

REALIZE

San Francisco Bay Area Program Strategy Recommendations



CNCA
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SF Environment
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Department of the City and County of San Francisco



Net-Zero
ENERGY COALITION



**Rocky Mountain
INSTITUTE®**

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Acronym Key

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Acronym Key

Acronym	Phrase
AMI	Area Median Income
BayREN	Bay Area Regional Energy
CA	California
CDC	Community Development Corporation
CTCAC	California Tax Credit Allocation Committee
CUAC	California Utility Allowance Calculator
EPC	Energy Performance Contract
ESCO	Energy Services Company
FiT	Feed in Tariffs
HUD	US Department of Housing & Urban Development
IOU	Investor Owned Utility
KW	Kilowatt
LEED	Leadership in Energy and Environmental Design
LIHTC	Low Income Housing Tax Credits
LIWP	Low Income Weatherization Program
LLC	Limited Liability Corp

Acronym	Phrase
M&V	Measurement and Verification
MASH	Multifamily Affordable Solar Housing
NY	New York
NZE	Net Zero Energy
NZE _c	Net Zero Carbon
OEM	Original Equipment Manufacturer
PG&E	Pacific Gas & Electric
PHIUS	Passive House Institute US
PILOT	Programmed Inquiry Learning Or Teaching
PV	Solar Photovoltaic
RMI	Rocky Mountain Institute
SF	San Francisco
TDV	Time Dependent Valuation
UA	Utility Allowance
US	United States
WP	Work Package, with specified deliverables

Introduction & Executive Summary

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Introduction

CONTEXT

Desirability, convenience, and cost are the three greatest barriers to adoption of deep energy retrofits. One root cause is that both the supply (the architecture, engineering and construction industry) and demand are disaggregated. Every upgrade is custom, which increases cost, project duration, and complexity. To date, selling energy efficiency at scale has not been achieved, so only a minority of existing homes in the US have had a deep energy or zero energy retrofit.

A program in the Netherlands known as Energiesprong has sought to overcome these barriers by facilitating a market and treating retrofits as a product to be delivered by industry, rather than bespoke projects. The program has succeeded, retrofitting thousands of social housing units to net zero energy with financing from energy cost savings. Energiesprong retrofits are now being completed in fewer than 10 days per project without displacing residents, using industrial solutions. Energiesprong has reduced project costs by 60% since the first pilots three years ago, while at the same time going from a 50% energy reduction to net zero energy (NZE).

PROJECT INTENT

While the approach is proven in the Netherlands and expanding in Europe, it has yet to be tried in the US. In coordination with Energiesprong, REALIZE seeks to import this approach to the US – and adapt where necessary – to facilitate the delivery of comfortable, fast, desirable, affordable, and reliable zero net energy cost retrofits. With over 137 million existing homes, the US is a significant market opportunity.

Executive Summary

INTRO

To kick start a mass market for deep energy retrofits, REALIZE initially targeted affordable housing, which benefits from scale, motivation for sustainability, and periodic recapitalization. Developing the offering for affordable properties in the US will establish the conditions to expand to other segments. The plan in this report is informed by primary and secondary research; technical analysis of three representative building types; and workshops in San Francisco and New York.

TARGET MARKET

Our target market segment, affordable housing, was selected because owners and developers tend to own portfolios (scale); many owners have a mission to provide safety, comfort and affordability (motivation); and can invest in rehabilitation at the time of re-syndication (opportunity).

ORGANIZE

Like Energiesprong, REALIZE will facilitate the retrofit market by coordinating the value chain – removing barriers, recognizing perceived risks, and mitigating confusion and protectiveness. Our objective is to aggregate demand through the development of a deal between property owners and solution providers, which will yield the leverage to change market conditions. As deals are facilitated, each expansion in volume increases reward for industry to invest in technical solutions – developing retrofits as product, rather than projects.

Executive Summary (continued)

FINANCE

Many affordable housing properties receive capital for rehabilitation under the Low Income Housing Tax Credit (LIHTC). Renovations trigger energy code (California Title 24) and water efficiency requirements. The incremental cost of getting to net zero is minimized if it coincides with renovation – but it’s usually greater than the funds available. Utility incentives and energy cost savings must be tapped to finance net zero retrofits.

In master-metered sites, owners retain utility cost savings. However, tenants do not have an incentive to conserve and lenders typically underwrite only 50% of projected energy savings.

In tenant-metered and sub-metered sites, tenants have the incentive to conserve. Tenants receive a utility allowance (UA) as a deduction from maximum gross rent. When UA is reduced, rent increases – and lenders underwrite 100% of rent. However, UA adjustments are complex, and subject to limitations. Permission to reallocate savings to financing has proven successful in the Netherlands, and California Tax Credit Allocation Committee (CTCAC) rules allow use of a California Utility Allowance Calculator (CUAC) and energy model to adjust UA in certain limited instances. In order to unlock the ability to underwrite energy savings cash flows, CUAC regulations are currently being developed to significantly expand applicability.

REALIZE will use the U.S. Department of Housing & Urban Development (HUD) and California Tax Credit Allocation Committee (CTCAC) databases to target properties approaching LIHTC renewal.

PERFORMANCE

Energiesprong has an innovative business model to manage performance risk: In an “Energy Plan” a building owner purchases a set of energy-dependent services for each housing unit from the solutions provider; these energy services describe a high-quality Zero Net living environment (thermal comfort, hot water, and plug loads) at a fixed cost, analogous to a mobile phone contract; the solutions provider is responsible for ensuring performance within specifications; and the tenant pays the utility or owner for energy usage beyond the Energy Plan. REALIZE will develop an Energy Plan with California housing and financing stakeholders.

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Energiesprong Overview

REALIZE is informed by Energiesprong's original program in the Netherlands – which provided proof of concept for an innovative new market transformation model for carbon emissions reduction through residential NZE retrofits.

In this section, we explore the Energiesprong model. REALIZE is envisioned as a partnership with Energiesprong, where we continue to openly exchange best practices and solutions.



Who

Transition Zero is the name for the **franchising model** to expand *Energiesprong* throughout Europe and parts of North America. The linchpin of the model is a **regional team organizing the market** to deliver affordable, high quality retrofits as **products**, rather than projects.

What

Energiesprong **does not** carry out retrofits; third-party suppliers do. Instead, Energiesprong acts as a **catalyst to develop a mass market** for retrofits by organizing the supply chain.

How

Energiesprong believes high construction costs can be overcome through **cost reductions** driven by **developing a coordinated market** and **aggregating commitments** to purchase large volumes of retrofits at a lower price point than bespoke retrofits.

Goal

Energiesprong specifies that retrofits as a product must have four attributes:

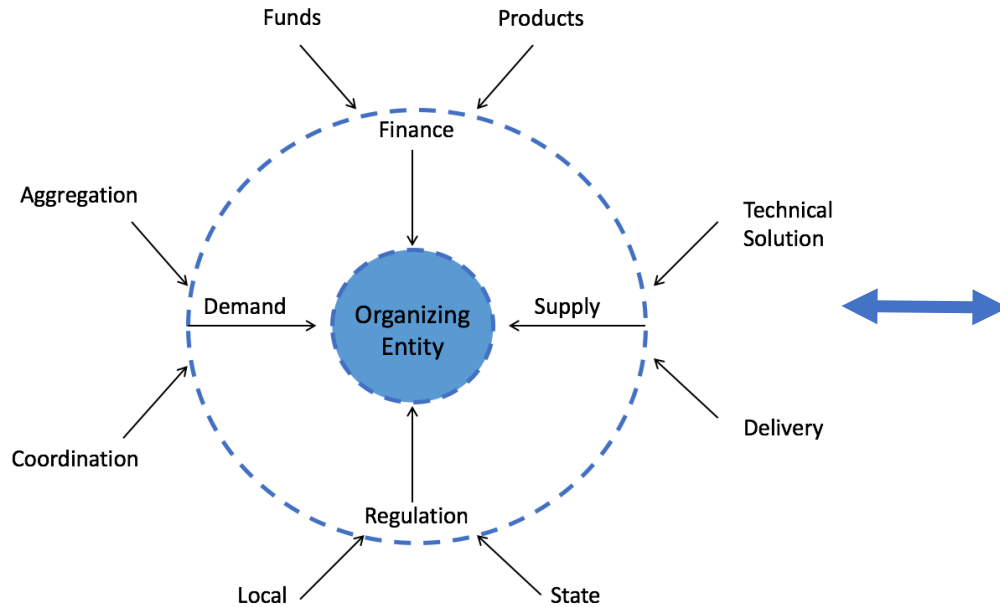
- **Energy neutrality** – annually, a home will produce as much energy as it uses for heating, hot water, lights and appliances
- **Financing** – retrofit investments are repaid by utility cost savings
- **Fast** – installation executed within 10 days per unit to minimize disruption to tenants
- **Guaranteed Performance** - 30-year energy performance warranty from the solution provider (builder or original equipment manufacturer (OEM)).

