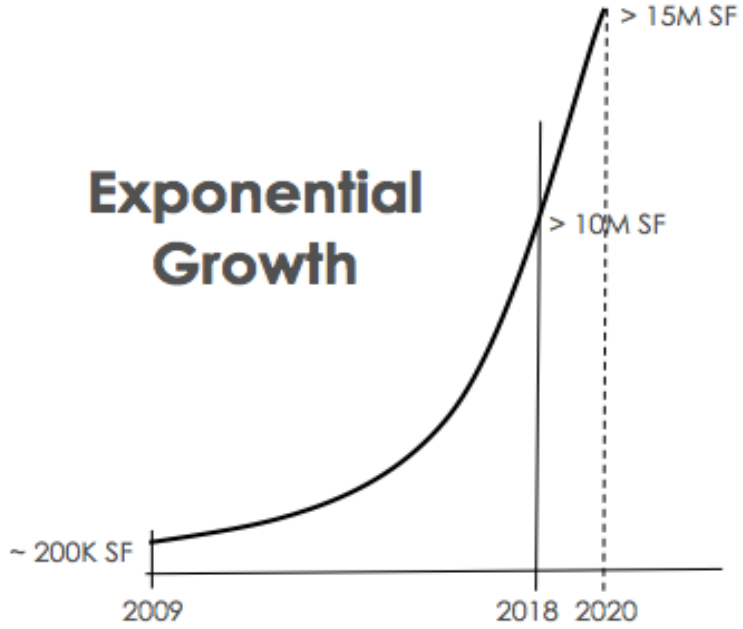
Today's Presentation (1/2)

- Passive House and how it fits with other sustainability initiatives in our efforts to mitigate the Climate Crisis
- In our 90 minutes, we will explore:
  - The building blocks of Passive House
  - How PH protocols deliver high performance
  - Impacts of PH on occupants, communities, and the future of the planet
  - Evidence Based Performance
- A critical part of the solution to climate crisis, housing crisis, ongoing health of people and the planet

Today's Presentation (2/2)

- Today's objective: Put you in position to make informed decisions on whether and how you make a difference for PH
  - AHAs, Nods… Yes, that makes sense
  - Given the opportunity, I would be a supporter of Passive House, and/or the associated steps, policies, and programs that bring Passive House levels of performance to our communities

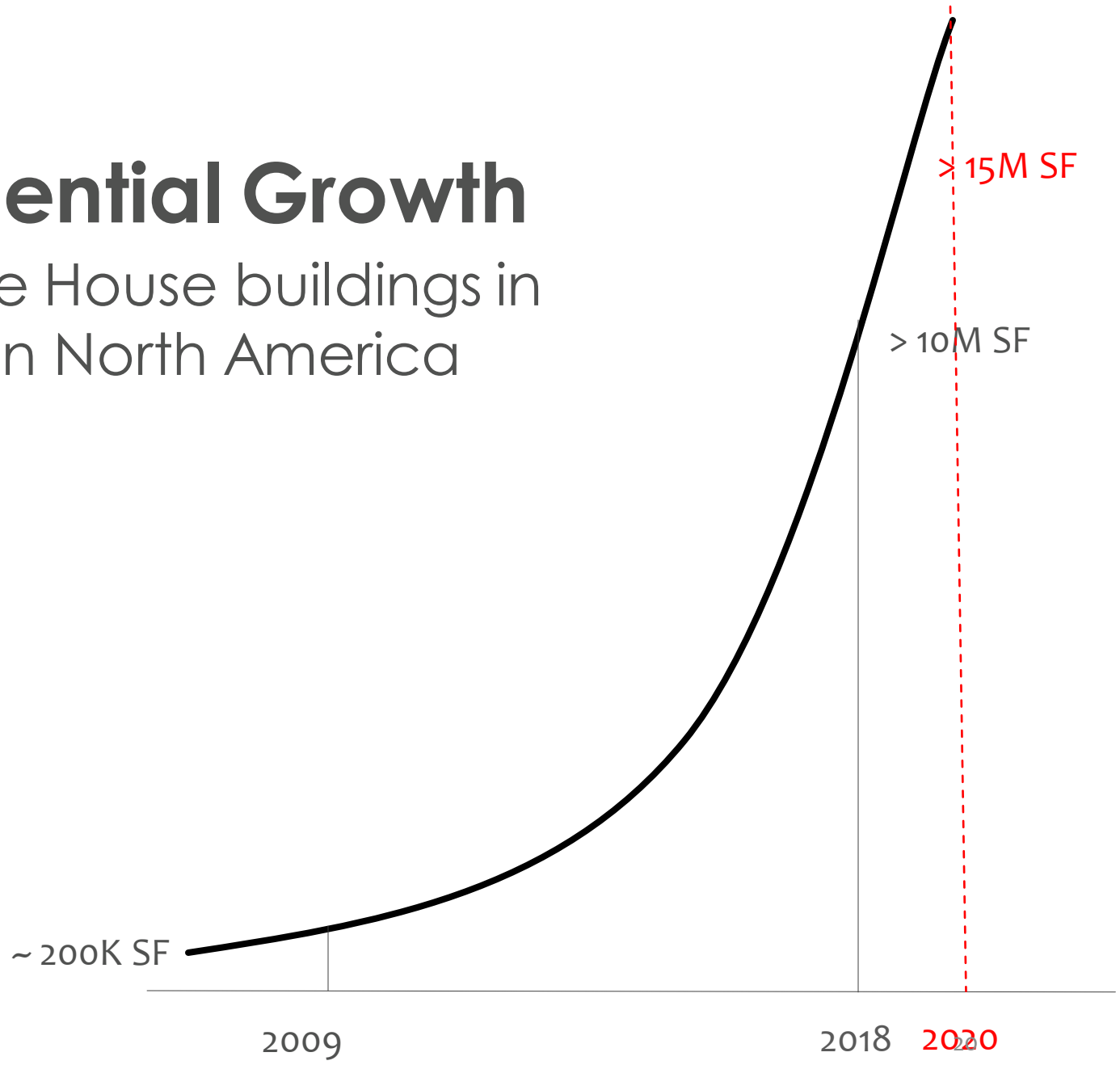




Passive House has Arrived

Exponential Growth

of Passive House buildings in Pipeline in North America



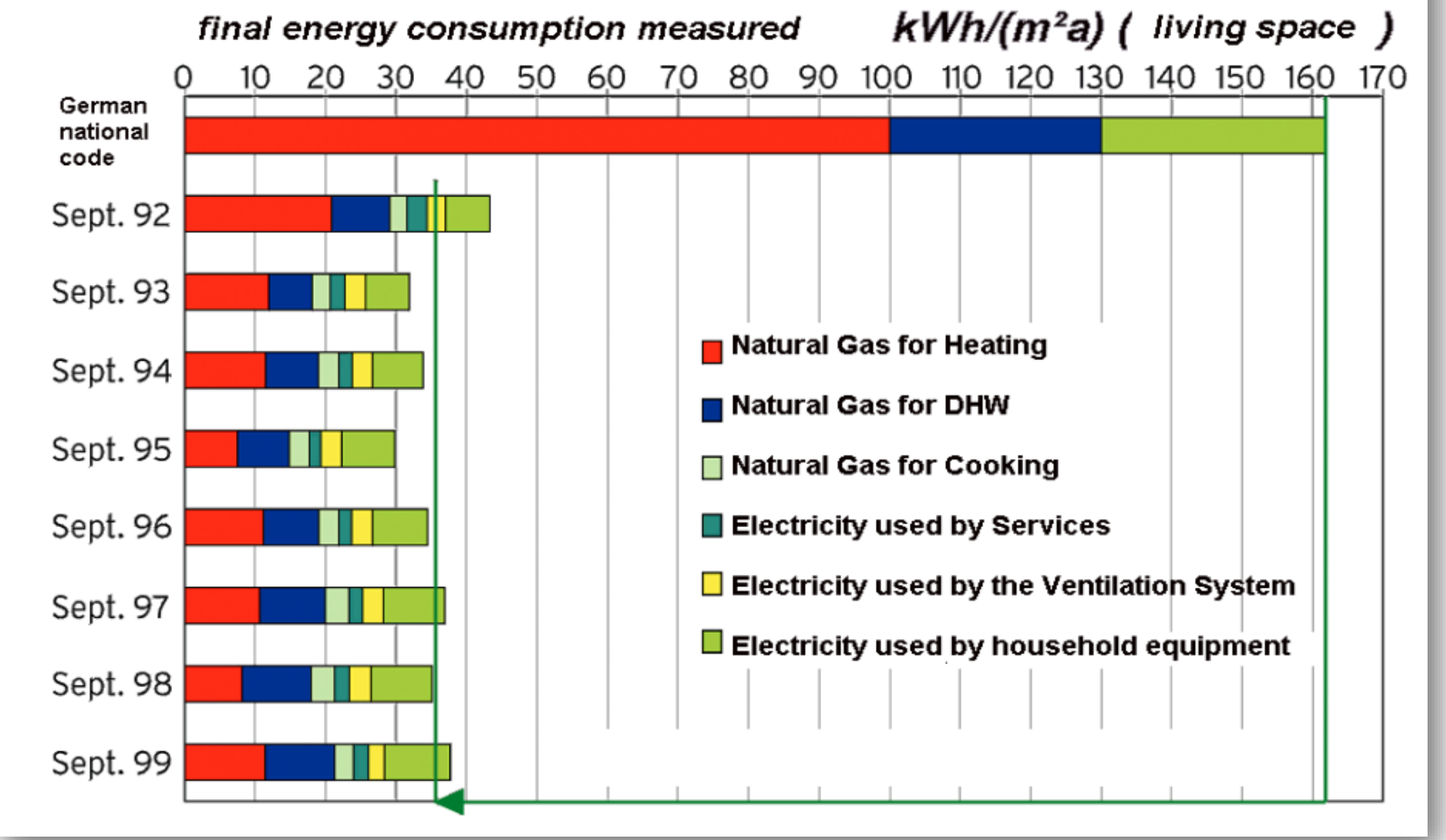
And is Here to Stay

In their recent report, The Sheldon Group notes that…
"During times of crisis, fringe ideas migrate rapidly into the mainstream. It's happening right now as we continue to respond to Covid-19.
High-performance buildings in general and Passive House in particular, used to be considered fringe. They are not anymore.
These days, with the climate and health challenges we face, they should be considered standard."

9/16/20 – Lloyd Alter - TreeHugger

Passive House Delivers Performance

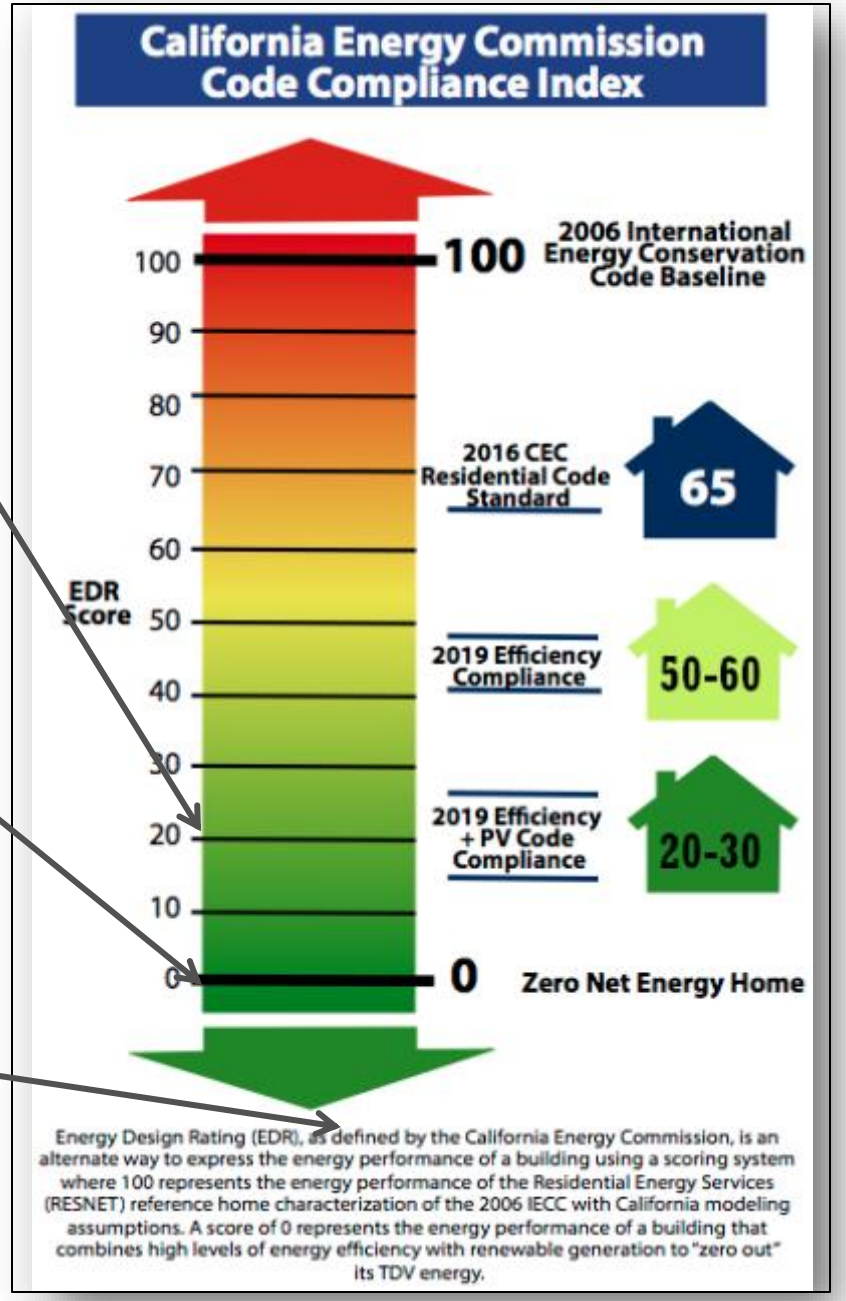
measured_energy_savings_passive_house.png



