

REALIZE CA Retrofits: Scaling Solutions to Retrofit Multifamily Affordable Housing

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Session Overview

- There are a number of residential retrofit programs currently funded by state agencies, REN's and CCA's. Today I'll review lessons learned from the research and delivery of deep energy retrofit pilots from the REALIZE-CA program.



Theory of Change



STANDARDIZE THE
RETROFIT PACKAGE



STREAMLINE
FINANCING



SCALE SOLUTIONS



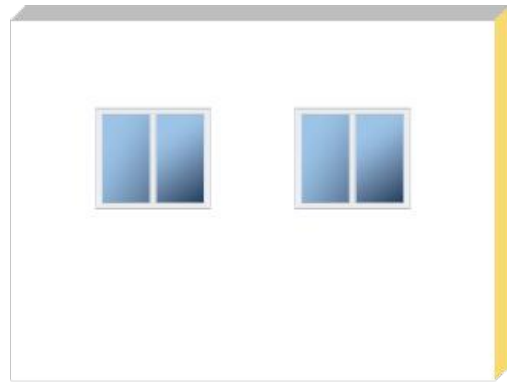
energie
sprong



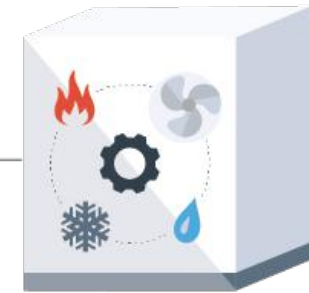
REALIZE Package Technologies

High-performance roof system
including integrated solar

Integrated mechanicals
including domestic hot water,
heating, cooling, and ventilation,
with controls and option for
smart inverter and energy
storage



Prefabricated wall panel including
high-performance windows
and doors



All-electric appliances

REALIZE Impact

Communities

- Improve tenant health and safety in DAC's



Emissions Reductions

- +50 MTCO2 reductions spurred



Equitable Growth

- >40% MWDVBE contractor goal
- Partnership with the State Building Trades



Policy Advocacy

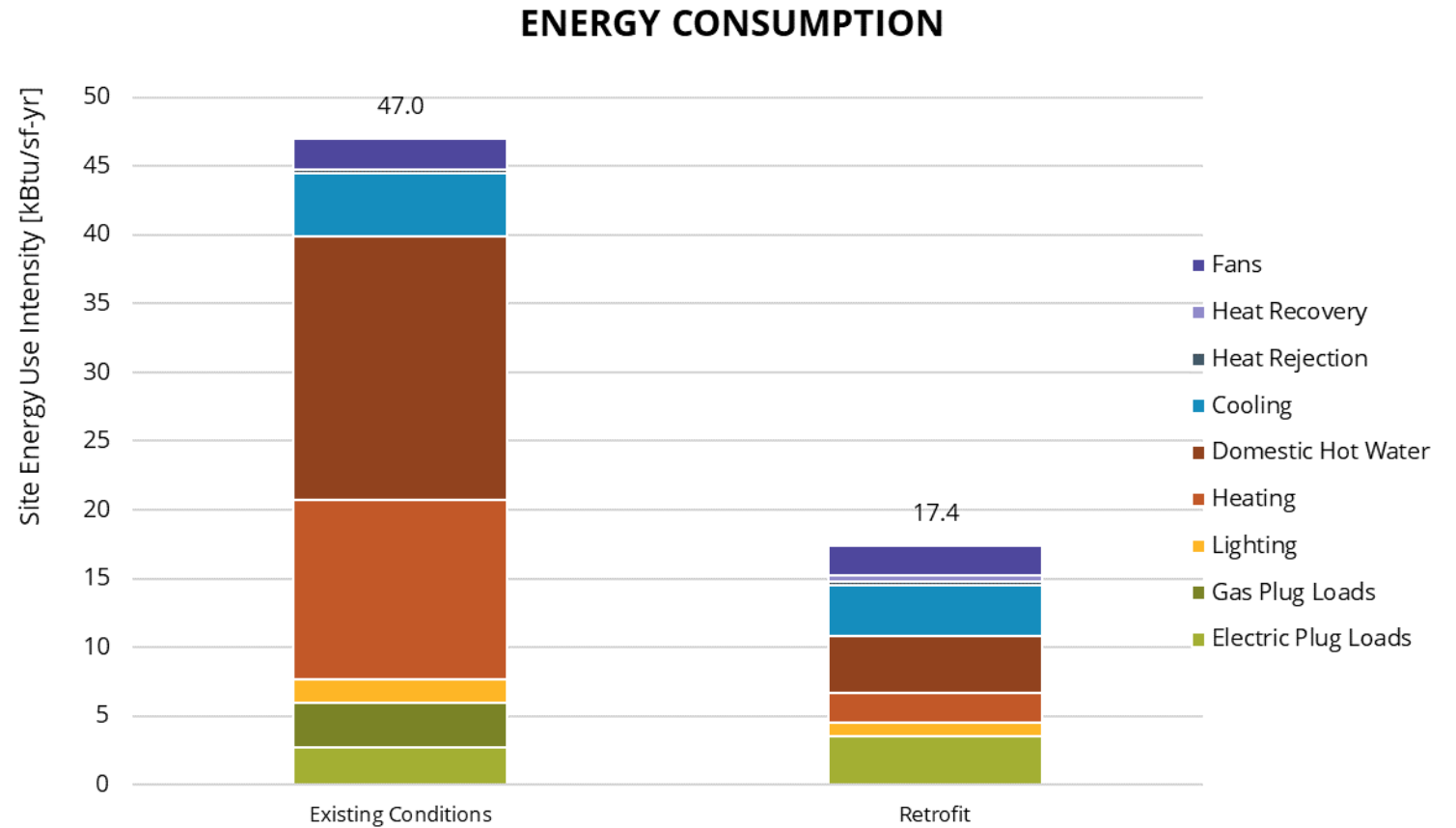
- Affordable housing retrofit incentivization
- Workforce partnerships founded in labor and community nonprofits



