2024 PROJECT PEER REVIEW

U.S. DEPARTMENT OF ENERGY
BUILDING TECHNOLOGIES OFFICE

BTO Peer Review:

Next Generation Wall Retrofit Panels w/ Integrated VIPs

Phase 2 & 3:

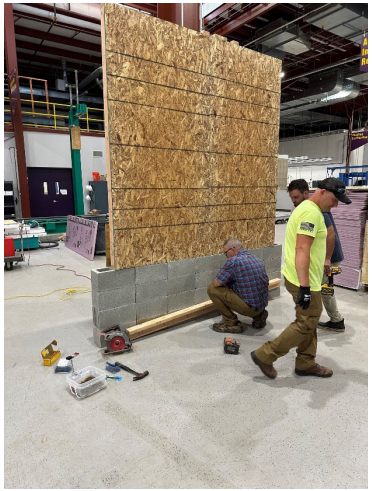
Overview of Baseline Data, Manufacturing, and Construction

Next Generation Wall Retrofit Panels w/ Integrated VIPs

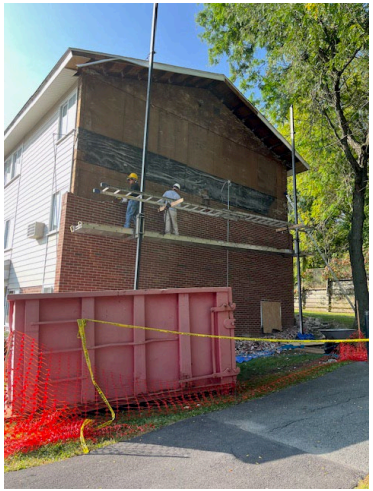
Baseline Data

Manufacturing

Contractor Training



Construction



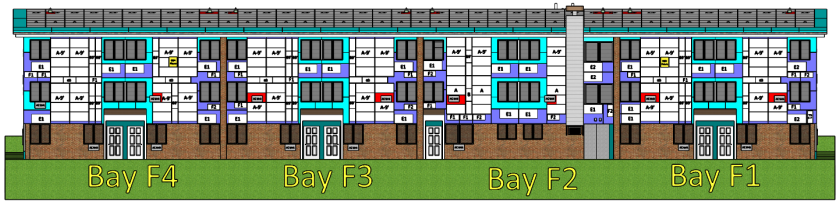
Performing Organization: Home Innovation Research Labs, ORNL, Albany Housing Authority, SIPA, and Va-Q-Tec
Principal Investigator: John B. Peavey, Director of Building Science
Contact Information: (301) 430-6238 and jpeavey@homeinnovation.com
DOE Project: DE-EE0009063

Project Summary

OBJECTIVE, OUTCOME, & IMPACT

Focus on improving the energy efficiency of multifamily buildings built between 1920-1980:

[1] VIP Enhanced – Retrofit Insulated Panel
[2] Target Existing Affordable Housing
[3] Target EUI improvement of 70%
[4] Whole-Building Approach



TEAM & PARTNERS

Technical: Home Innovation Research Labs, ORNL
Location: Albany Housing Authority
Association: SIPA
Manufacturers: Va-Q-Tec & Panel Wrights LLC
Field Representative: LaRocque Services

STATS

Performance Period: 07/01/2020 – 11/30/2026

DOE Budget: $4,229k, Cost Share: $1,613k

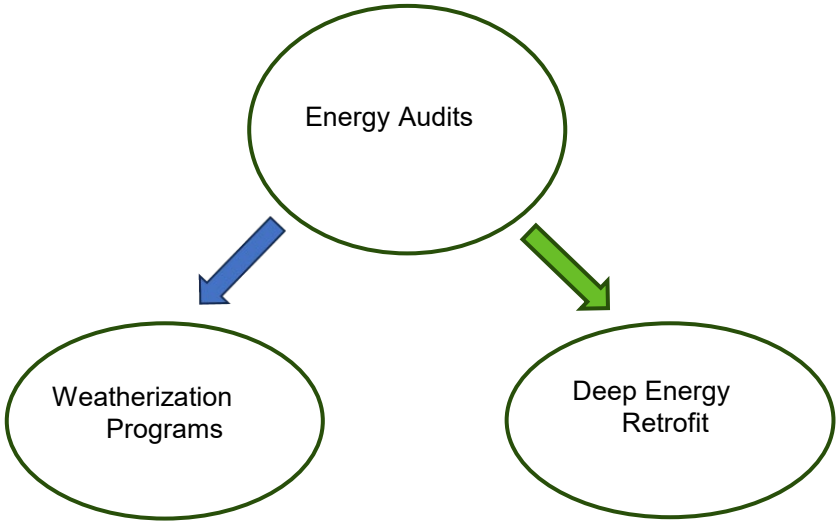
Milestone 1: Product Testing

Milestone 2: Effective R-Value (R26-R33)