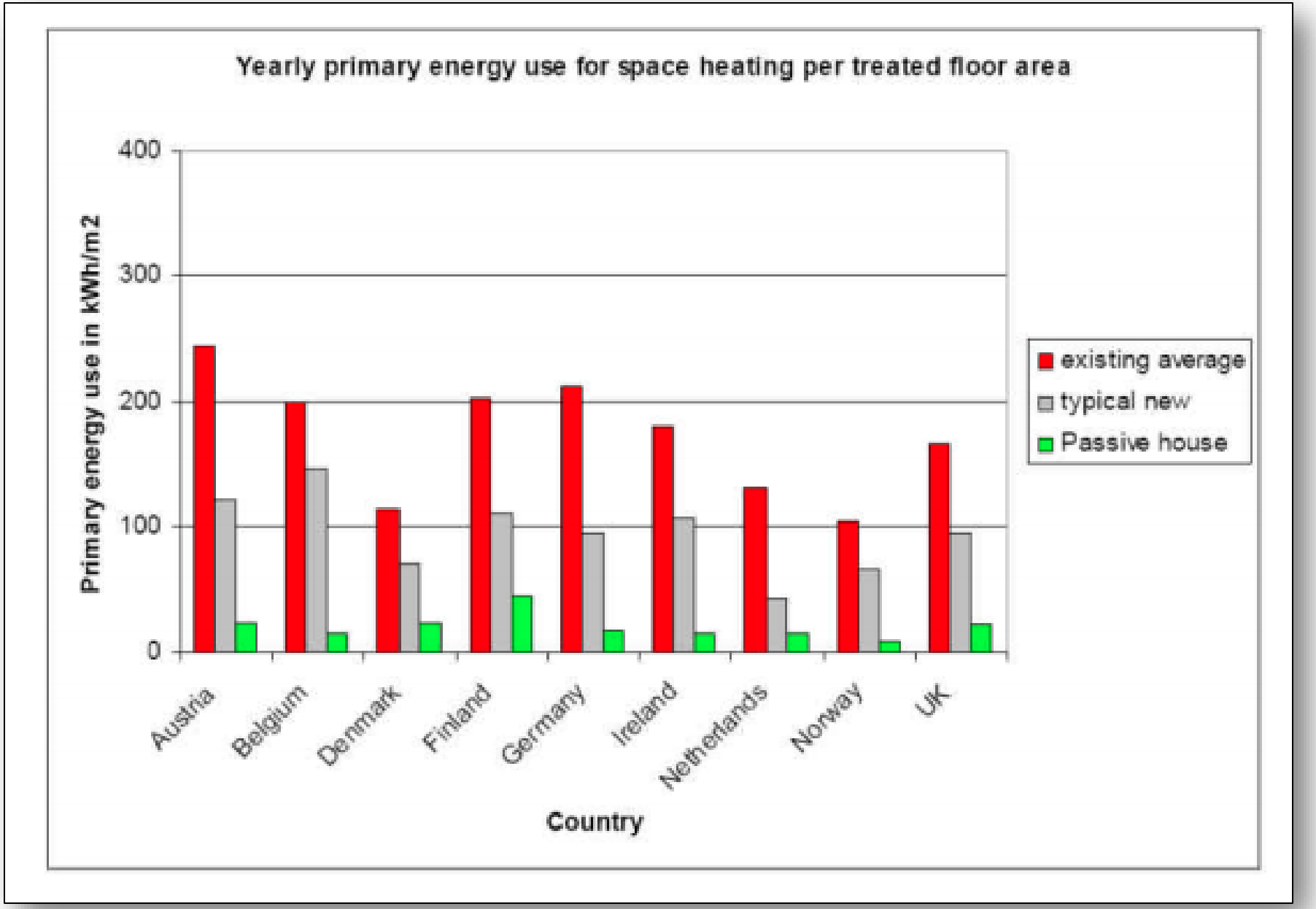
Passive House Classic

Passive House Plus

Passive House Premium



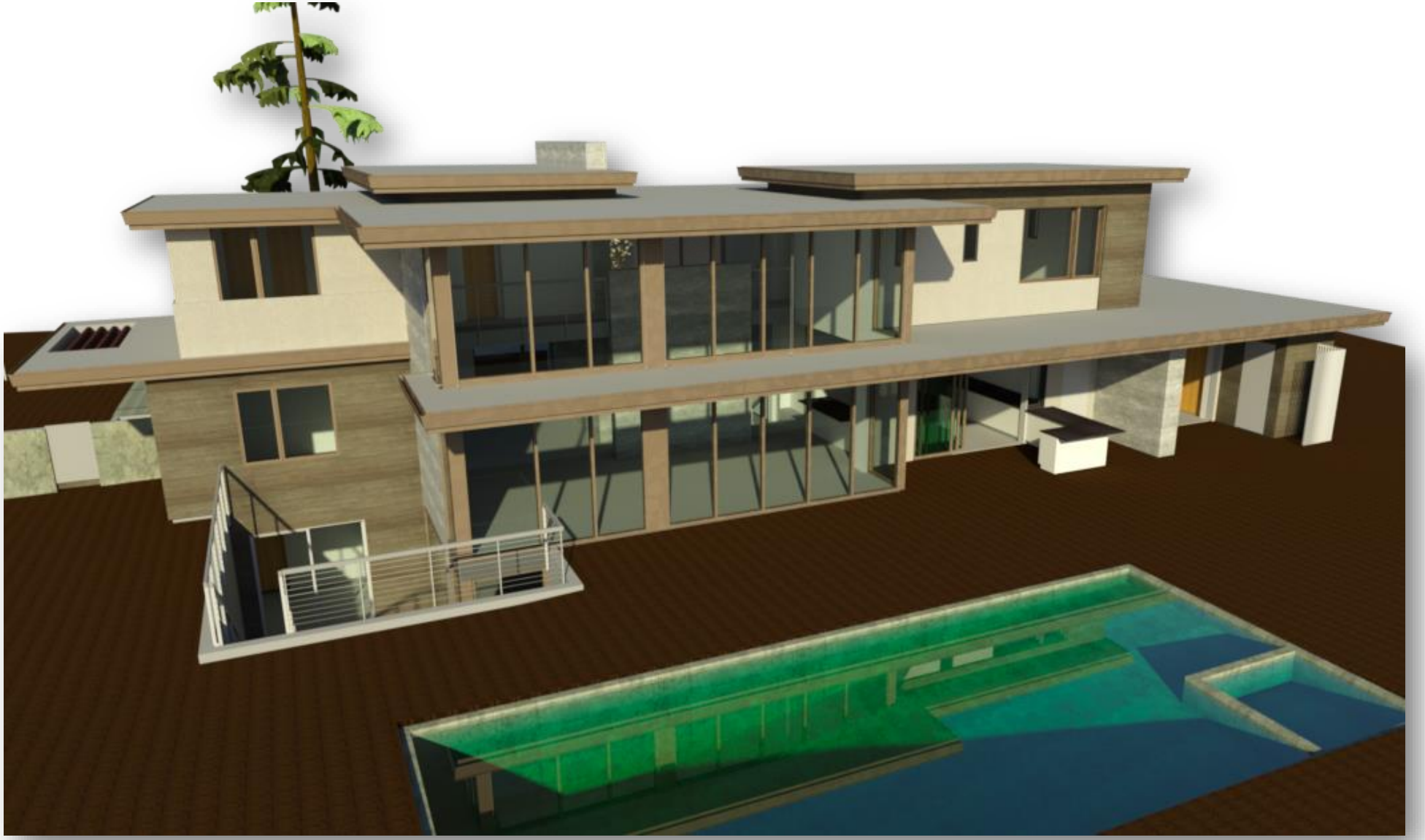
Understanding Passive House



Passive House is “Passive”

Summer Solstice 3:00 PM

Winter Solstice 3:00 PM



Passive - It's In the Name

- Solutions that deliver desired performance naturally, as a function of design
- And continue to deliver that performance over time with little or no intervention other than normal maintenance

Passive - It's In the Name

- Elegant Solutions that deliver desired performance naturally, as a function of design
- And continue to deliver that performance over time with little or no intervention other than normal maintenance

The wing on a race car

Reverse angle diagonal parking

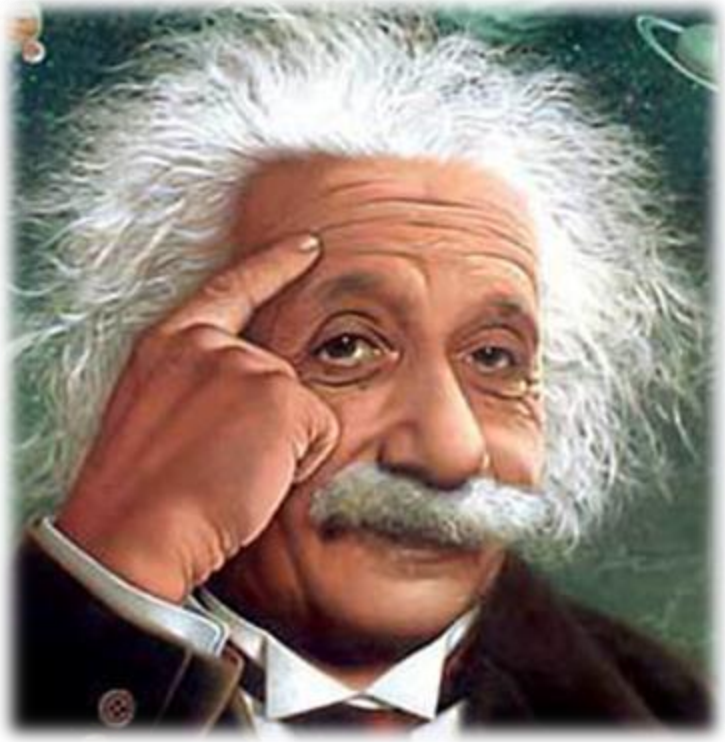
Another Elegant Solution

Passive Active

1st

2nd

Reduce… then Produce



"Renewables Last"

- Start with Passive House
  - Achieve Net Zero with significantly less renewables
  - Use any excess to power your EV or for Electrification
  - Install a smaller battery storage system to achieve desired resilience (short/long term)

Passive House Efficiency

Enables this approach to Net Zero

Renewables without Addressing Efficiency First

May require this approach to reach Net Zero

Goal: Drive from Ventura to San Francisco

- Zero stops for fuel
- Even though driving a car with a bad transmission and leaky fuel line

Goal: Drive to Los Angeles

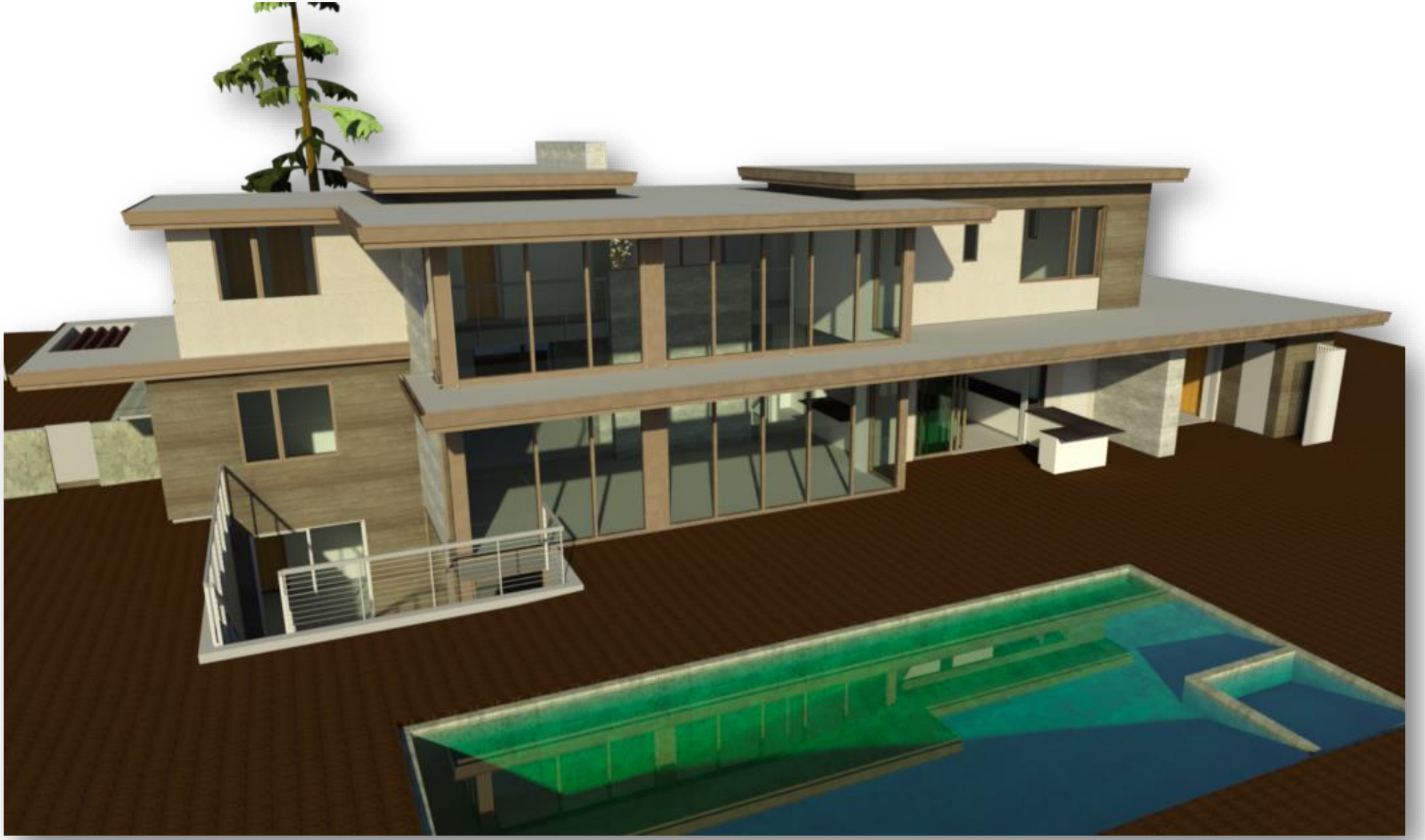
CA

All you need is a bigger gas tank

How Passive House Delivers Performance

Summer Solstice 3:00 PM

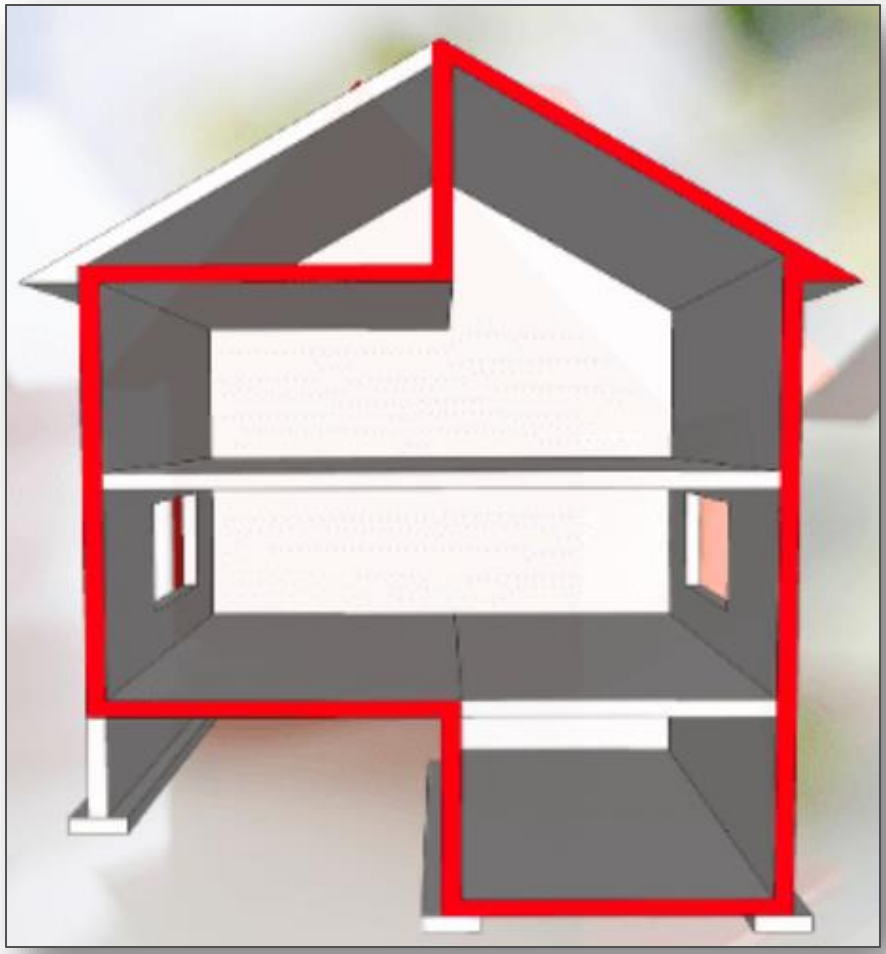
Winter Solstice 3:00 PM



- **An Airtight Shell or Envelope**
- **Sufficient Insulation**
  (to avoid the intrusion of heat from the outside or the loss of heat from inside)
- **Continuous Fresh Air**

Passive House – The Basics

- Many elements but the he big 3 are
  - **Airtight building shell**
  - Better insulation correctly applied
  - Mechanical ventilation with heat recovery



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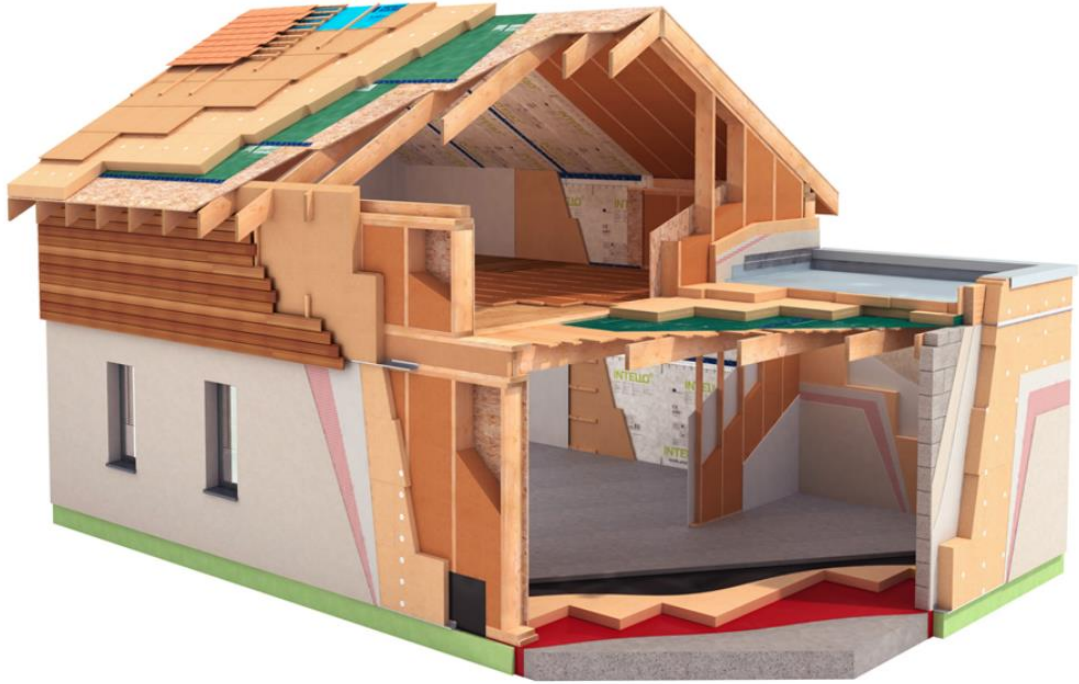

