nbi new buildings institute

How to Get to Zero Energy in Multifamily

Better Buildings Summit

Ralph DiNola

CEO, NBI

May 27th, 2015

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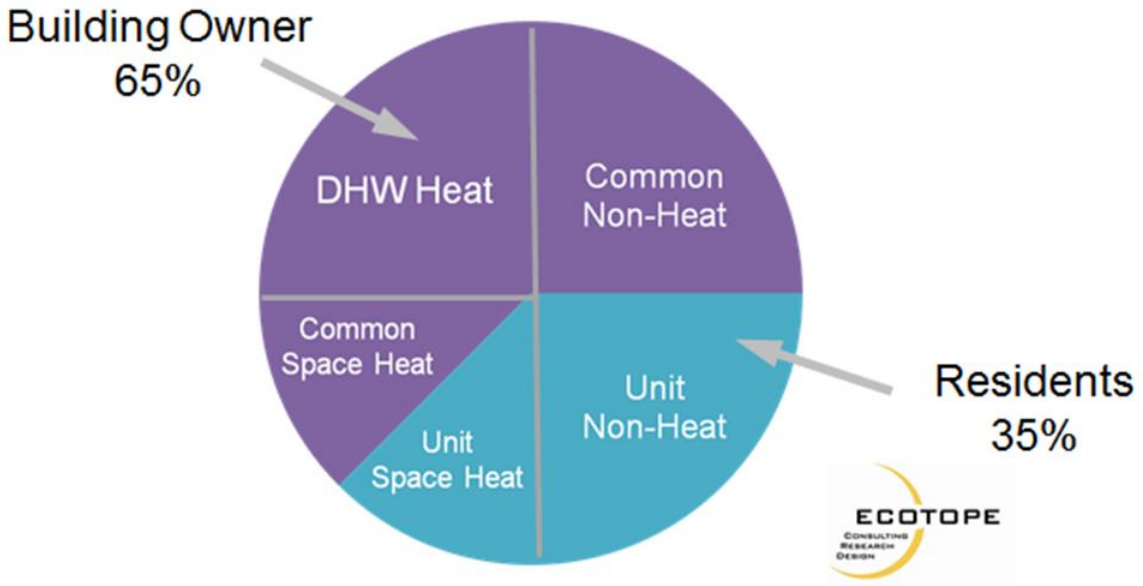
Market and Policy Context

Multifamily Context

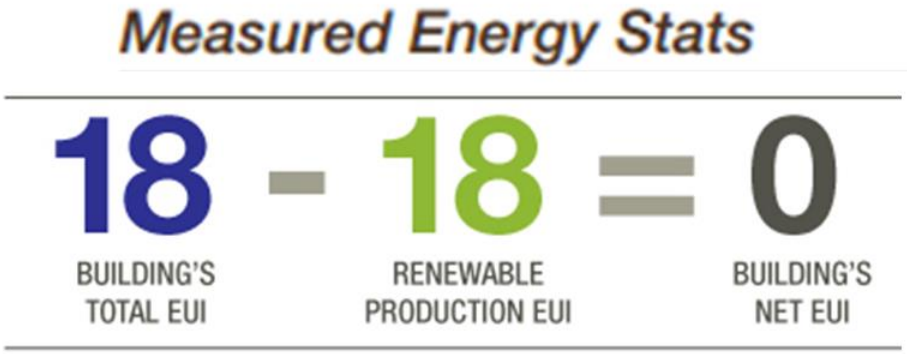
- 24% of the national housing stock
- Large MF buildings are over 30% of units



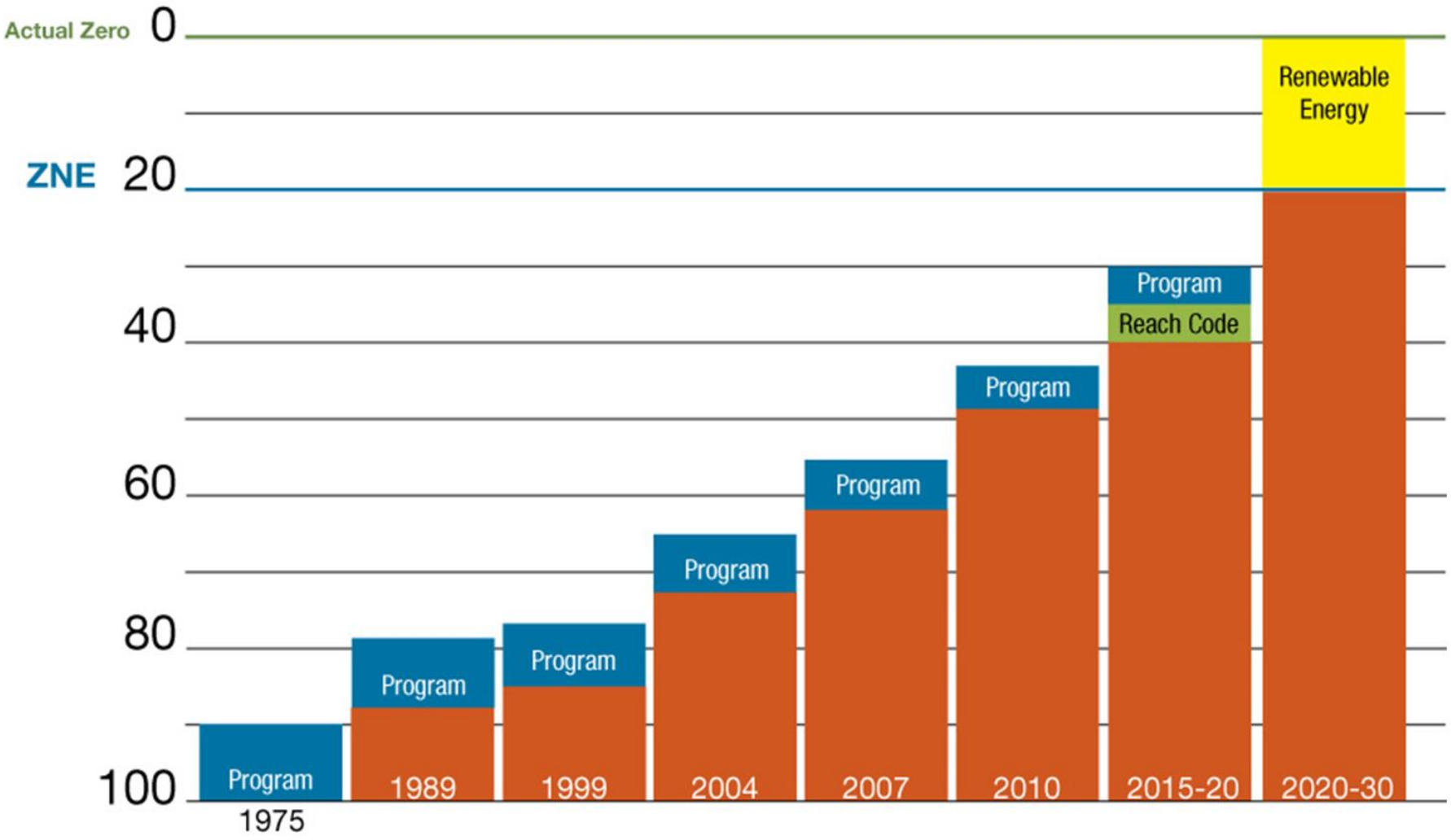
Zero Net Energy

Defined…

Zero Net Energy buildings are buildings with greatly reduced energy load such that, averaged over a year, **100% of the buildings energy use can be met with onsite renewable energy technologies**. *Also known as Net Zero Energy.*



Advancing Policy to Zero



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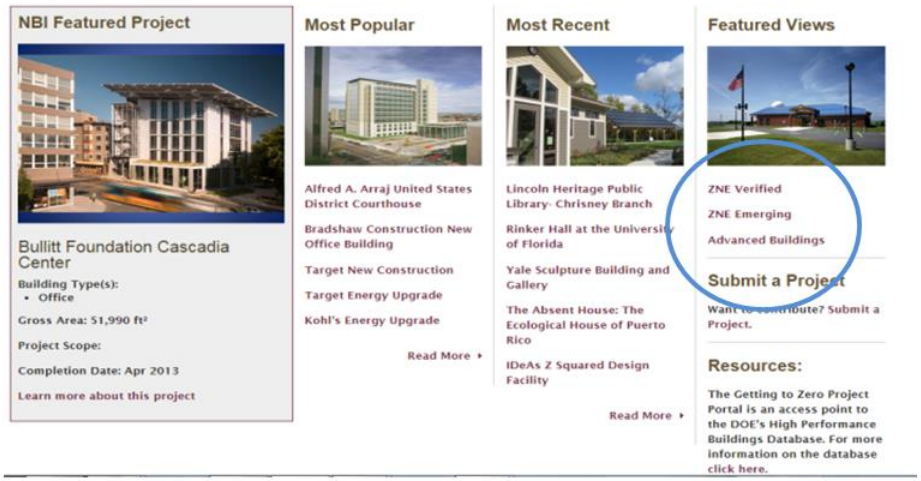
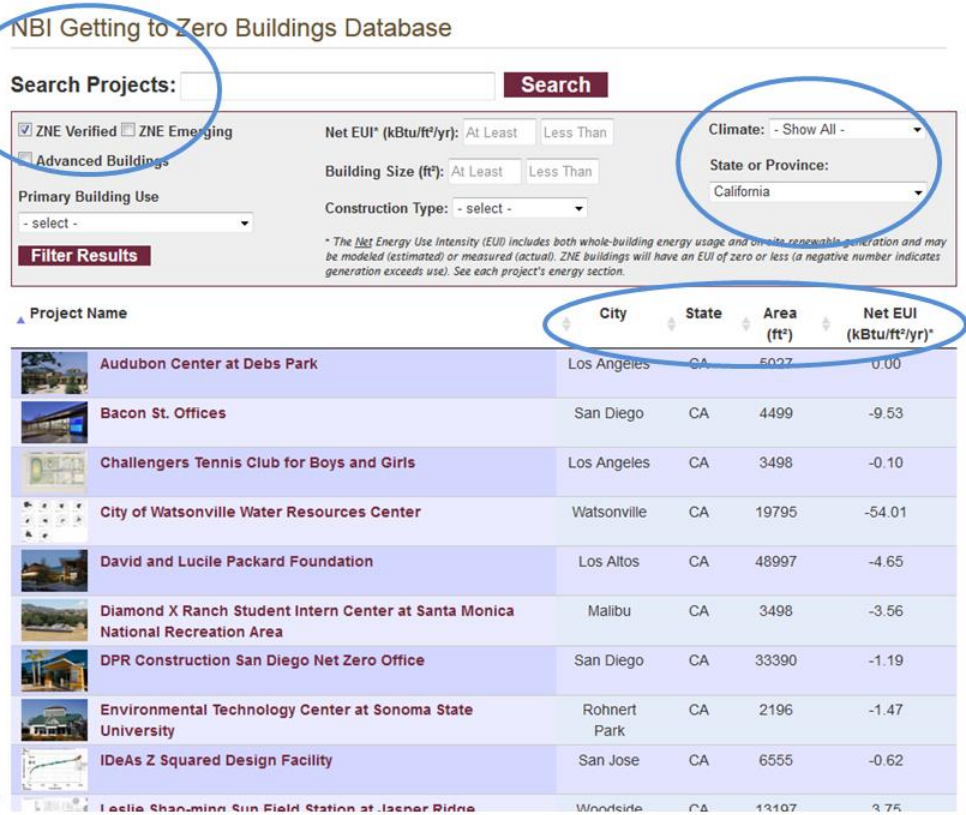
GETTING TO zero BUILDINGS DATABASE