Milestone 3: Construction and M&V

Problem: Reducing Energy Usage in Existing Buildings

Is there value in improving the energy usage in existing buildings? Yes



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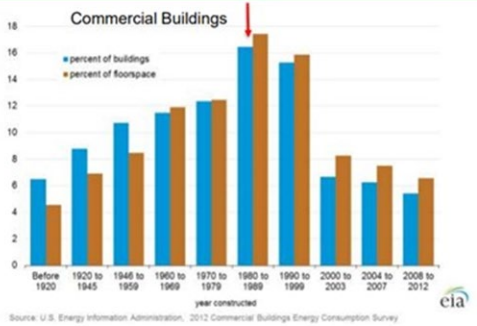
Half of Our Nation's Buildings > 40 Years Old



Source: U.S. Energy Information Administration, 2012 Commercial Buildings Energy Consumption Survey

Residential Buildings

Characteristics	Estimate (millions)
Single Family	80
2 to 4	10
5 or more	20
Mobile/Trailer	7
Total Occupied Units	**118**
Year Structure Built	
2010 to 2015	4
2005 to 2009	8
2000 to 2004	9
1990s	15
1980s	16
1970s	18
1960s	13
1950s	13
1940s	6
1930s	4
1920s	5
pre-1920	8
Median Year Built	**1976**

- ✓ **Updating our existing buildings generally beats building new efficient ones (from lifecycle energy perspective)**
- ✓ Depending on assumptions…takes between 10 to 80 years to make up the energy used during construction

Source:
Excerpt from DOE Presentation
Joan Glickman (February 5, 2020)

Problem: Reducing Energy Usage in Existing Buildings

The current challenges with Deep Energy Retrofits is well known…

- Too Slow
- Too Disruptive
- Too Costly
- Too Short on energy savings
- How can we encourage or incentivize existing building owners to do deep energy retrofits?
- Can innovative solutions be implemented and realized within 3-5 years?

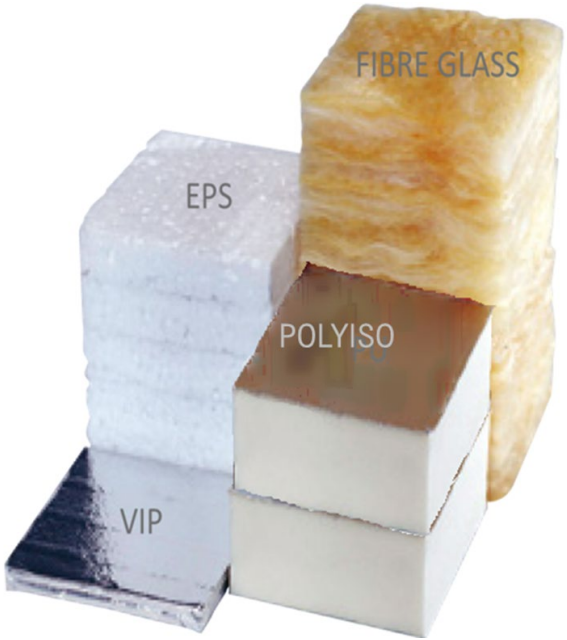
Source:
Excerpt from DOE Presentation
Joan Glickman (February 5, 2020)