Insulated Thermos vs. Heated Pot

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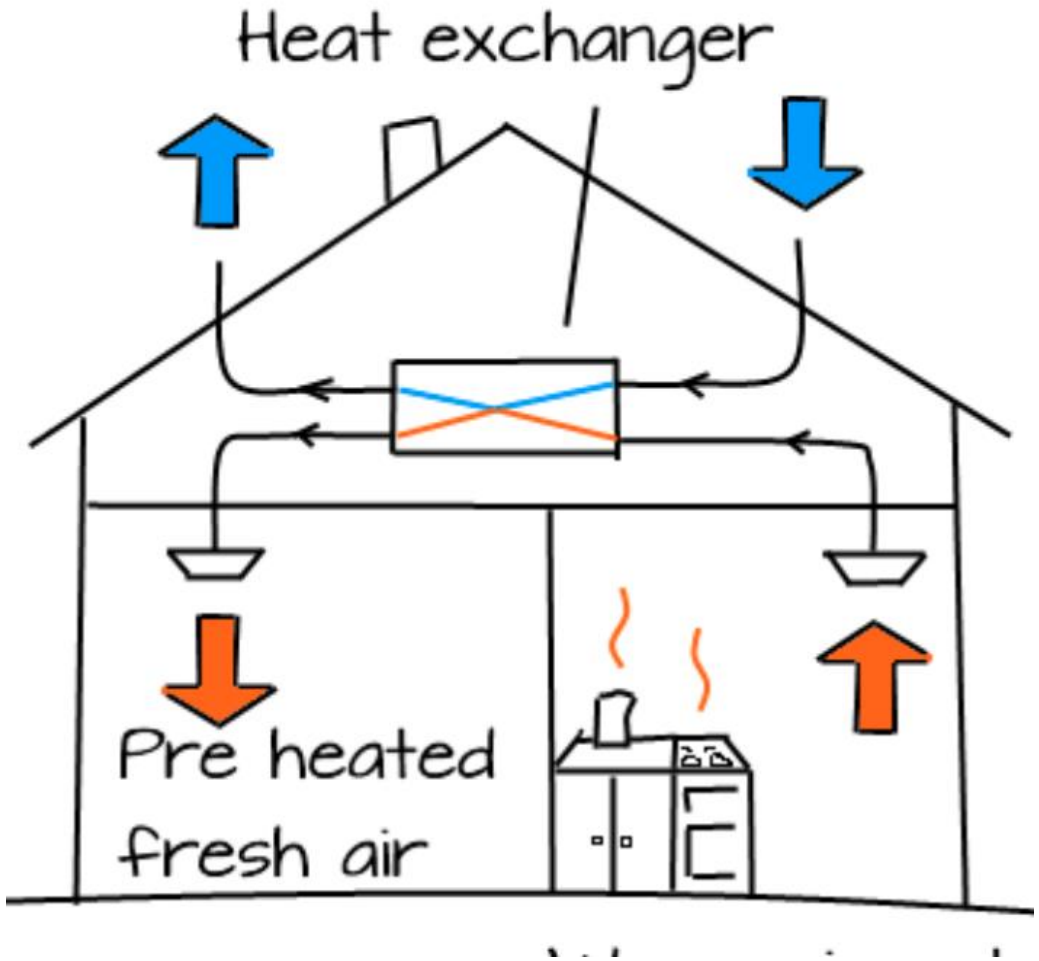
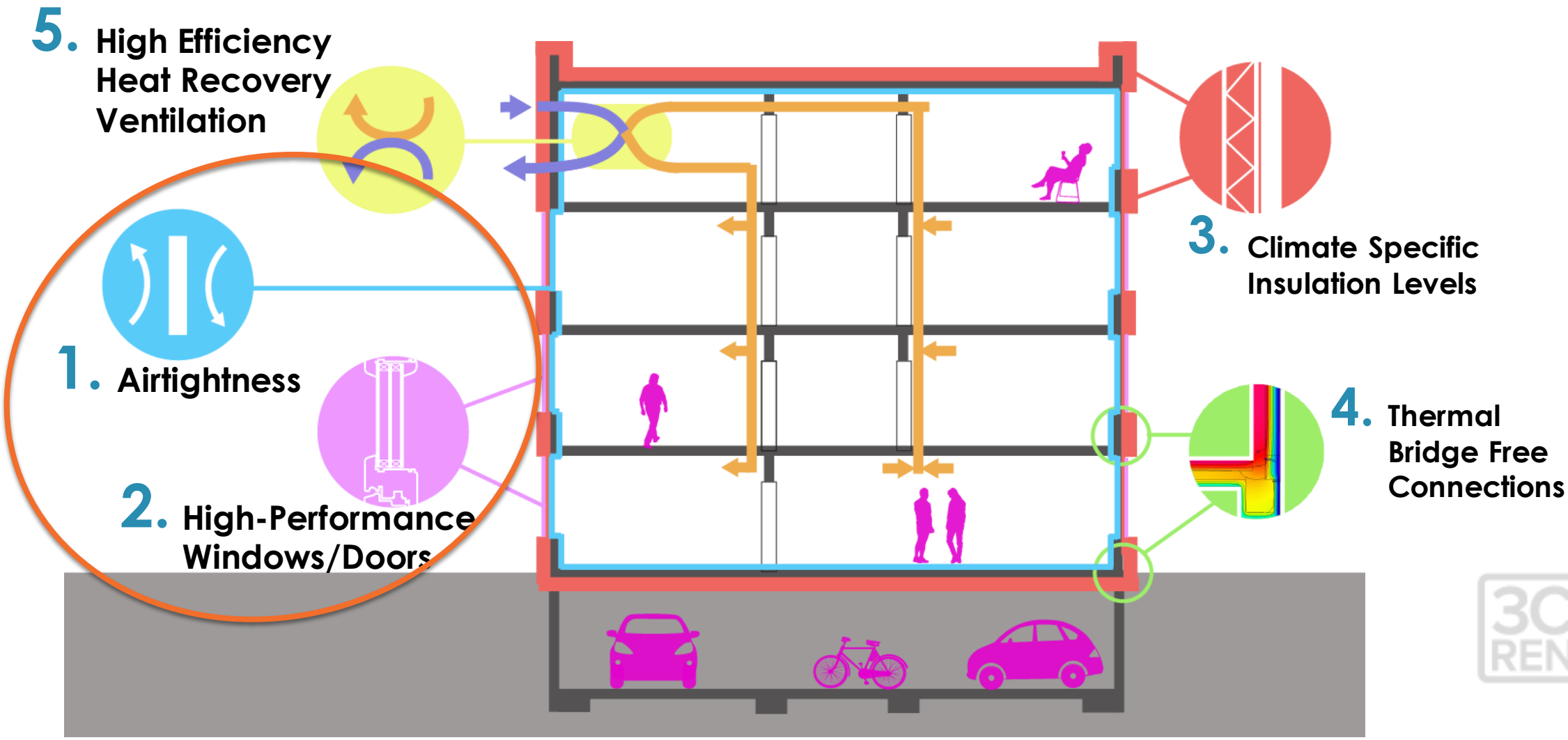
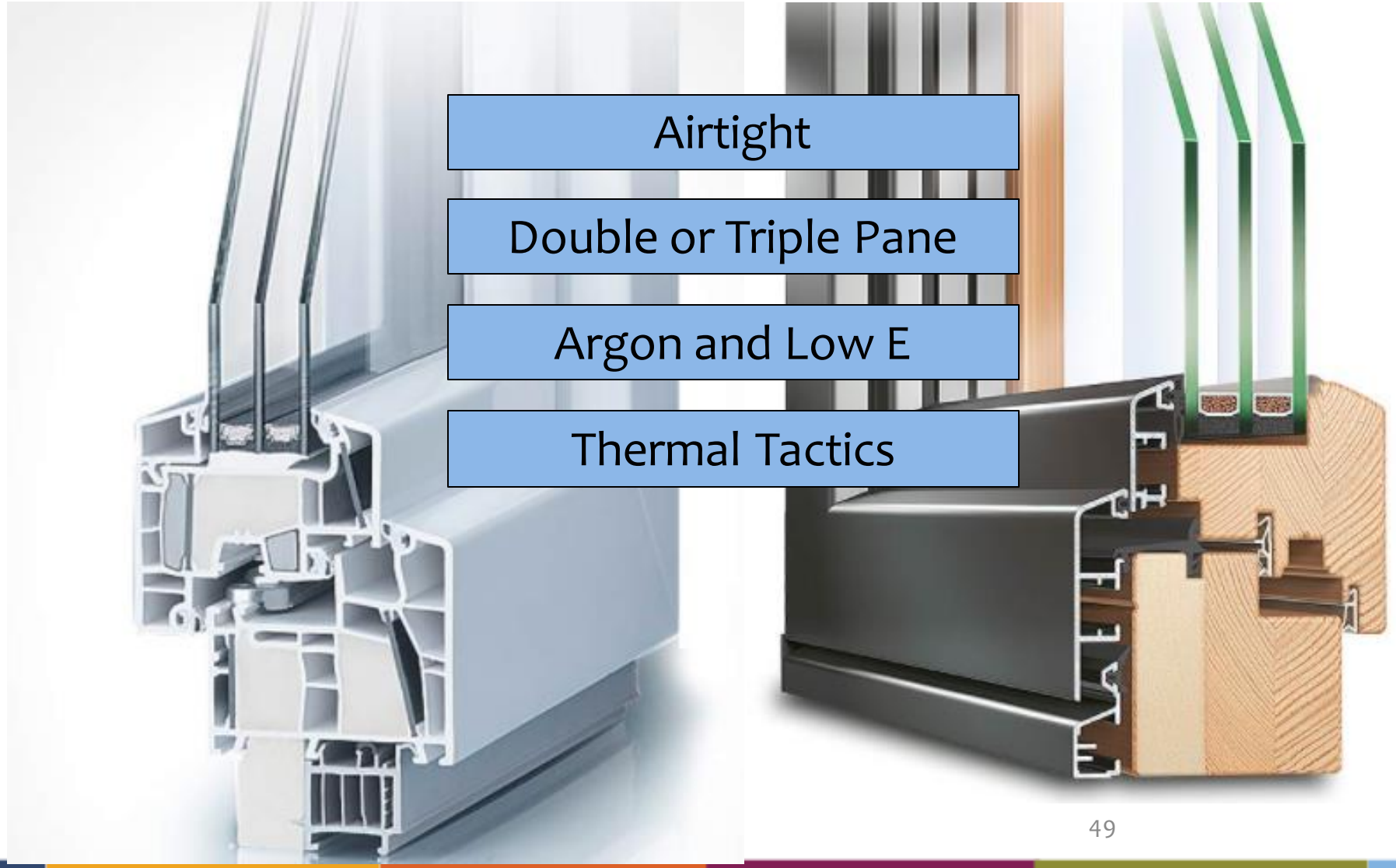


Five Key Principles:



High Performance Windows

CA



- Airtight
- Double or Triple Pane
- Argon and Low E
- Thermal Tactics

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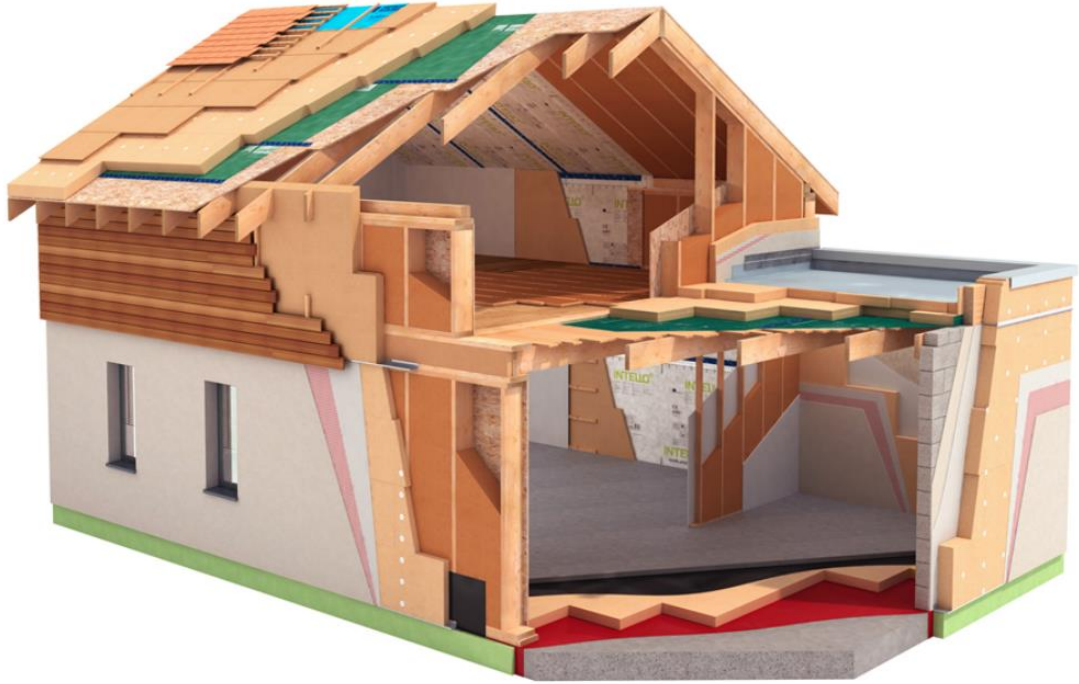
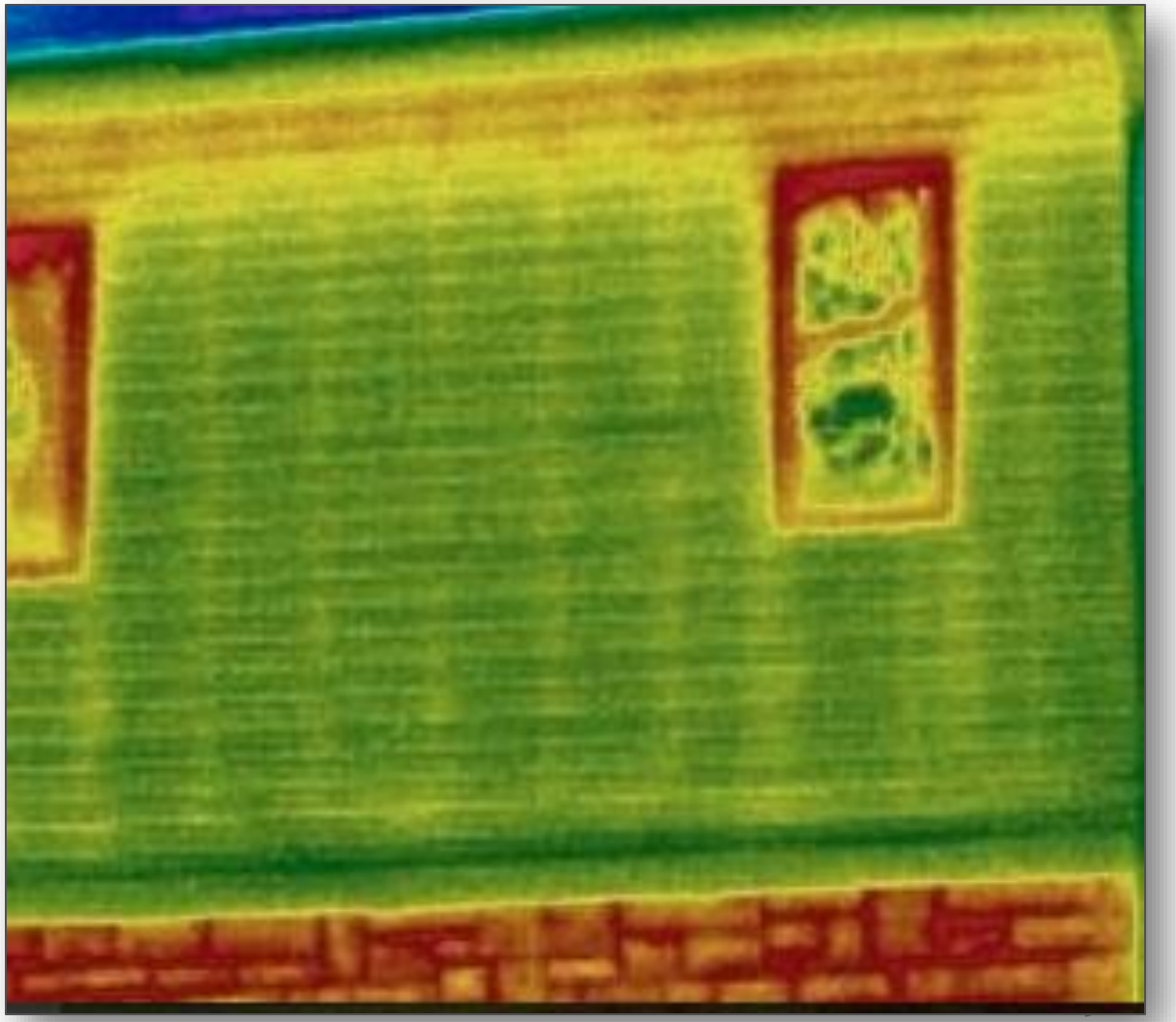


Eliminate Thermal Bridges



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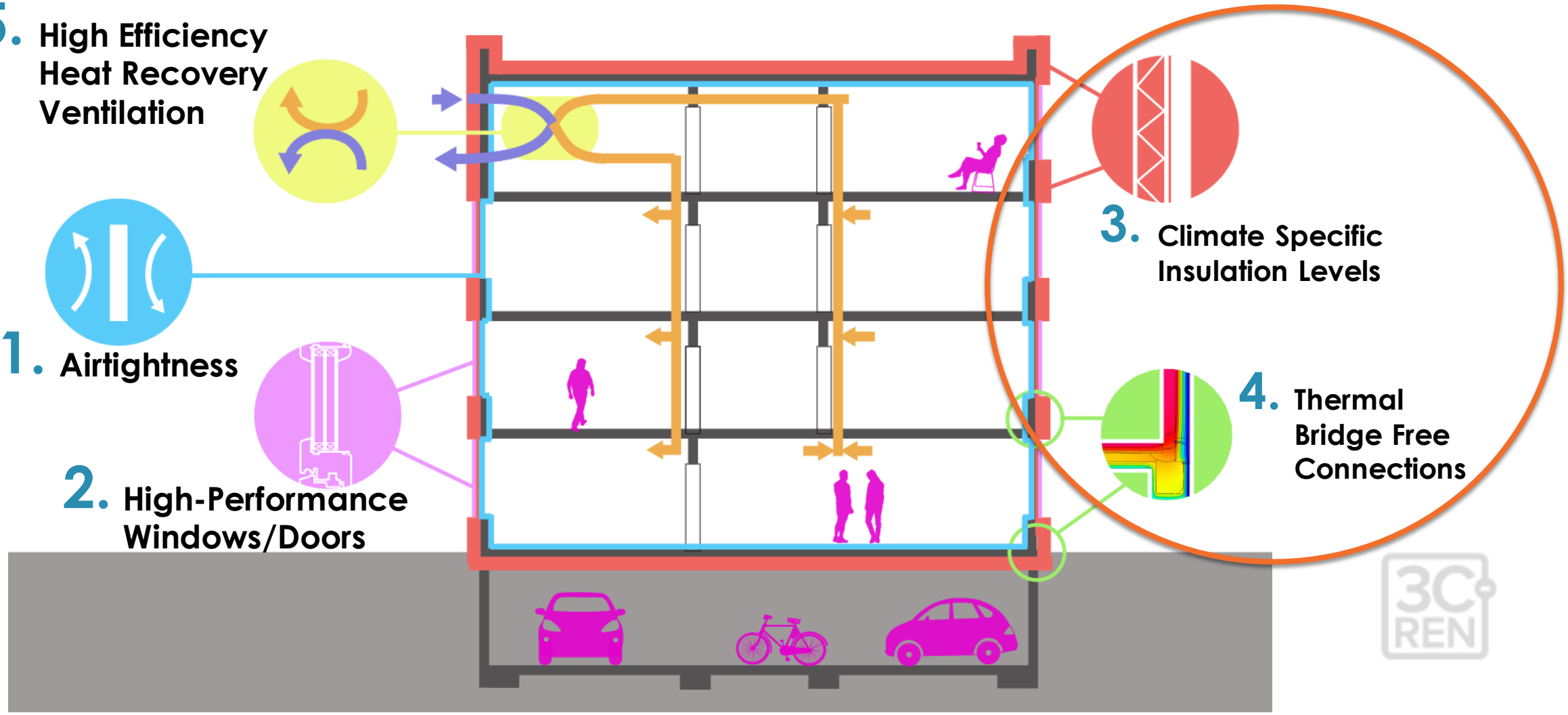

