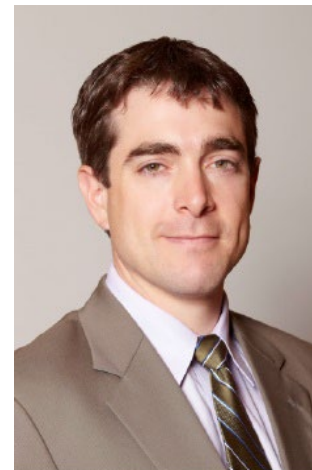


Transforming Public Housing with Deep Energy Retrofits



Project Team Members:

- Castle Square Tenant Organization
- WinnDevelopment
- Reisen Design Associates
- New Ecology Inc.
- Urban Ingenuity
- Keith Construction Inc.

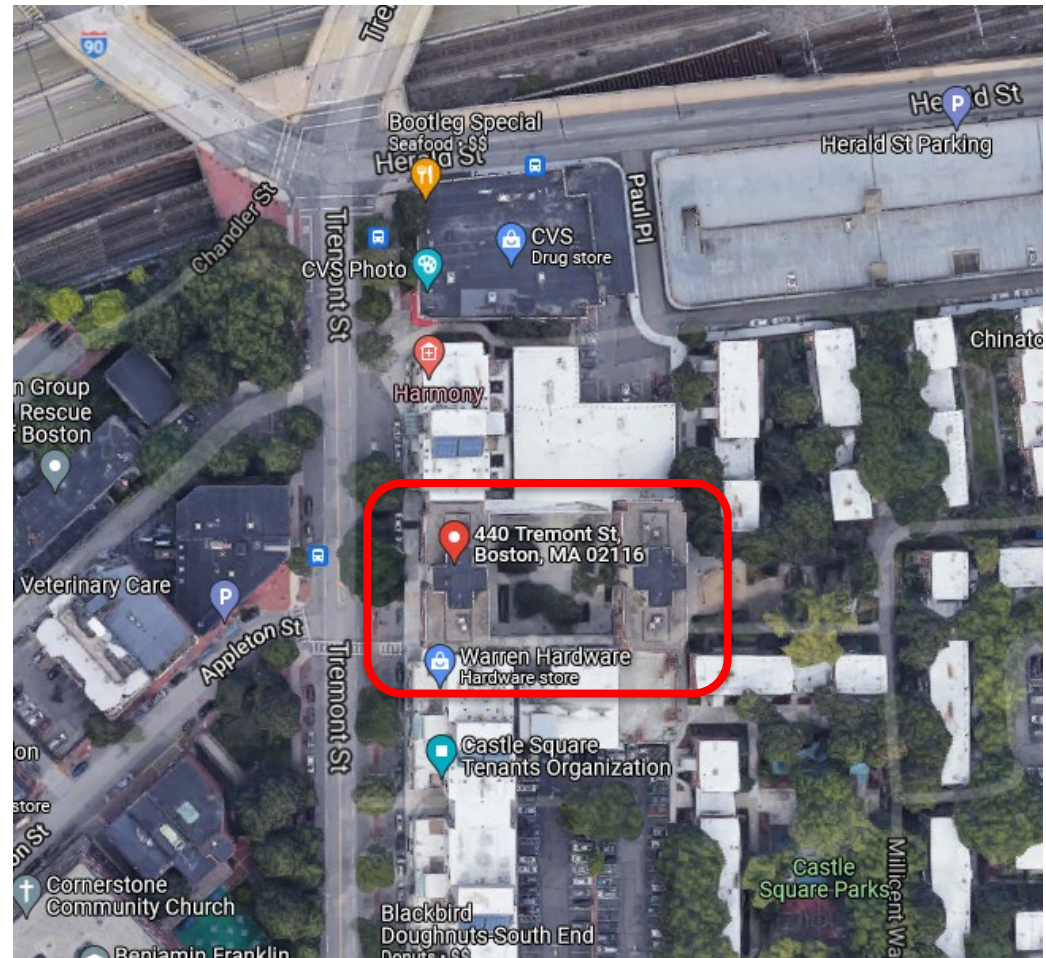
Christina McPike, WinnCompanies,
Director of Energy & Sustainability

Darien Crimmin, WinnCompanies,
Vice President of Energy & Sustainability

We are a multidisciplinary team with expertise in **affordable multifamily housing development, property management, green finance, architecture and MEP engineering, construction and estimating, sustainability consulting, and resident services**. Open Market ESCO will lead its team of design, construction, and finance experts through an integrated project delivery process focused on designing and scaling deep energy retrofit solutions for affordable multifamily housing.