Energy Goals

Annual Energy Consumption

The retrofit package has an EUI of 17.4 kBtu/sf, with 63% savings from existing conditions. The EUI is driven by end-uses of cooling, water heating, lighting and plug loads.



Why Affordable Housing?



Subsidized affordable housing locations compared to CalEnviro Screen locations of DACs courtesy of California Housing Partnership



1.3 million units

of naturally occurring affordable housing (NOAH)

455,859 units

of subsidized affordable housing

In order to equitably meet CA's 2050 climate action goals:

45,586 units or 3.57%

of all affordable housing must be retrofitted to zero-carbon annually

Source: McKinsey & Company, Preserving the largest and most at-risk supply of affordable housing, February 2021
California Housing Partnership, Affordable Homes at Risk, February 2021



Building Typologies

Targeted Multifamily Building Types



TOWNHOUSE
762,018 Units



GARDEN STYLE
647,511 Units



LOADED
CORRIDOR
629,470 Units

A total of **5,185 Low Income Housing Tax Credit projects (LIHTC)** and **386,520 units in CA** (just over 10% of total multifamily housing).

On average, about **5% of LIHTC projects** are eligible for a retrofit per year.

Pilot Demonstrations



East Palo Alto, CA



Corona, CA



Fresno, CA



Richgrove, CA



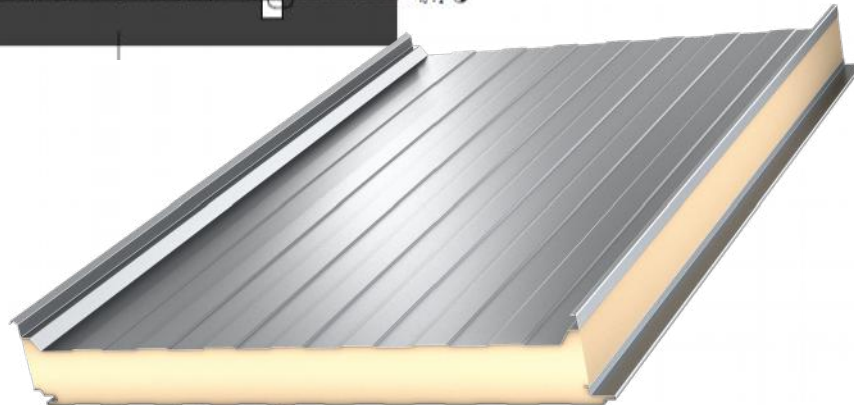
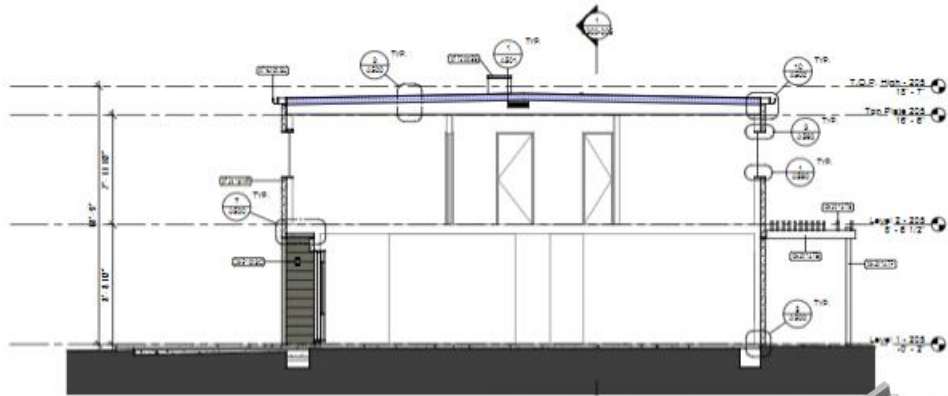
REALIZE Technology Overview



Panelized Roofing

Technologies

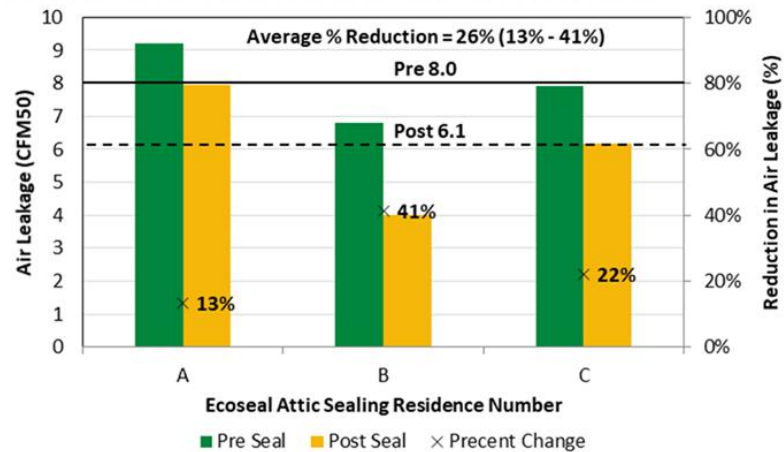
- Panelized roof system
 - Flat roof application
- Insulated metal panel (IMP) roof system



Air Sealing

Technologies

- Elastomeric seal on walls
- Attic air sealing - 3 different strategies being compared for air leakage reduction effectiveness
 - Traditional hand sealing with spray foam
 - Liquid-applied sealing product
 - Aerobarrier Aeroseal product cloud-applied (first attic air sealing application of product*)
- Panelized envelope systems meant to improve



* Supported by DOE-funded study



Spray foam via hand seal

Aeroseal via remote-controlled

Walls & Windows

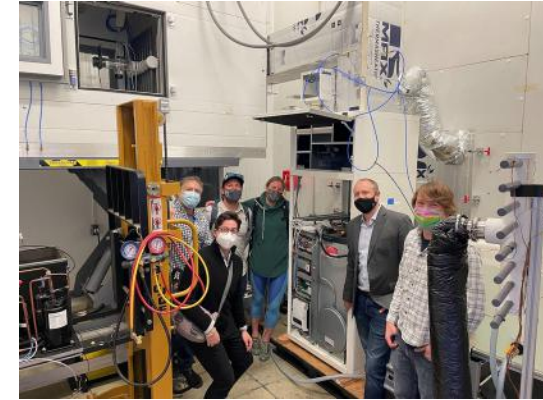
Technologies

- Panelized wall systems
- Elastomeric sealing
- High performance windows
 - Alternatives to high performance dual pane
 - Thin triple pane windows
 - Storm window inserts
- Digitization of data collection tools
 - 3D scanning to point cloud conversion
- US DOE & CA CEC grants funding research & development work