Energiesprong Business Model

Energiesprong has created a two level strategy focused on coordinating the supply chain in order to support a mass market for residential energy retrofits.

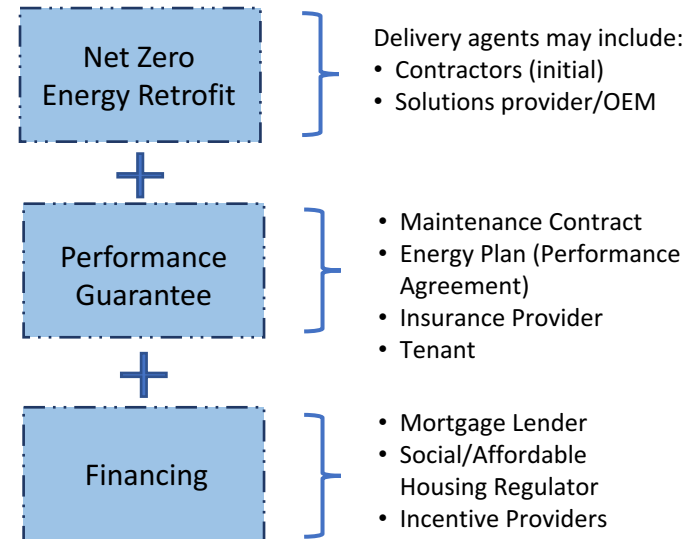
Level 1: Coordinate Stakeholders

Organize value chain by providing unique value propositions to each actor within the value chain



Level 2: Create Mass Retrofit Market

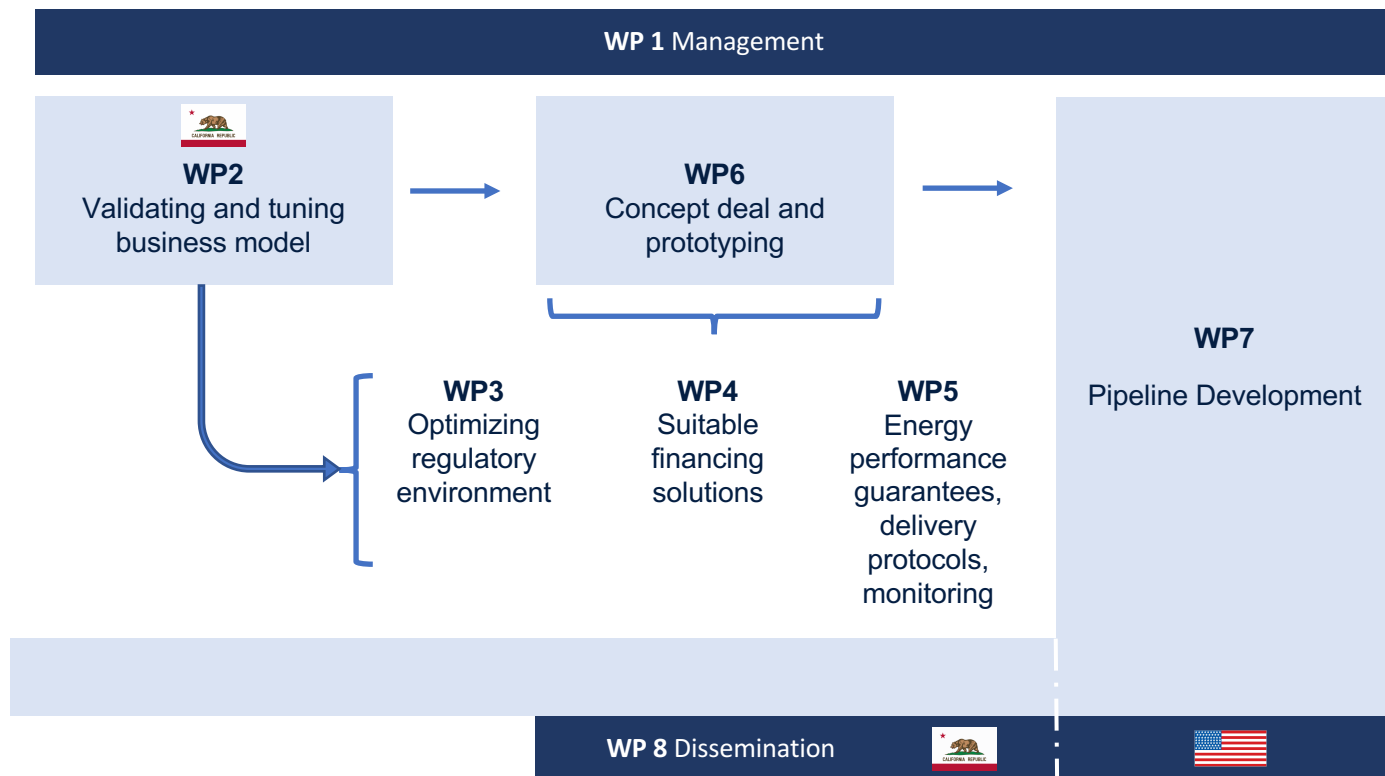
Ensure a comprehensive product offered to the consumer:
multifamily housing developer/owners