ABC Final Quarterly Update – December 2021

- Review Project Objectives
- Project Tasks Overview
- Design Status
- Construction Pricing
- Financing



Project Objectives

1. Lead an integrated project design process with key performance objectives
2. Engage general contractor, manufacturers, and subcontractors for pricing & constructability feedback loop.
3. Identify financing barriers and solutions for retrofit costs.
4. Scope and detail replicable whole building retrofit solution.
5. Engage residents and maintenance staff.
6. Engage with housing policy and industry stakeholders.



Reisen Design Associates

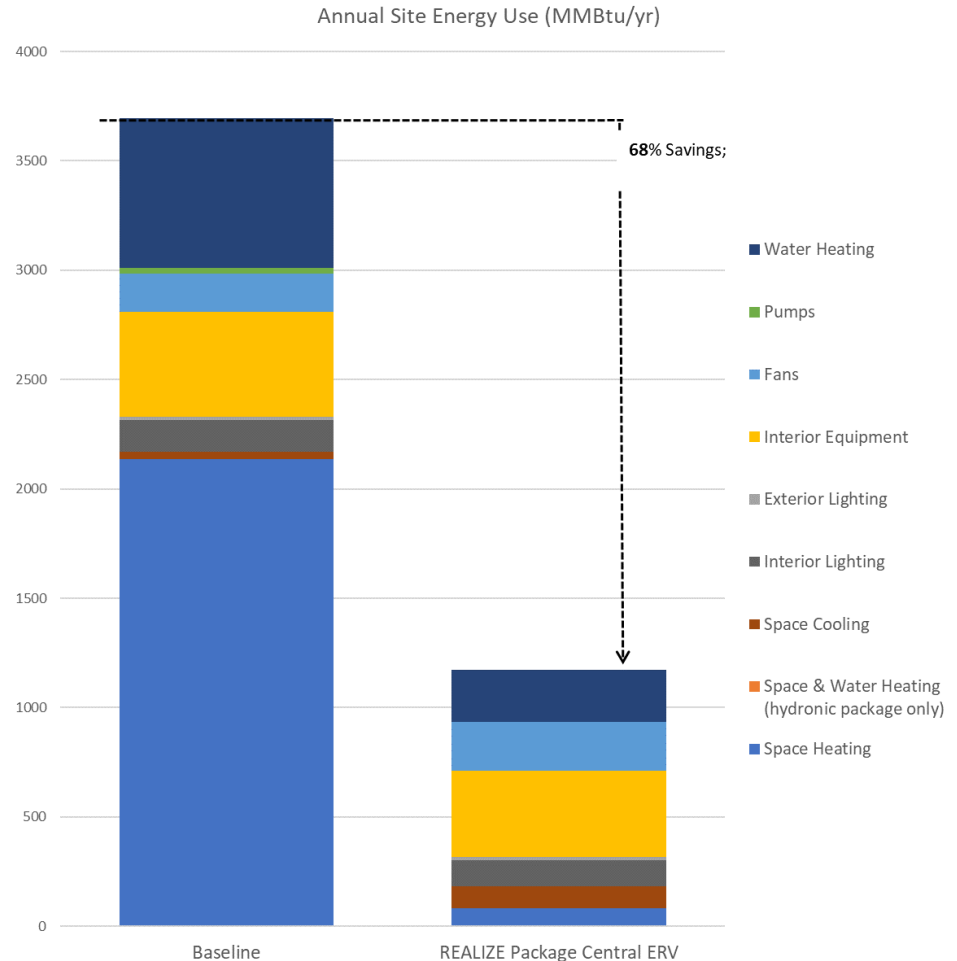


Project Tasks

- **Integrated Design**
 - Conceptual Narratives & Goals
 - Schematic Drawings
 - 50% Construction Documents, and going
- **Pricing & Contractor Engagement**
 - Contractor Outreach
 - Iterative Pricing
- **Financing & Deal Structuring**
 - Gap Funding
 - Consents & Integration
- **“DER” Scale-Up**
 - Operations, Maintenance, Resident Outreach
 - Portfolio Review
 - Stakeholder Engagement

