ADVANCED BUILDING CONSTRUCTION

Collaborative

RMI
ENERGY. TRANSFORMED.

ADVANCED BUILDING CONSTRUCTION FOR ENVELOPE RETROFITS

Need and Opportunity for ABC Retrofits

Lucas Toffoli | RMI

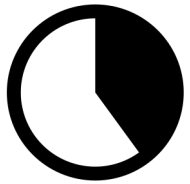
27 October 2022

PhiusCon | Chicago

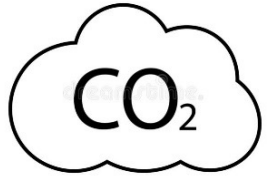
Cycle A+P

US Existing Building Stock

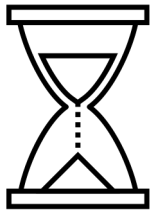
125+
million buildings across the US



40%
of total U.S. energy use

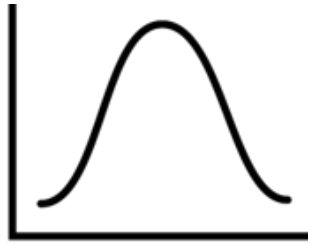


35%
of carbon emissions



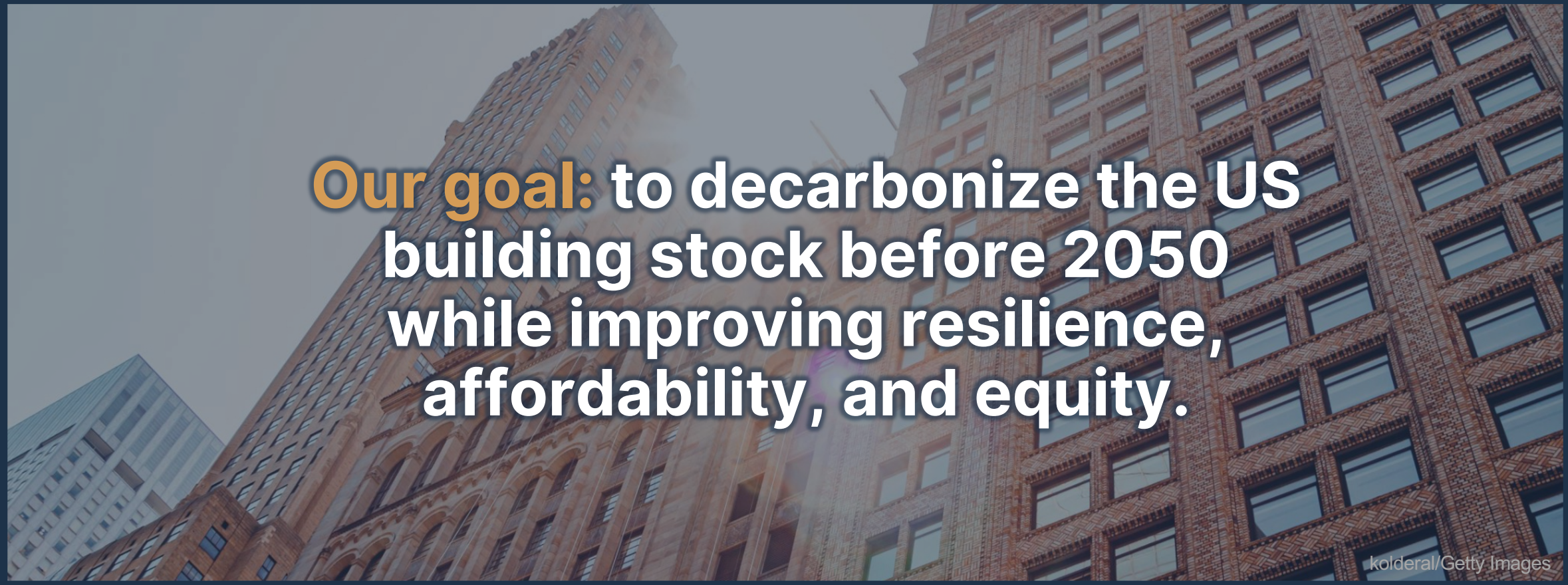
50%
of U.S. buildings are >40 years old

75%
of electricity



75%
of peak demand

EIA Annual Energy Outlook 2020; EIA CBECS 2012 and RECS 2015


Our goal: to decarbonize the US building stock before 2050 while improving resilience, affordability, and equity.
kolderal/Getty Images