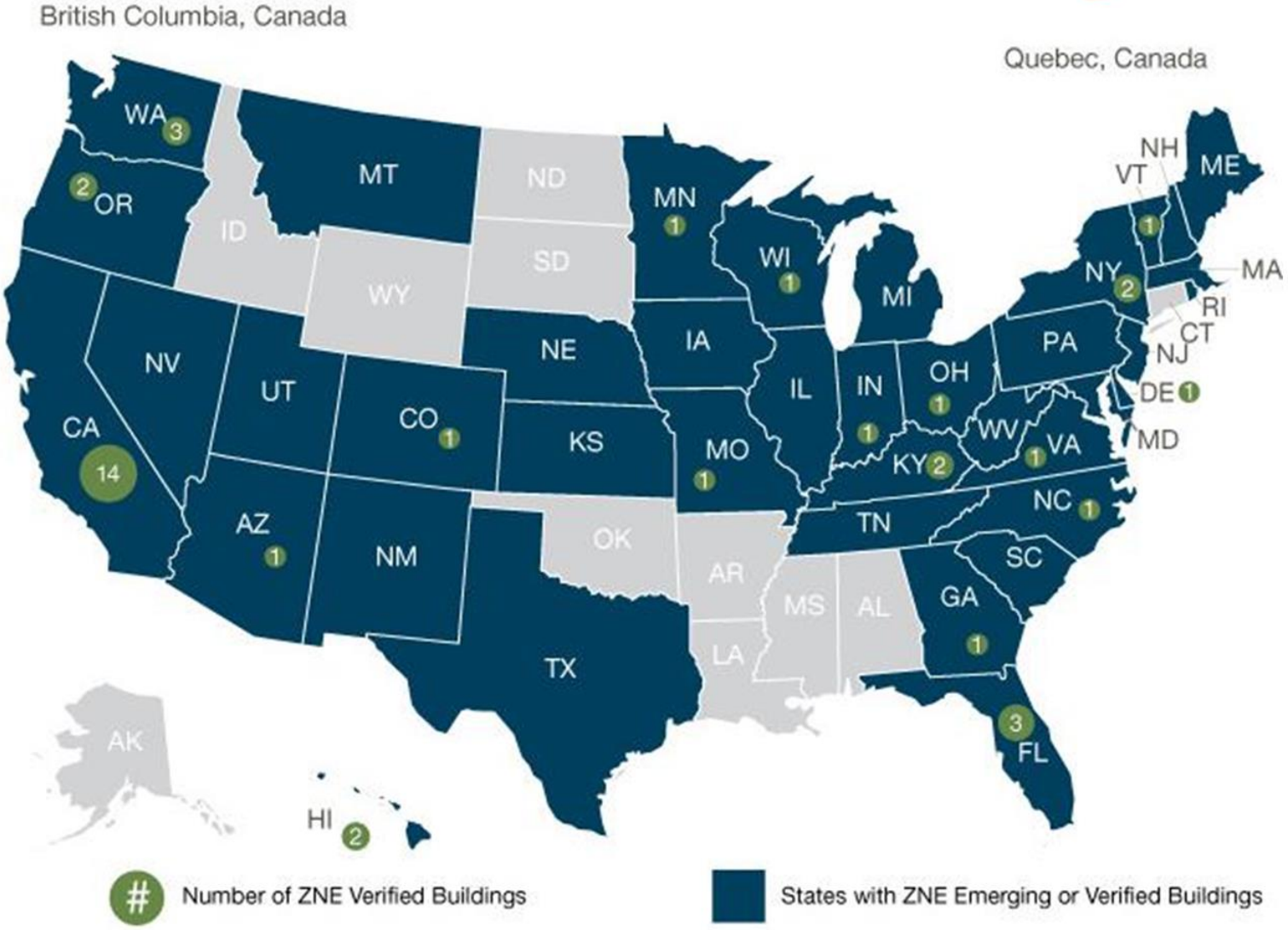
New Buildings Institute is proud to introduce our Getting to Zero Buildings Database.





The largest database on ZNE buildings in North America and the only database searchable by ZNE Status & Energy Performance
http://newbuildings.org/getting-to-zero-buildings-database

40 States with ZNE Buildings



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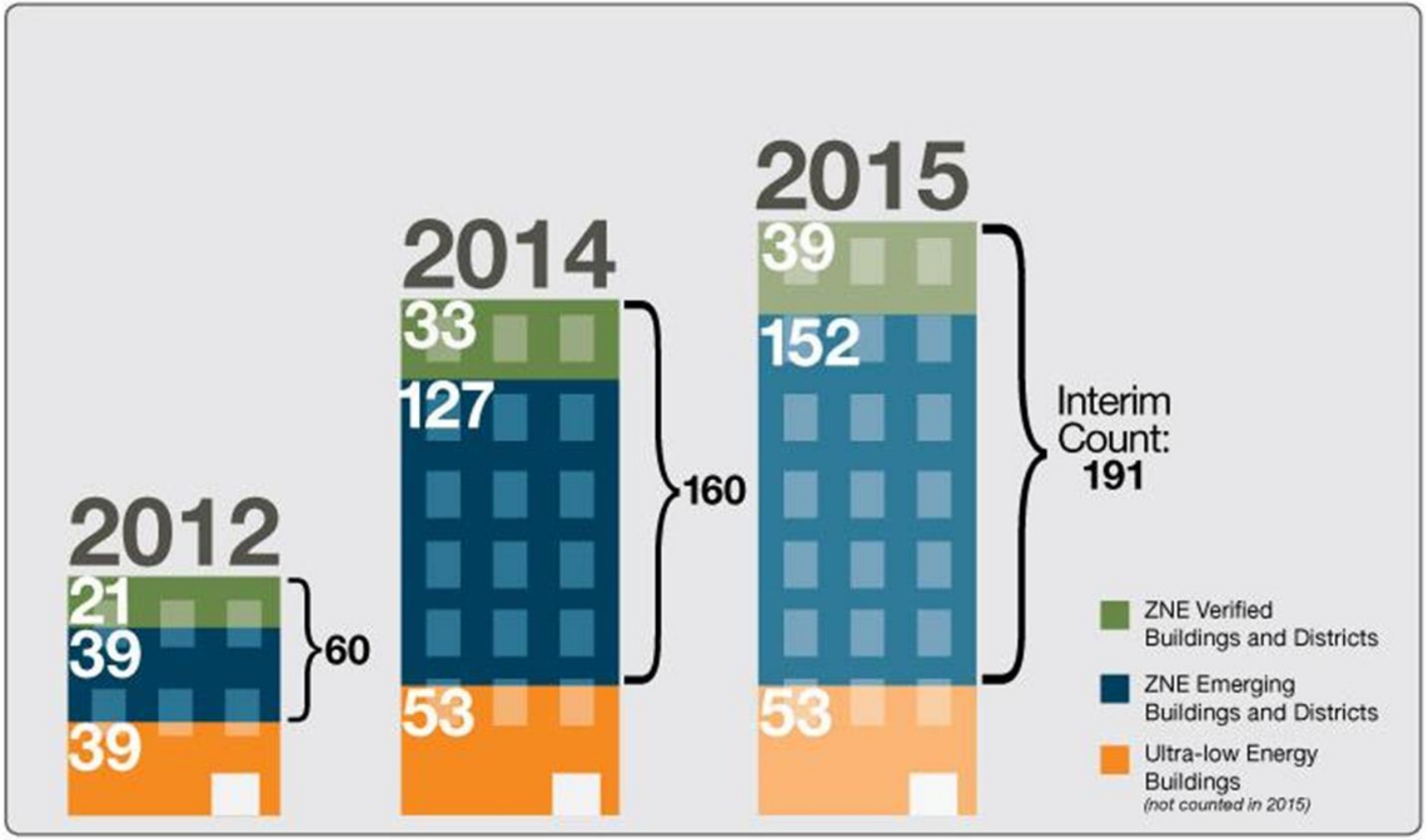
Zero Net Energy Buildings



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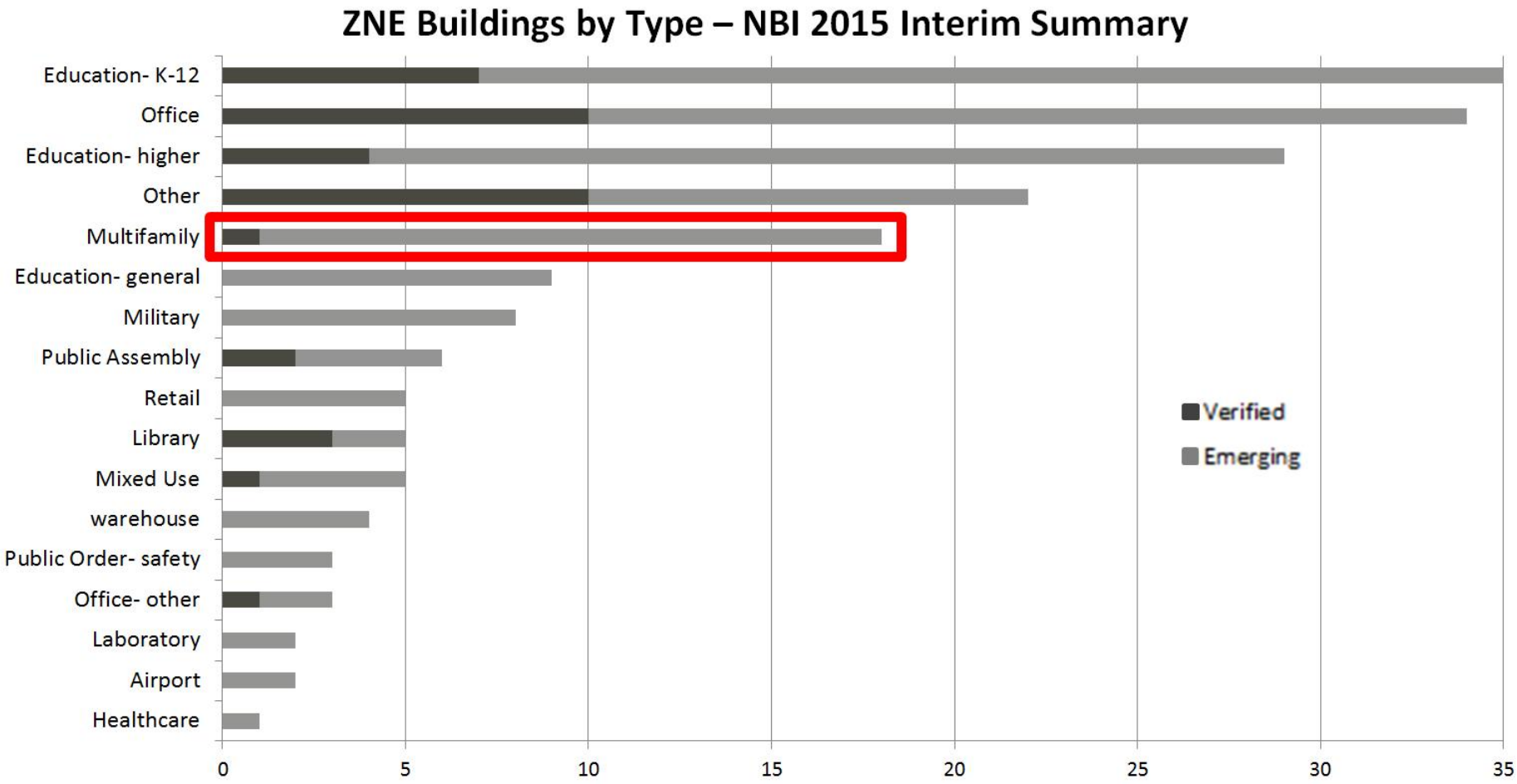
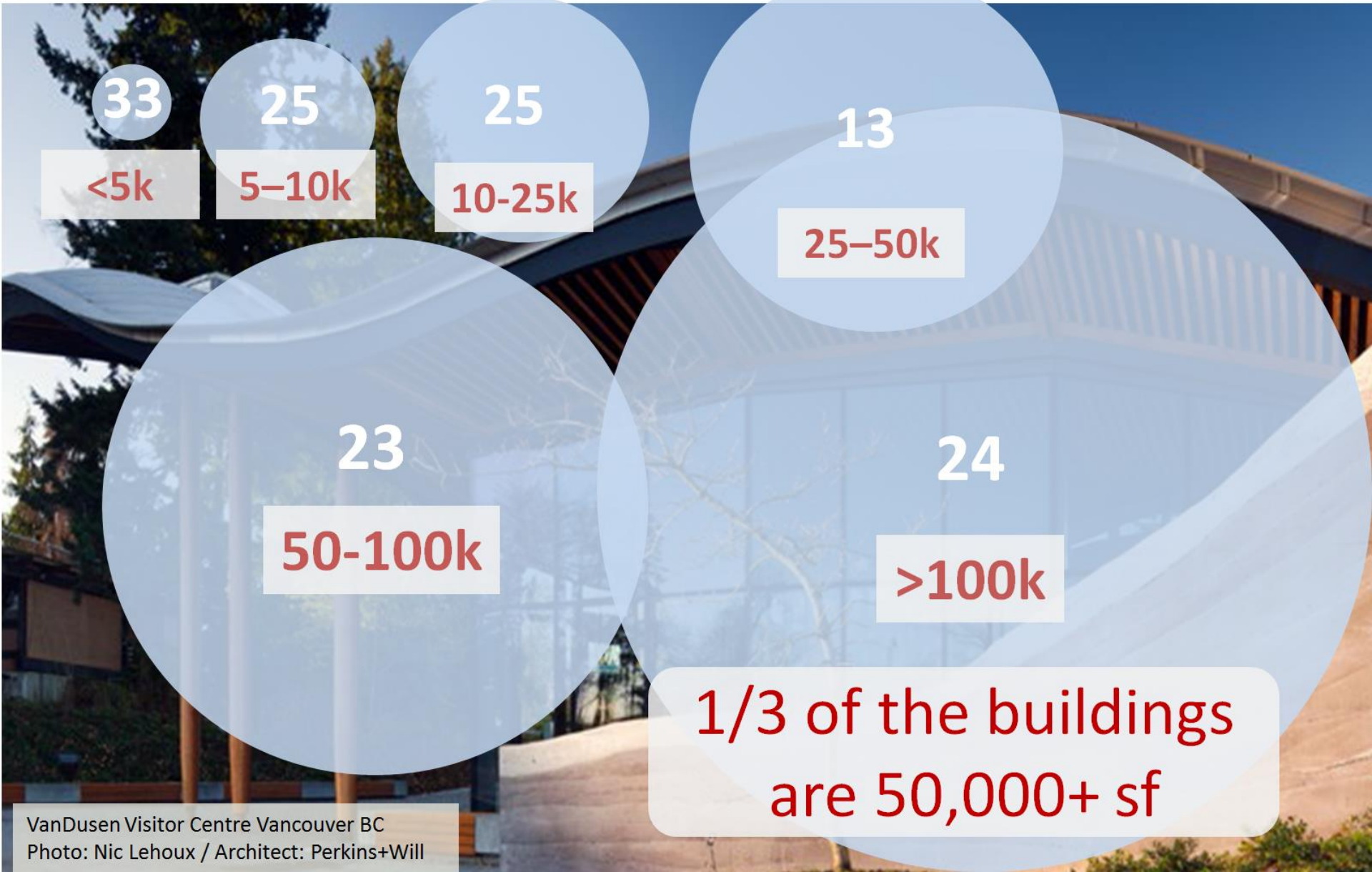
14 Building Types