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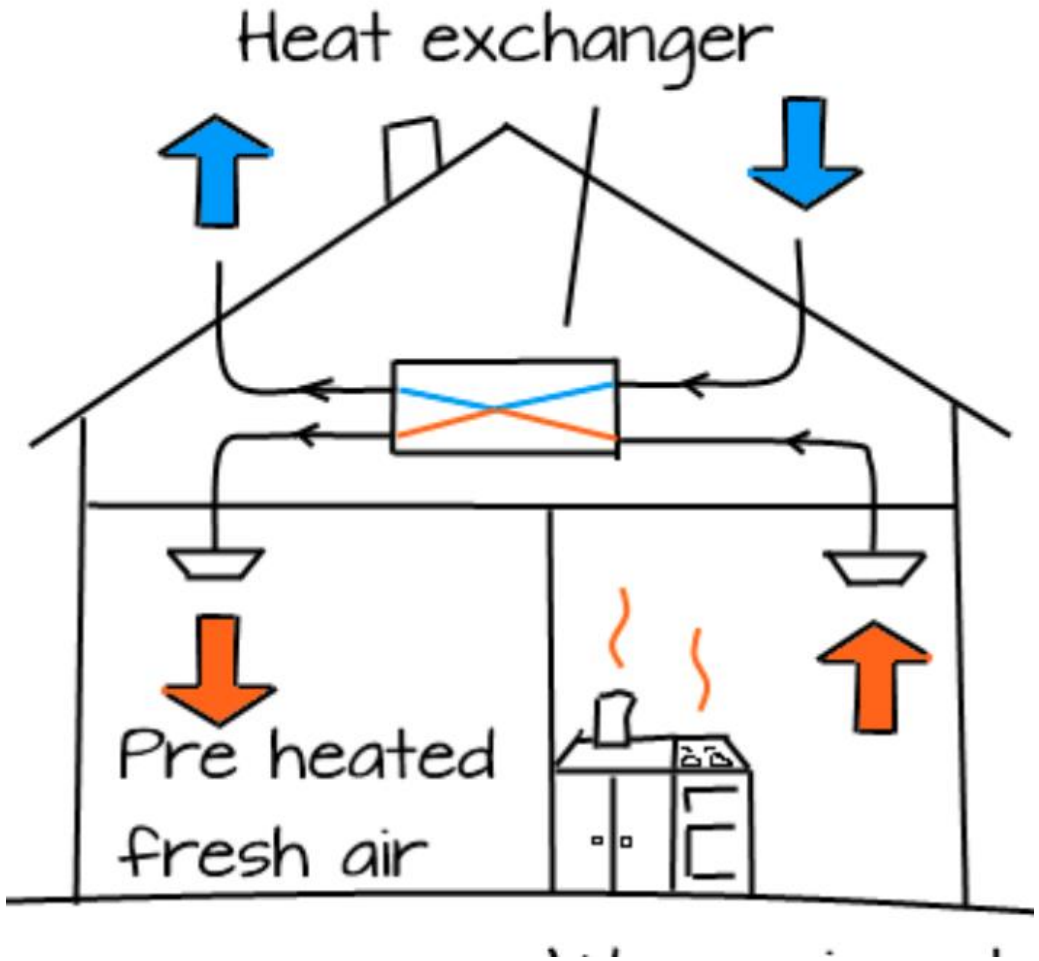

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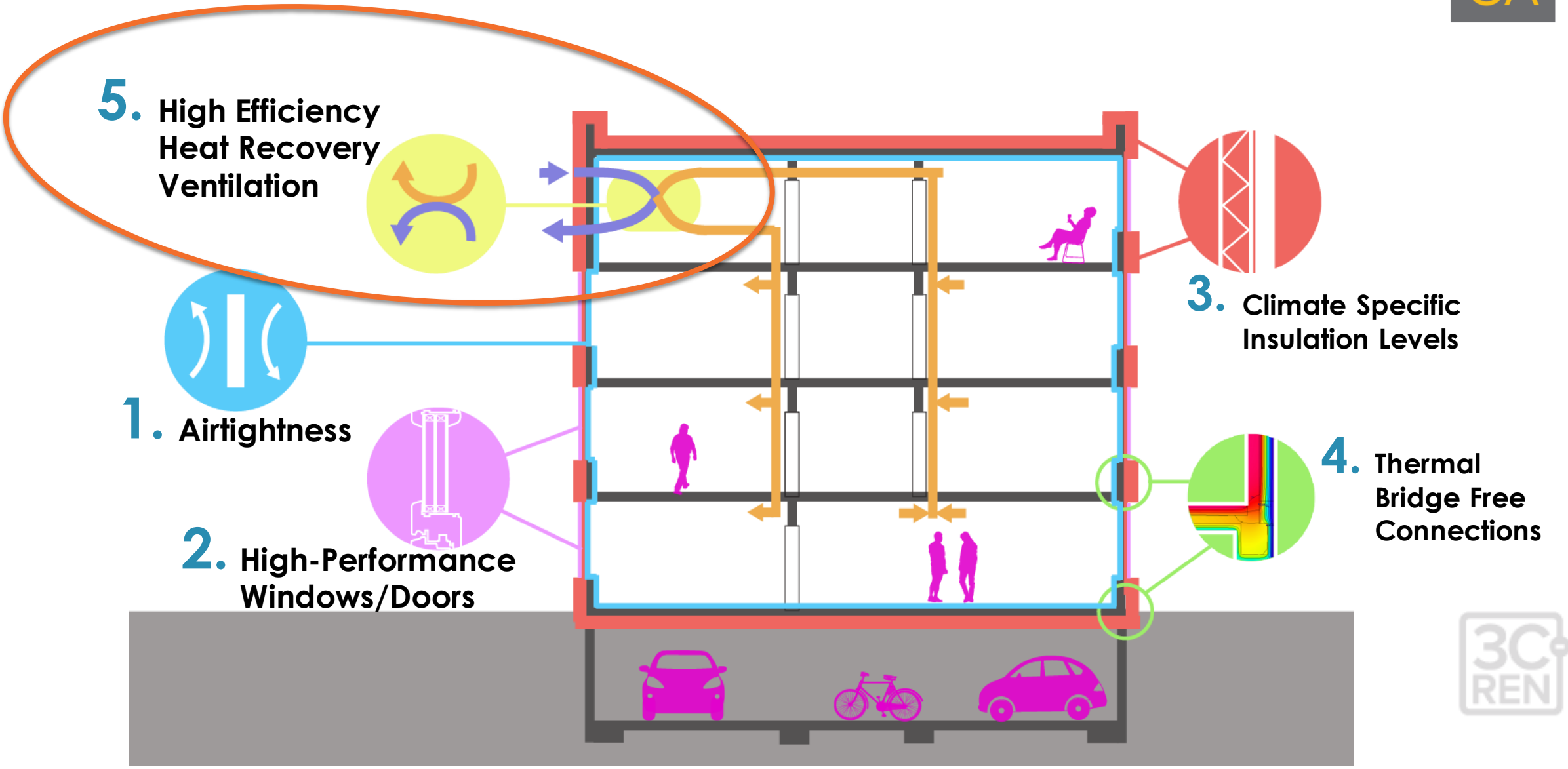
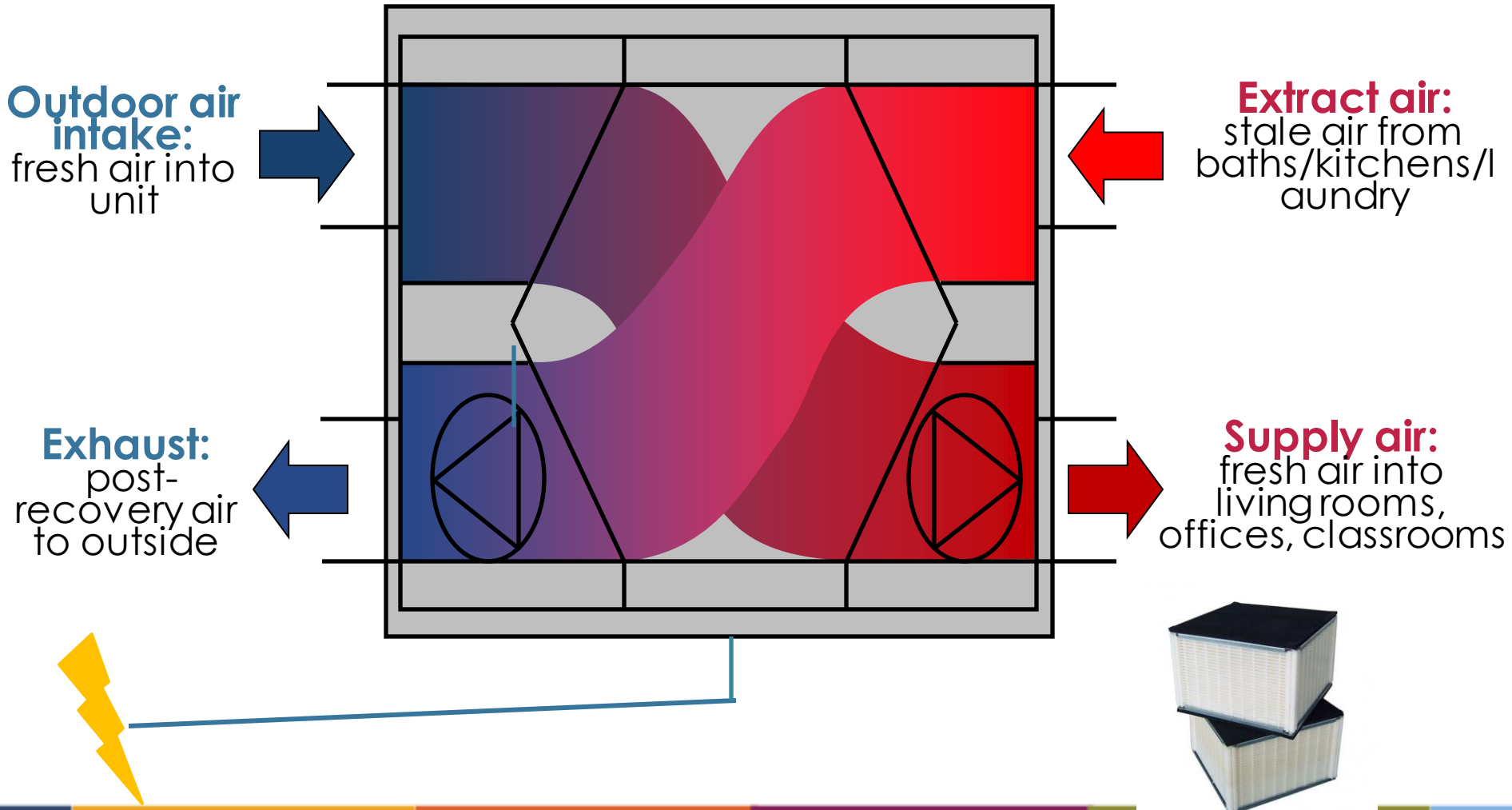


Heat/Energy Recovery Ventilation



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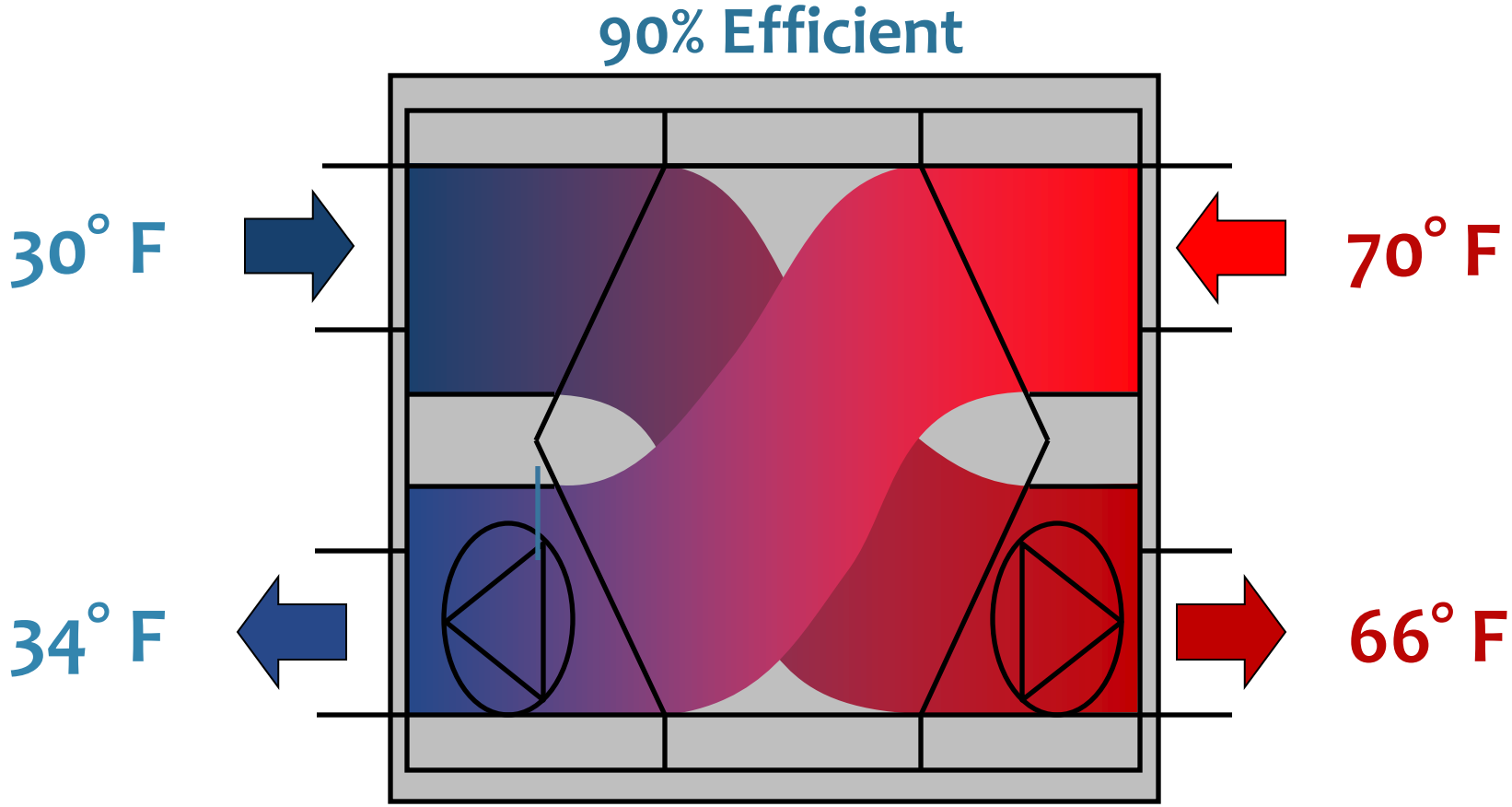
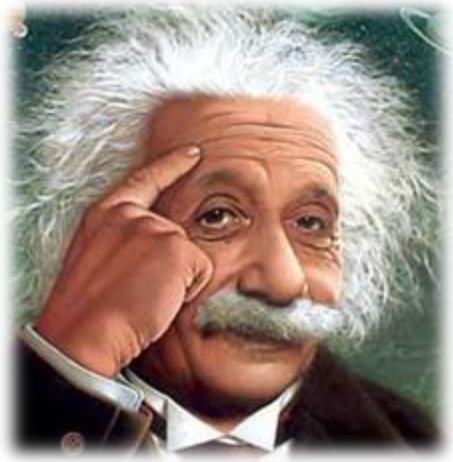
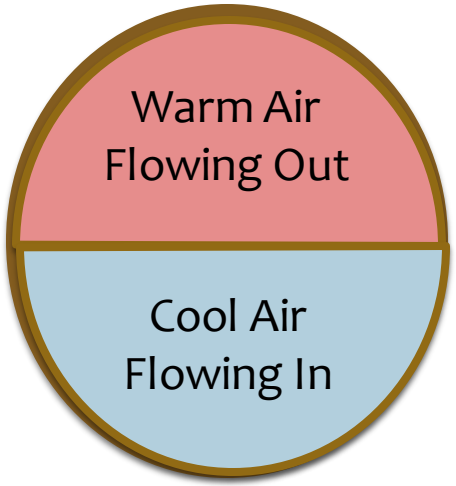
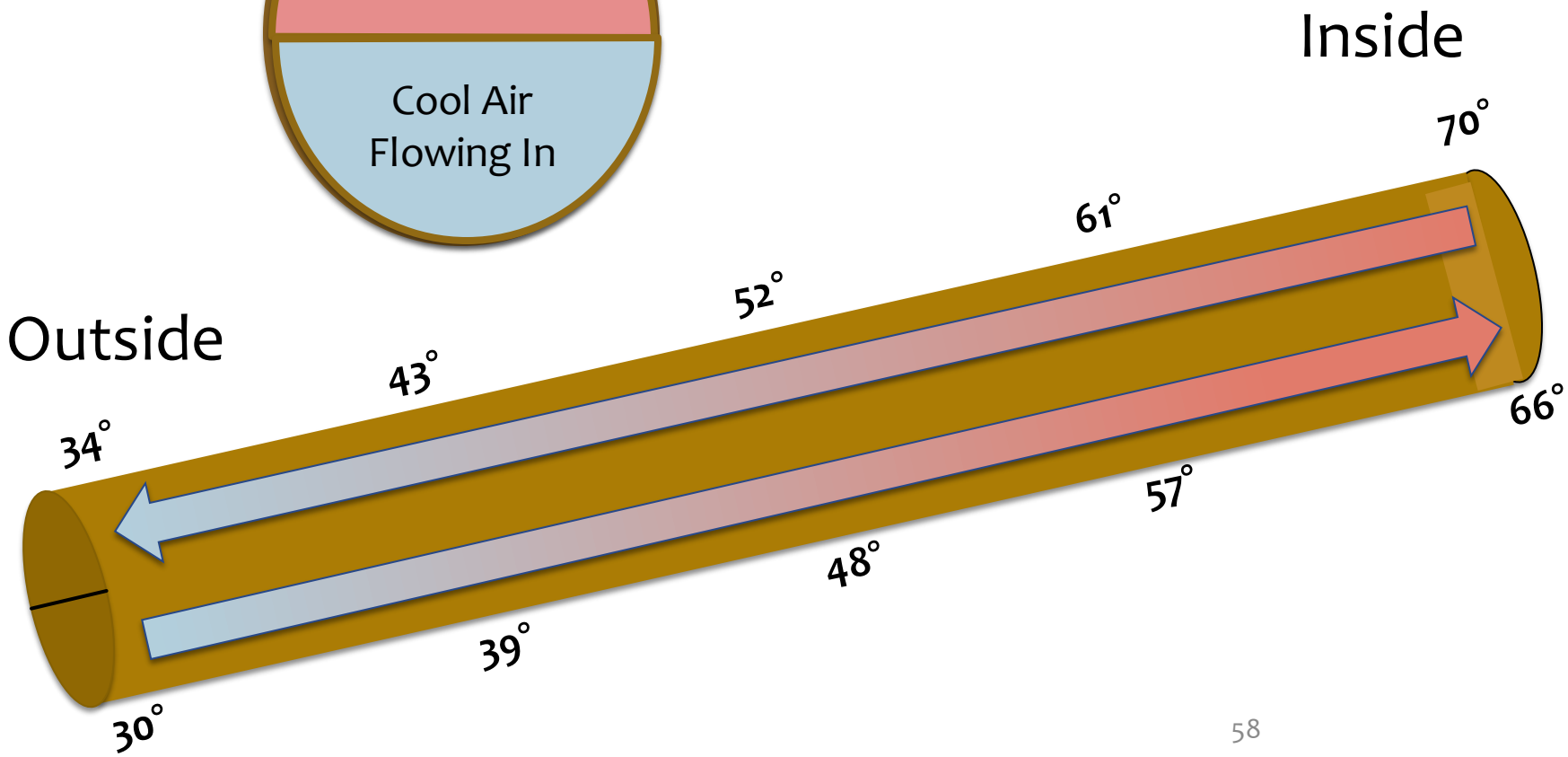