Market Entry Roadmap

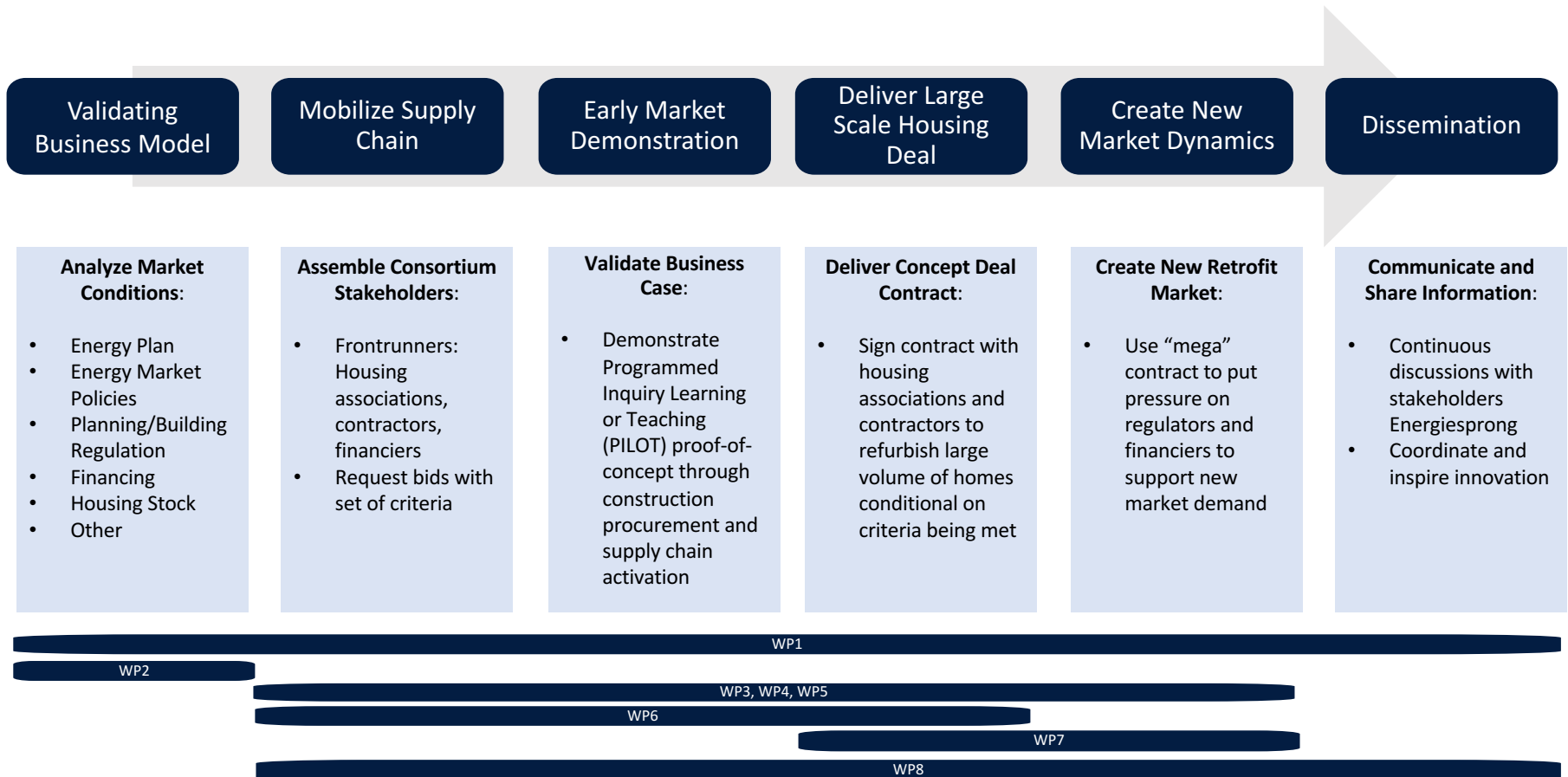
Transition Zero has divided the process of developing an Energiesprong offering in new countries in the EU into eight work packages, indicated below.

California flags indicate which portions of this work program have been explored or partially met by the current project.



Implementation - Work Plans

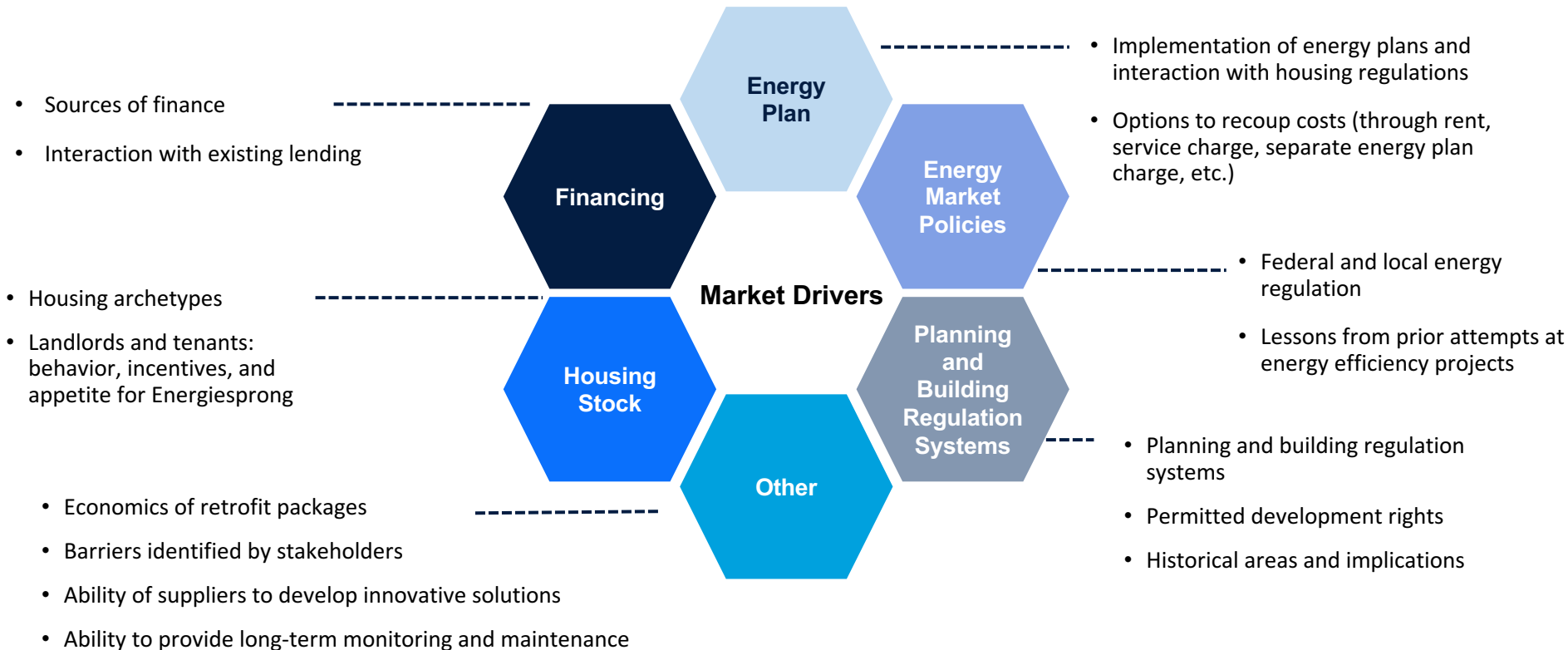
Each Transition Zero acts as a network organization, facilitating replication of Energiesprong. Each work package defines a scope of work necessary to unlock the retrofit market.



Validating and Tuning Business Model



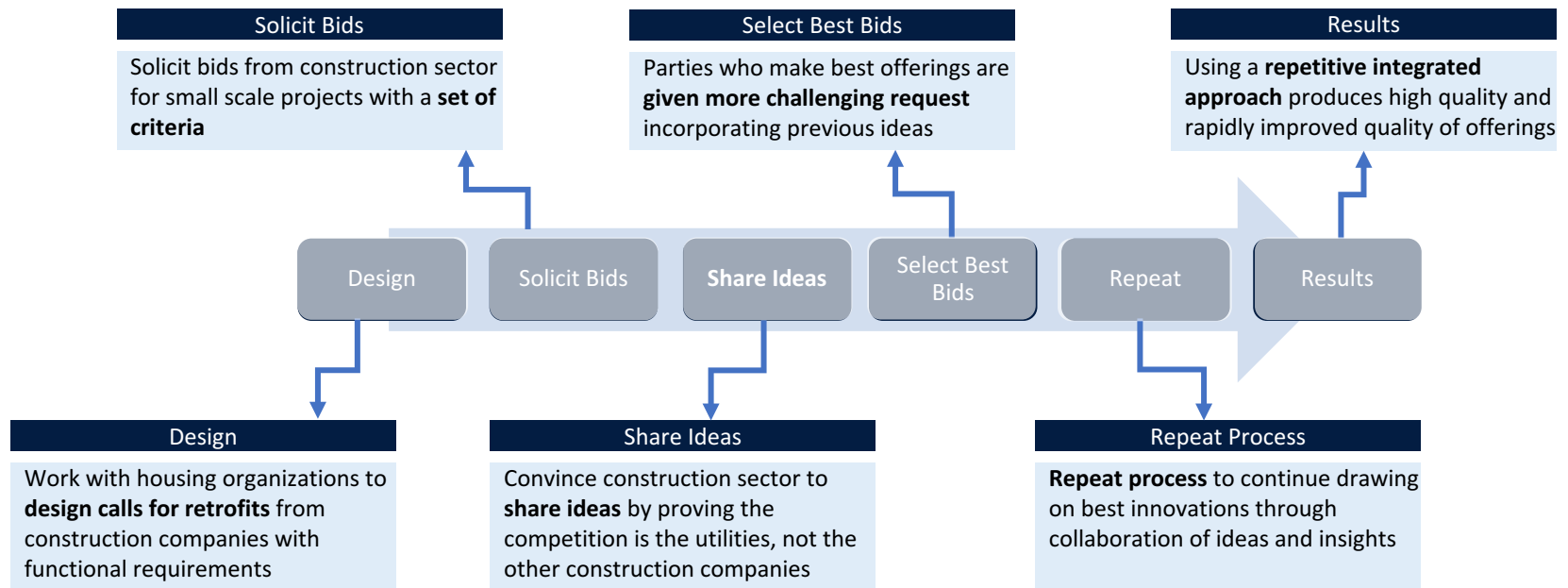
Investigate market drivers to determine conditions that will promote success, and determine which conditions create barriers to implementation.