Our hypothesis: by modernizing the construction industry and using more holistic definitions of quality and value, we can accelerate the pace at which decarbonization strategies are adopted by the mainstream buildings sector.
Mariko Reed / Onion Flats

Our approach:
Advanced Building Construction (ABC)

ABC refers to retrofit (and new construction) solutions that combine:

Energy-efficient building decarbonization

+

Scalable, streamlined industrialized construction approaches

Deep energy efficiency has substantial co-benefits.

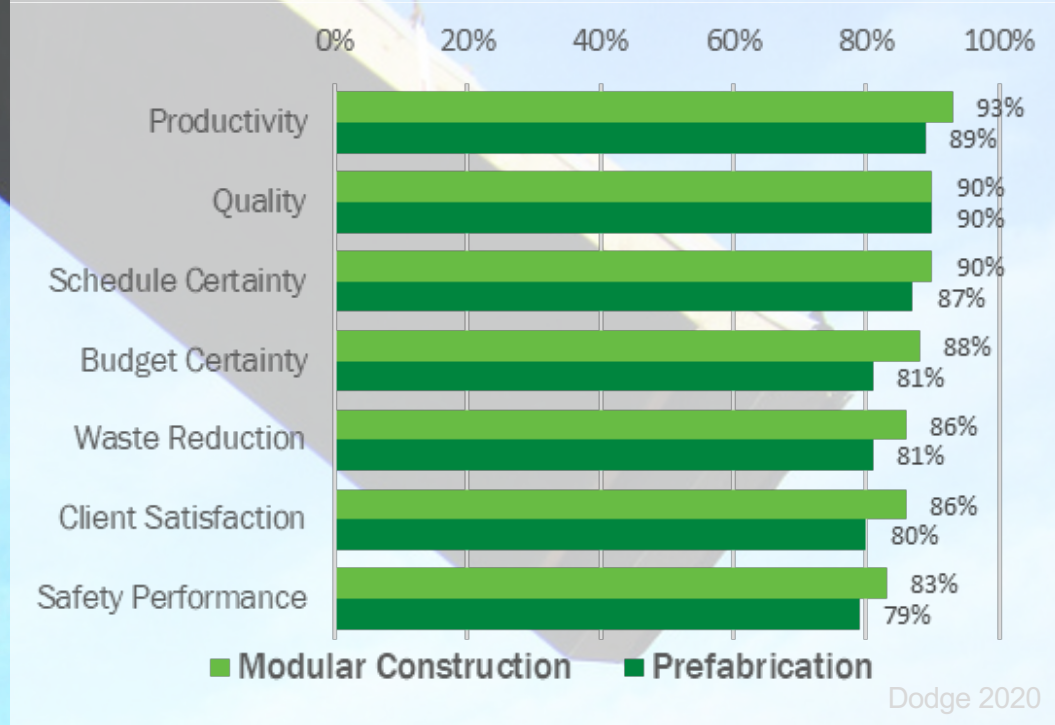
- Reduced maintenance
- Increased thermal and acoustic comfort
- Improved indoor air quality and health outcomes
- Resilience, including passive survivability
- Reduced emissions for climate and compliance
- Electrical grid stability

Industrialized construction (IC) can help rapidly deploy energy-efficient, low-carbon retrofits at scale.

- Only a small percentage of US construction uses industrialized approaches.
- Yet a latent zero-carbon retrofit market could be unlocked using IC methods, which can enable **higher performance, faster deployment, less disruption, reduced schedule risk, precise material use and waste reduction, enhanced QC, technology integration, and workforce benefits**.