Alignment and Impact: The Innovation

New Building Product: Thinner Insulation Products w/ Higher R-Value

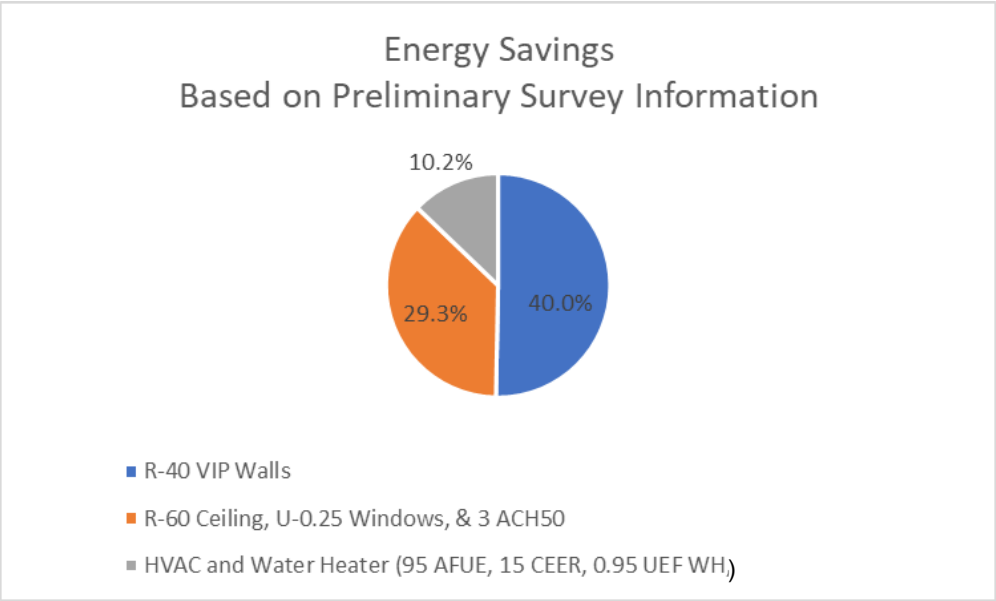
Next Generation Retrofit Insulated Panel

- Modify existing product to make it perform better.
- A Thinner Panel is easier to use for retrofit projects
- Leverage the existing supply chain.
- Demonstrate the cost-effectiveness of the solution and if existing incentive programs are enough to support the renovations.



Alignment and Impact: The Case Study

Creighton Storey Homes Apartments



Benefits to Communities

- **Equity:** Focus on older multifamily housing to reduce energy bills for low- and-middle income households.
- **Affordability:** For housing authorities, reduce operating costs (50-70% EUI).
- **Resilience:** Improve the structure (roof and wall connections when possible).

Approach: Deep Energy Retrofits (Exterior Insulation)

Using Retrofit Nail Base Panels to improve insulation in the building envelope

Source: Capitol Woods Development (2015)
(Multifamily Apartment Units owned by Albany Housing Authority)

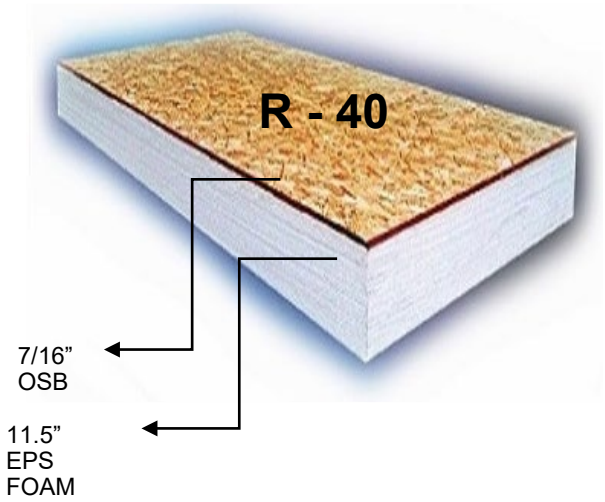
Existing Product: Retrofit Insulated Panel

EPS Foam or Neopor
R-Value: 3.5 per inch to 4.5 per inch

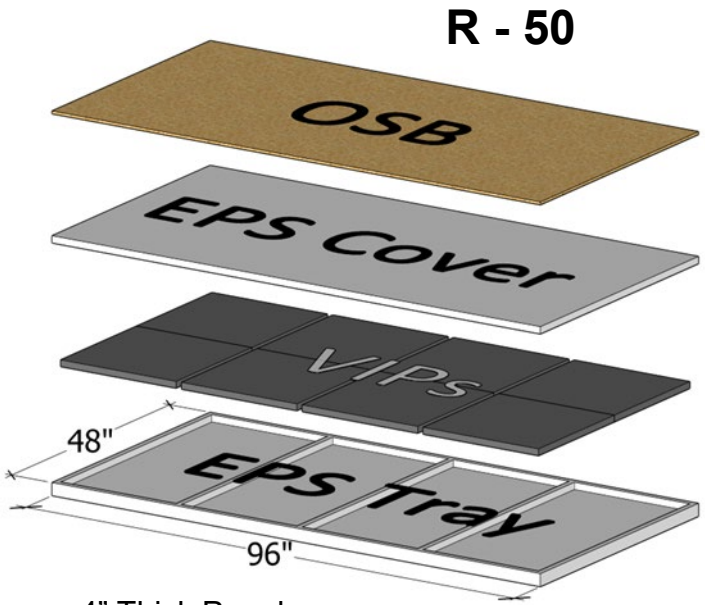
Limitations:
*Panel Thickness
*Wall Façade
*Windows
*Cost