Design Findings & Results

- **REALIZE-MA Performance**
 - Established original specs:
 - R-30 Wall
 - U-0.26 Window
 - 0.20 ACH50 infiltration
 - R-40 Roof
 - R-20 Breezeway
 - All-Electric
 - Modeled savings:
 - 68% site energy savings
 - EUI 96 → EUI 31
 - 143 mtCO₂e/year
 - \$34,815/year



Design: Key Takeaways

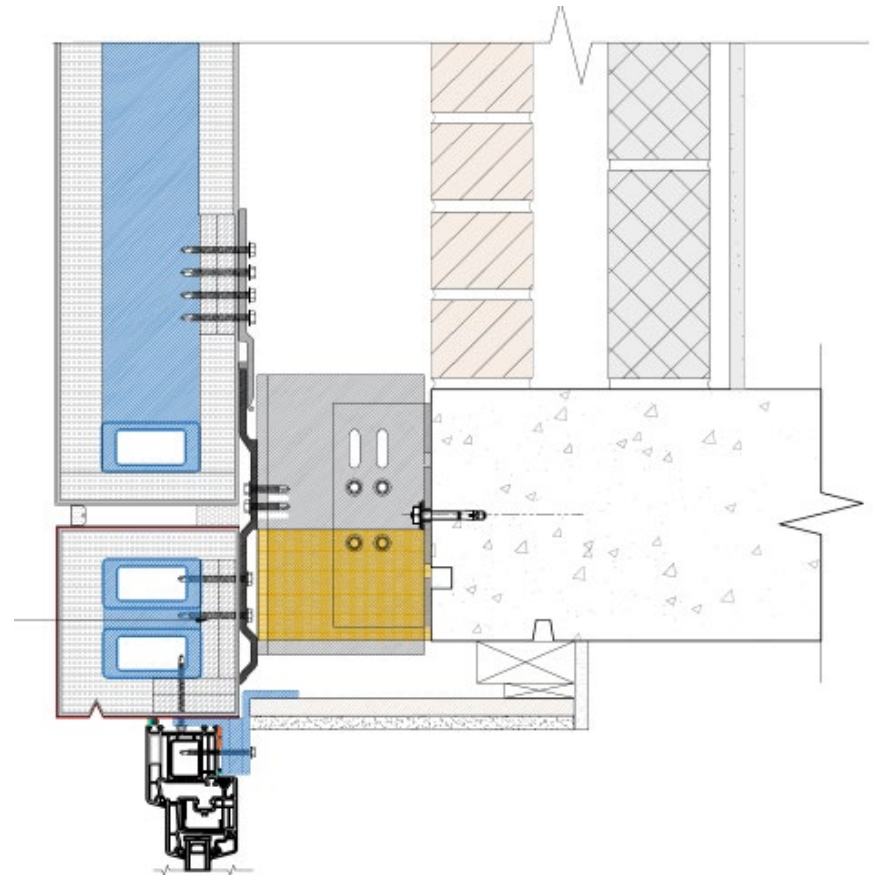
- **Integrated Design Process** “refers to a structure, process, and qualitative experience that creates conditions conducive to effective collaboration.”
 - *Product* unknowns lead to *project* unknowns = redesign, frustration, liability concern/risk
 - Performance goals are inspiring and help disrupt typical approaches, motivations, and “what I did before” mentality
 - Skip ahead, get into the details early
 - Typical design deliverables less valuable
 - Mutual accountability is ongoing problem
 - Design Review, AKA aesthetics still matter
- **Technical Design**
 - Panel Update
 - HVAC Update