Collaboration is critical to achieve this!

Survey of AEC stakeholders: improvements in various categories with IC



Renusol

The status quo is failing us—
transformation is needed to address retrofits

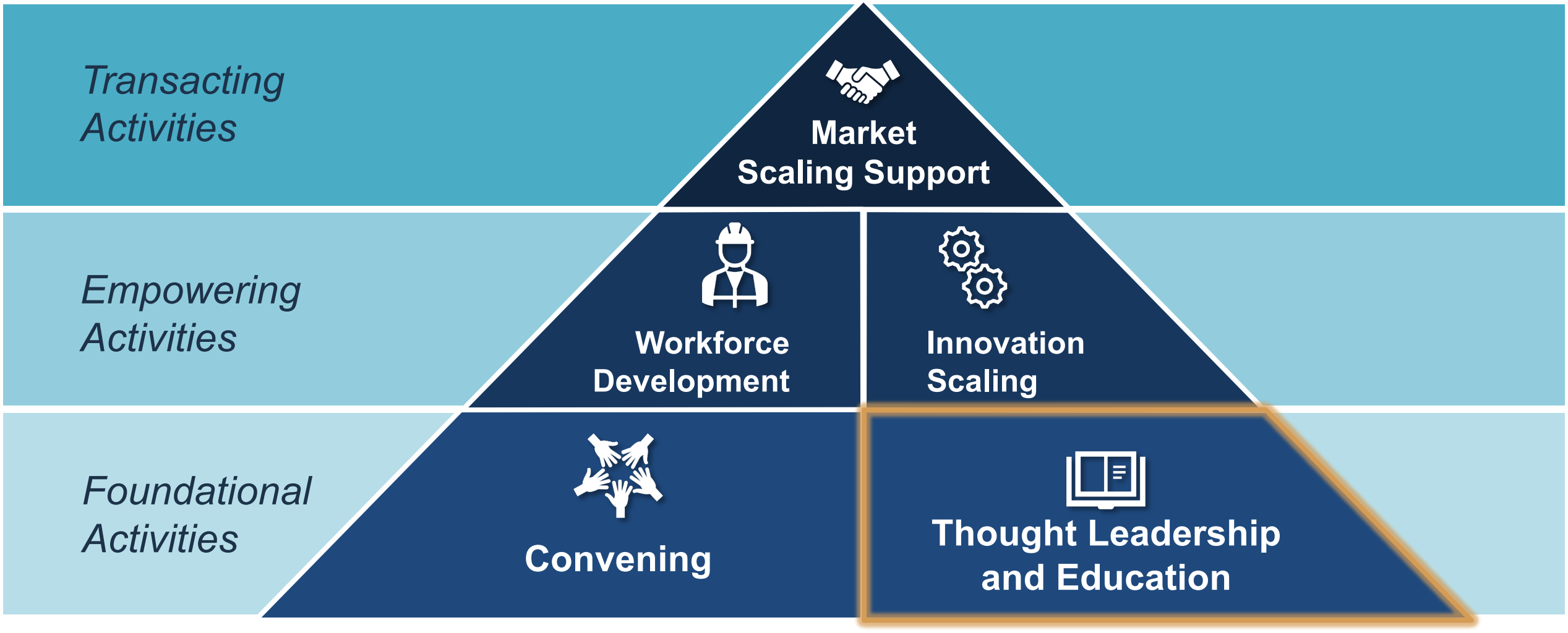
US annual retrofits fall far short

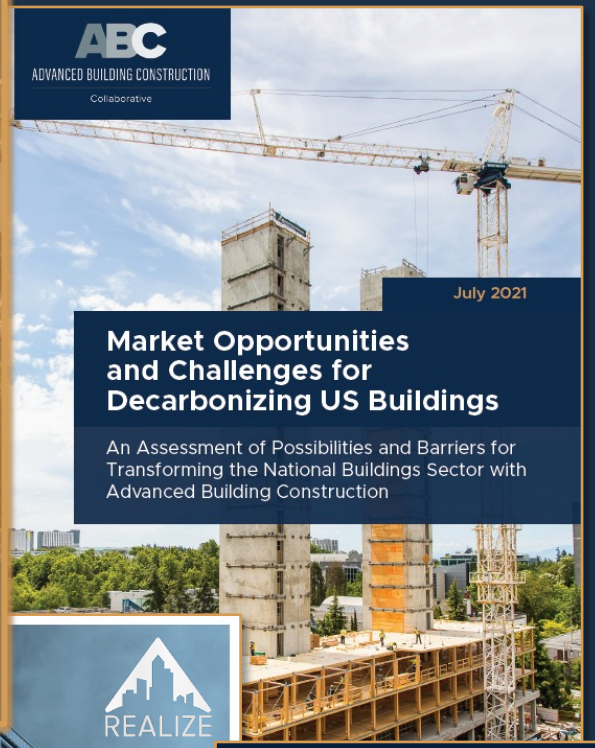
- Only **~2% of commercial building space** and **<1% percent of homes** undergo energy improvements each year
- Improvements are **typically shallow**, rarely surpassing 30% energy savings
- Comprehensive **upgrades don't appeal to consumers:** too costly compared to perceived value, slow, disruptive, and inconsistent

2030 objectives

- **3M+ net-zero carbon retrofits** per year
- **ABC is used in at least 25%** of overall construction activity
- **Innovative private sector business models** and public sector support unlock the market

The ABC Collaborative's core activities foster, inform, and accelerate an ABC ecosystem.