Mechanical Pod Systems

- Combining 4 major mechanical end uses into one system
 - Space conditioning, water heating, and ventilation from one system
 - Opportunity for energy recovery
- Space conditioning and water heating utilizing one heat pump
- Heat recovery ventilation
- Closet space needed, with ability to duct to outdoor air access
 - Demands larger single space, even if smaller cumulative space
- Distribution routing to one location
- Supply air ductwork is existing, would need to add return and exhaust ductwork
- US DOE & CA CEC grants funding research & development work



Systemair Genius: 4-in-1

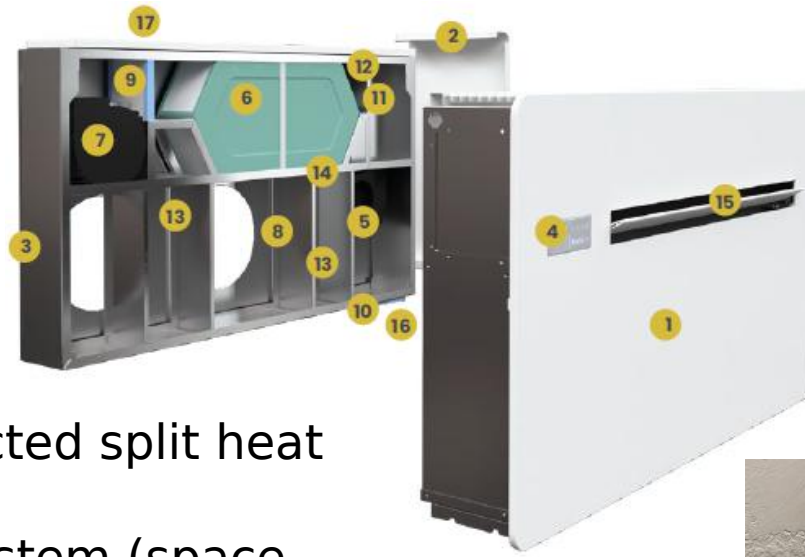


TK Fabricate HydroPod: 4-in-1

HVAC

Technologies

- High efficiency, inverter driven ducted split heat pump
- 3-in-1 combined inverter driven system (space heating, cooling, heat recovery ventilation)
- Inverter driven through-wall packaged terminal heat pump
 - In development: insertable ERV module
- Multi-speed, quiet bath and kitchen exhaust
- Smart thermostat



Water Heating

Technologies

- Unitary systems
 - Packaged heat pump water heater, with electric resistance back up
 - Split inverter driven heat pump water heater, no electric resistance backup
- Central systems
 - Modular split inverter driven heat pump water heater, no electric resistance backup
 - Standardized split inverter driven heat pump water heater, no electric resistance backup, on a skid
 - Packaged central heat pump water heating system



Corona Del Rey (CDR): A Closer Look

CDR Overview

- No [wall or roof insulation](#). Energy use and comfort are major issues.
- Major stucco damage, termite damage, dry-rot damage and mold.
- Interior gyp and exterior stucco are both hot (asbestos).
- No exterior sheathing, inadequate and damaged lateral bracing, other structural deficiencies (e.g., missing sill plates, anchor bolts, etc.).
- Addressing deferred maintenance on general [plumbing](#) is a high priority.
- [Rooftop PV](#) and [electrification](#) are also owner priorities.