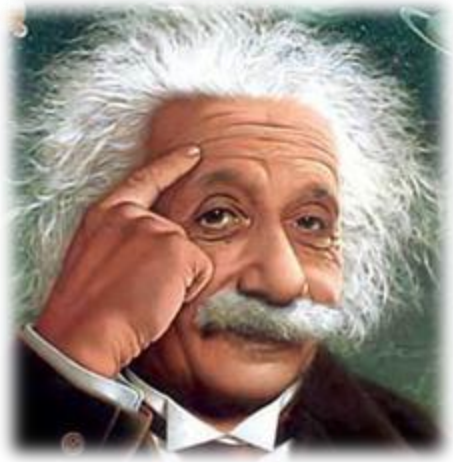
How Does That Work?

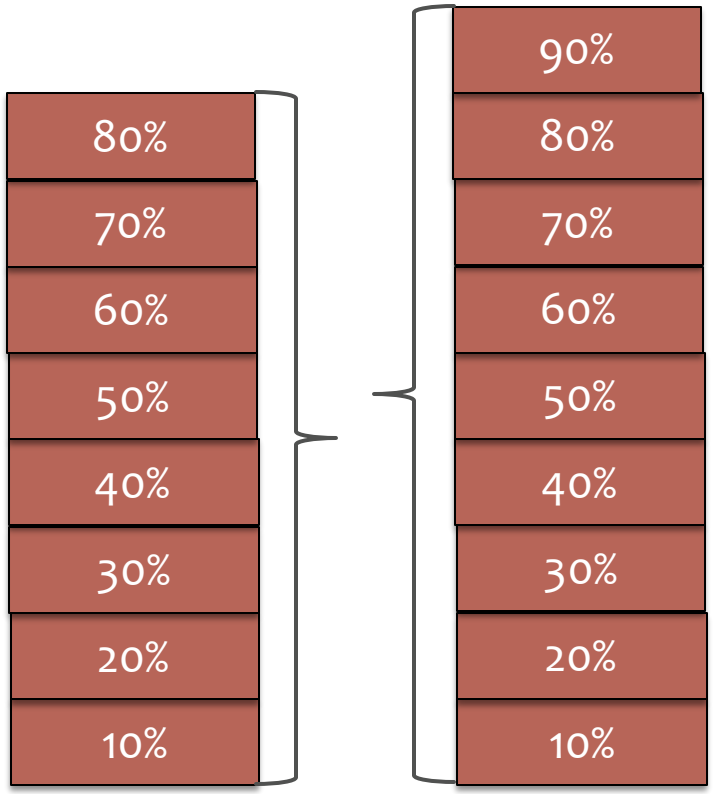




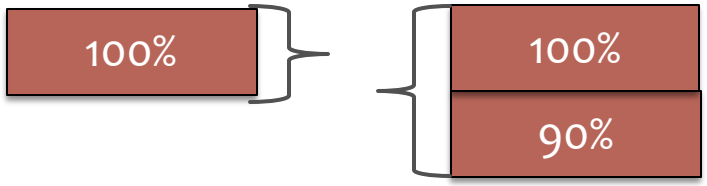


90% Versus 80% Efficiency



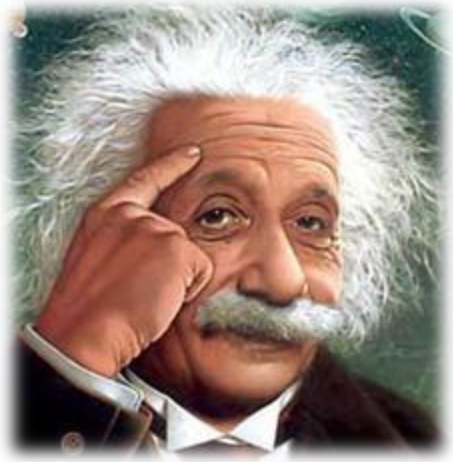


Seems like a pretty small difference

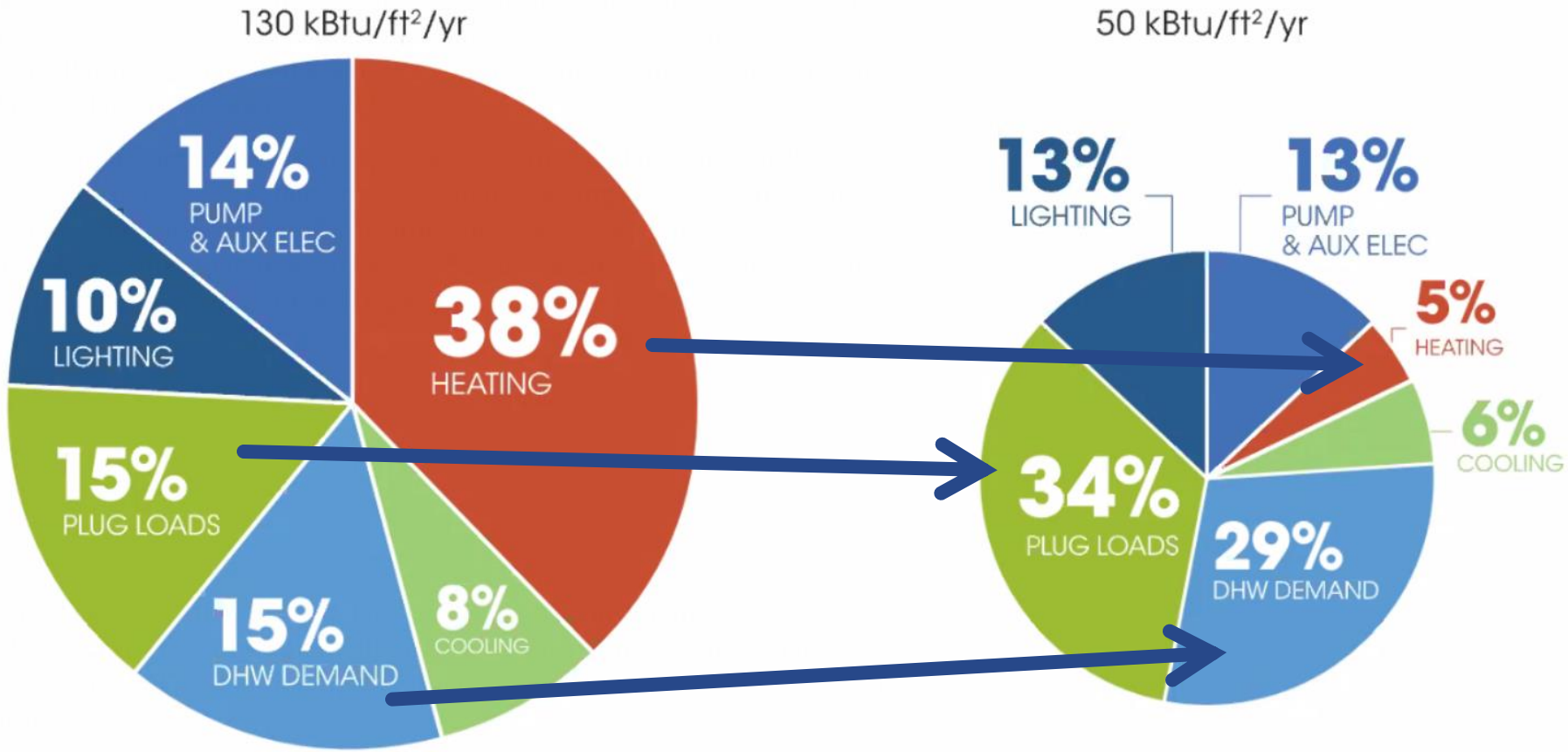


But it doubles the energy required to generate the heat and distribute the warmer air

PH Changes Priorities



The Passive House Impact: Source Energy Use Intensity (pEUI) Distribution Comparison



Typical NYC Multifamily Residential Building[1]

Multifamily Passive House Building

Source : Urban Green Council: NYC's Energy and Water Use Report, October 2017

Passive House Performance

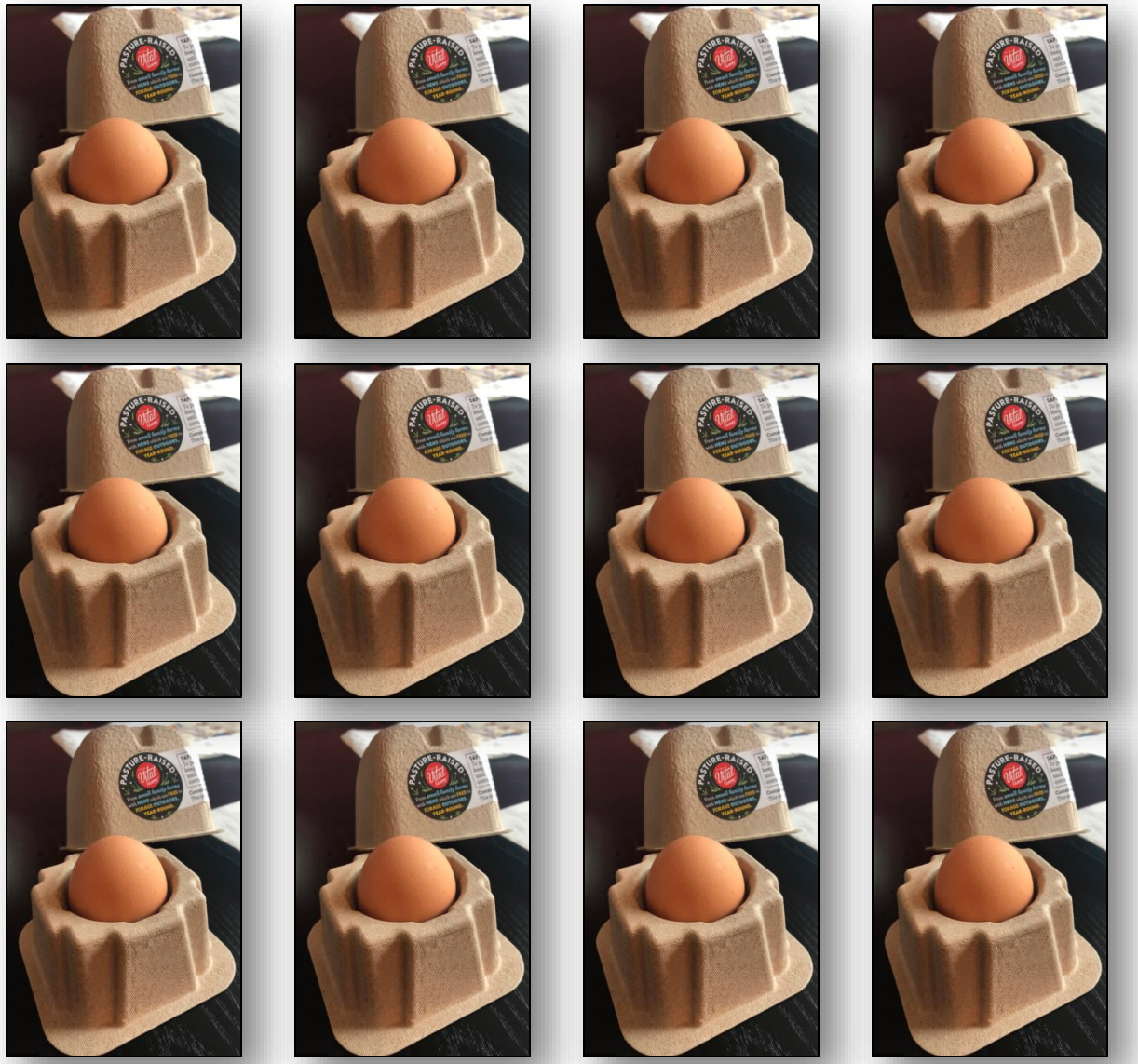
- 80% to 90% reduction in energy for heating/cooling
- Up to 70% e
- Up to 95% ration of airborne pc
- Comfort, H and Resilience
- Enhances, e impact of renewables