Approach: Next Generation of Retrofit Insulated Panel

Existing Product

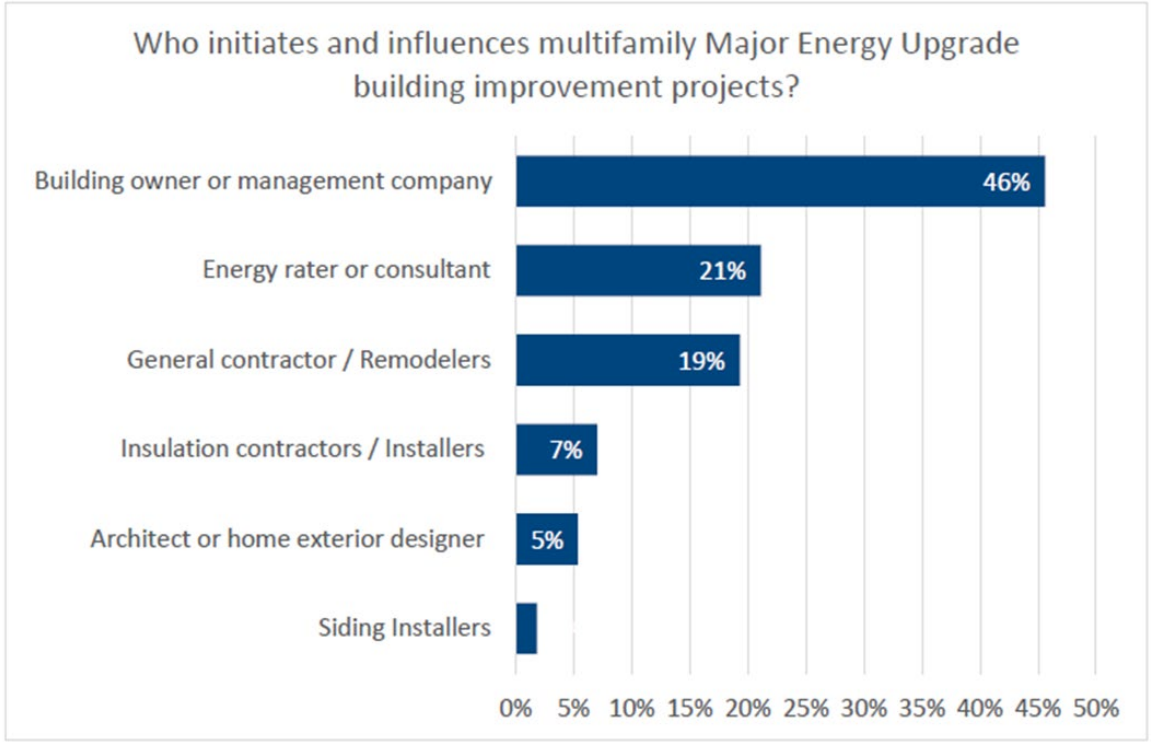


Next Generation Product

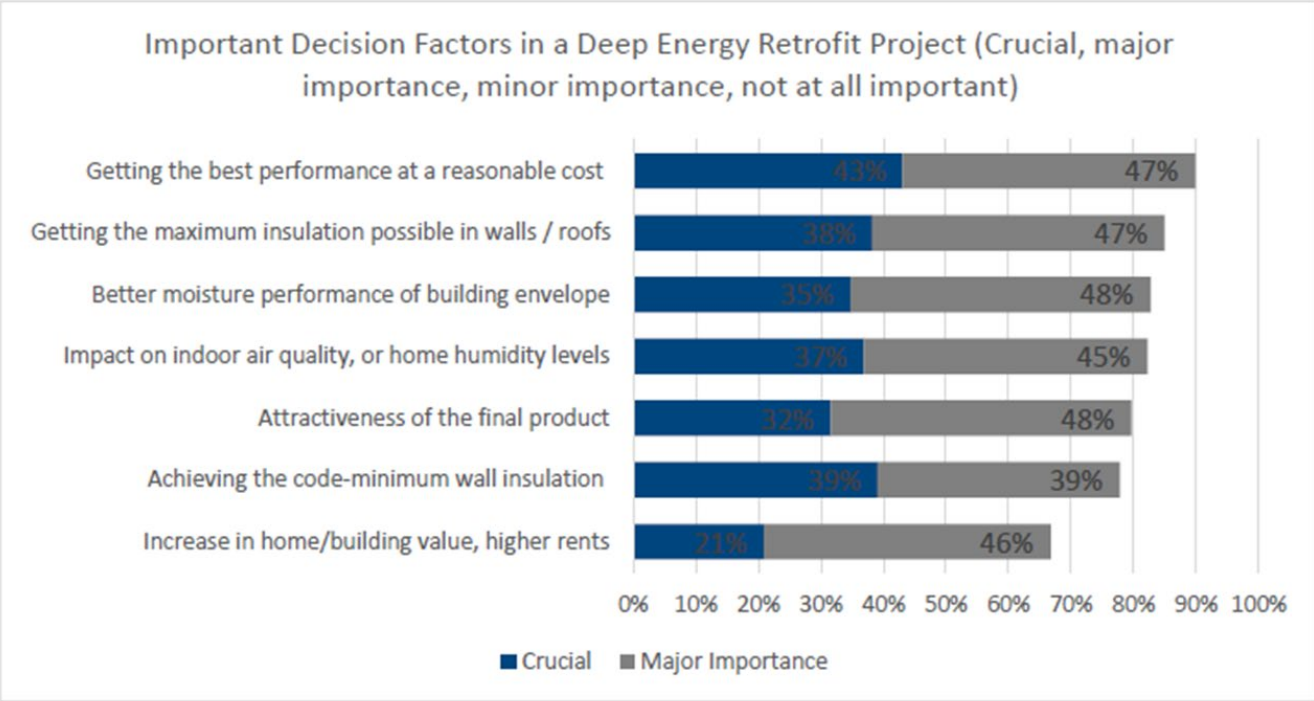


4” Thick Panel