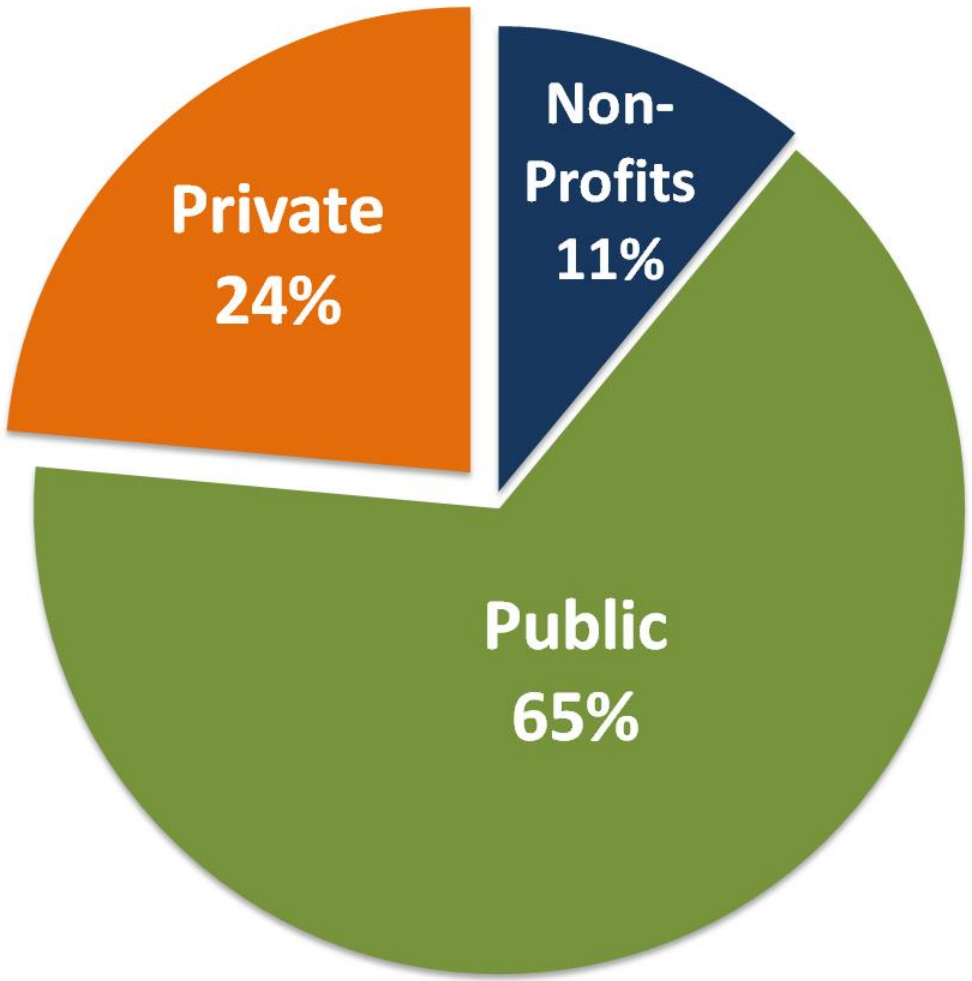


Size of ZNE Buildings



VanDusen Visitor Centre Vancouver BC
Photo: Nic Lehoux / Architect: Perkins+Will

Owner Type



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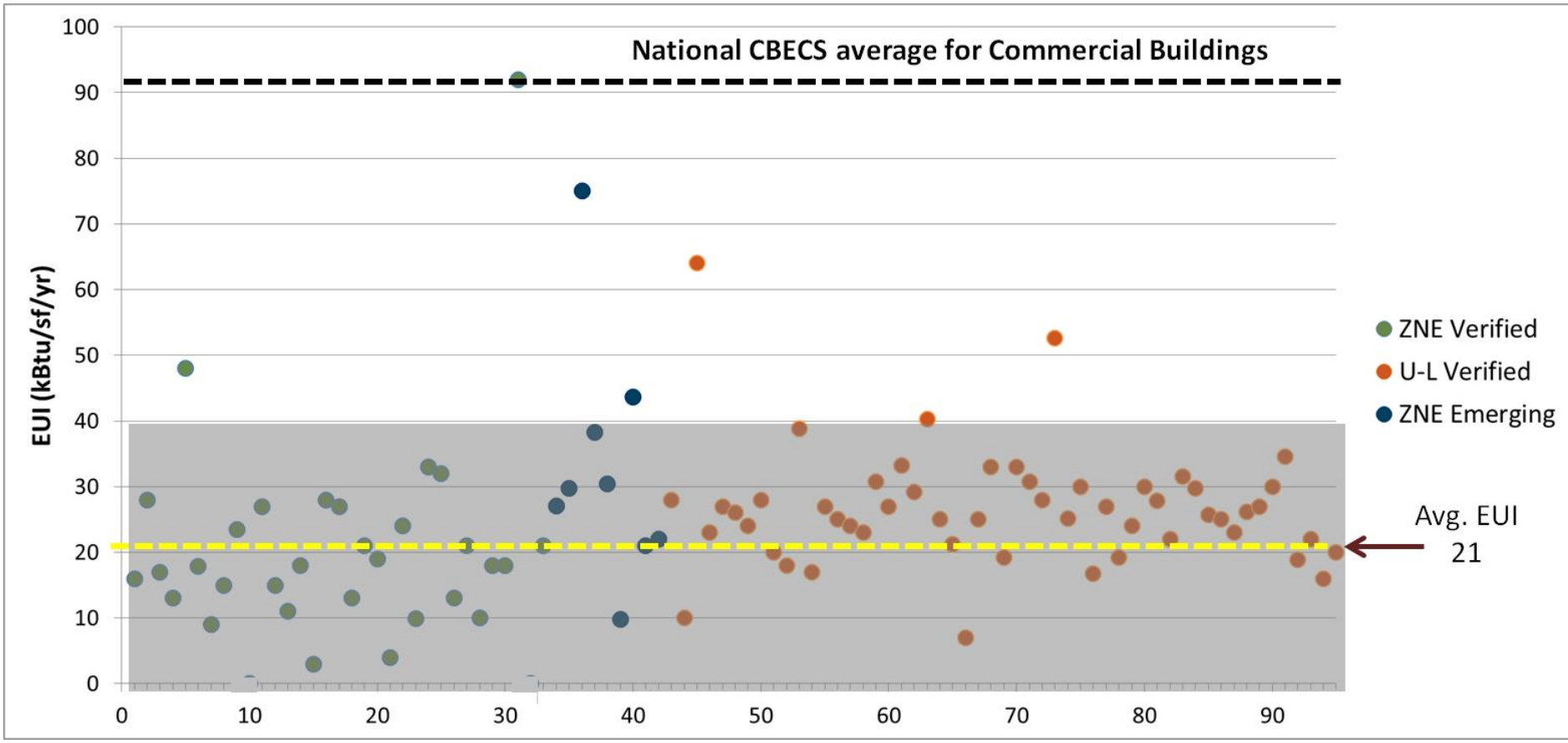
Performance Range

(measured performance data)



MULTIFAMILY PRECEDENTS

The Ramona, Portland, OR

Ultra-Low Energy Affordable Housing

6 Story, 138 Units, 230,762 SF, Certified LEED Gold, EUI of 18.7

The Ramona

Portland, OR

BENCHMARKS

LEED Gold
Architecture 2030

ENERGY

38% Saved
18.7 EUI

WATER

22% Saved
Low Flow Fixtures
Blackwater

FEATURES

PV
Solar Hot Water
Geothermal
Daylighting
Green Roof

MULTIFAMILY PRECEDENTS

EcoFLATS, Portland, OR

Targeting Net Zero , 18-Unit Apartment Building

MULTIFAMILY PRECEDENTS

EcoFLATS, Portland, OR

Targeting Net Zero , 18-Unit Apartment Building

MULTIFAMILY PRECEDENTS

Z-Homes, Issaquah, WA

Net Zero Energy

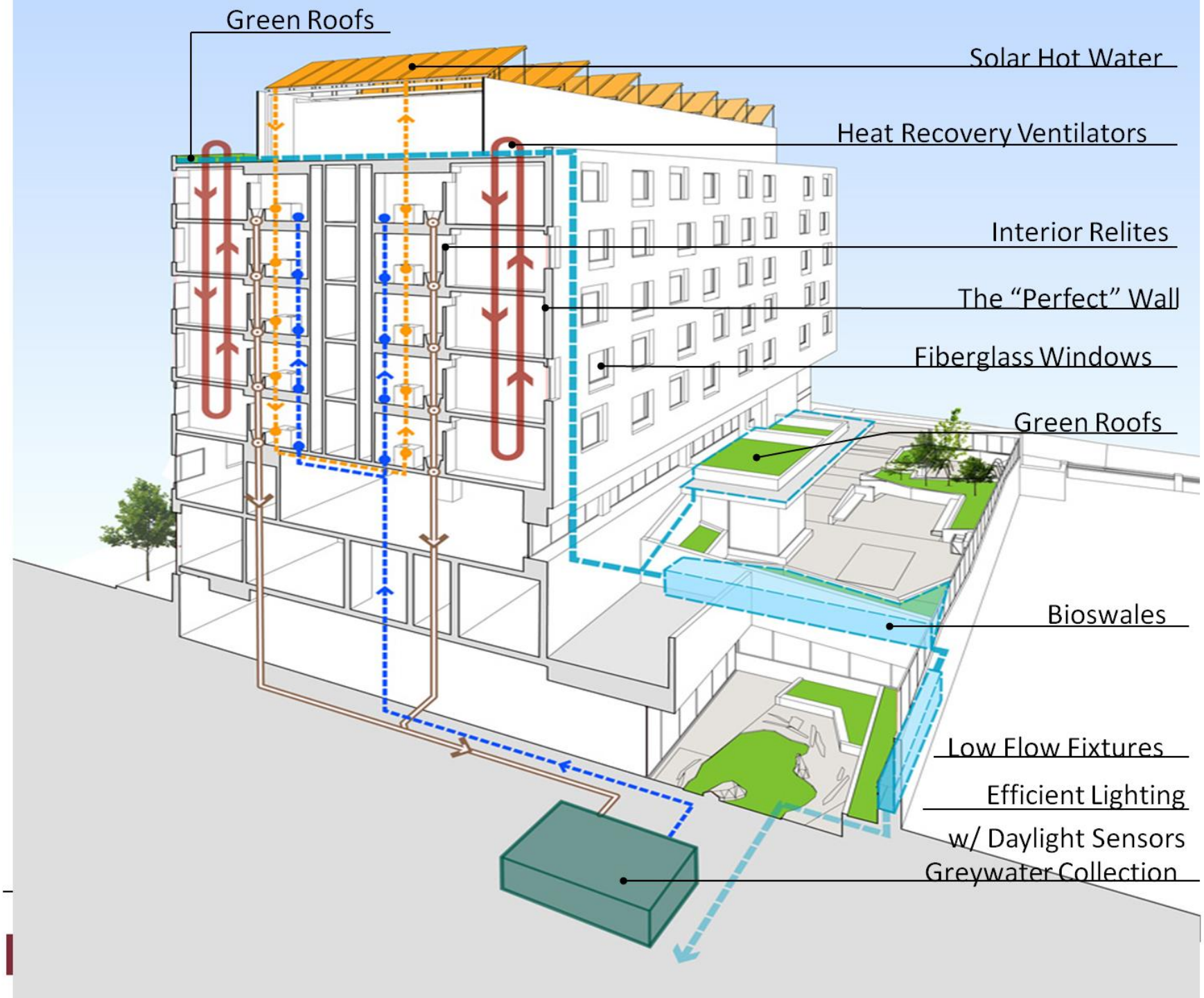
10 -Unit, Attached Townhome Development

MULTIFAMILY PRECEDENTS

Bud Clark Commons, Portland, OR

Ultra-Low Energy Affordable Housing

108k SF. 130 studios + 90 bed men's transitional shelter, LEED Platinum


Green Roofs
Solar Hot Water
Heat Recovery Ventilators
Interior Relites
The “Perfect” Wall
Fiberglass Windows
Green Roofs
Bioswales
Low Flow Fixtures
Efficient Lighting
w/ Daylight Sensors
Greywater Collection

The Resource Access Center was designed to save $51,000/year in energy and $9,000/year in water.