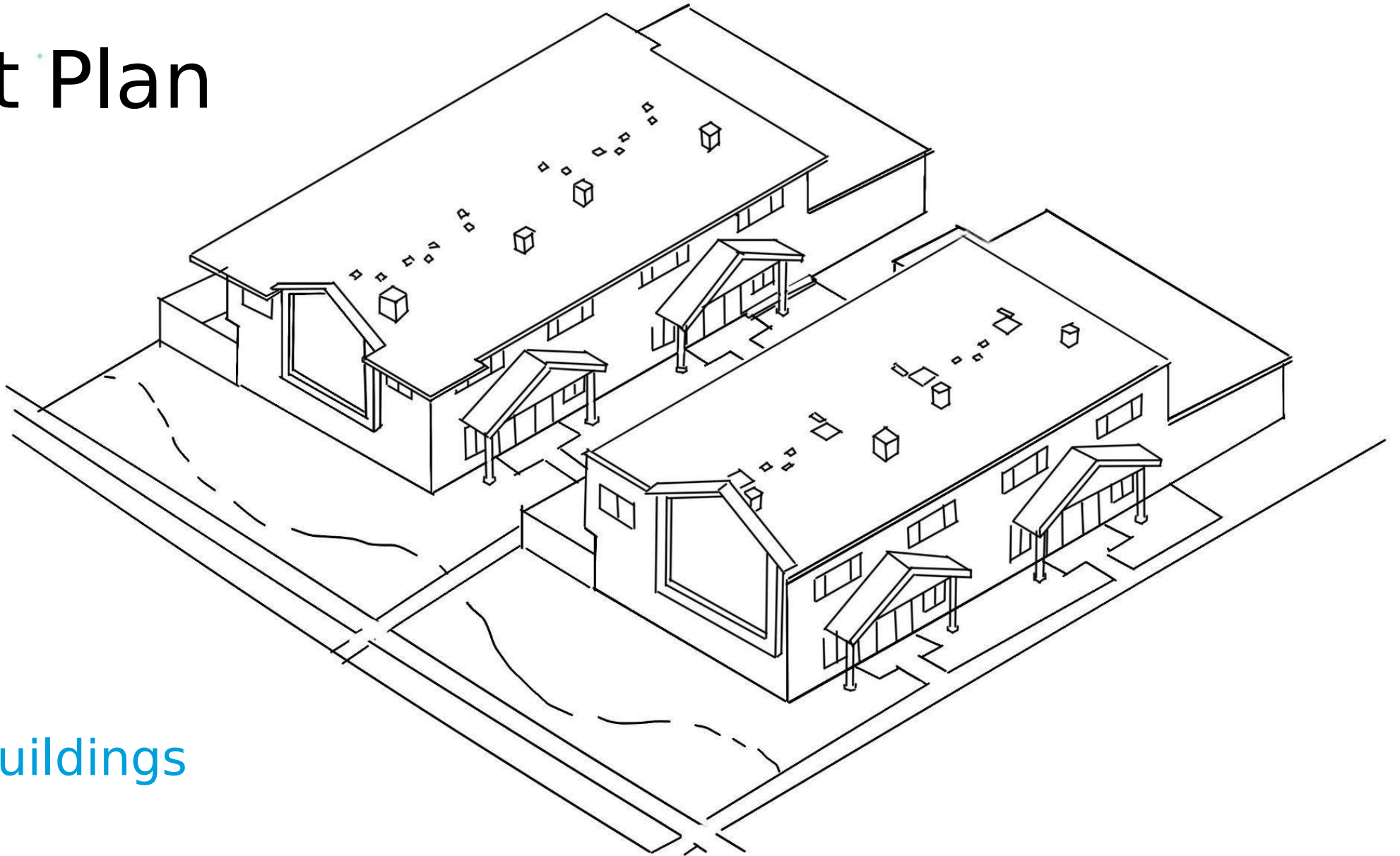


CDR Retrofit Measures

Source	Package	Misc. Need	HVAC	DHW	Air Tightness	Wall R-value	Roof R-Value	Windows
Existing	Baseline	Asbestos, Pest, Mold, Structural	Heating: NG Ducted Furnace Cooling: Split DX-roof	NG, Central Leaky PEX	Leaky; RDH value in 2022 Blower Door Report	Failing stucco, Uninsulated	Flat Roof, Uninsulated	SG aluminum
REALIZE Package	Equipment + Non-Structural Panels	- Digital envelope scanning - M&V equipment install (in wall) - Blower Door	- Combo Mechanical Pod - Continuous ventilation	HPWH – no pref for in-unit or central	1 ACH50 via wall & window retrofit* *Target= 0.4 CFM/sf at 75 Pa (Title 24 requirement)	R16 Prefab Wall	R30 Prefab Roof	U .3 SHGC .23 - 0.35?
205 & 217	Fedderlite + Revitalite Panels	- Remediation Needs - Electrical Upgrade - Energy Star Appliances - LED	- HP Ductless – inverter driven PTHP w/ ERV - Mechanical Pod (1) w/ prefab ductwork - Ceiling Fans - Improved bath + kitchen ventilation	Central HPWH	TBD	R16 Prefab Wall	R30 Site built flat roof	T24: U .32 SHGC .23
Owner / Full Site Rehab	Bathroom + Kitchen	- Remediation Needs - Electrical Upgrade - Electrify Appliances - LED	HP Ductless Minisplits	Central HPWH	NA	NA	NA	NA