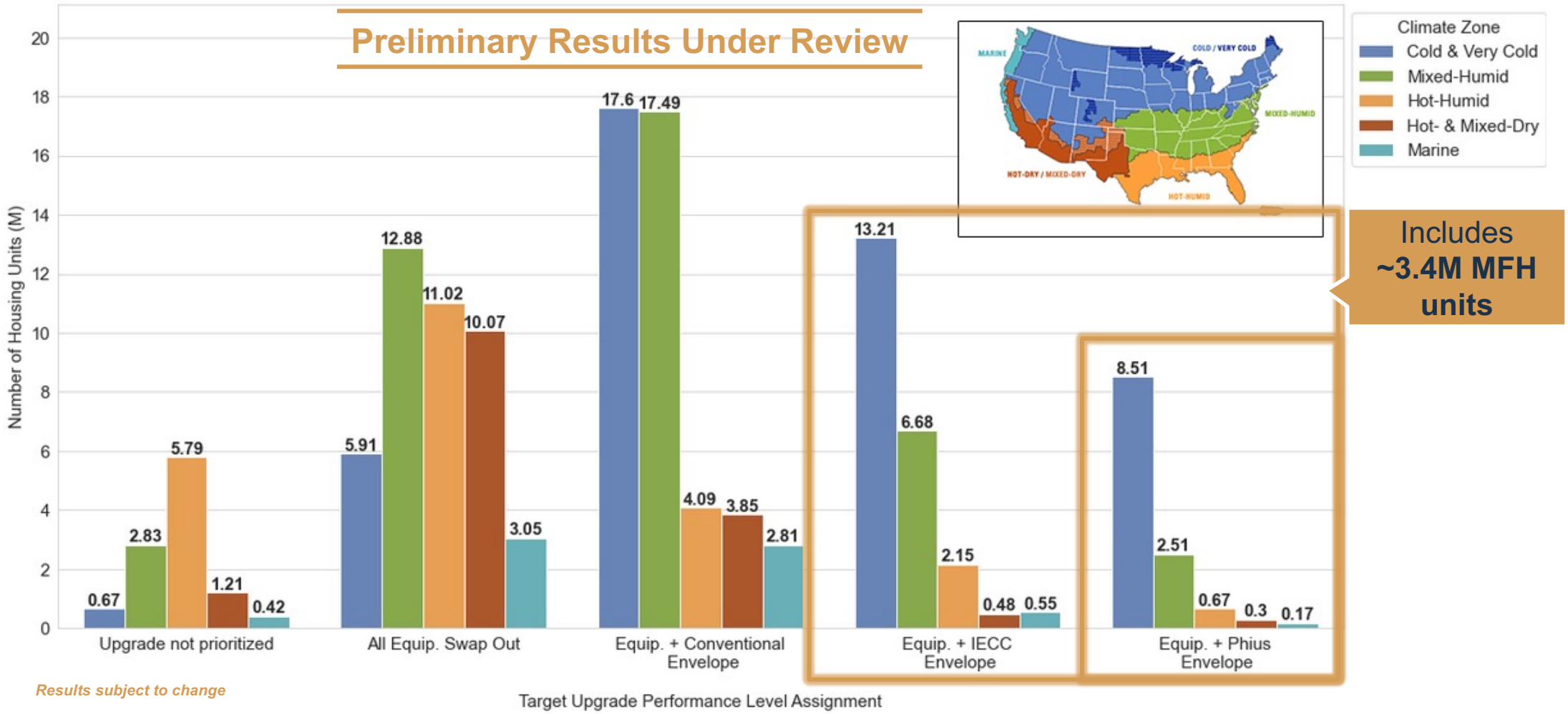


Thought leadership helps guid industry actors in the