Design: Key Takeaways

Envelope

- 70% CD's complete, Shop Drawings underway
- Proceeding with Tremco's Revitalite unitized panel
 - “Prefabricated, Lightweight, Structural, Insulated Façade”
 - 6” thick, EPS or GPS core with internal hollow framing and EIFS coatings/finish
 - H-brackets 32” O.C.
- Testing Update
 - NFPA 285 Tested
 - Air, water, thermal Dec-Jan

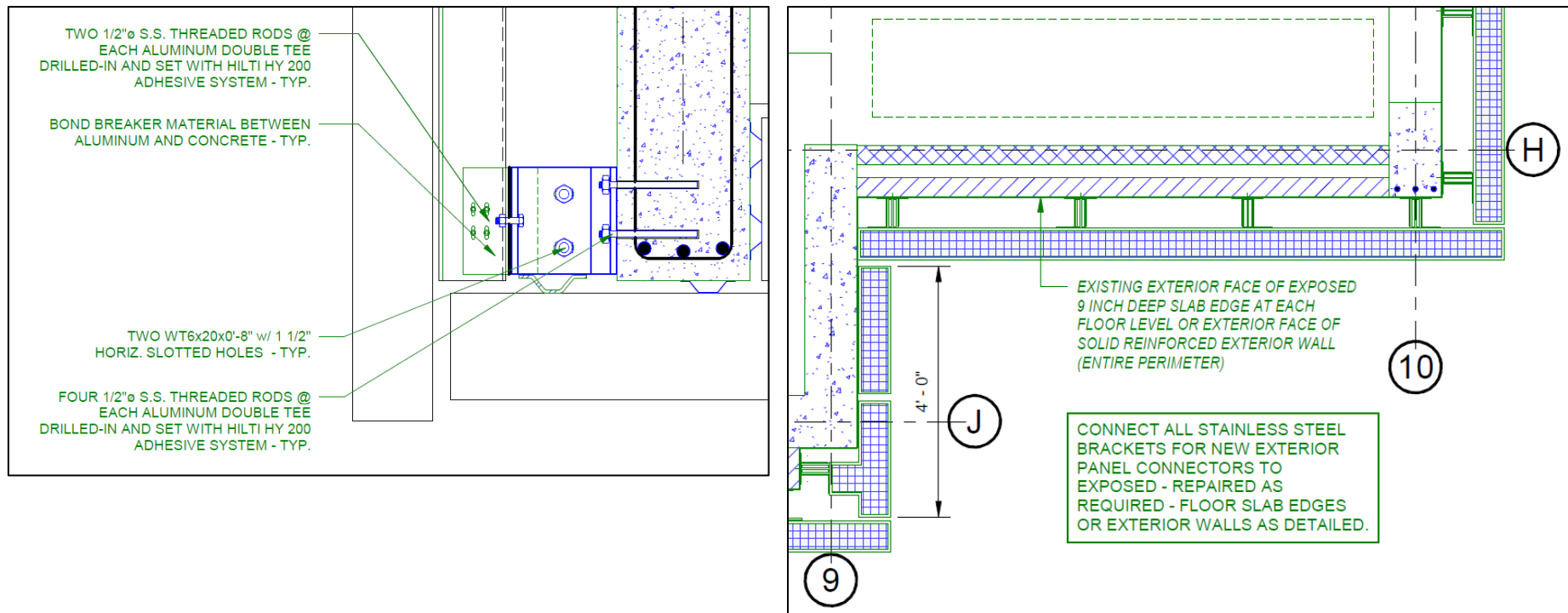
Representative Detail



Design: Key Takeaways

Structural Details

- **Structural attachments: H Bracket, P Tube, S Rail, Z Rail**



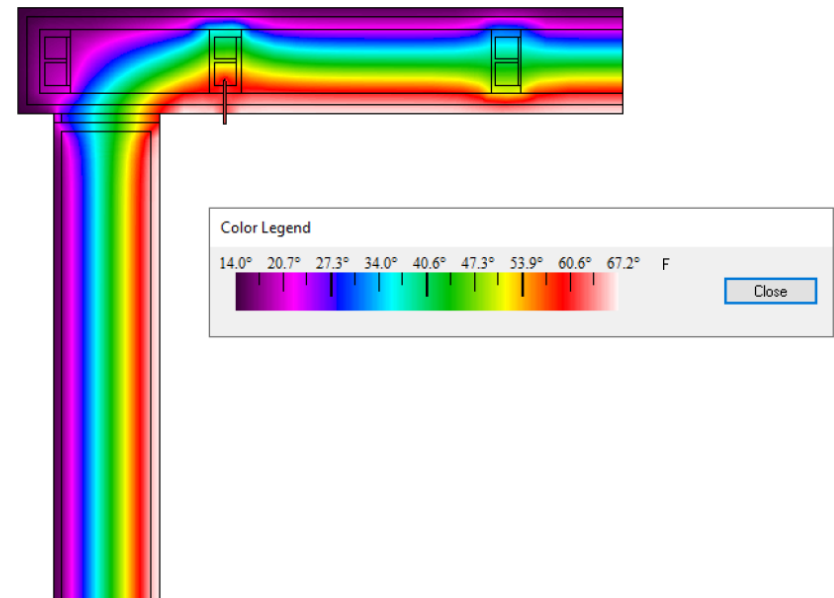
Design: Key Takeaways

Hygrothermal Analysis

- 144 WUFI simulations
- No issue on West elevation