(2010 rates)

At the RAC, $60,000 will purchase:

- One year of **rent for 12 housing residents,** or
- One year of **dinners for 90 men** who live in the shelter, or
- One year of **salary for a case manager** to work with homeless clients in the day center

Multifamily, a unique opportunity

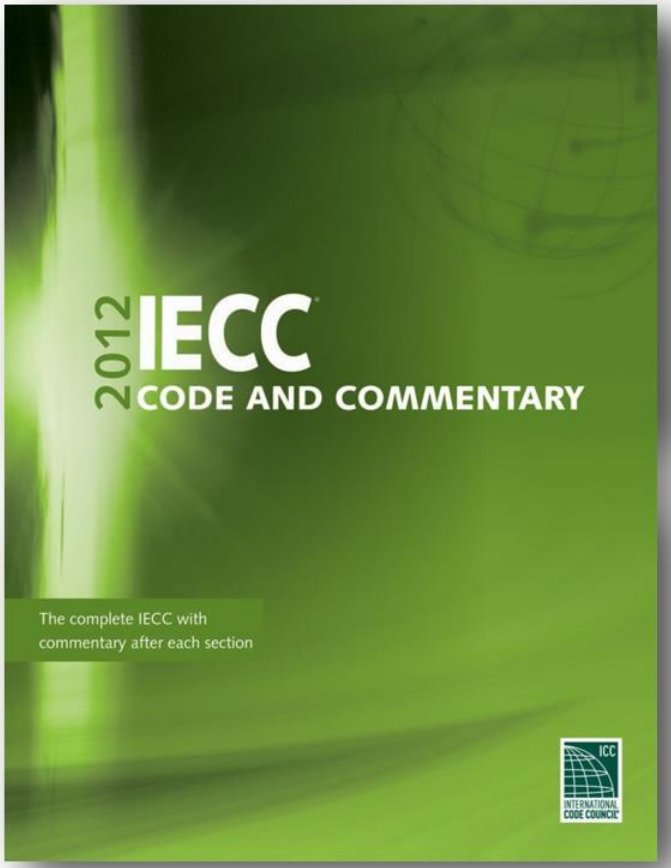
Multifamily, a unique opportunity


Emerald City Plymouth Housing

Multifamily, a unique opportunity


Emerald City Plymouth Housing

Multifamily, a unique opportunity



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redefining what's possible in the built environment

Thank You!

ralph@newbuildings.org

David and Lucille Packard Foundation Building
Courtesy: EHDD

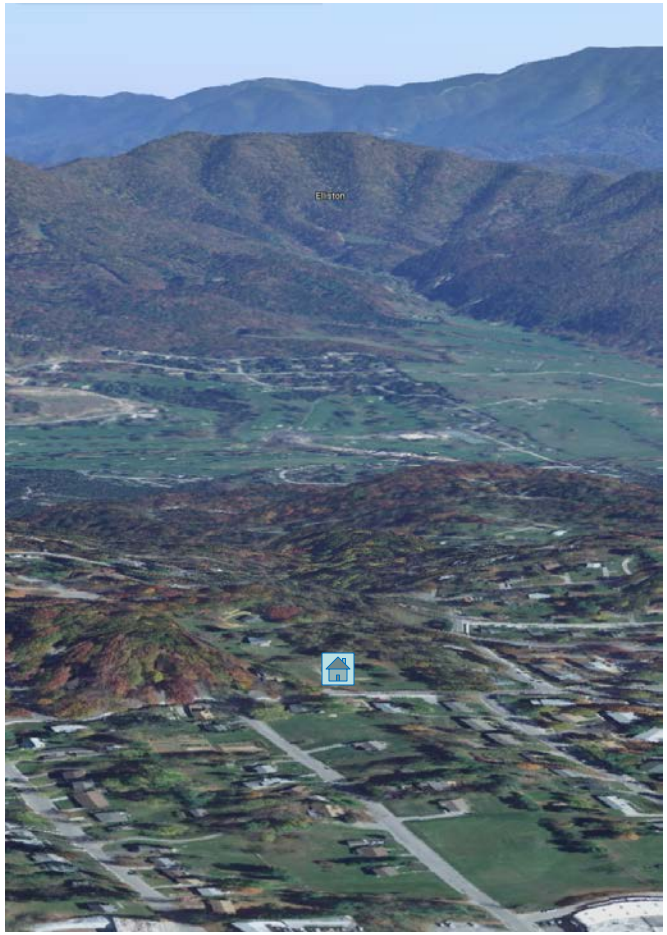
ENERGY SOLUTIONS

NEAR ZERO TO NET ZERO

27-April-2015 – Benjamin Knopp

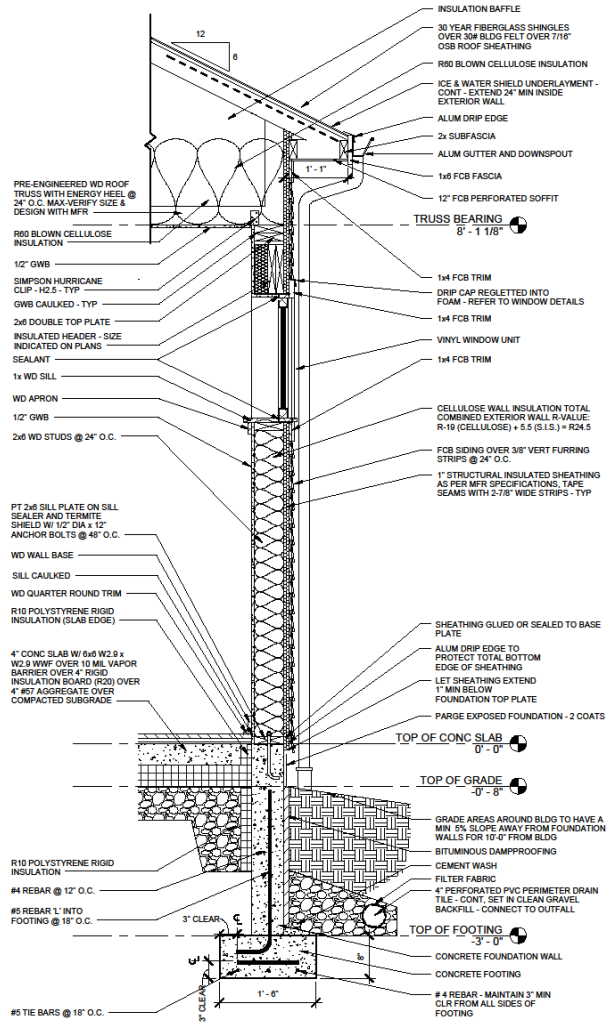
Grissom Lane: A Case Study

BACKGROUND



- Built in late 2014
- Blacksburg, Virginia
- Four duplexes
- Eight units (950ft²/ea)
- Senior affordable housing

ENVELOPE



- Floor: R-20 (EPS under slab)
- Walls: R-25 (cellulose + SIS)
- Ceiling: R-60 (cellulose)
- Windows: triple-pane
- Air Sealing: caulked sill, taped sheathing, etc.

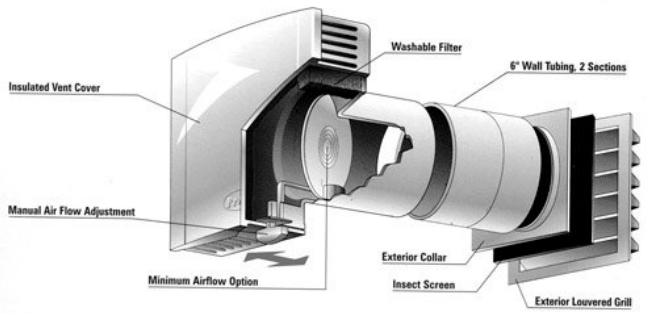
HVAC

- Mini-Split Heat Pump

  21.5 SEER, 12.2 HSPF

- Distribution: slim interior ductwork

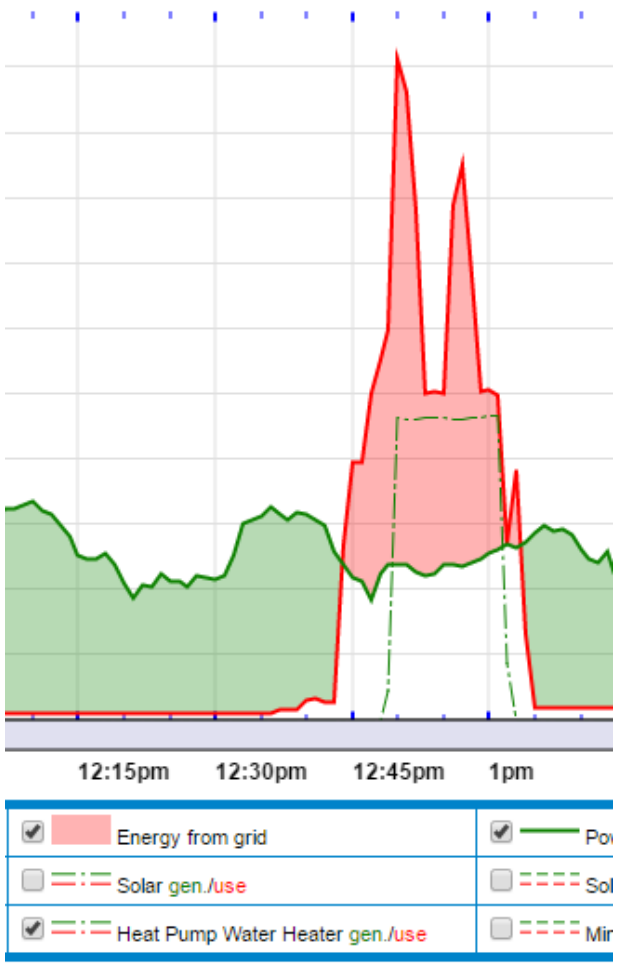
- Ventilation: exhaust-only with passive air inlets



WATER

- Fixtures: EPA WaterSense
- Layout: all ¾" (½" to tub)
- Water Heating: 2.75 EF heat pump water heater

APPLIANCES

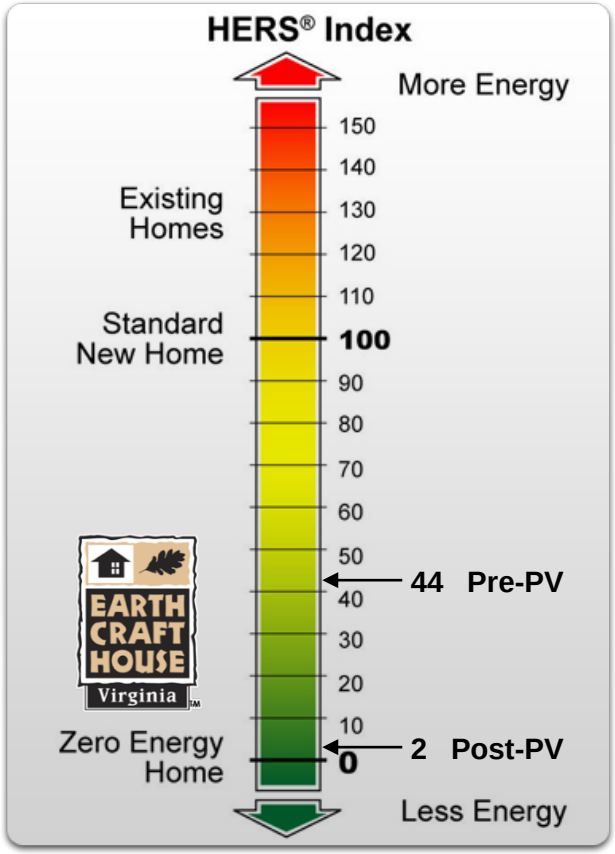


- Washer: ENERGY STAR
- Refrigerator: ENERGY STAR
- Lighting: 90% LED, 10% CFL
- Verification: circuit level energy monitoring