Mobilize Supply Chain



Energiesprong uses a multi layered bid system to collect market knowledge, integrate insights, and support competitor cooperation.



Early Market Demonstration



Programmed Inquiry Learning or Teaching (PILOT) projects may be useful to bring confidence to the market and test technical solutions, but they may not be necessary if previous projects are available that can be analyzed and copied.

Option 1

Proof of concept developed through analysis of existing projects

- Demonstration is important, but **depends on resources and availability of information**
- Given the large amount of Dutch pilot houses in place, it has proven **easier to convince** construction companies how to reach net zero in refurbishment
- Because concepts are known and function to required specifications, development teams can **share knowledge and technology** about concepts that have been proven
- Energiesprong has **eliminated** a pilot phase as a required process to start innovating

Option 2

Proof of concept developed through physical prototype construction

- Prior to large scale housing commitment, create **PILOT demonstration** by physically retrofitting properties and/or testing soft approaches such as specifications, contracts, or regulatory variances
- **Delivery model for demonstration** while providing validation of technical and coordination feasibility
- Use results from PILOT as **context for further discussions** and to **motivate stakeholders** to become involved and continue innovating

Deliver Large Scale Housing Deal



Assurance of large scale demand is essential to put pressure on the regulators and financiers to adjust market conditions to meet market demand.



Supply

- Stakeholder unification will **kick start** technical innovation cycle
- Establish group of suppliers prepared for **large scale** NZE retrofits

Concept Deal Contract

- Draft “**concept deal**” – contractors and housing associations **commit** to refurbish properties **conditional** on certain criteria being met
- **Testing regulatory/ financing conditions**, finding workaround solutions
- Brings **clear focus** on what conditions need to be worked on

Demand

- **Aggregate demand** through large housing providers
- Establish group of housing providers and housing stock **prepared for large scale** NZE retrofits



Create New Market Dynamics



Focus on conditional elements of the “concept” deal – develop and improve market conditions to support the retrofit as product (i.e. scale provides market stability to catalyze iterative performance improvement and reduction in unit cost).



Dissemination

Validating
Business Model

Mobilize Supply
Chain

Early Market
Demonstration

Deliver large
scale housing
deal

Create new
market
dynamics

Dissemination

Use available networks and stakeholders to disseminate lessons learned and incorporate external ideas and innovations.



Transition Zero Management Team

Coordinate non-hierarchical organization that facilitates, coordinates, and inspires innovation



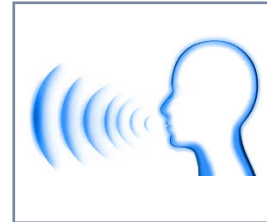
Quarterly Discussions

Social housing owners, financing, construction, and Energiesprong



Branding

Utilize external organizations to develop net zero brand, publicize lessons, and drive support



National Conferences

Attend Energiesprong speaker series to share experiences and innovations

Transition Zero: Resources Required



*Transition Zero is the **European Union-funded initiative** to replicate the conditions of **Energiesprong's** success across Europe, using **regional teams** to organize a market to deliver retrofits as a **product**, rather than projects.*

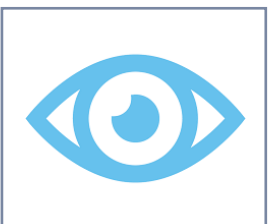


Regional Transition Zero/*Energiesprong* Team

Organizing a market requires systematically identifying reasons existing market actors – many motivated, skilled, and well-resourced – are not delivering residential NZE at scale. The team is an entrepreneurial and neutral party – not selling a product, not regulating, but facilitating development of a market by disrupting entrenched practice. Transition Zero teams start with 3-4 members managing specific work plans (see: Implementation) and expand to 5-8 when needed, with the project structured to complete all deliverables and see retrofits in production in quantity in three years.

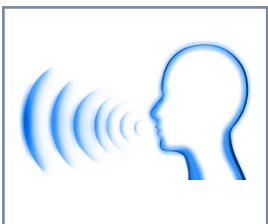


There is no set formula for this team. The endeavor requires: non-hierarchical leadership and negotiation; communication and facilitation; marketing and education; business planning; policymaker engagement; measurement and transparency; and supply chain insight.



Resources Required

Transition Zero staff estimate the minimum cost of this effort is \$3 million per market over 3 years, sufficient to attract staff with the necessary skills and experience.

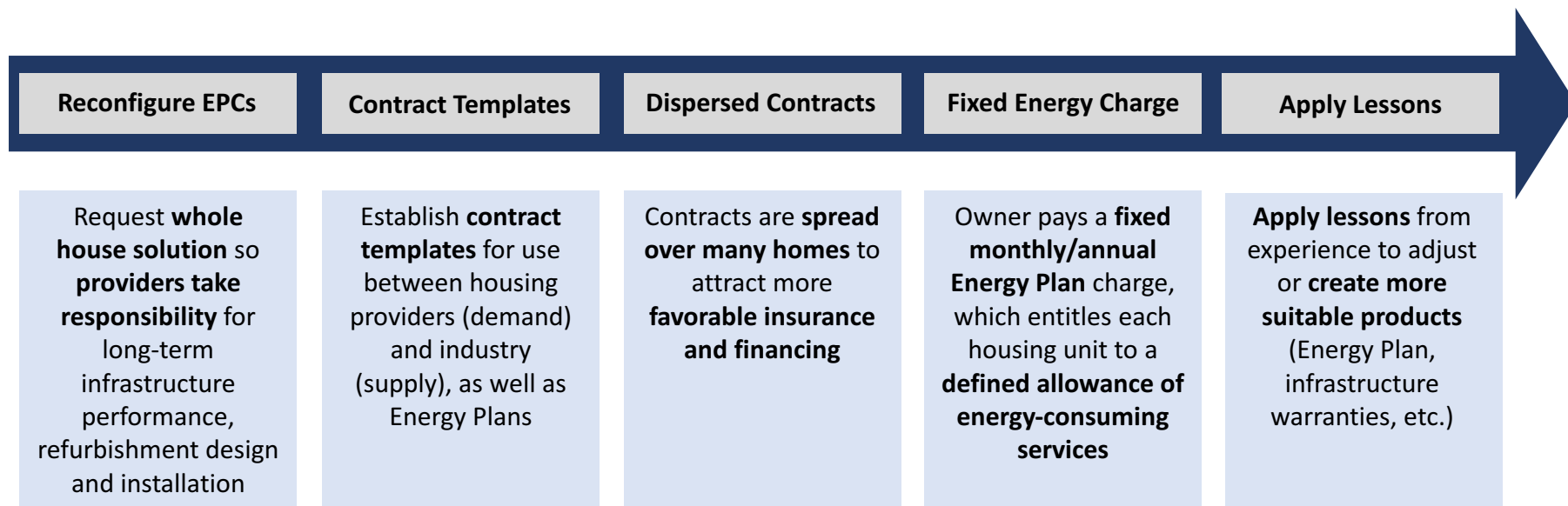


In return, policymakers receive a scaling market, declining cost curve for building performance as a product, and private sector investment in retrofit technology.