nascent ABC market.

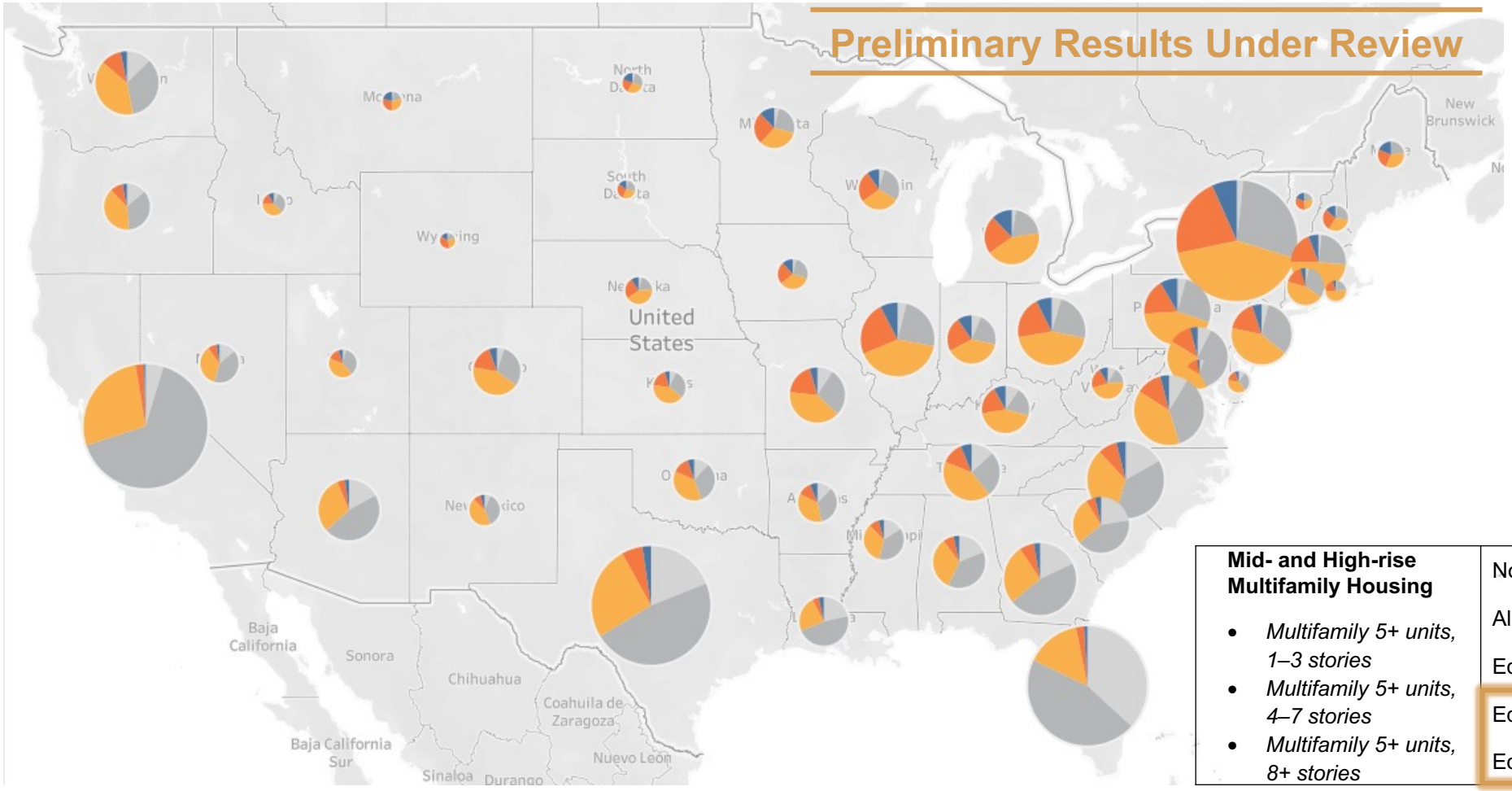
Guidance for ABC stakeholders includes:

- ABC Market Insights Report
- Building Stock Characterization Studies (NREL)
- Industry Guidance Report – residential report expected this fall
- Topical briefs and Working Group outputs
- Topic/stakeholder-specific knowledge shares and educational sessions
- Insights on ABC opportunities

Industry Guidance Report:
many buildings will need “deeper” retrofits!



Industry Guidance Report: Northeast and Midwest need many deep MFH retrofits



Mid- and High-rise Multifamily Housing			
• *Multifamily 5+ units, 1–3 stories* • *Multifamily 5+ units, 4–7 stories* • *Multifamily 5+ units, 8+ stories*	Not prioritized for upgrade	2.7M	11%
	All equipment swap out	9.5M	40%
	Equip. + conventional env.	8.0M	34%
	Equip. + IECC envelope	2.6M	11%
	Equip. + Phius envelope	0.8M	4%

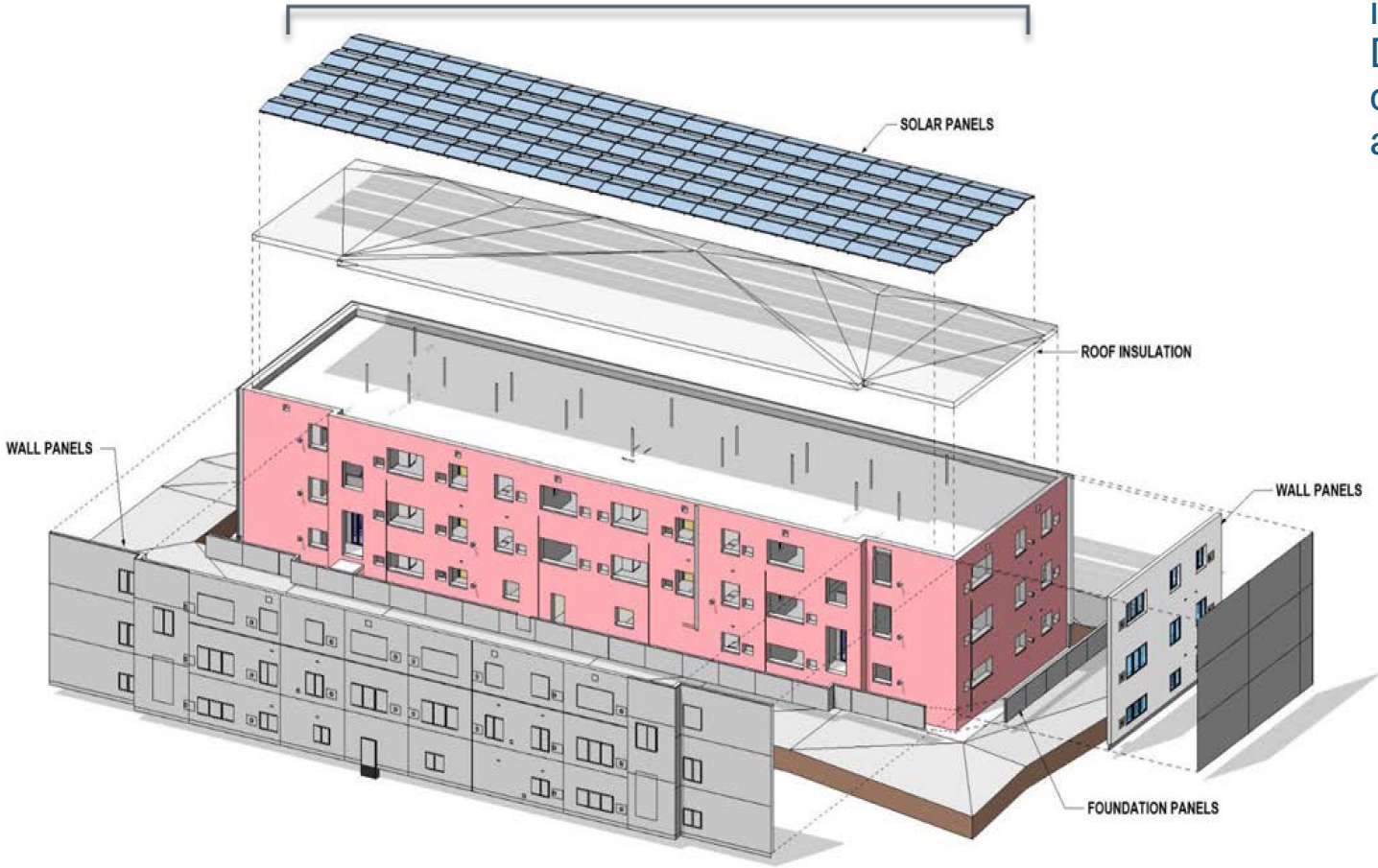
Results subject to change

Standardized packages can enable scale.

High-performance roof system
including integrated solar

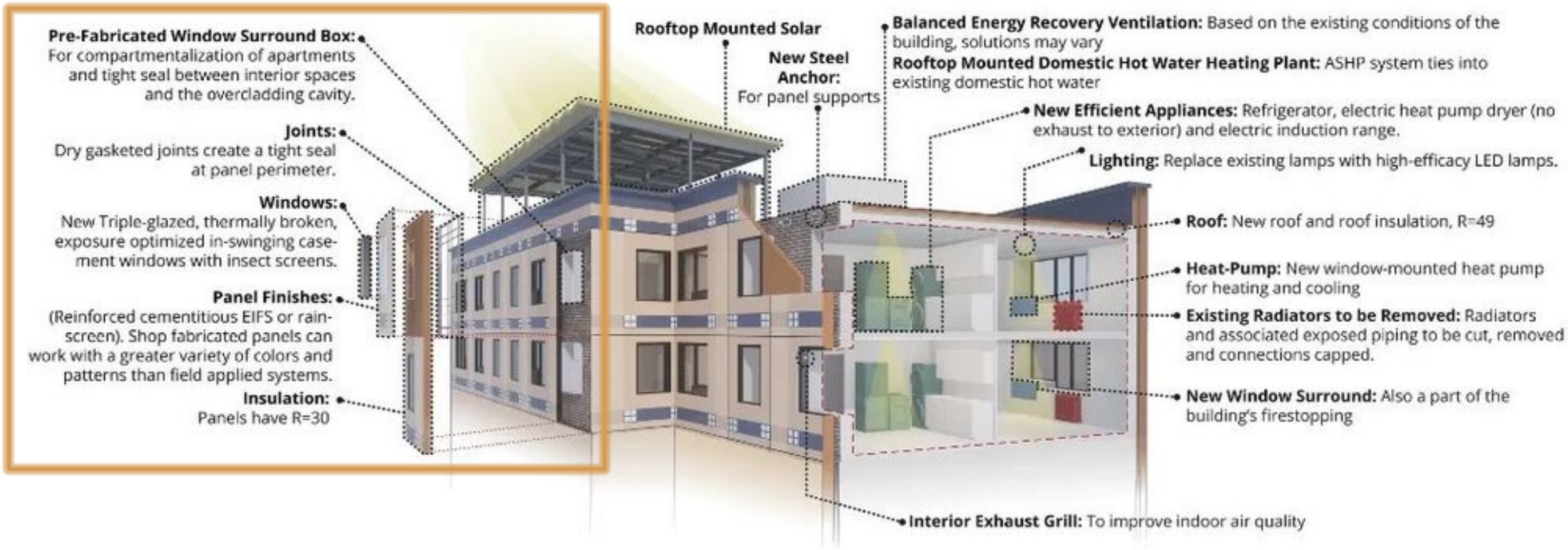
Integrated mechanicals
including HVAC and DHW, with controls and option for smart inverter and energy storage