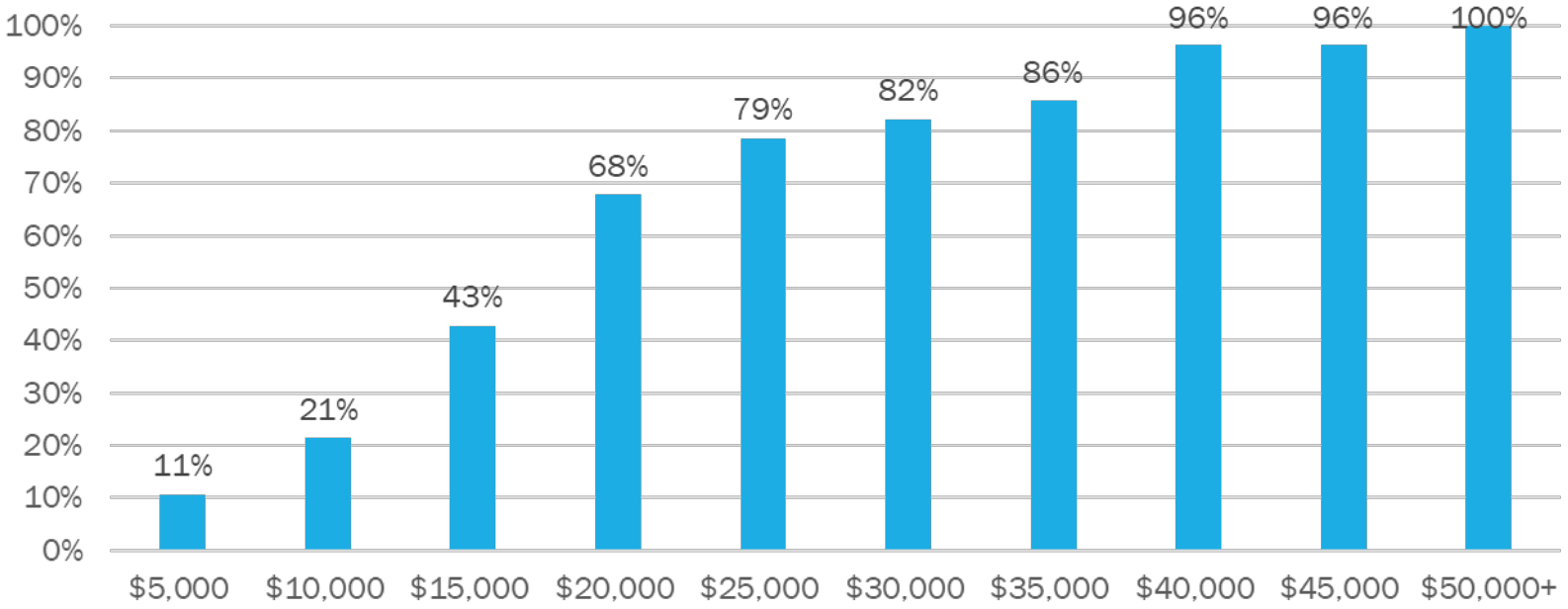
Approach: Market Research – Who are the Decision Makers



Approach: Market Research – Value Proposition



Approach: Market Research – Do Incentives Drive Retrofits?