Deep Dive - Performance Guarantees

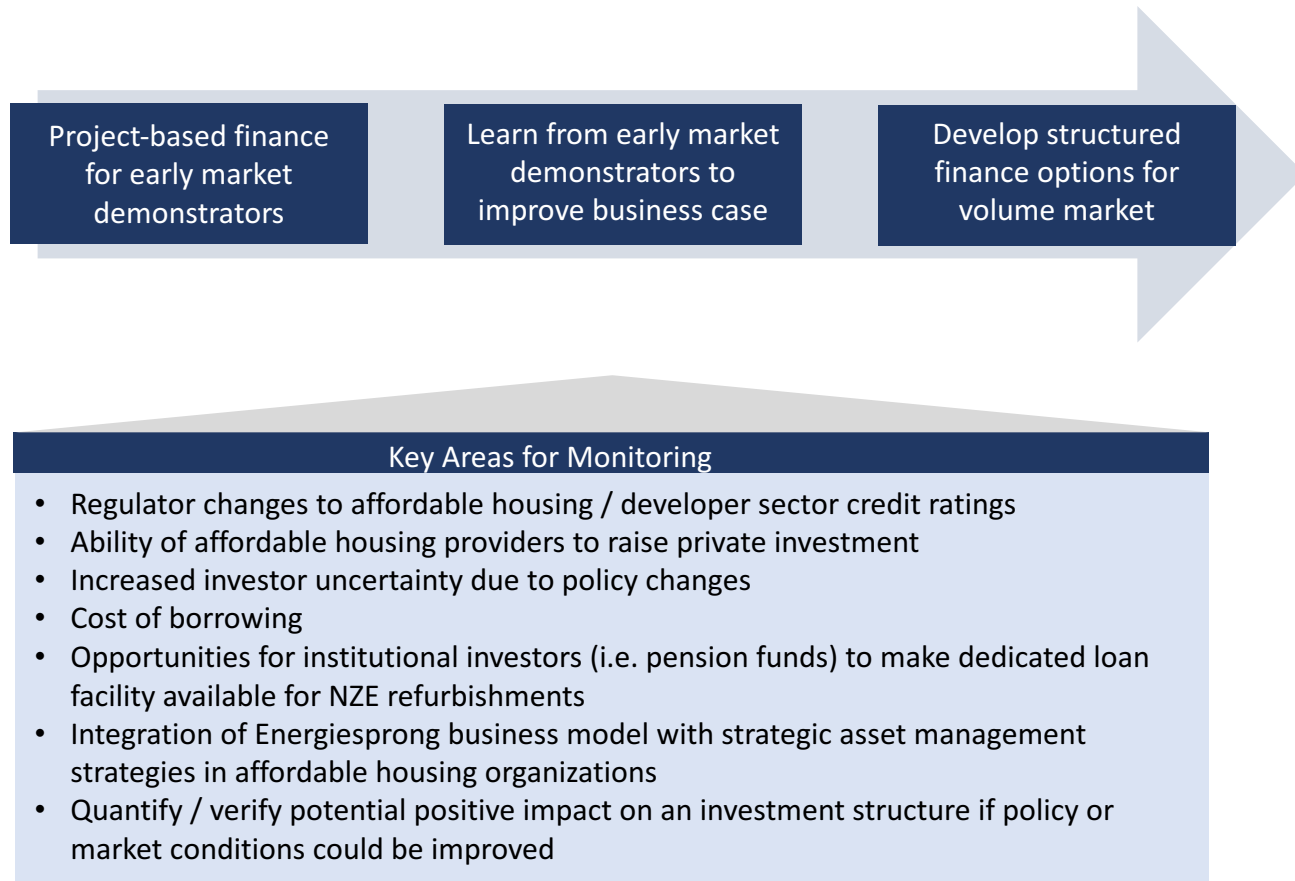
Utilizing a performance guarantee decreases riskiness for housing associations and helps attract financing.

Contract Key Elements	Energy Plan	Agreement to deliver specific services that consume energy. Objective is not the execution of works or the supply of goods
	Infrastructure Warranty	Mechanism that protects a person/owner against pecuniary loss. Define how the owner is made whole in the event of a problem
	Measurement and Verification	Measurement protocol to verify contractually agreed performance, and assign deviations to either tenant behavior or technical issue
	Performance Assurance	Establish protocol to correct deviations from performance due to technical issues
	The Investment	Future energy savings or increased rent are used to securitize debt



Deep Dive - Finance

Upfront financing is required to fund initial retrofit costs, and loan installment payments are underwritten based on future maintenance and energy savings.



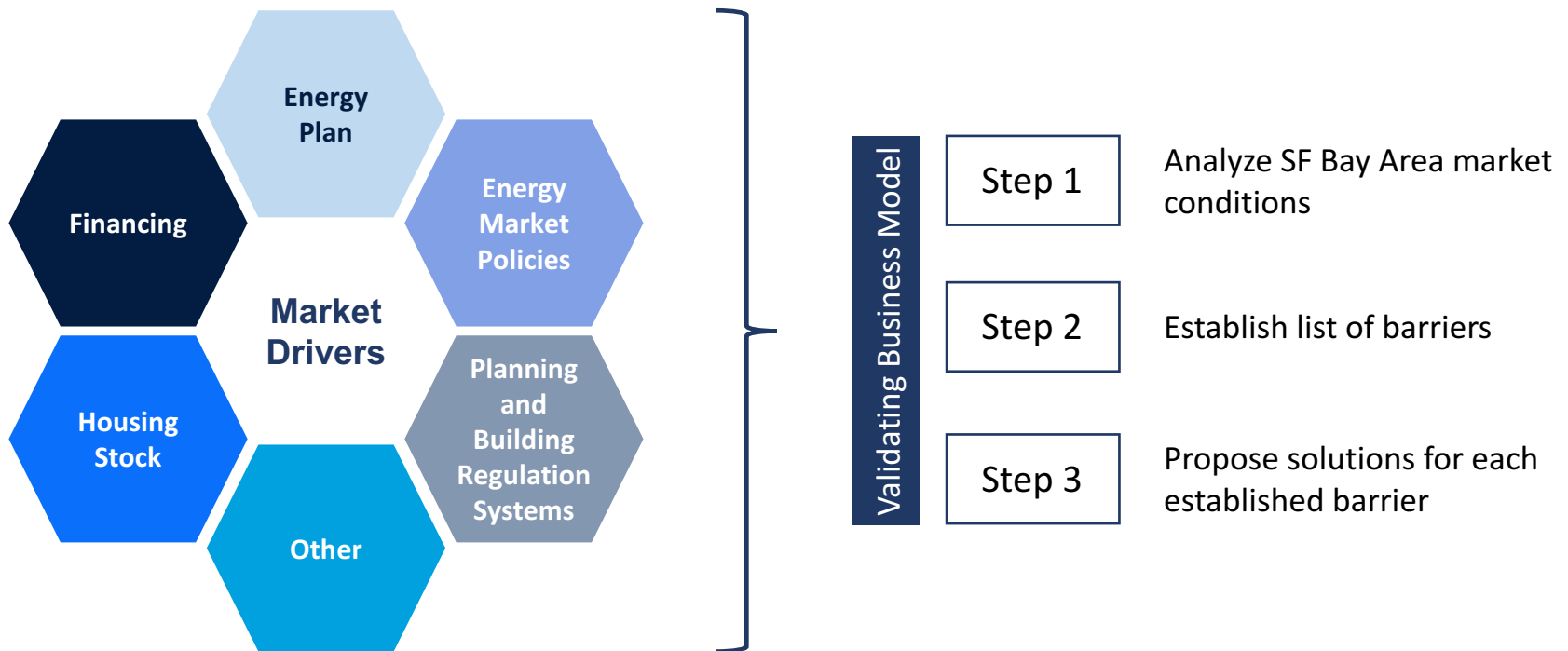
REALIZE: SF Bay Area Business Model

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REALIZE: SF Bay Area Business Model

Where the previous section introduced the Energiesprong model, this section summarizes our findings about the actions necessary to import the model for the San Francisco Bay Area. Adaptation is necessary, but we aim to hew as closely to the Energiesprong model as local conditions allow.