Retrofit Plan

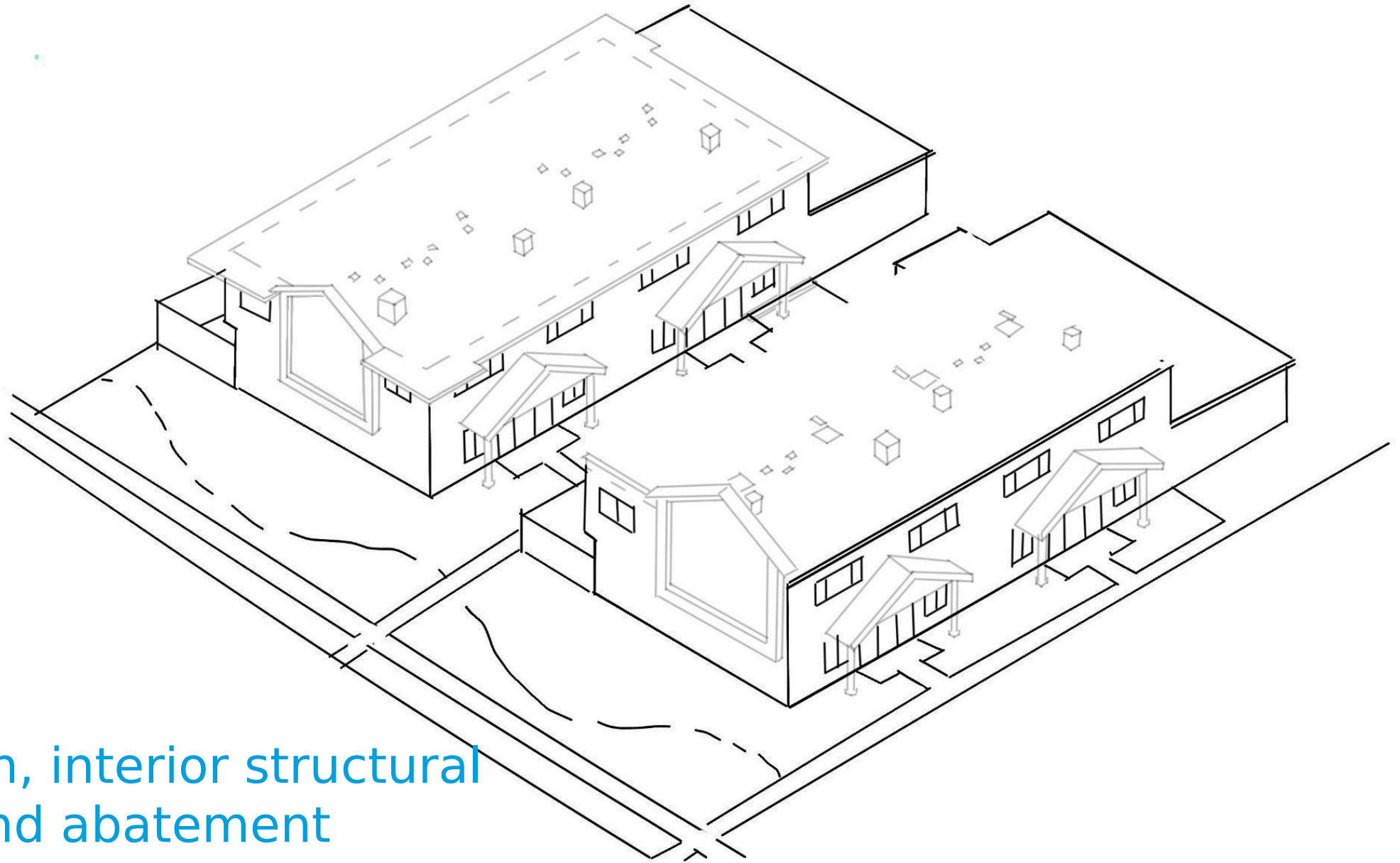


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Existing Buildings

2

Demolition, interior structural