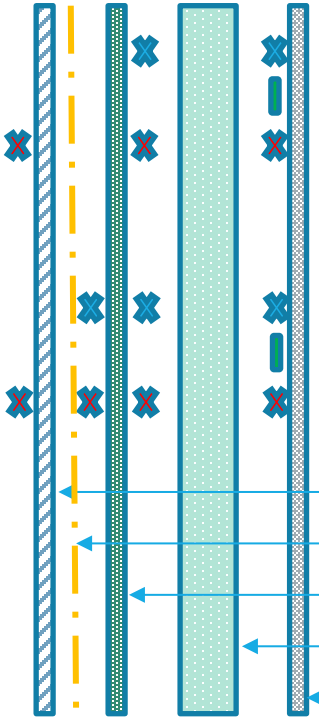


Q21. What is the minimum subsidy PER APARTMENT OR LIVING UNIT that would be sufficient for you to INITIATE A DEEP ENERGY RETROFIT for buildings your company owns to take advantage of the subsidy?

Approach: Creighton Storey Homes – Exterior Sensors

1st Floor
Apartment [Front]

1st Floor
Apartment [Back]

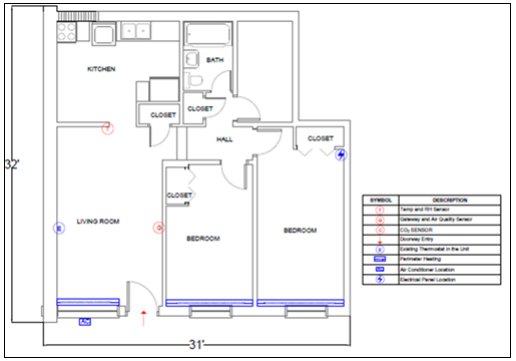


Pre-retrofit sensor package

- Temperature
- Relative humidity
- Heat flux transducer

- Exterior cladding
- OC Pink Wrap
- Exterior sheathing
- Foil faced fiber glass batt
- Interior drywall

Approach: Creighton Storey Homes – Interior Sensors



(17) of 30 Apartments

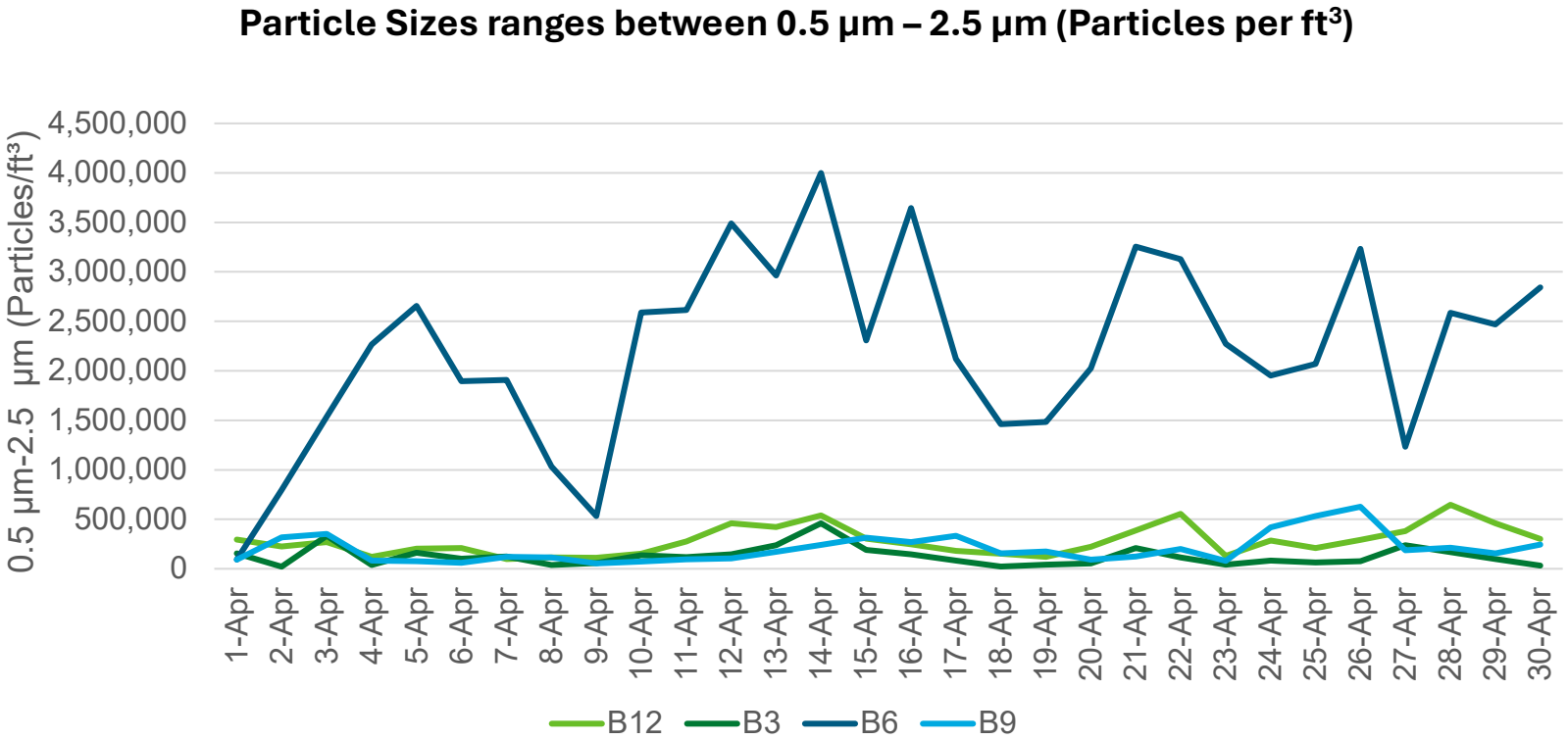
(21) Months of Baseline Performance Data