Analyzing market conditions and barriers for each market driver enables REALIZE to propose solutions to overcome obstacles to implementation.



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Housing Stock – Market Conditions

Housing stock market conditions present a number of variables that impact a developers ability to profit from energy retrofits.



Ownership	A majority of LIHTC properties in California (CA) are owned by nonprofits.
Government	HUD restricts the amount of rent that can be charged, and how energy is charged and paid. A site may receive subsidies from multiple HUD and non-HUD programs
Condition	Often older affordable housing properties require significant renovations to the property (elevator repairs, carpet replacement, etc.) in addition to energy improvements. Many properties are also historical buildings or are located in historical areas of the city, which restricts development rights.
Costs	Water and water heating costs are typically the highest operational property costs in the Bay Area, as opposed to heating and cooling.

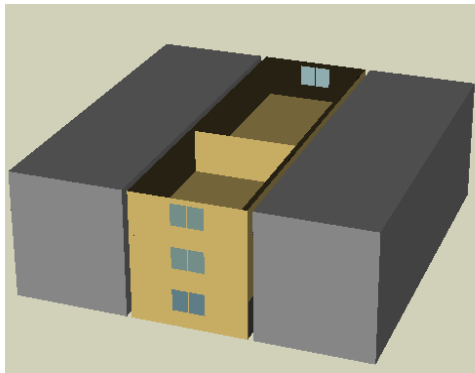
Housing Stock – Market Conditions (continued)

The majority of affordable multifamily buildings in San Francisco were constructed prior to 1980, have gas furnace heating, and are three stories or less. There are roughly 69,857 affordable housing units in the San Francisco Bay Area. A retrofit feasibility study was conducted on three prototypical building typologies.

Category: 5-9 unit building Market Share: 8.9% (~6.2K)

6 Unit Prototype

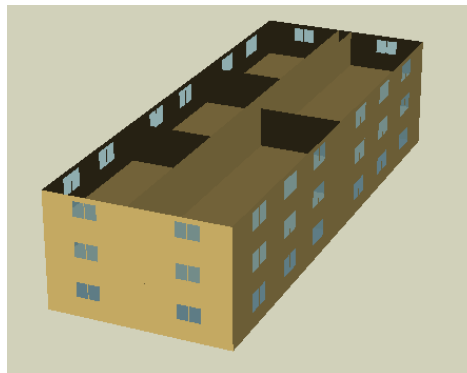
- Built pre-1980s
- 4,725 sf
- 3 stories
- Row home
- Furnace, no cooling*
- Individual gas HW heater



Category: 10-19 unit building Market Share: 22.5% (~16K)

15 Unit Prototype

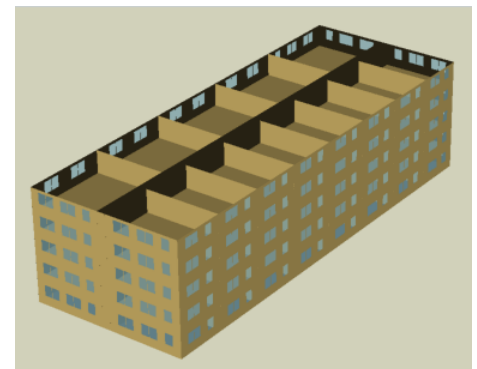
- Built pre-1980s
- 11,270 sf
- 3 stories
- Stand alone building
- Furnace, no cooling*
- Central gas HW heater



Category: 20+ unit building Market Share: 66.2% (~46K)

65 Unit Prototype

- Built pre-1980s
- 40,900 sf
- 5 stories
- Stand alone building
- Central boiler, no cooling*
- Central gas HW heater



* 58% of San Francisco homes use natural gas, 36% electricity according to an ACEEE 2017 report

Housing Stock – Market Conditions (continued)

Net zero carbon retrofit cost benchmarks and targets were determined by averaging results from a set of hypothetical net zero carbon retrofit packages for each building prototype category. With incentives most low-story projects are well in the money.

	6 Unit Prototype	15 Unit Prototype	65 Unit Prototype
Current Net Zero Carbon Retrofit Cost (\$/Unit)	\$19,013	\$22,255	\$22,296
Cost With Current Incentives (\$/Unit)	\$7,527	\$8,985	\$11,329
25 Year Present Value* Utility Bill Savings – I.e. Price Point for Retrofit Funded by Cost Savings (\$/Unit)	\$17,997	\$22,053	\$12,189
Cost Reduction Required for Retrofit Repaid Through Utility Bill Savings (Without Incentives/With Incentives)	5.34% / 0%	0.9% / 0%	45.3% / 0%
Price Point for 10 Year Simple Payback Period (\$/Unit)	\$9,045	\$11,371	\$5,867
Cost Reduction Required for 10 Year Simple Payback Period (Without Incentives/With Incentives)	52.4% / 0%	48.9% / 0%	73.7% / 48.2%

*Energy savings PV calculated using a 5% discount rate and an escalation rate of 2.35% for the 6 unit prototype, 2.28% for the 15 unit prototype, and 2.48% for the 65 unit prototype. Escalation rates are a blended average based on 10 years of gas and electric escalation in California from the EIA. 25 years selected as life of retrofit package. Water and sewage savings calculated assuming 5% discount rate and 5% escalation rate.

Housing Stock – Barriers & Solutions



Barrier	Solutions
NZE retrofits may not be economically feasible for a subset of properties	<ul style="list-style-type: none"> • Target LIHTC-supported renovations, so utility savings need only cover costs additional to CA T24 Energy Code compliance • Demonstrate feasibility through PILOTs or prototype modeling by housing typology and market segment • Develop options for off-site renewable electricity, such as 100% renewable power from utility or CCA • Focus on properties with high water-related utility costs
Some properties have central systems or unit-associated space for HVAC or DHW equipment	<ul style="list-style-type: none"> • Catalog solutions, such as compact technologies, incorporating equipment into the façade, etc. • Where possible, convert central systems to efficient distributed systems • Collect performance data to better document performance risk in master-metered properties
Tenants may object to retrofit due to hassle of disruption	<ul style="list-style-type: none"> • Initially target LIHTC-supported renovations where baseline scope requires temporary tenant relocation. Focus second-wave outreach on aesthetic, safety and comfort benefits to tenants. • Consider sequencing to complete work that does not require relocation either before resident departure or after return
Historical protections may require retention or replication of existing facades, and may be difficult to acquire permits	<ul style="list-style-type: none"> • Avoid sites with historic resources during initial demonstrations • Allow the “product” to differ at historic sites. Energiesprong examples at heritage/historic sites have included air sealing and insulation coinciding with façade restoration (not panelized solutions), and retrofits focused on mechanical systems. • Develop protocols for consistency in allowed energy efficiency updates to historic resources.