repairs, and abatement



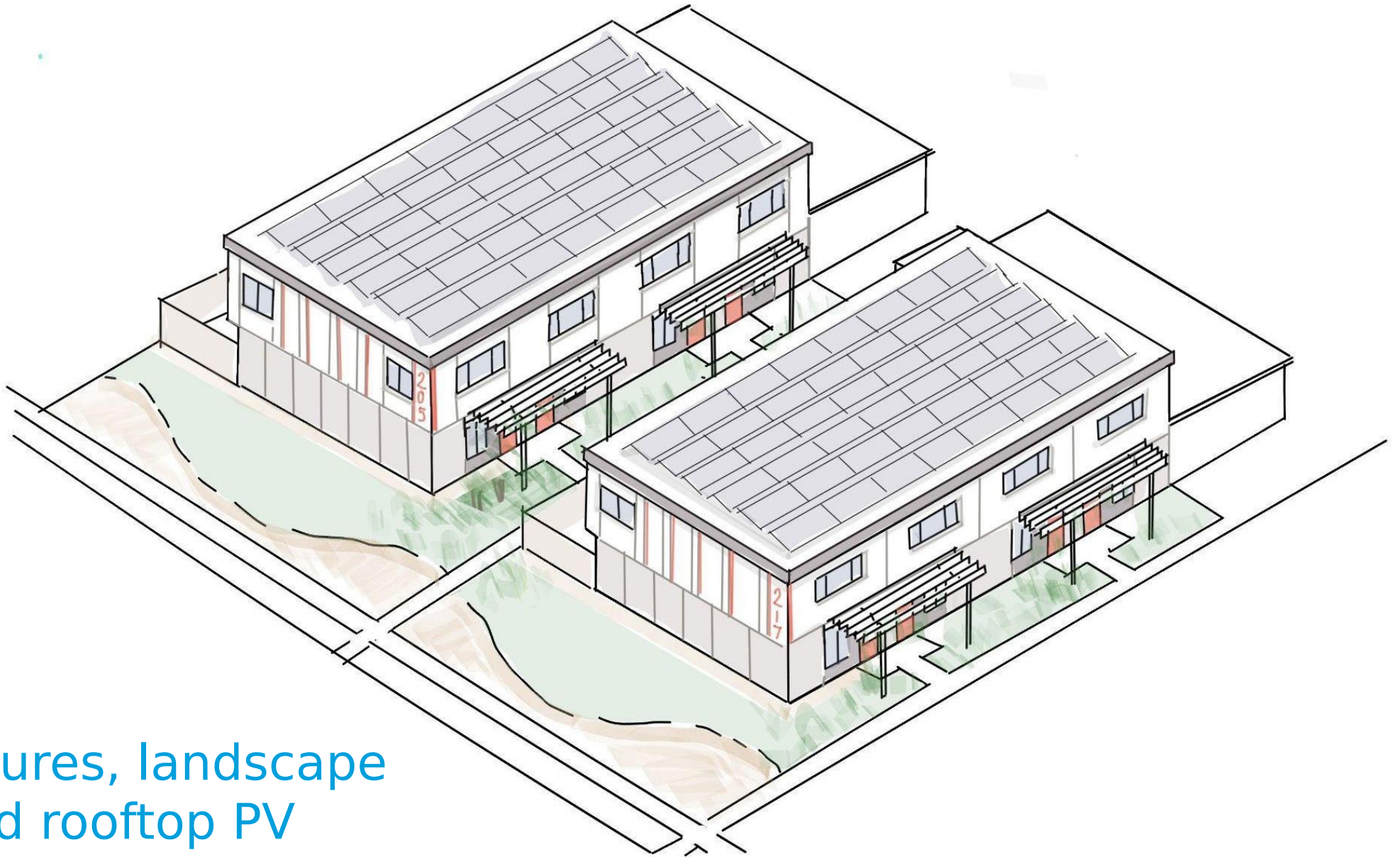
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Panelized walls, new windows,
and field-installed insulated roof