- East oriented wall shows possible moisture/mold concerns within the new cavity (on inside face of panel).
 - Solution: Apply the panel only after a period of minor or no rain to limit the potential water content in the brick veneer.

THERM Modeling

3. Tremco Outside Corner THERM Model with Panel Gap Reduced from 2" to 0.5":

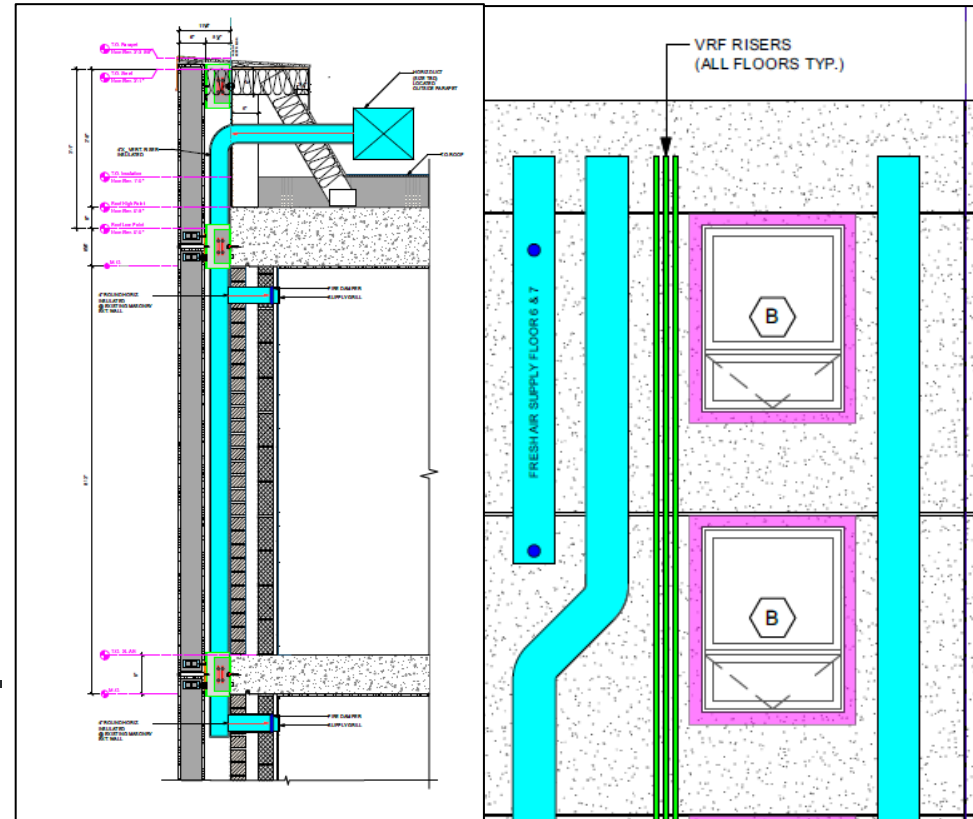


Design: Key Takeaways

HVAC

- Standard systems
 - VRF, Mitsubishi Y-series
 - ERV, Annexair
 - HPWH, Mitsubishi QAHV
- Master metering required
- Central systems preferred for maintenance
- Space constraints in units
- Distribution studies: interior vs. exterior
 - 780 CMR Section 717.6.1