Passive House is Scalable


UNION

Safe and Comfortable for a Single Family

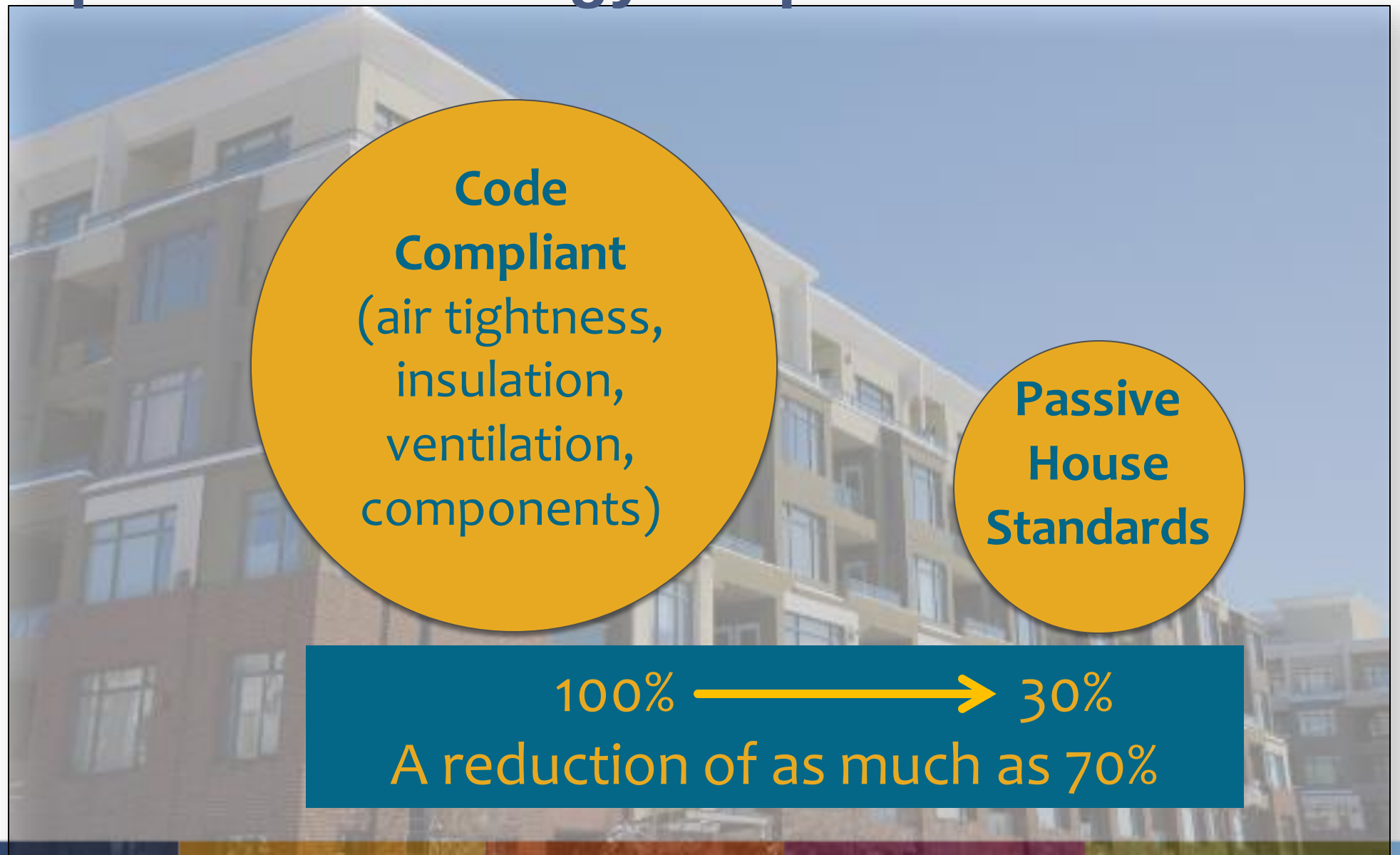
Safe and Comfortable for Multifamily



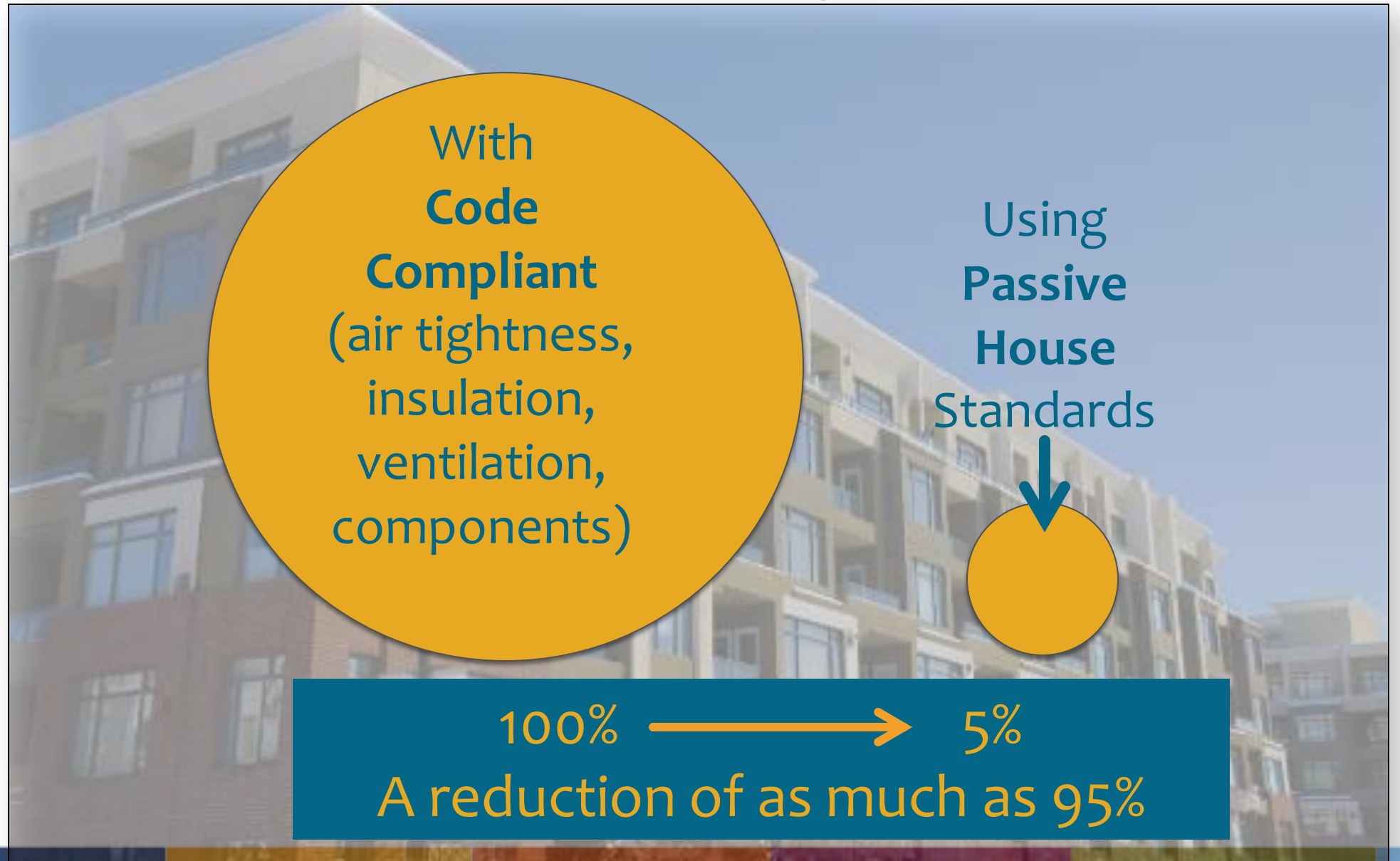
Safe and Comfortable is Cheaper by the Dozen

The Logic in Circles: Need for Housing in CA

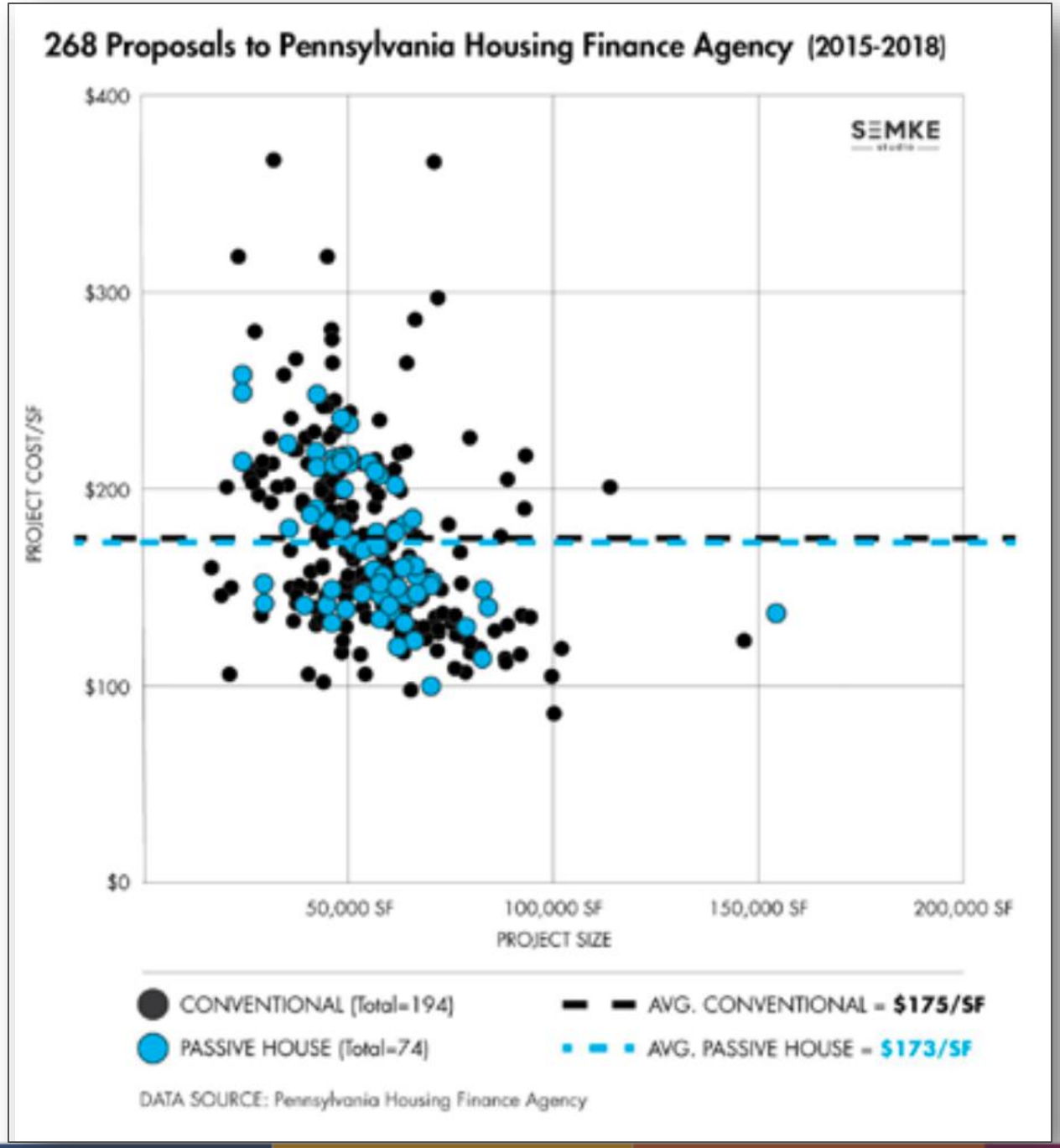
The Logic in Circles: Operational Energy Required



The Logic in Circles: Airborne Pollutants/Allergens

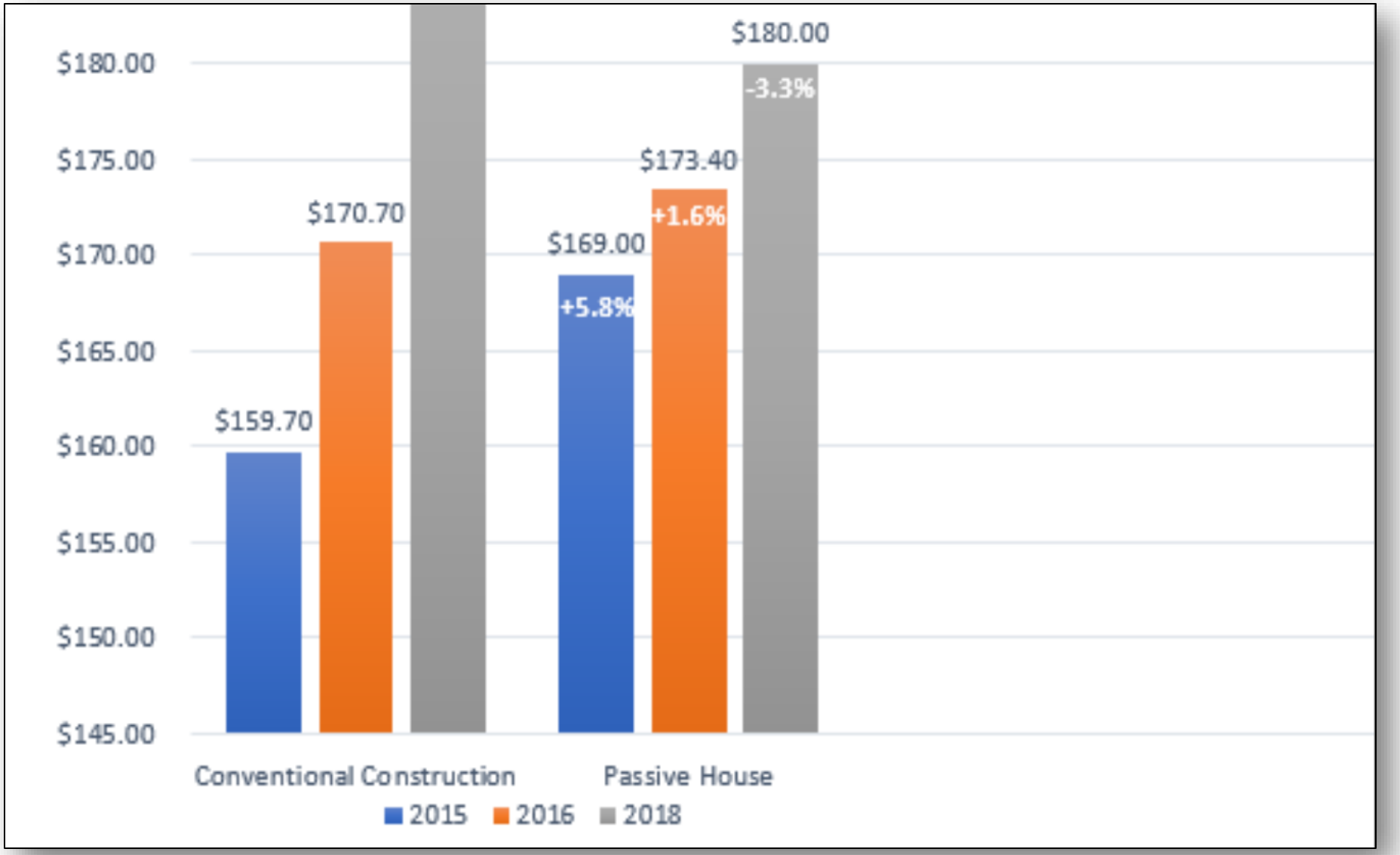


The Logic in Circles: Investment to Design and Build



- Granted 10 extra points for applicants willing to pursue Passive House
- Tracked the costs to build all projects over 3 years
- Found the Passive House projects came in LOWER $/SF

Passive House Costs Less with Experience



The Logic in Circles:
For the People – For the Planet

The Question is not Why? It is WHY NOT?

Evidence Based Performance

Evolution of Sustainability

From 1960 – 2020

- Conservatism and Activism - **Think It**
  - EDF, Greenpeace
- Prescriptive Standards - **Choose It**
  - Energy Star, LEED, BIG
- Performance Standards - **Measure It**
  - Passive House, RESET AIR, WELL Building
- Performance Accountability - **Prove It**
  - Legislation, Disclosure Ordinances, Stretch Codes

“Evidence Based Performance”

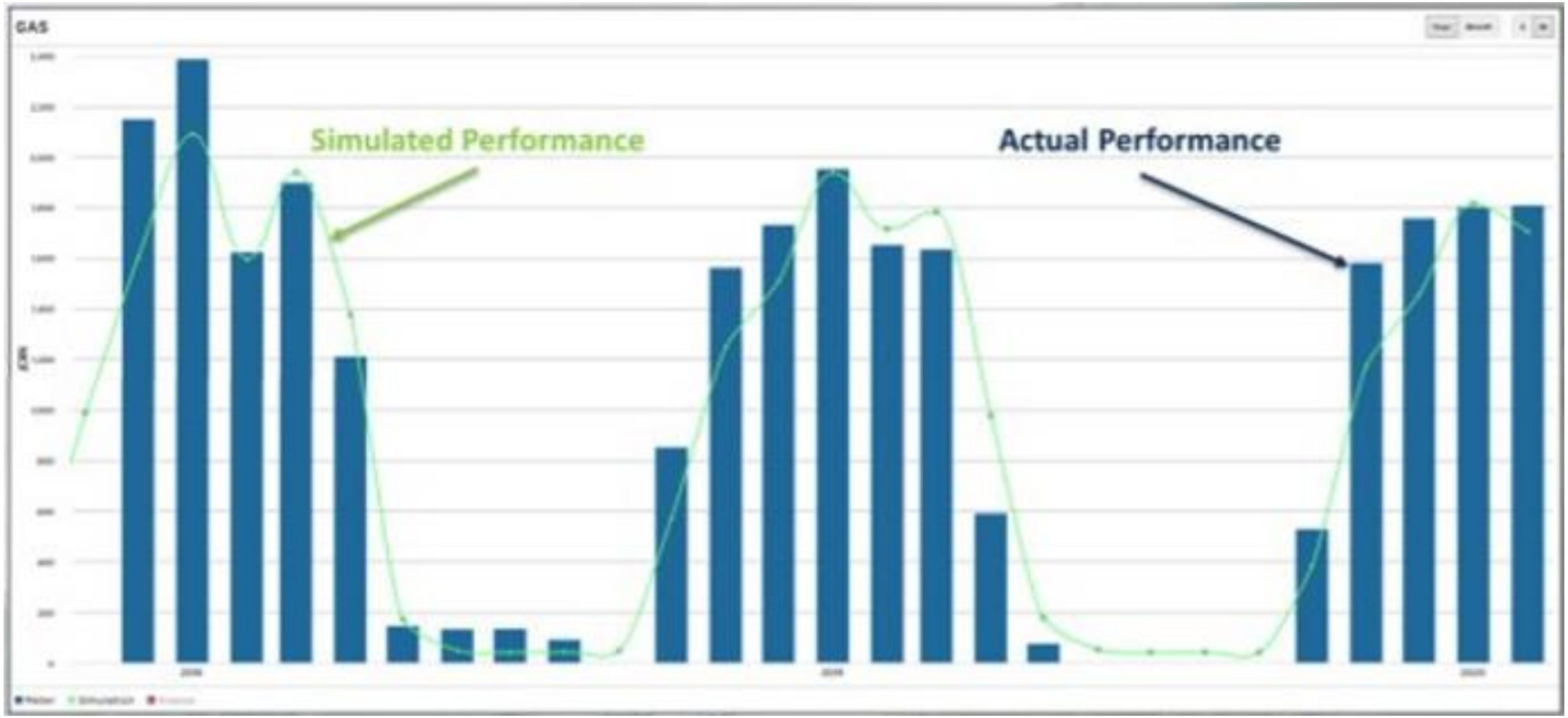
- Set Performance Goals & Measurement Methods
- Employ Detailed Modeling
- Testing/Commissioning to Verify Performance
- Monitor Performance and Occupant Experience