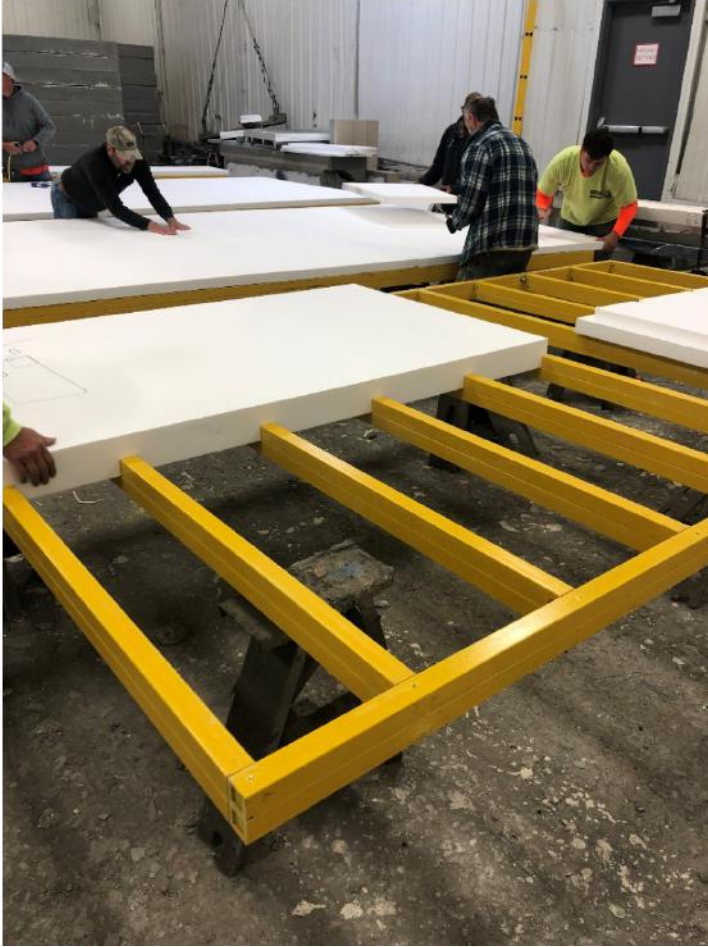


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Entry features, landscape
repair, and rooftop PV



Prefabricated Exterior Wall Panels



Panels fabrication



BEFORE



AFTER (estimated completion December 2023)

What did we learn? And how can it help your next retrofit project?



CA Buildings are **NOT** Dutch Buildings



- Wood-framed (light-weight, prone to damage)
- Most do not meet current seismic standards
- Stucco or T1-11 siding
- More complex geometry

- Brick/masonry
- No additional cladding
- Relatively simple geometry across typology



Lessons Learned

Key lessons learned from pilot demonstrations are as follows:

- **Existing Conditions** – to reduce risk, we recommend packages adhere to established eligibility criteria that considers factors such as asbestos presence (e.g., drywall, ductwork, stucco, etc.), known structural and/or plumbing concerns, planned cap improvement and/or recapitalization events, etc.
- **Product Readiness** – certain technologies in the package (i.e., prefab wall panels and mechanical pods) are not ready for scale, due to factors such as cost, performance, and manufacturing limitations
- **Energy Savings** – based on preliminary M&V data across demonstrations and the Market Guidance Report (MGR), aggressive (exterior) envelope interventions aren't warranted in most climate zones statewide



Lessons Learned Cont.

Key lessons learned from pilot demonstrations are as follows:

- **Trained Workforce** – despite existing participating contractor networks in electrification programs, more contractors and trained workers are needed to scale multifamily retrofits

RANP Funding: Last month we submitted a proposal to DOE for a Contractor Training Program with the State Building Trades Council, that seeks to develop skills matrices and update curriculum for Locals capable of performing decarbonization scope, such as Laborers, Roofers & Waterproofers, Electricians, Pipe Trades, Glaziers, and Insulators. The program would include targeted recruitment/enrollment of at least 40% of Minority, Woman, Disabled, Veteran-Business Enterprise (MWDVBE) contractors, and trainings would utilize existing union facilities and signatory contractor networks.

- **Code & Permitting Issues** – simplifying permitting and inspections is recommended to reduce soft costs for emerging technology deployment



Thanks!

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