SOLAR

- 3.78 KW of PV per unit
- 34 KW of PV total

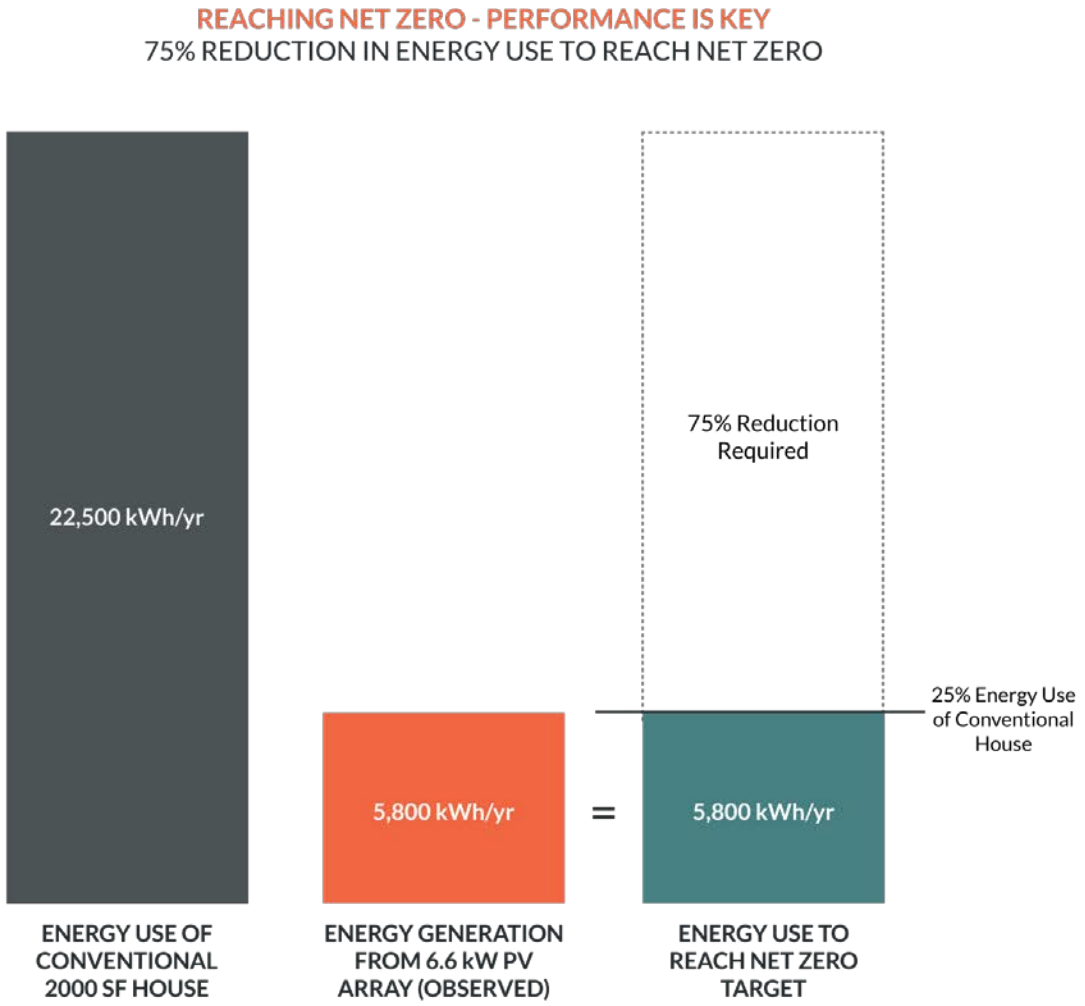
PERFORMANCE



- CFM50: 308
- ACH50: 2.14
- CFM50/SFBE: 0.1
- HERS 44 (pre-renewables)
- HERS 2 (post-renewables)

A PATH TO NET ZERO

- Passive House Techniques
  - Orientation
  - Geometry
  - Super Insulation
  - Thermal Breaks
  - Airtight Enclosure
  - Windows & Doors
  - Mech. Equipment



Source: www.hammerandhand.com

NOTE: Net Zero calculations based on onsite generation from a 6.6kW PV array (typically the max practical size for SFHs in urban settings) for a 2000SF house. Based on conventional EUI of 38.4 kBtu/sf/yr (USEIA).

ENERGY BREAKDOWN

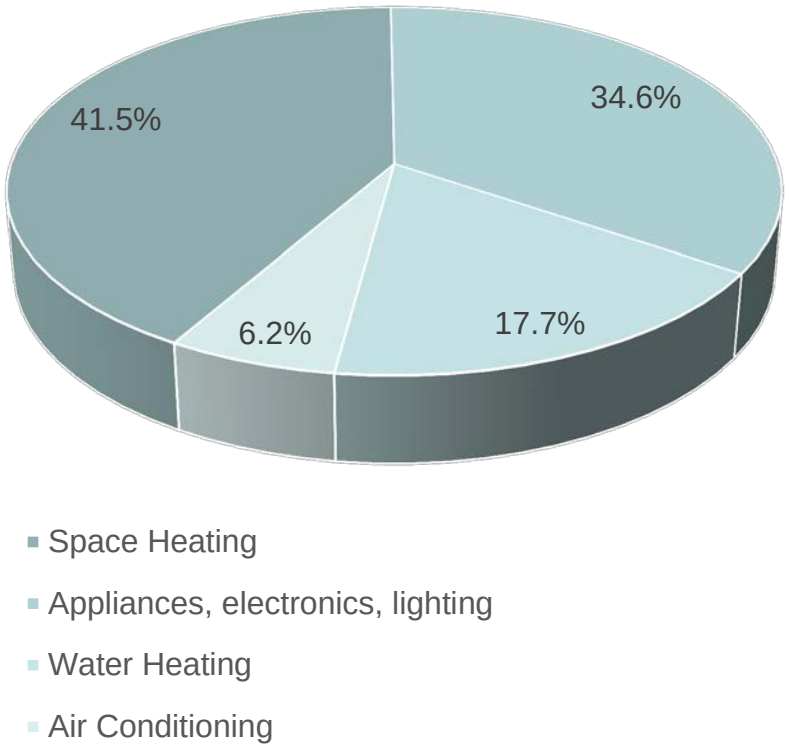
Energy End Use in US Homes

2009 Survey:

- Space heating/cooling: 48%
- Baseload: 52%

1993 Survey:

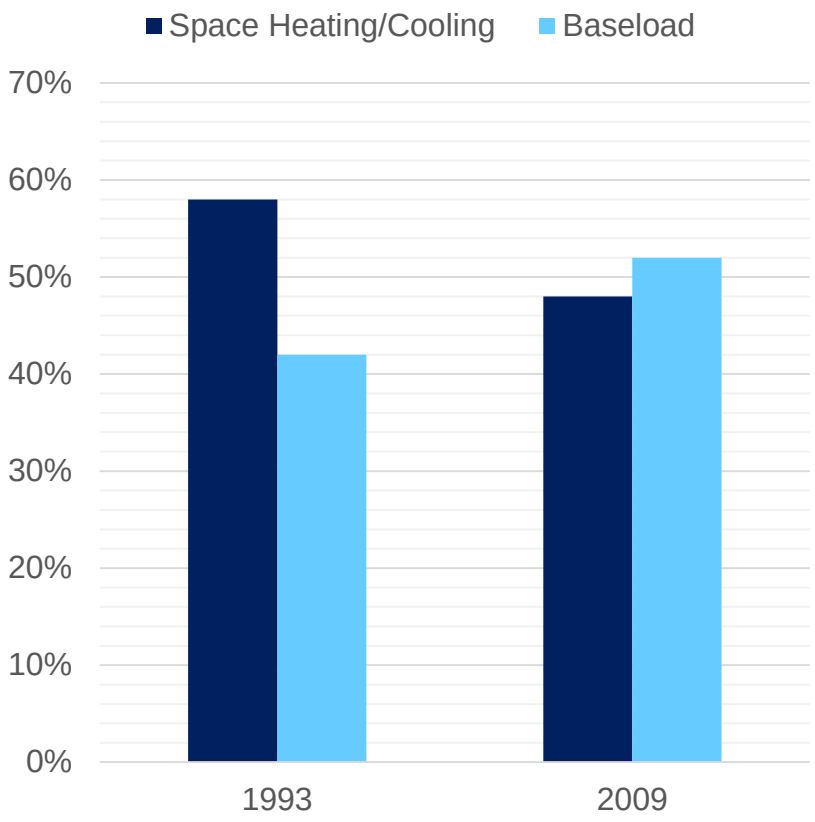
- Space heating/cooling: 58%
- Baseload: 42%

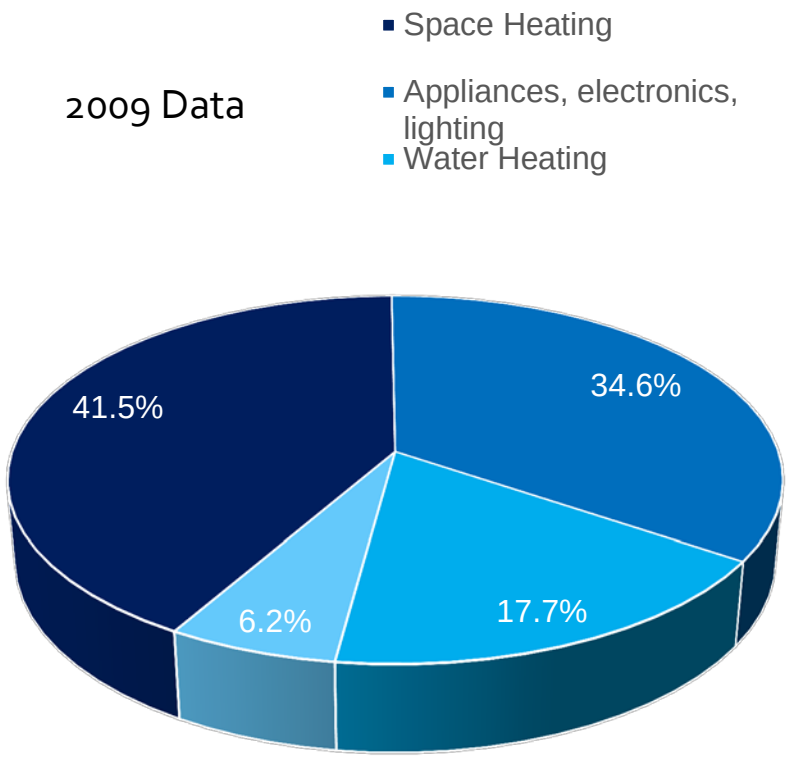


Source: US Energy Information Administration

ENERGY BREAKDOWN

Energy End Use in US Homes





Source: US Energy Information Administration

MULTIFAMILY ADVANTAGE

- Better volume-to-surface-area ratio
- Centralized systems
- Economies of scale
- Attract conscientious tenants

Photo: NAIT (www.nait.ca)

CONCLUSION

- Use proven techniques from high performance standards (Passive House, Living Building Challenge, etc.)
- Think "efficiency first, then renewables"
- Take advantage of economies of scale
- Include energy monitoring in project
- Include operations and maintenance plan
- Include tenant education – tenant behavior can make or break a net-zero project

QUESTIONS?

Presented by

Benjamin Knopp

Energy Specialist

Community Housing Partners

Energy Solutions

bknopp@chpc2.org

ENERGY
SOLUTIONS

aeon®

Homes for Generations

Better Building Challenge – How to Get to NetZero in MultiFamily

Gina Ciganik, Vice President – Housing Development

Aeon's Vision:

that every person has a home and is interconnected within community.

aeon
Homes for Generations

Aeon and University of Minnesota Center for Sustainable Building Research –

New Const.