Essentially, Begin Early — with the End in Mind

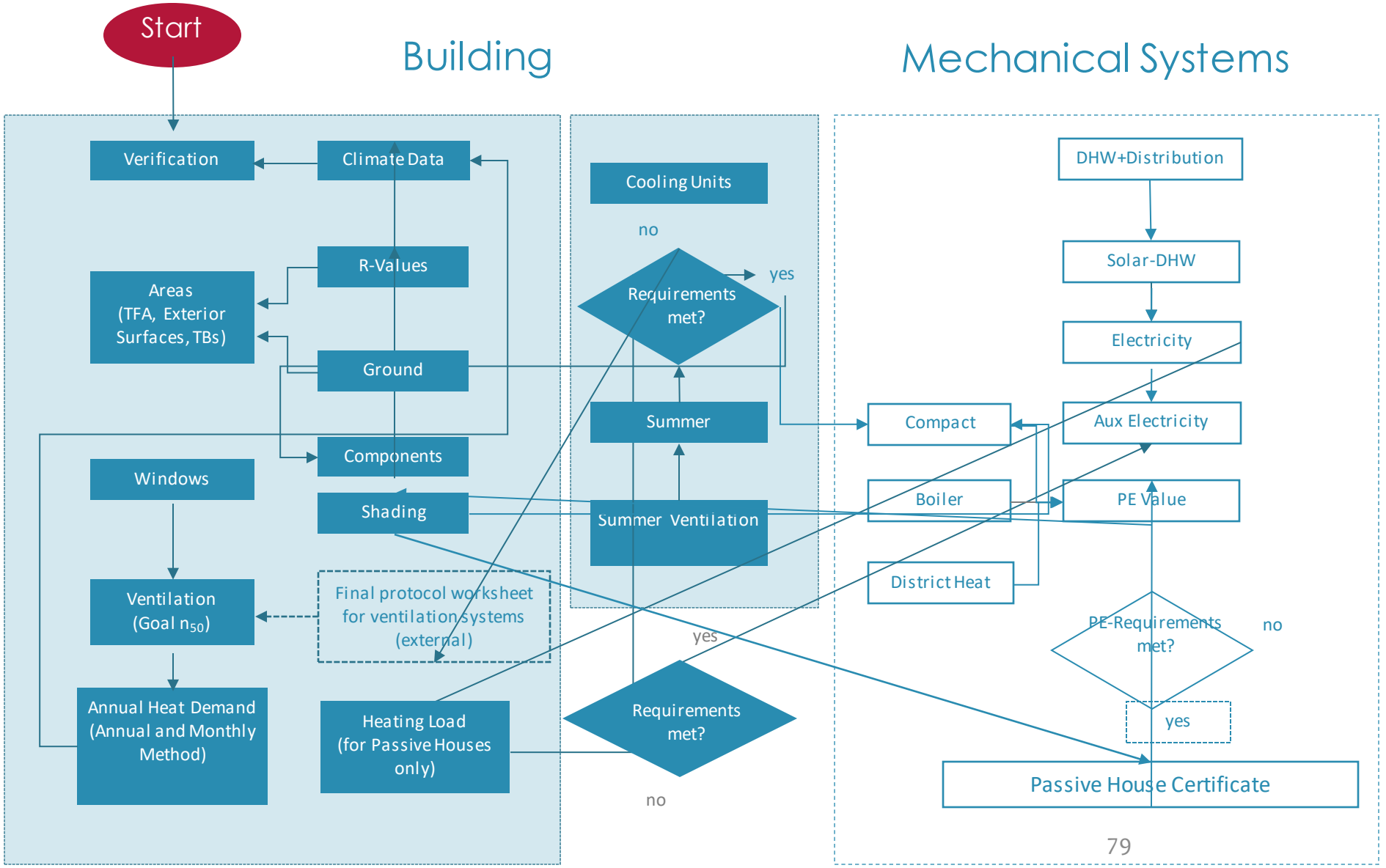
Owner's Project Requirements (OPR)

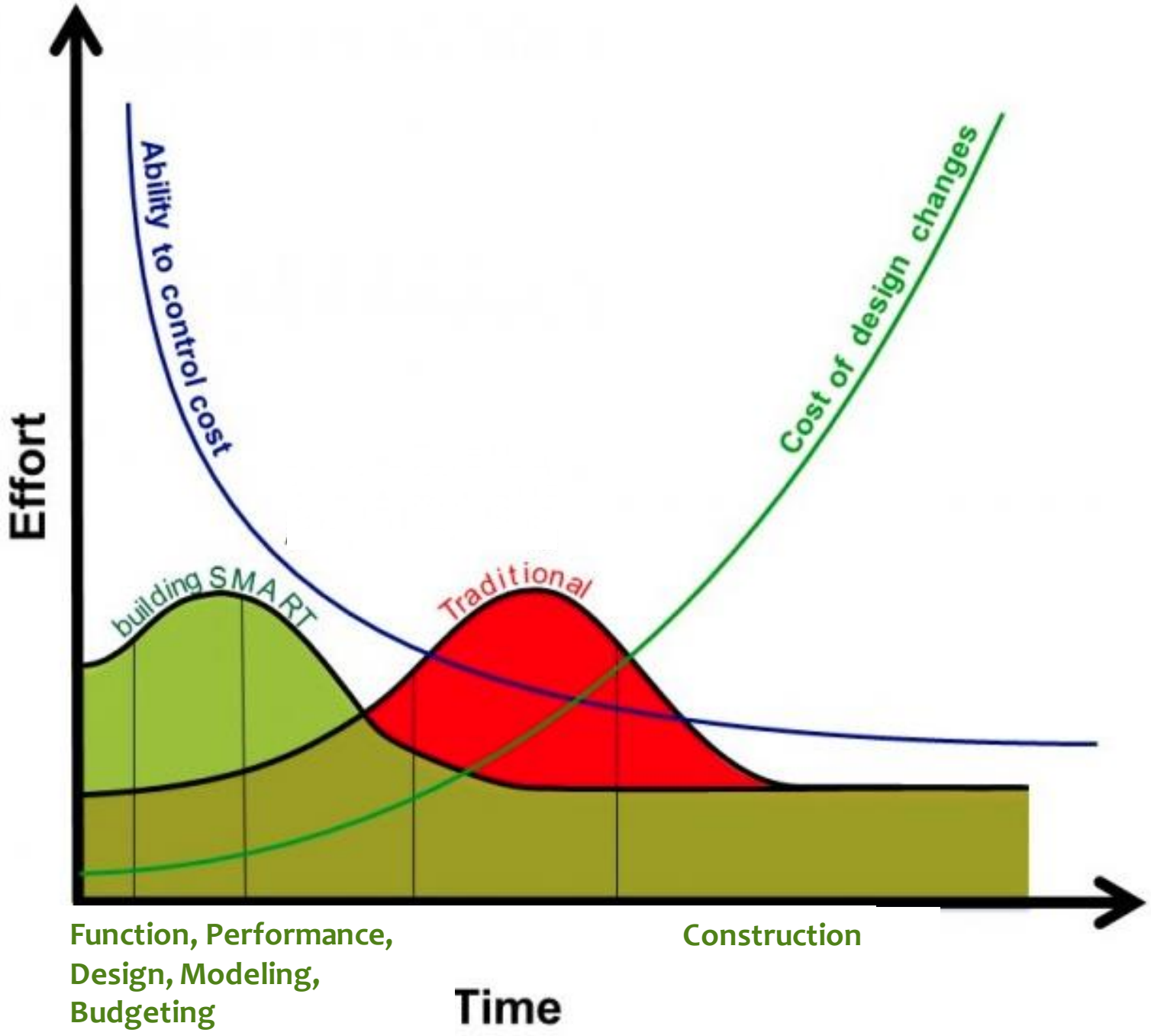
- Envelope (Airtightness, Insulation Values, Thermal Bridge Analysis)
- Energy Efficiency (Site EUI, Renewables)
- Indoor Air Quality (Continuous Fresh Air Ventilation Rate, Temperature, Humidity, CO2,, CO Particulates, Ventilation rate)
- Water Management (Potable Water Reduction and Quality, Storm Water Reduction)
- Indoor Environmental Quality (Sound, Light)
- Materials (Toxicity, Embodied Energy)
- Community (Social Equity and Inclusion, Community Benefits)
- Operations and Maintenance (Annual Budgets)
- Waste Management (Construction and Post Construction Waste)

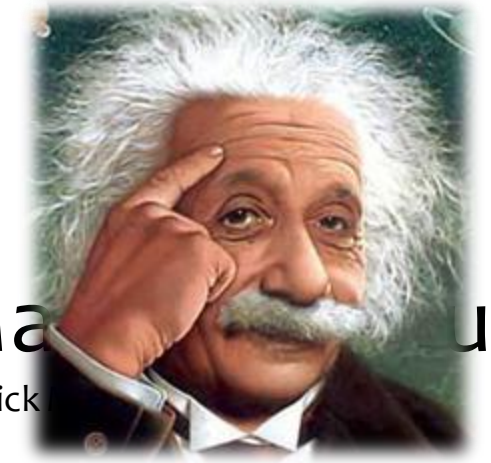
Dynamic Modeling → Accurate Simulations



PHPP Roadmap







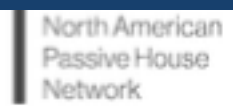
Ma urve

Patrick

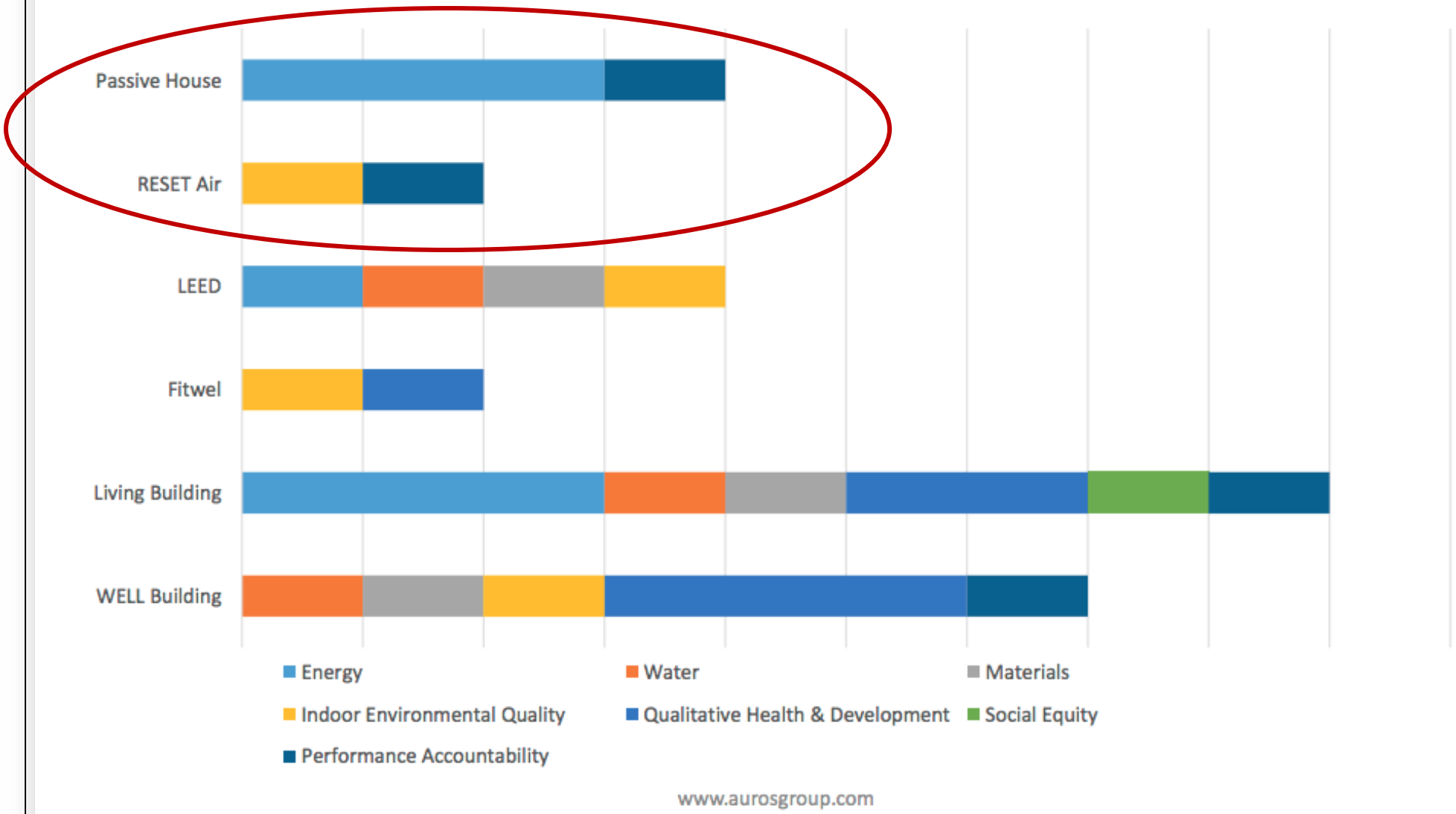
- Start with an aspirational approach (What is possible?)
- Adjust down as required
- You will achieve a better outcome

Set Performance Goals and Measurement Methods

Bias to Tested, Modeled, Measured, and Monitored



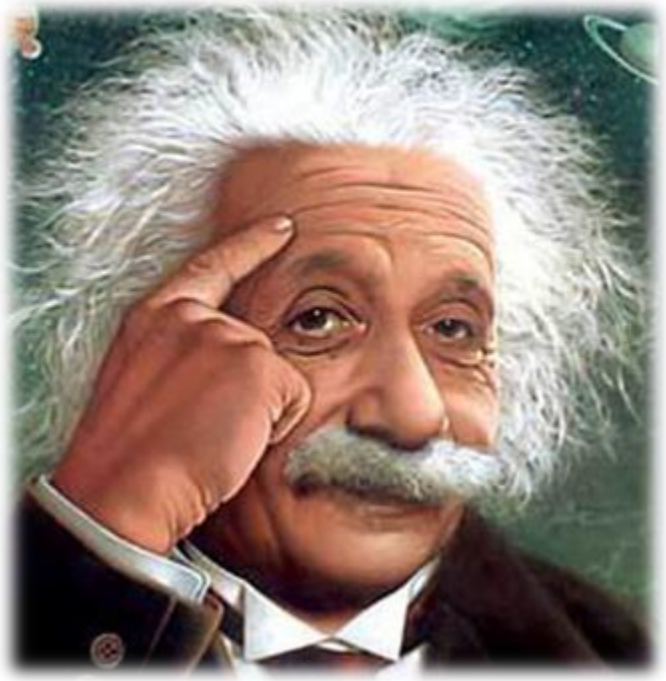
PROGRAM BY IMPACT CATEGORY



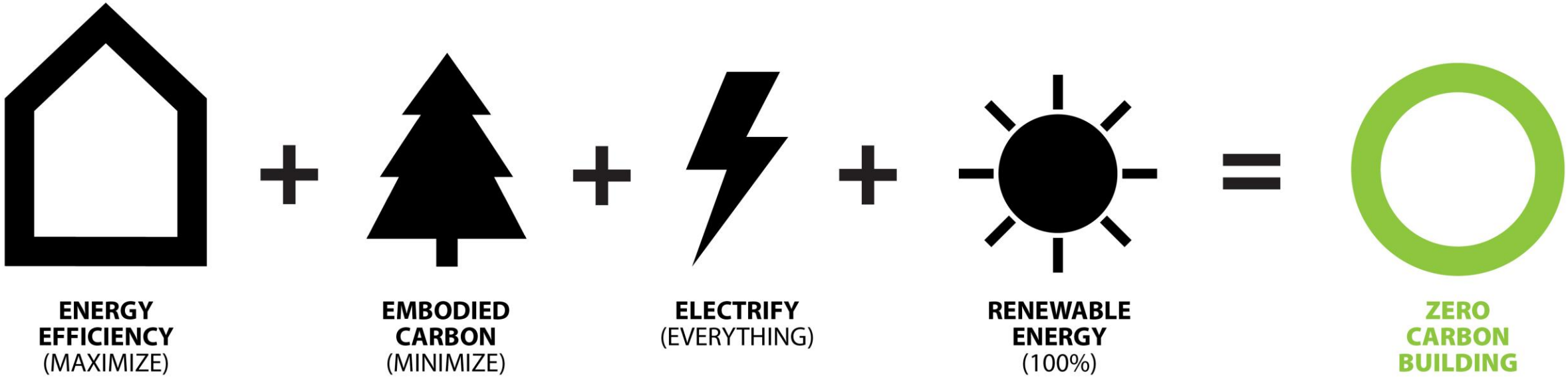
www.aurosgroup.com

Efficiency is the First “Renewable”