Voluntary Participants (Using IRB Survey)

Sensor Package: Energy and Indoor Air Quality Monitoring

Model	Description
Omnisense G-7	Gateway, CO Sensor, Particle Counter
Omnisense S-19	CO2 Sensor
Omnisense S-2-2	T&RH Sensor
Omnisense S-60	Wireless Energy Meter (AC)
Monnit MNS2-9-IN-3P-500	500 AMP 3 Phase Energy Meter (Whole Building)

Progress and Future Work: Baseline Data

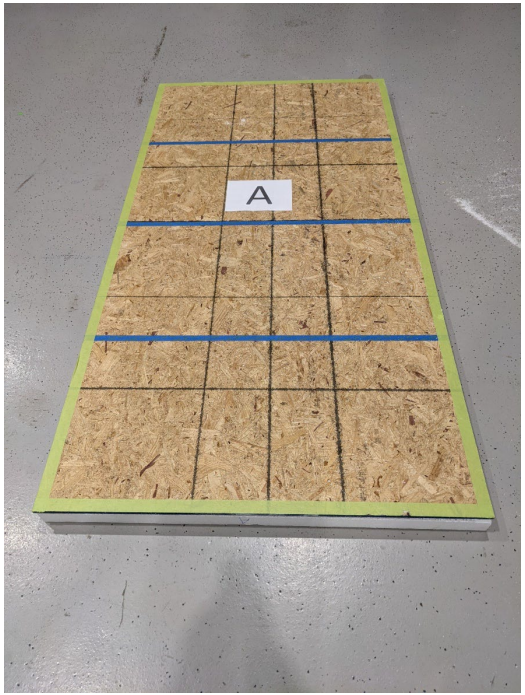


IAQ - Four Units from One Multifamily Building (Albany, NY) – April 2023: Baseline Particulate Data