Prefabricated wall panels including high-performance windows and doors



All-electric
equipment

Standardized packages can enable scale.



Cycle A+P

Collaborative Network*

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ADL VENTURES

ASSOCIATION FOR ENERGY AFFORDABILITY

phius

veic

REALIZE

CALIFORNIA ENERGY COMMISSION

MASSACHUSETTS CLEAN ENERGY CENTER

NEW YORK STATE OF OPPORTUNITY. NYSERDA

MMC Modular Mobilization Coalition

GAF

NASEO National Association of State Energy Officials

MIGHTY BUILDINGS

Housing Innovation Alliance

sto Building with conscience.

ICC INTERNATIONAL CODE COUNCIL®

Emerald Cities COLLABORATIVE America empowered.

MODULAR BUILDING INSTITUTE

WYTHE WINDOWS

BERKELEY LAB

WinnCompanies

NEXII

NREL Transforming ENERGY

THIRD DERIVATIVE

ALPEN HIGH PERFORMANCE PRODUCTS

VOLUMETRIC BUILDING COMPANIES

AO Smith. Innovation has a name.

Goodman Air Conditioning & Heating

City of Milwaukee

UL

OWENS CORNING

FUJITSU

cpc Community Preservation Corporation

MITSUBISHI ELECTRIC

REVISION ENERGY

MODULE

California Housing Partnership

LG Air Conditioning Technologies

NYCEEC BUILDING FINANCIAL SOLUTIONS

Innovation Incubator

Taco Comfort Solutions A Taco Family Company

ONION FLATS ARCHITECTURE

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DOER Massachusetts Department of Energy Resources

MERLIN SOLAR

TIMBERHP by GO LAB

ZNE CAPITAL

GREEN BUILDING ALLIANCE

Rheem

INOVUES ADAPTIVE GLAZING SHIELDS

CRATE

GigaCrete

passivhaus MAINE

aBS

PEABODY PROPERTIES

RENEWABLE ENERGY

KOMAN

The Composites iacmi Institute

FABRIC

OAK RIDGE National Laboratory

HYDRONIC SHELL TECHNOLOGIES

FLAIR

BuildingEase Connecting the dots from design through procurement

etopia More than just a house builder.

WCEC WESTERN COOLING EFFICIENCY CENTER

Sheppard Group, LLC

Akeptus

function form

PUMA RISK

alpha group

Arqlite

KAPTURE PREFAB

*Partial list; see website for current list of Collaborators and Supporters.

Includes ABC Collaborative team members, funders, MOU signers, Letter of Support writers, and other significant collaborators


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