Subst. Rehab

Mod. Rehab

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Homes for Generations

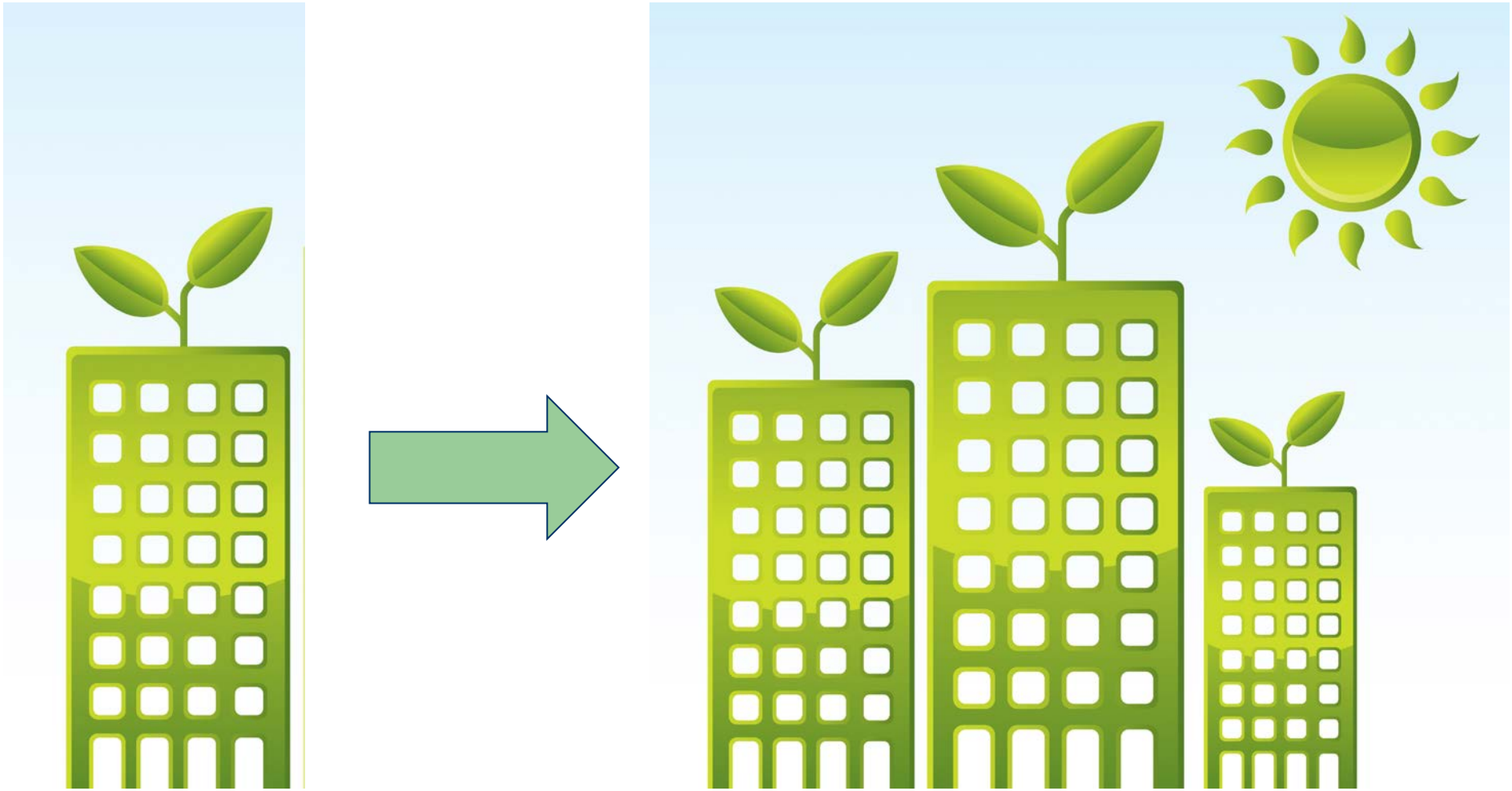
Pilot Projects - 2006 -2010

Utility Costs over 20 years…

$130 Million

Paeon
Homes for Generations

Replicable, Scale-able, Model…



LIVING BUILDING CHALLENGE™ 2.0

A VISIONARY PATH TO A RESTORATIVE FUTURE

www.ilbi.org

aeon
Homes for Generations

LIVING BUILDING CHALLENGE™

Seven Petals:
The Living Building Challenge

MATERIALS
Red List
Embodied Carbon Footprint
Responsible Industry
Appropriate Sourcing
Conservation + Reuse

WATER
Net Zero Water
Ecological Water Flow

ENERGY
Net Zero Energy

HEALTH [and Happiness]
Civilized Environment
Healthy Air
Biophilia

SITE (Place)
Limits to Growth
Urban Agriculture
Habitat Exchange
Car Free Living

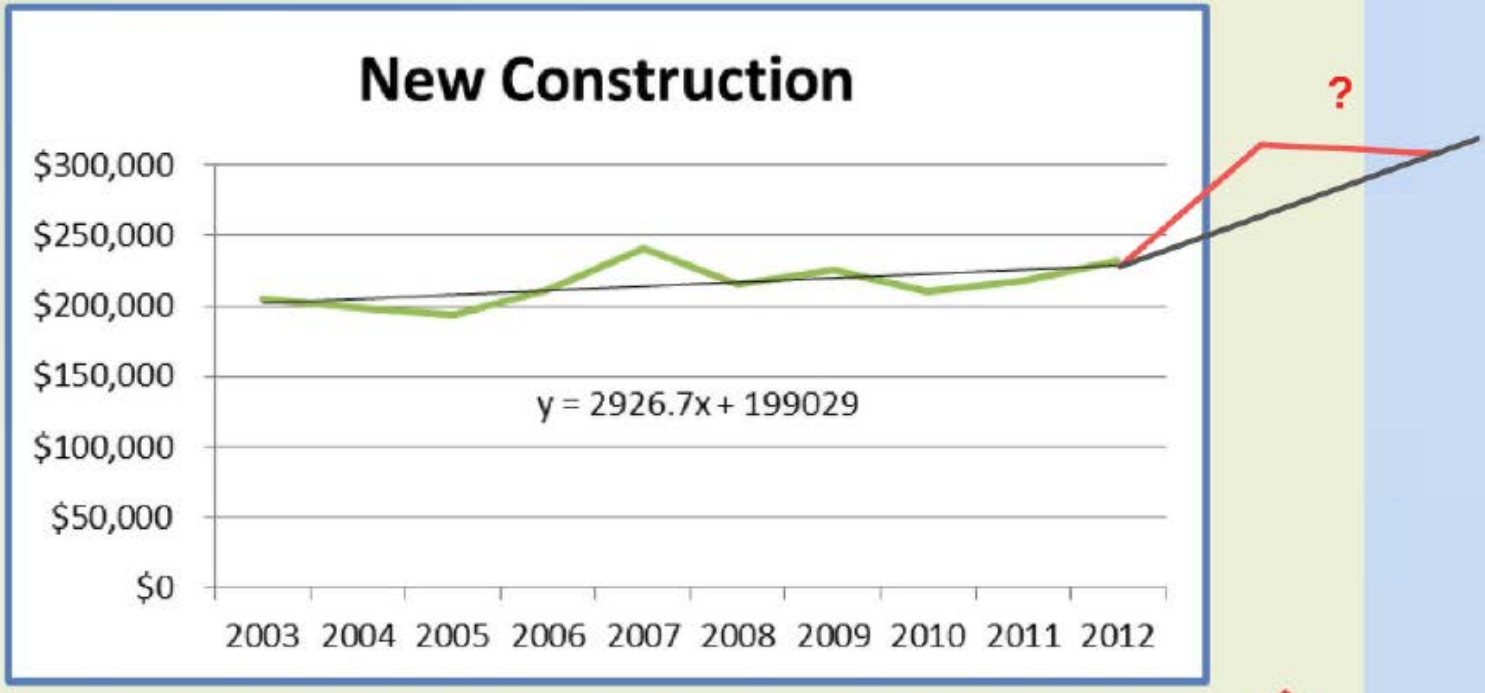
EQUITY
Human Scale + Humane Places
Democracy + Social Justice
Rights to Nature

BEAUTY
Beauty + Spirit
Inspiration + Education

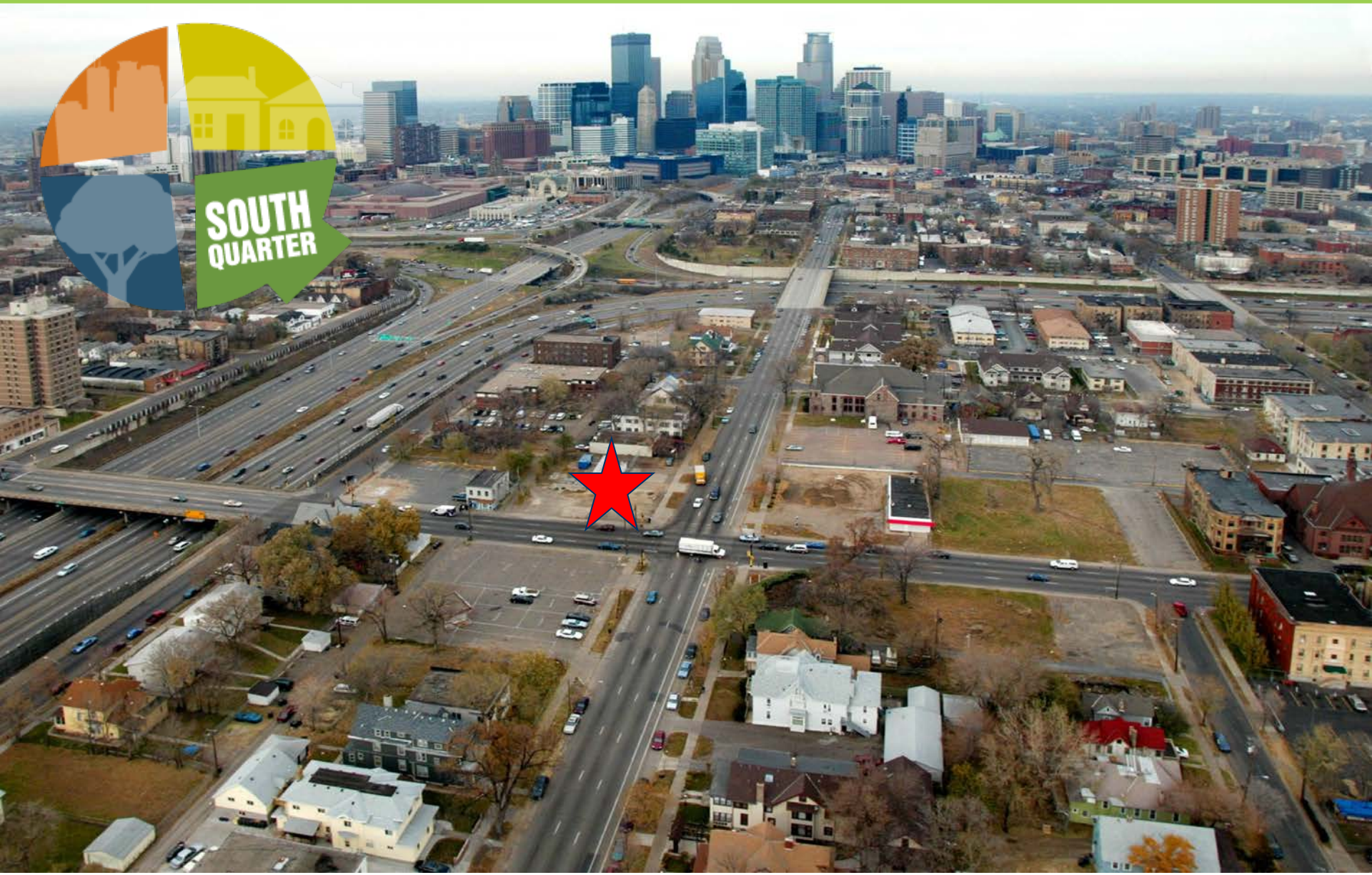
Don’t forget that money is a scarce resource too!!

aeon
Homes for Generations

Minnesota's Cost Curve (adj. for inflation)



Minnesota Housing Finance Agency



aeon
Homes for Generations

HOPE
Community

Before

South Quarter = 240+ homes

aeon
Homes for Generations

HOPE
Community

Storm Water Management

aeon
Homes for Generations

HOPE
Community

Solar Thermal

AEON SOUTH QUARTER: THE ROSE
FINAL EXTERIOR RENDERINGS
01.24.2014

MSR

710 South 2nd Street, 8th Floor
Minneapolis, Minnesota 55401–2282

PORTLAND AVE. AND FRANKLIN AVE.
-PERSPECTIVE OF THE MAIN ENTRY FROM SOUTH EAST CORNER OF SITE

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Homes for Generations

HOPE
Community

MSR

DISCOVERY URBAN FARM BY HOPE COMMUNITY
AT THE ROSE, 1920-1928 PORTLAND AVE. MINNEAPOLIS, MN 55404

VIEW FROM NORTHWEST CORNER OF GARDEN

HOPE Community

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ENERGY

Paeon
Homes for Generations

LIVING BUILDING CHALLENGE℠

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Homes for Generations

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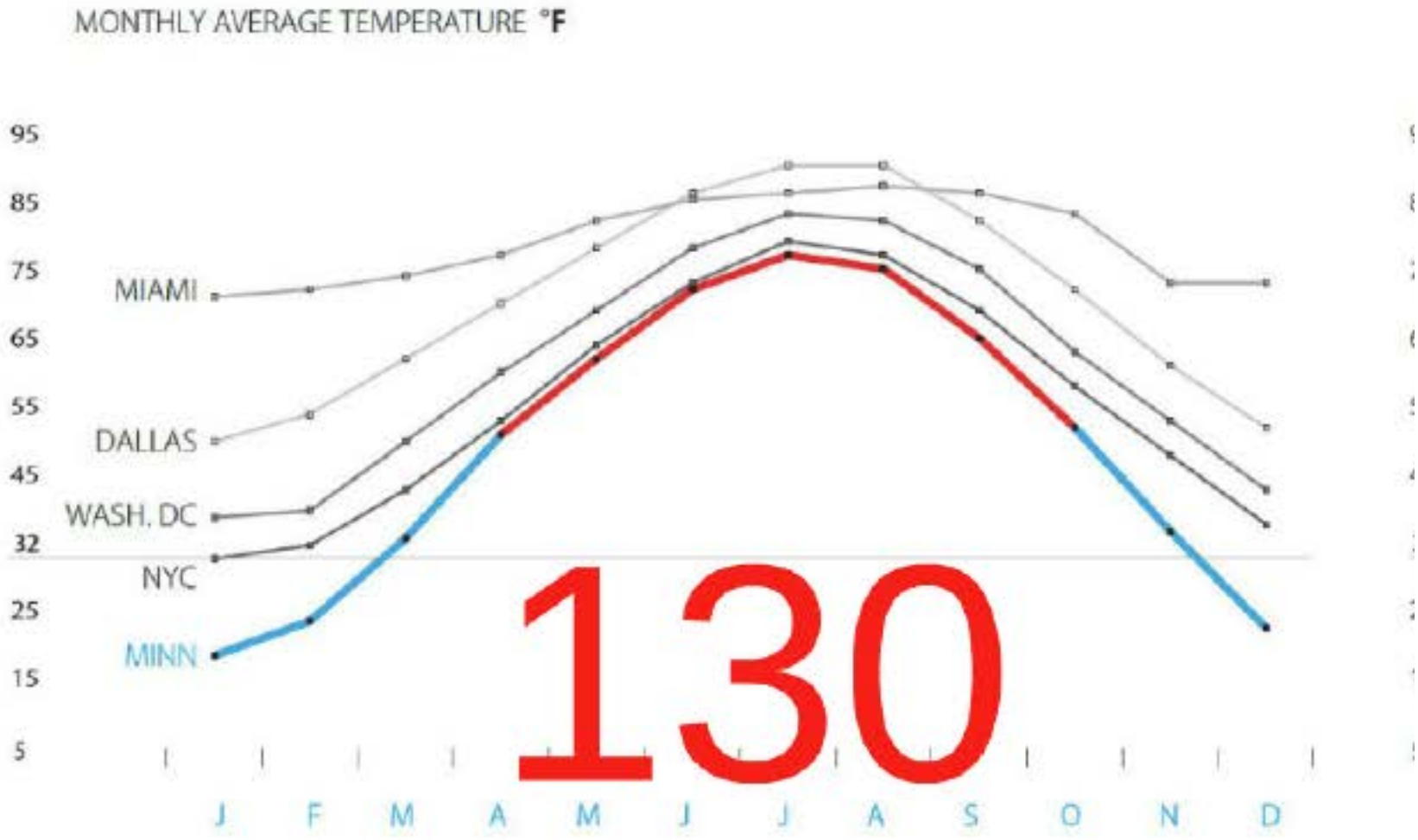
Homes for Generations