Progress and Future Work: Manufacturing

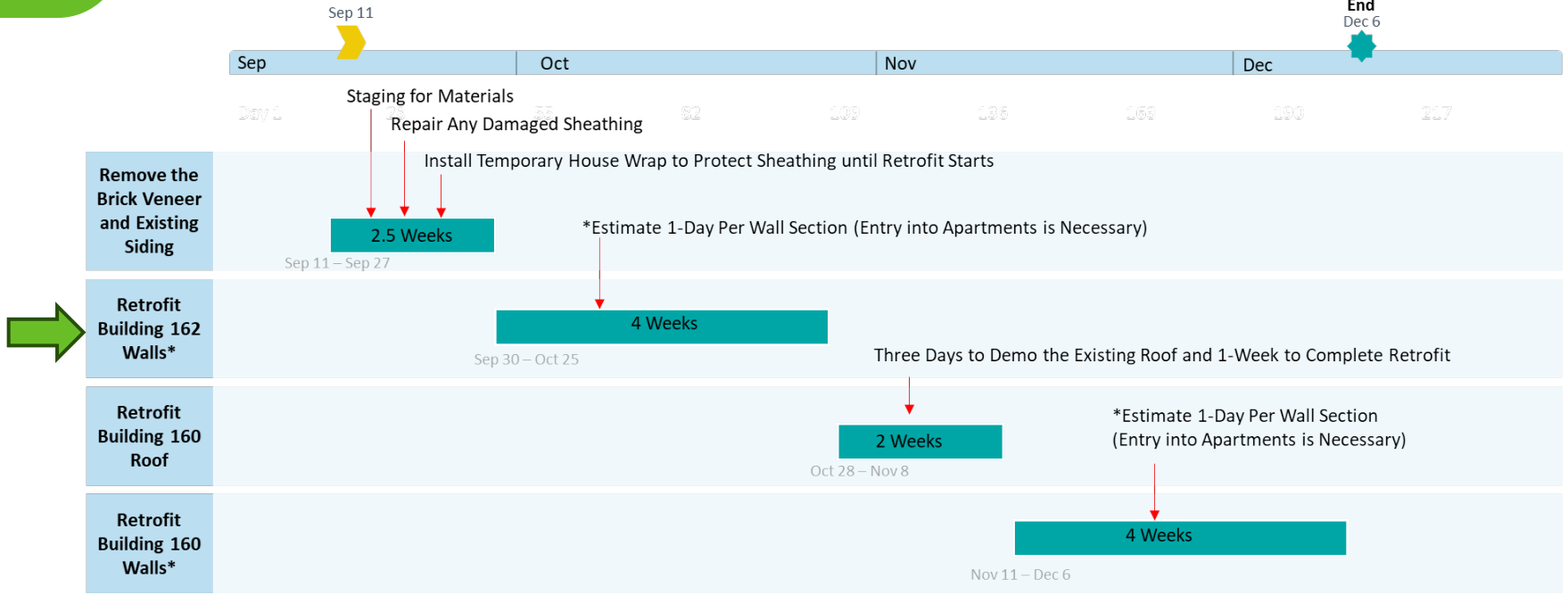
CNC Machining

Glue & Press Panels



Next-Gen Panels

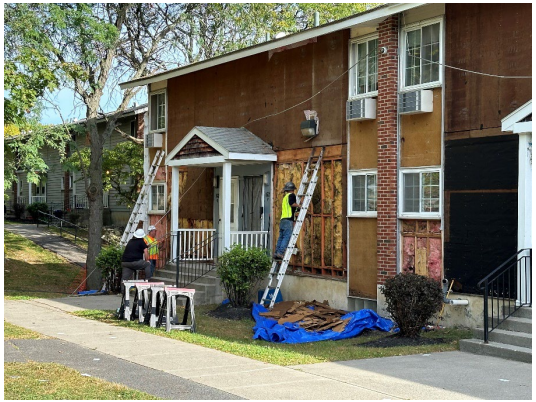
Progress and Future Work: Construction Schedule



*Notify Tenants a minimum 48-Hours before Work Starts in their Apartment

- Provide $100 Gift Cards during the Week of September 16th
- Provide $50 Gift Cards when Cable is Interrupted

Progress and Future Work: Construction



Demolition & Repair Complete

Next Steps:

*Complete Retrofit

*Monitor Bldgs. for 12 Months

*Data Analysis (Before & After)

*Issue Commercialization Kit

*Final Technical Report

*Conduct Outreach Decision Makers

Thank you

- **Performing Organization:**
  Home Innovation Research Labs
  and Oak Ridge National Labs

- **Principal Investigator:**
  John B. Peavey,
  Director of Building Science

- **Contact Information:**
  (301) 430-6238
  jpeavey@homeinnovation.com

- **DOE Project:** DE-EE0009063

Home Innovation Research Labs

Reference Slides

Project Execution

	FY2023				FY2024				FY2025			
Planned Budget	**$1.5 Million**				**$2 Million**				**$750 K**			
Spent Budget	**$1.5 Million**				**$1.5 Million**							
	Q1	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
PAST WORK - COMPLETE												
Milestone: Product Testing												
Milestone: Product Manufacturing												
Milestone: Baseline Energy [Exterior & Interior] and IAQ Data												
Current/Future Work												
Milestone: Construction												
Milestone: Commercialization Kit												
Milestone: 1-Year Monitoring and Data Analysis												
Milestone: Outreach - Key Decision Makers and Incentive Programs												Until FY 2026
Milestone: Final Technical Report												**FUTURE ->>>**

Team

John B. Peavey

Director

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Tynica Stefun

Project Manager

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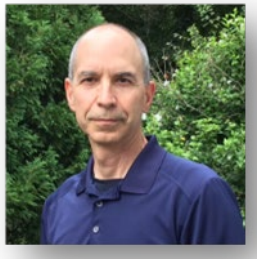
Andre O. Desjarlais

Program Manager

ORNL



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Senior R&D Staff

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