Housing Stock – Barriers & Solutions (continued)



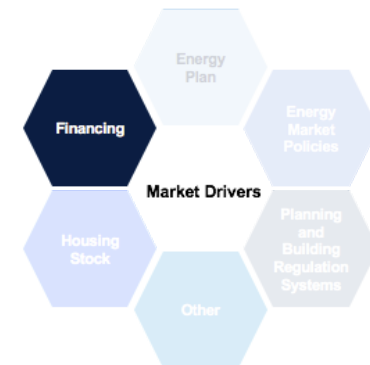
Barrier	Solutions
<p>Risk that energy performance goals are not met because housing owner mismanages energy efficiency systems or procedures after retrofit</p> <p>Risk that energy performance goals are not met due to occupant behavior</p>	<ul style="list-style-type: none"> • An “Energy Plan”, Performance Warranty, and tenant-metering or sub-metering re-assign responsibilities to create transparency about energy consumption due to non-performing systems, maintenance, or occupant behavior. (See Energy Plan section.) • Test varied approaches to training owners and management teams on use of energy systems, and supply easy-to-use manuals • Test varied approaches to training tenants to operate their home • Where standard Energy Plan does not apply – possibly sites with master-meters or central systems – consider maintenance and retro-commissioning plan with retrofit refurbishment provider, informed by measurement and verification (M&V) • Partner with researchers to document performance, and inform/ update subsequent Energy Plans to meet occupant expectations
Some properties are under-heated or under-cooled, so provide poor comfort with little potential for energy savings	<ul style="list-style-type: none"> • Document rate of under-heating/cooling, which reduces baseline energy spend – reducing amount financed by savings. Seek subsidies from governments or philanthropy to provide equitable comfort and safety for residents
Variation in building stock requires bespoke solutions	<ul style="list-style-type: none"> • Inventory affordable housing and group on the basis of typologies requiring relatively homogeneous solutions
Many properties require significant renovations, not just energy improvements	<ul style="list-style-type: none"> • Focus on sites eligible for recapitalization at LIHTC re-syndication, where deferred maintenance and upgrades for code compliance are already on the table

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Finance – LIHTCs

California Tax Credit Allocation Committee (CTCAC) administers the federal 4% and 9% LIHTC programs for CA properties.



	4% Tax Credit Category	9% Tax Credit Category
Tax Credit Mechanics	<ul style="list-style-type: none"> Credits provide dollar-for-dollar reductions in a taxpayers federal income tax, run by CTCAC Typically paid in annual allotments over 10 years, credit compliance is 15 years After 15 year cycle, may “re-syndicate” to receive new round of tax credits to fund property improvements 	
Attributes	<ul style="list-style-type: none"> Used for both new construction and rehab Subsidizes 30% of low-income unit costs Typically required to remain affordable housing for at least 30 years after project completion 	<ul style="list-style-type: none"> Used predominantly for new construction Subsidizes 70% of low income unit costs Requires 55 year affordable housing period
Eligibility	<ul style="list-style-type: none"> Less competitive, minimum requirements Typically available if project economics work Some projects may benefit from additional credits from the State of CA; REALIZE does not depend upon it. 	<ul style="list-style-type: none"> Highly competitive Determined through point system (140 points) – 5 points available for sustainable measures, experience taken into consideration
Retrofit	<ul style="list-style-type: none"> To access tax credits for retrofits, must prove increased level of energy efficiency, measured through metric called “Time Dependent Valuation” (TDV) a metric underpinning CA T24 Energy Code Property must provide increase in 10%-15% TDV TDV derivation expected to significantly change in 2019 	

Note: A detailed example calculation for LIHTCs can be found in Appendix B

Sources: Lowell Chu, City & County SF; Sean Armstrong, Redwood Energy; Mara Blitzler, SF Mayor’s Office of Housing and Community Development; Nehemiah Stone, Stone Energy Associates

Finance – LIHTC Retrofit Timeline

There are several restrictions for LIHTC property owners: when the property can be sold, when the property can be re-financed, and how a retrofit can be funded.



**Years
1 - 15**

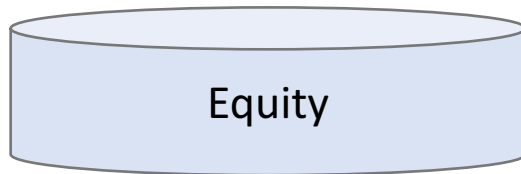
- Restricted from selling property before year 10
- The capital stack typically includes 9-16 partners, each partner with incentives to continue their ownership until year 15
- Property improvements within 15 year cycle typically responsibility of owners (owner required to set aside capital for improvements)
- Typically required to maintain property as affordable housing for 30 years (55 years for 9% category)

**Years
15 - 30**

- After 15 year cycle, typically two options to fund retrofit
 1. Recapitalize using new owners/partners, granting access to new LIHTC for retrofits
 2. Owner can self-fund retrofit (without use of credits) and profit off reduction in UA (if reduction to UA is allowable)

Finance – Capital Stack

Affordable housing properties includes three levels of capital financing.



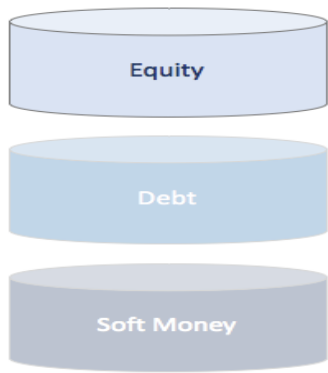
- Typically made up of LIHTC equity
- Covers acquisition and rehab cost basis (eligible basis), not land
- Qualified Census Tracts: Developments completed on qualified tracts or difficult to develop areas opens opportunity for 30% tax credit boost in eligible basis



- For 4% LIHTCs 50% of total eligible project basis must be covered by private activity bonds
- Written as 1st mortgage
- 35 year amortization schedule
- 18 year note