Supply Air & Refrigerant



Design Findings & Results

- ABC Performance Goals

Baseline Building and Proposed Building Energy Use Index (EUI) Summary

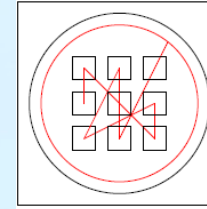
Table 1. Baseline Building and Proposed Building Total EUI Summary

Building Case	EUI (kBTU/sq.ft.)	% Energy Savings
Baseline	104.2	-
Proposed	29.0	72%

Table 2. Massachusetts DOE Target EUI vs. Proposed Building EUI Summary

Building Case	EUI (kBTU/sq.ft.)	% Energy Savings
DOE Baseline Target (heating, cooling, water heating only)	30.1	-
Proposed (heating, cooling, water heating only)	7.82	74%

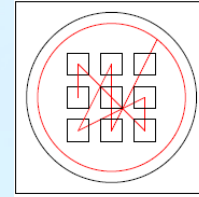
Design Findings & Results



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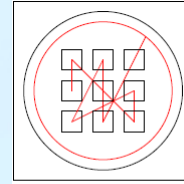
Design Findings & Results



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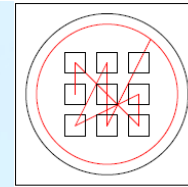
Design Findings & Results



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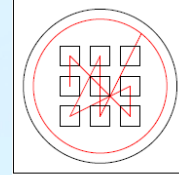
Design Findings & Results



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Design Findings & Results



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Construction Pricing Findings & Results

- Construction budget driven by two contractors: panel installer and HVAC contractor
- Schematic pricing → 50% pricing saw costs cut in half, with greater detail, clarity, and engagement
 - Material Price: \$65/sf | Labor Price: \$45/sf

	Baseline, no DER	REALIZE DER	Notes
Mechanical HVAC	\$1,032,800	\$1,943,600	Boiler → VRF, ERV systems
Plumbing	\$376,100	\$576,100	Repairs → complete replacement
Electrical	\$374,611	\$645,850	Power to new equipment
Total	\$1,783,511	\$3,165,550	Gap = \$1,382,039

	Baseline	DER Envelope	Notes
Demo	\$68,300	\$169,325	Full sill removal
Exterior façade insulation	\$0.00	\$2,088,100	Aluminum in-kind window replacement vs. Revitalite panel
Windows	\$691,900		
Façade repairs, cleaning	\$194,900	\$80,000	Removed cleaning and crack repairs
Gypsum	\$243,640	\$517,740	Window infills
Special Construction	\$80,000	\$148,000	Staging and lifts
Total Cost	\$1,278,740	\$3,003,165	Gap = \$1,724,435

Financing Results

- **Existing rehab budget helps ‘buy down’ the DER cost**
 - BAU: \$150k/unit
 - DER: \$250k/unit (cost includes some non-energy upgrades)
- **New sources needed to support added costs**
 - Utility incentives: \$1,560,000
 - Proportionally higher LIHTC equity: \$468,000
 - RAD/Section 18, “Demolition and Disposition of Public Housing”
 - High Housing Construction Costs (“HCC”) in “high cost areas” unlocks greater program blending → higher supportable debt
 - \$10m in additional proceeds
 - Rents are higher for HUD, equal for residents

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ENERGY

Office of
**ENERGY EFFICIENCY &
RENEWABLE ENERGY**

Thank you!

Christina McPike, Director of Energy and Sustainability

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cmcpike@winnco.com