MONTHLY AVERAGE TEMPERATURE °F
95
85
75
65
55
45
32
25
15
5
MIAMI
DALLAS
WASH. DC
NYC
MINN
130
J
F
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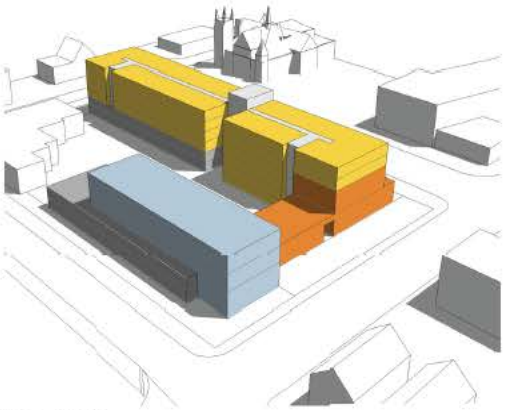
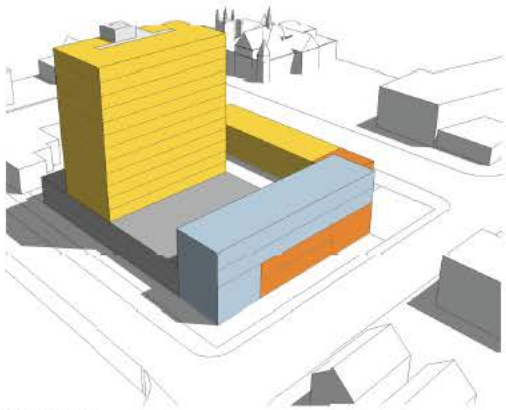
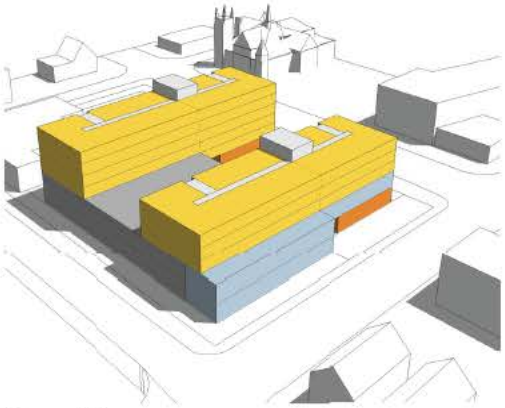


Scheme 01

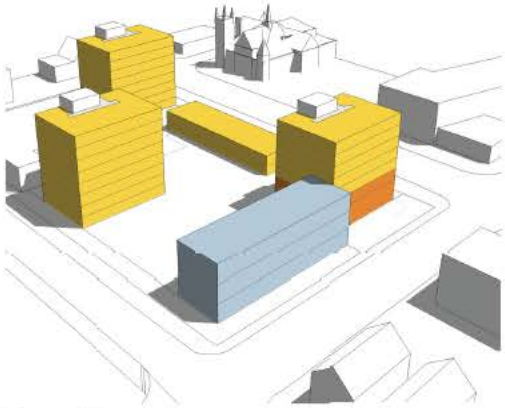
Scheme 02



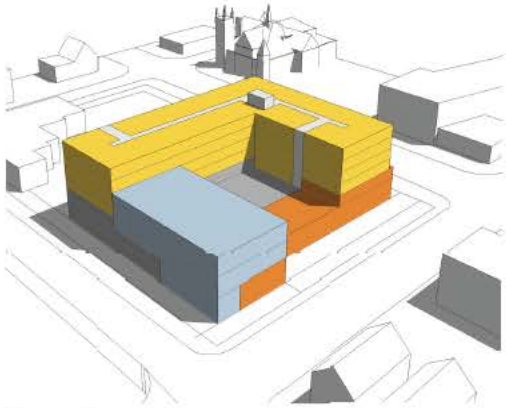
Scheme 03



Scheme 04



Scheme 05



Scheme 06

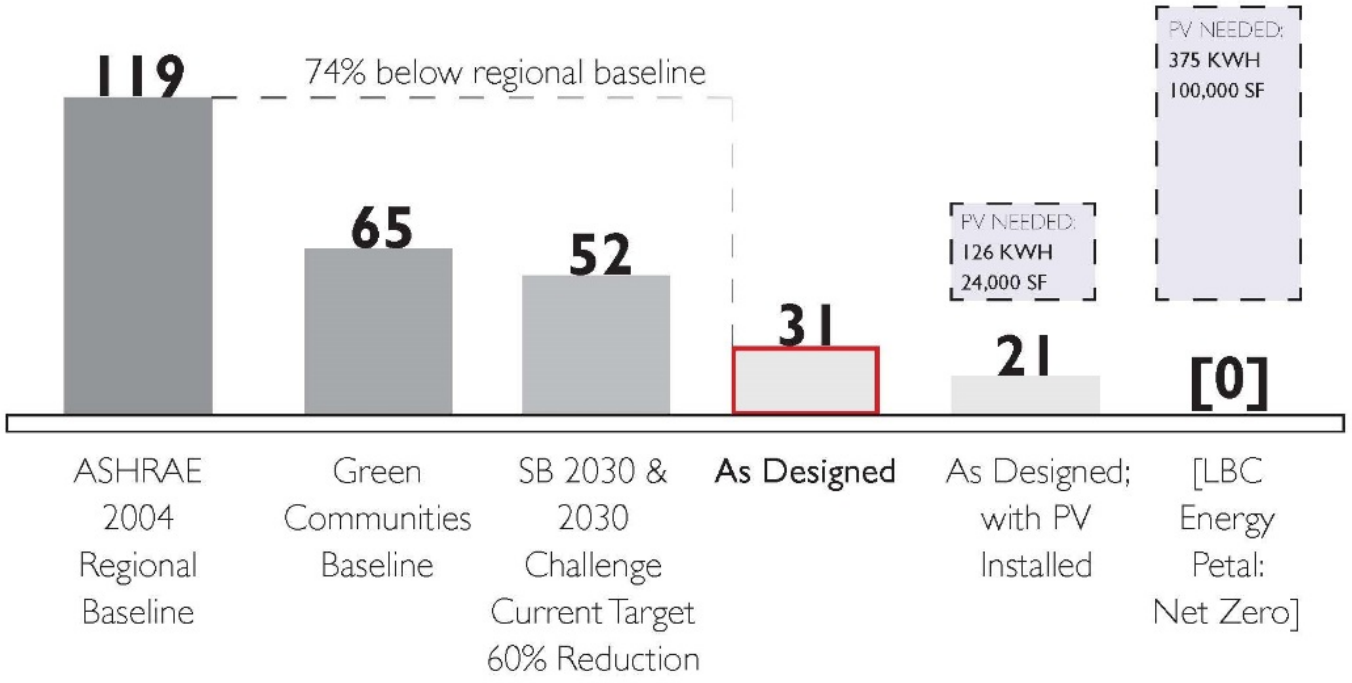
HOPE Community

aeon
Homes for Generations

Orientation, Massing, Energy Modeling

What does this add up to?

Design EUI **31** kbtu / sf / year



Sustainable Living

Resident Engagement Pilot Project

Paeon
Homes for Generations

HOPE
Community

Balfour Beatty
Communities

Achieving Net Zero with Balfour Beatty Communities






@TCInnovator

Tabitha Crawford, CEM, CDSM

SVP Balfour Beatty Investments

May 28th, 2015

Balfour Beatty
Communities

Agenda

- About Our Company
- Why Net Zero Makes Business Sense
- Behavior: Beyond the Homes

Balfour Beatty Communities

Balfour Beatty Across the U.S.

- Over $17.1 Billion Construction on LEED projects, not including NGBS, Energy Star, or residential portfolio
- New Homes Built Top 1% for Energy Efficiency (NAHB external review)
- 350 LEED APs
- Largest rooftop solar-powered community at Fort Bliss, TX 13.4 MW
- Built first / largest NGBS Emerald community (75% Net Zero)
- 2014 NGBS Multifamily Project of the Year – Fort Bliss Emerald Community

Balfour Beatty
Communities

About Balfour Beatty Communities

- Diverse Portfolio of Owned and Operated Properties
  - 45,000 Homes
  - 55 Military Housing
  - 8 Student Accommodation
- North American PPP Focus
  - Military Family Housing
  - Municipal Centers
  - Hospitals

Balfour Beatty Communities

Net Zero in our DNA

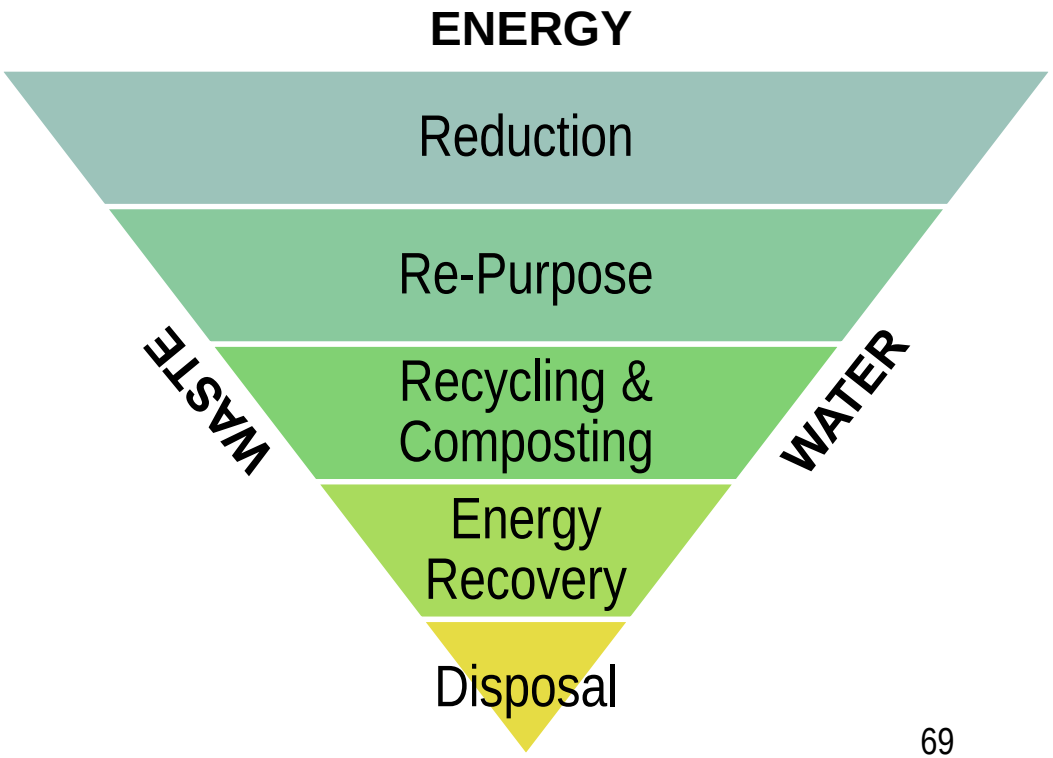
- Net Zero Higher Education:
  - Portland Community College, Sylvania Campus, OR
  - University of Hertfordshire, UK
- Texas' first Net Zero Public Middle School
- Net Zero Gov't Bldg Edith Green-Wendell Wyatt Fed Reserve
- First Zero Carbon Office in Hong Kong
- Army Partner for Housing at:
  - 2 "Net Zero Installations"

    (Waste, Water, Energy: Fort Carson, Fort Bliss)
  - 2 "Net Zero Energy" Installations (West Point, Fort Detrick)