- The cheapest energy is the energy that you don’t use
- Once designed in, it delivers performance continually (Passive)
- The natural order of decarbonization
  - Maximize Efficiency (PH)
  - Minimize Embodied Carbon
  - Then Electrify Everything



The Natural Order of Decarbonization



Testing and Commissioning to Verify Performance

- Pressure test to confirm airtightness
- Commissioning to verify installed performance of sub-systems such as:
  - Mechanicals (HVAC)(Including noise level)
  - Electrical (including storage)
  - Controls (design confirmation)

Monitor Performance and Occupant Experience

- Energy Efficiency
- Comfort
- Healthy Indoor Air
- Durability
- Resilience

Evidence Based Performance: Energy Efficiency

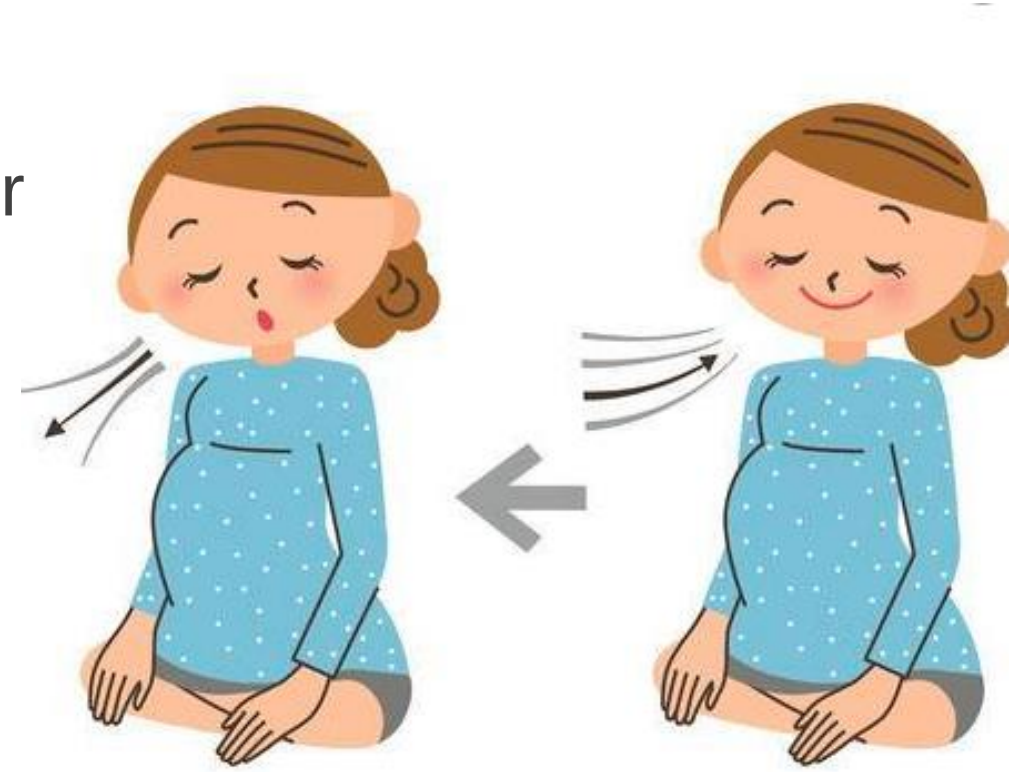
- 90% reduction in energy required for Heating and Cooling
- 50% to 70% less energy overall

Evidence Based Performance: Comfort

- Even temperature upstairs and down
- No drafts
- No hot or cold spots
- Comfortable when next to windows
- Quiet

Evidence Based Performance: Healthy Indoor Air

- Balanced ventilation with continuous fresh and filtered air
- 95% reduction in the infiltration of airborne allergens and pollutants
- Humidity within healthy range



Evidence Based Performance: Durability

- Performance of the building envelope
  - Airtightness dramatically reduces unplanned infiltration/exfiltration of air through the structure
  - Carefully specified materials and smart membranes manage water vapor support drying
  - Together they nearly eliminate the risk of condensation and the moisture related damage
- "Right sized" mechanical systems
  - Are generally smaller and extremely reliable
  - Maintain desired temperatures at lower settings and reduced cycling on and off

"The passive house concept turns out to be not only energy-saving but also most notably very durable and extraordinarily low-maintenance." Springer Link: March 9, 2019

Evidence Based Performance: Resilience

- 50% to 70% reduction in operational energy usage… doubles the impact of available:
  - Renewables
  - Electrical energy storage
  - Thermal energy storage
- Providing twice the Resilience

Evidence Based Performance: Occupant Satisfaction

"Every time I replace the HRV filter, I'm reminded, and thankful, that my family isn't breathing in what is caught in the filter." (Palo Alto)

"We love our Passive House." (Soquel)

"… it's calming… and we sleep better" (Bay Area)

"… much lower operating cost." (Berkeley)

"… gives us peace of mind." (Santa Cruz)

"Once you have experienced a PH home, it is hard to go back to anything else." (Bay Area)

Building Blocks to Achieve High Performance

Using the Steps for an RFP

CITY OF Monterey CALIFORNIA

REQUEST FOR PROPOSALS

Affordable Housing Development Opportunity

On Four City-Owned Properties

The Harbor Yard – 417 Figueroa Street

Parking Lot 14 – 442 Adams Street

Calle Principal Parking Garage – 438 Calle Principal

Madison Street between Dutra and Van Buren

https://monterey.org/Services/Community-Development/Housing

Addendum for Efficiency and Health

- **INTRODUCTION added:**
  "*They shall have a commitment to producing safe, affordable, durable, beautiful, healthy and energy efficient housing.*"

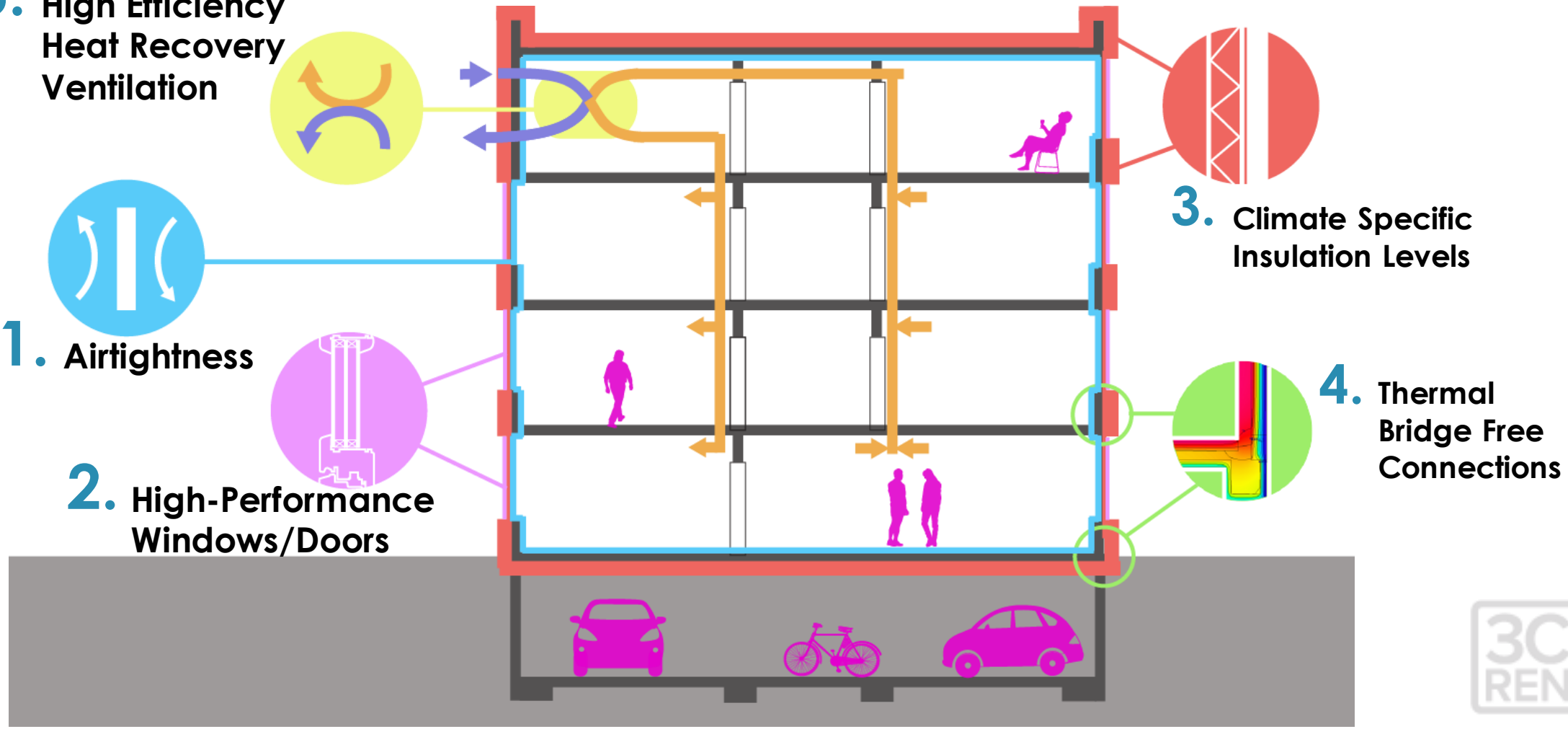
Addendum for Efficiency and Health

- **Evaluation Criteria: (up from 155 to 175)**

  "Project Energy Efficiency and Healthy Indoor Air Quality (20 points maximum)

  - *Net Zero energy demand (3 points max)*
  - *All electric usage (3 points max)*
  - *Air-tightness of building envelope (3 points max)*
  - *Continuous fresh air in a balanced system with heat recovery (5 points max)*
  - *Thermal bridge analysis (2 points max)*
  - *Energy storage (2 points max)*
  - *Other strategies to reduce embodied and operational carbon (2 points max)"*

Or… You Could Just Choose Passive House



Call To Action

Steps to Success

- Identify the Leaders
- Set Higher Targets
- Support Front Runners
- **Educate Everyone**
- Remove Barriers and Increase Incentives
- **Pilot Projects**

Educate Everyone

- Do you know of any organizations or groups that might benefit from learning more about Passive House?

Potential Pilot Projects

- Are you aware of, or do you have any ideas for Pilot Projects in planning or on the horizon?

Proof of Concept

Add Your Voice in Support

- In the future there will be opportunities to support programs and/or policies that will move toward “doing better”
- Would you like to add your voice to the conversation?

Personal Opportunities

- Are you getting ready to build or remodel a new home, multifamily, or commercial building… or do you know someone who is?
- Electrification – Heat Pumps for Heating/AC, and Hot Water
- Renewables for Home or Business

Support Passive House CA

- Join Passive House California
  - Individual Professional Membership
  - Organization/Company Membership
  - Sponsor
  - Donor or Volunteer

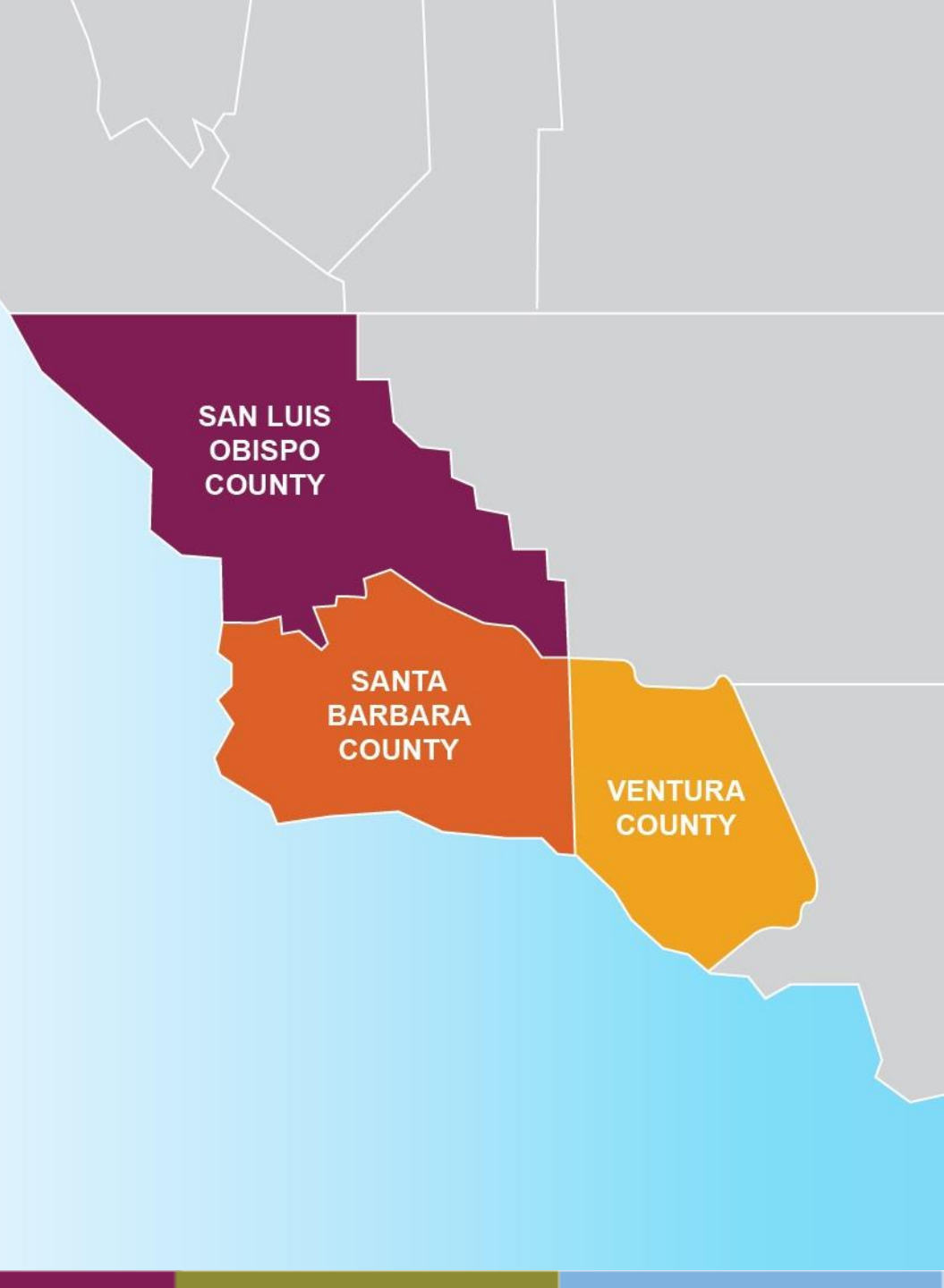
Be the Difference.

Jay Gentry
Jay@concomt.com
(831) 320-8538

Thank You for Your Time and Attention

3C-REN: Tri-County Regional Energy Network

- Three counties working together to improve energy efficiency in the region
- Services for –
  - **Building Professionals:** industry events, training, and energy code compliance support
  - **Households:** free and discounted home upgrades
- Funded by ratepayer dollars that 3C-REN returns to the region




3C
REN
ENERGY
CODE
CONNECT


3C
REN
BUILDING
PERFORMANCE
TRAINING


3C
REN
HOME
ENERGY
SAVINGS

3C
REN

3C REN ENERGY CODE CONNECT

- Serves all building professionals
- Three services –
  - **Energy Code Coach**
  - **Training and Support**
  - **Regional Forums**
- Makes the Energy Code easy to follow

Energy Code Coach:
3c-ren.org/codes
805.220.9991

Event Registration:
3c-ren.org/events

BUILDING PERFORMANCE TRAINING

- Serves current and prospective building professionals
- Expert instruction:
  - **Technical skills**
  - **Soft skills**
- Helps workers to thrive in an evolving industry

Event Registration:
3c-ren.org/events

3C REN HOME ENERGY SAVINGS

Coming soon!

- Free and discounted home upgrades

Stay Tuned:
3c-ren.org/home

Closing

- Continuing Education Units Available
  - Contact ian.logan@ventura.org for AIA HSW LUs
- Coming to Your Inbox Soon!
  - Slides & Survey – Please Take It and Help Us Out!
- Upcoming Courses:
  - QII for Contractors (3/18)
  - Healthy Housing Principles for Real Estate Professionals (3/23)
  - Residential Retrofits – Title 24 Best Practices for High Performance Buildings (3/25)
  - HRV and ERV for Passive House Applications (3/30)
  - Passive House Certification Course for Designers and Consultants (Thurs/Fri in April)

Thank you!

For more info:
3c-ren.org

For questions:
info@3c-ren.org

3C-REN

TRI-COUNTY REGIONAL ENERGY NETWORK

SAN LUIS OBISPO • SANTA BARBARA • VENTURA

Cachagua Passive House Project

Near the top of Cachagua Road

Patches of Red Fire Retardent

Guardrail Settled after Posts Burned

Sky Ranch Road just east of the PH

Sky Ranch Rd. across from previous

Cachagua Passive House

Looking Left (SE) as Walking In

Looking West

Looking South from the Deck

Looking Down (E) from the Deck

Looking Southeast from the Deck

Cachagua Passive House

Lessons and Observations

- Wildland Urban Interface Code (WUI) makes a difference
- So does All Electric Passive House
  - No Natural Gas or Propane Tanks
  - Airtight with non-combustible Roof and Shell… with wood fiber insulation
  - Continuous fresh, filtered air

- **An Airtight Shell or Envelope**
- **Sufficient Insulation**
  (to avoid the intrusion of heat from the outside or the loss of heat from inside)
- **Continuous Fresh Air**