Balfour Beatty
Communities

Why Net Zero—The Business Case

- Reduced Operating Costs
- Increased Energy Security
- Enhanced Community Sustainability
- Client Driven Standard



Balfour Beatty Communities

Fort Bliss NGBS Emerald Community: Near Net Zero

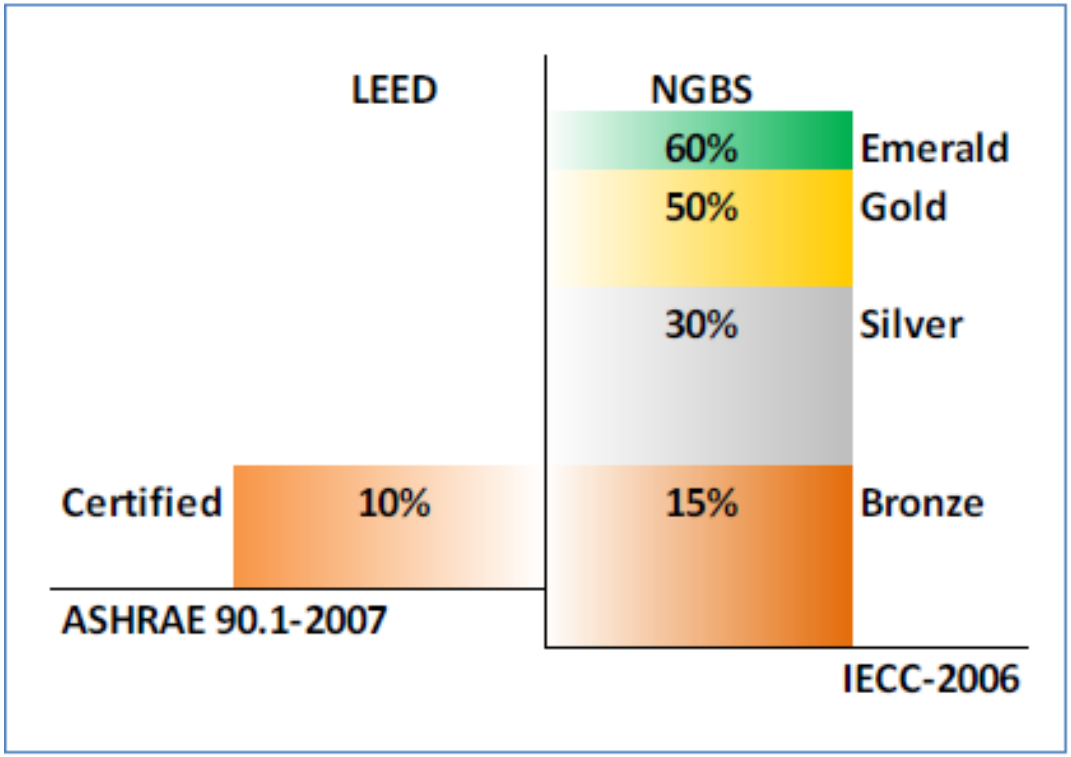
- 250 New Multi-family Development
- Largest Emerald Certified Community
- Only a 3% Construction Cost Premium
- 13.4 MW Community Solar

Balfour Beatty Communities

Why NGBS? Reduced Operating Expenses

- Utilities = Major Expense for Housing Portfolio
- Every Dollar Saved = Improved Amenities Quality of Life for Residents

Table 1 – Minimum Energy Efficiency Requirements
Percentage Improvement Above Code



5,200+ kWh savings/year per home
1,300,000 kWh savings/year all homes

$383/year per home*
$95,000/year all homes*

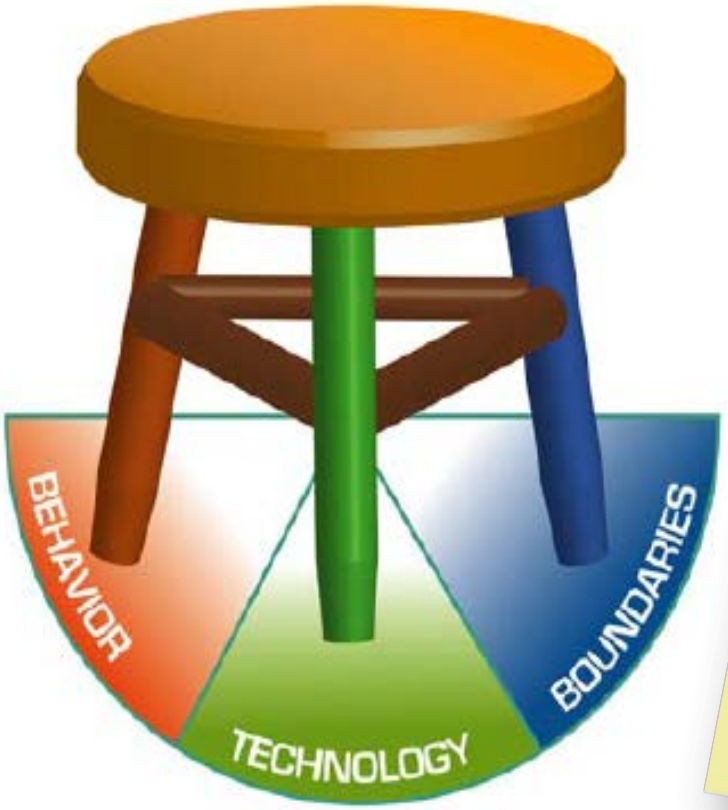
*Based on 2012 electric rate of $0.073/kWh

Balfour Beatty
Communities

3rd Party Owned Rooftop Creates No Cost to Project

Balfour Beatty
Communities

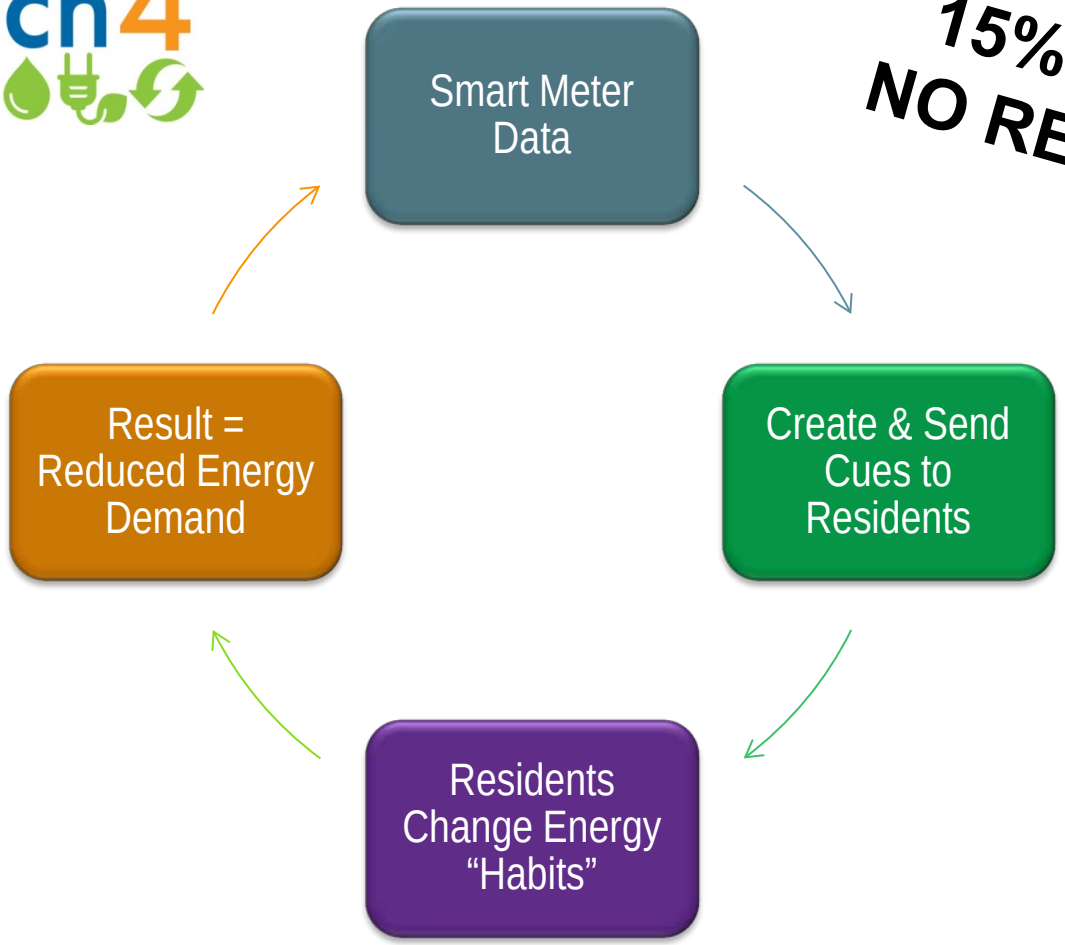
Behavior, Big Data & Smart Meters



Balfour Beatty Communities

Demand Side Management

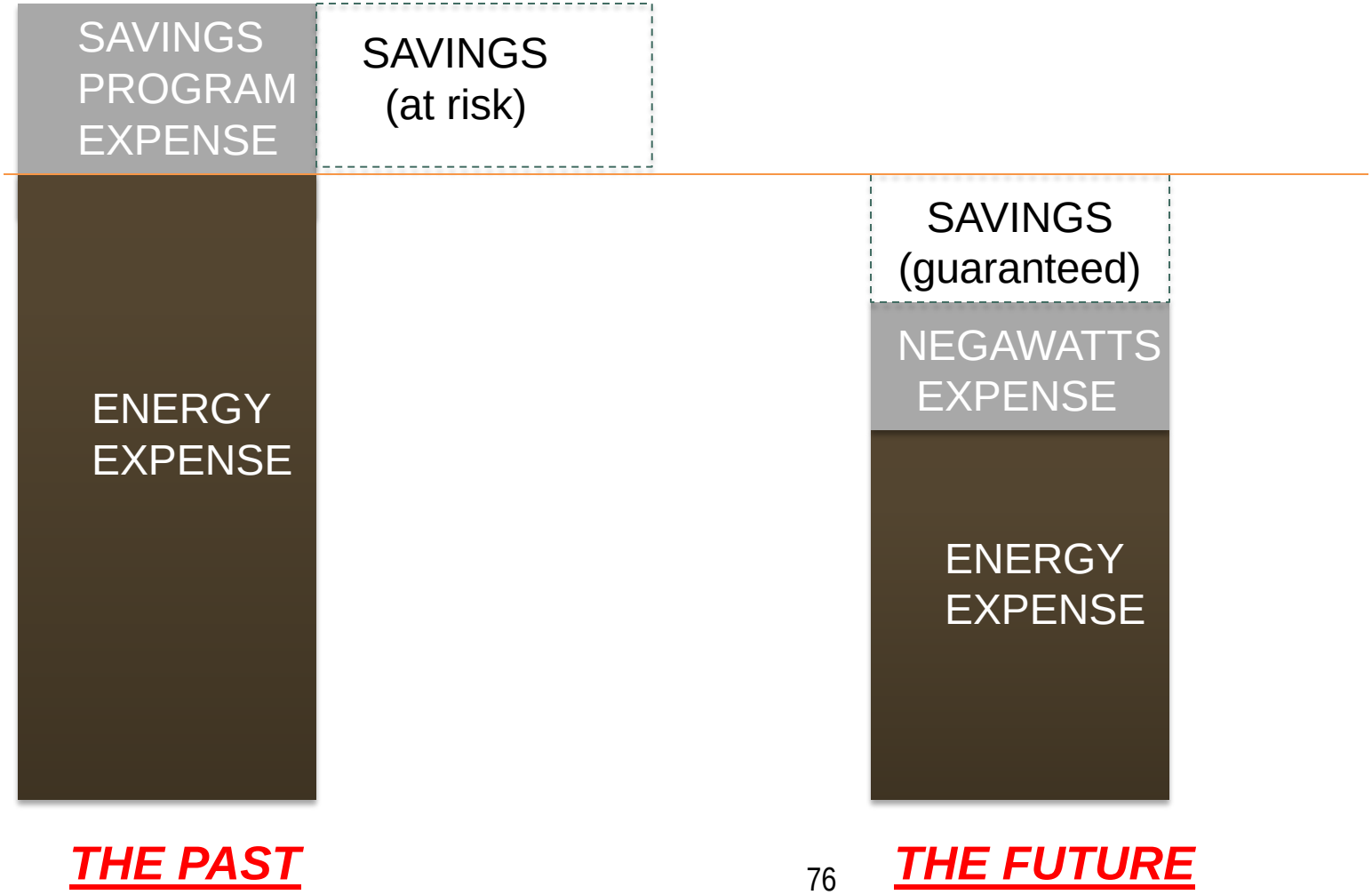
Switch4Good



15% Savings
NO RETROFITS

- Eliminate Upfront Cost – 3rd Party ESPC / PPA Type Model
- Guarantee No “Out of Pocket” Risk for Owner or Residents

Guaranteed Negawatts: Changes the conversation



Balfour Beatty
Communities

For more information….

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