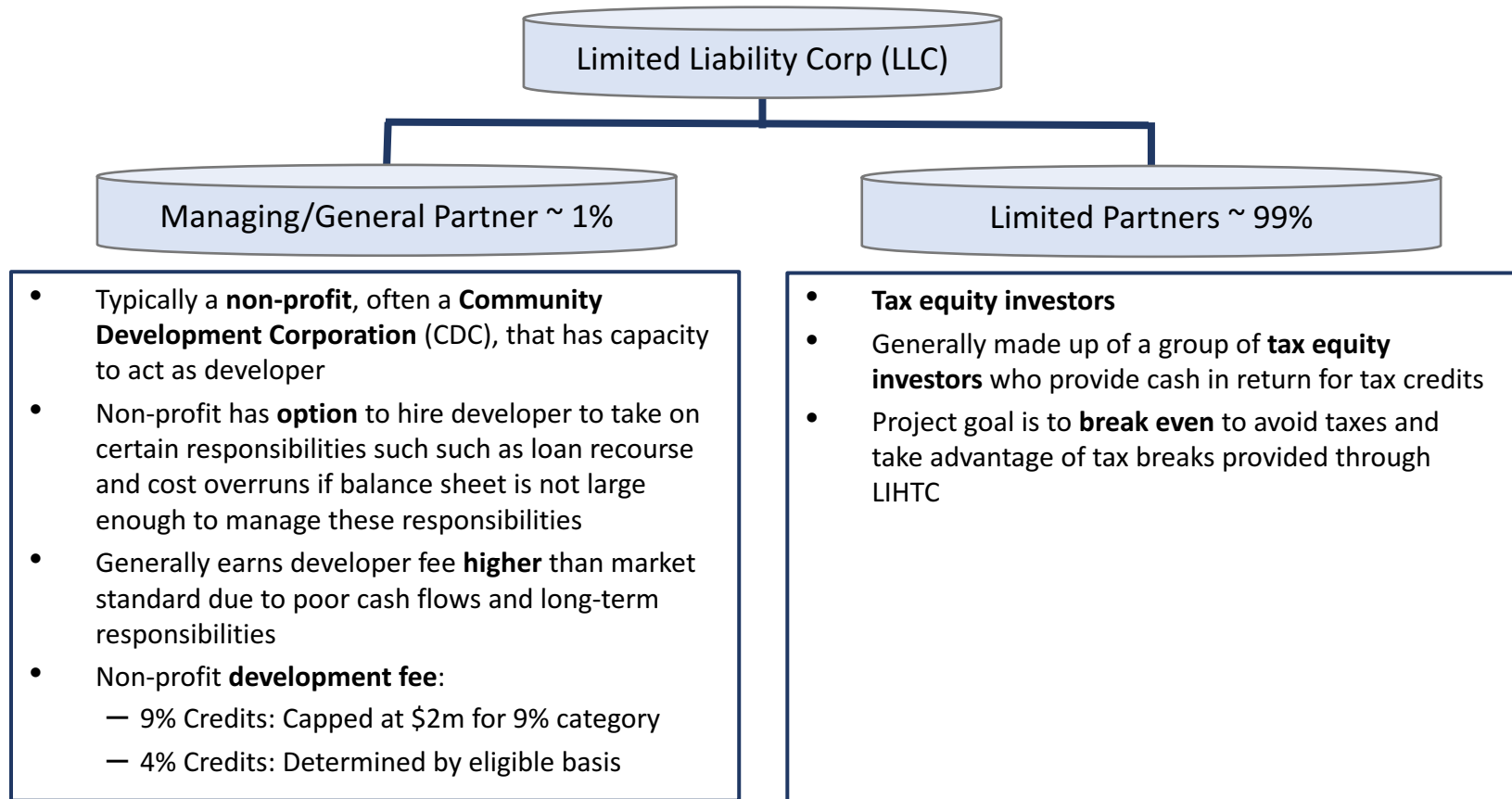


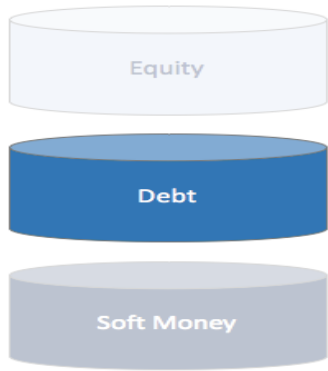
- Real estate transfer or sales taxes
- Subordinate loan with certain forgiveness
- Grants
- Long-term subsidized land leases
- Utility incentives



Finance – Capital Stack: Equity Structure

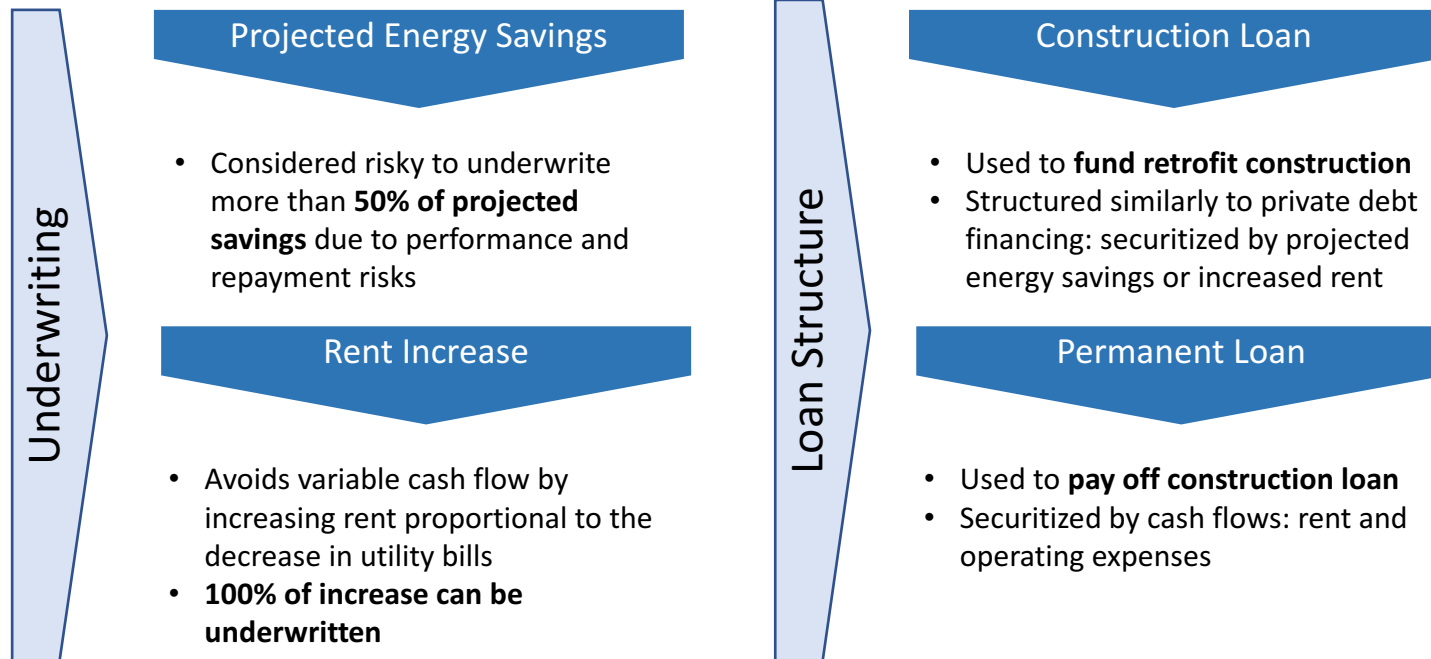
Affordable housing properties in CA are typically structured as a limited liability corporation, and the partnership typically includes at least one non-profit and tax equity investors.

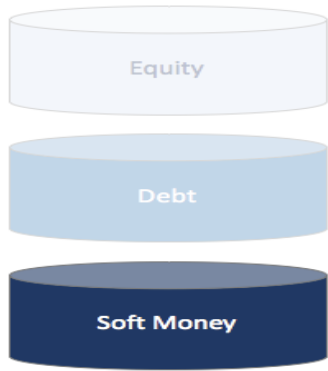




Finance – Capital Stack: Debt

When the project being financed includes an energy retrofit the ability to securitize additional project debt depends on whether the future generated revenue streams are created through projected energy savings or increased tenant rent.





Finance – Capital Stack: Soft Money

Affordable housing properties take advantage of various forms of soft money that are often competitive, time consuming to apply for, and require individual applications, yet are critical to make project economics work.



- Community Dev. Block Grants
 - Enterprise Community Grants
 - NeighborWorks America
- Revolving funds channeled through HUD
 - Unable to use Block Grants in SF
 - Typically cover soft costs



Bay Area Utility Ratepayer Funding Program Administrators

Bay Area Regional Energy Network: (BayREN)

- BayREN Multifamily Housing Program

Pacific Gas & Electric (PG&E)

- Multifamily Upgrade Program (energy efficiency)
- Multifamily Affordable Solar Housing



- CA Energy Commission Grants: Not revolving, one off grant
- Cap and Trade Funds: Not common in SF, most areas ineligible
- Subordinate loans with potential levels of forgiveness
- Long-term subsidized land leases
- Additional funding through pool of real estate transfer / sales taxes
- Net zero project grants

Finance – Barriers & Solutions



Barrier	Solutions
<p>Potential energy savings is typically not considered a tangible security to attach to a loan by financial institutions because of uncertainty of actual savings</p> <ul style="list-style-type: none"> Valued at 50% of total potential cost savings 	<p><u>Master metered</u>: Attach performance guarantee to energy savings to increase securitization of energy savings</p> <p><u>Tenant/Sub Metered</u>:</p> <ul style="list-style-type: none"> Document lender response in Netherlands to “Energy Plan”, performance warranty, and tenant-paid energy costs – which enable differentiation between non-performing systems, maintenance, and occupant behavior. Expand options to base UA on credible energy model, thus enabling opportunity to securitize increased rents
<p>Housing associations are restricted by existing secured loans and unable to take on additional debt</p> <ul style="list-style-type: none"> Unable to layer additional financing onto existing loans 	<ul style="list-style-type: none"> Focus on properties up for re-syndication (at 15 year LIHTC cycle) Accept participation by owners with capital to self-fund a retrofit
<p>Potential increase in property taxes</p>	<ul style="list-style-type: none"> Solar power systems in California are exempt from property tax through 2025 Focus on properties owned by non-profits, and/or deed restricted, because they are exempt from paying property taxes
<p>Difficult to streamline financing hurdles because the LIHTC subsidy requirements change, and many sites benefit from multiple subsidies (with different rules)</p>	<ul style="list-style-type: none"> Use HUD & CTCAC information to identify Bay Area affordable properties in the same re-syndication cycle and attempt to pool properties with similar financing constraints

Finance – Barriers & Solutions (continued)



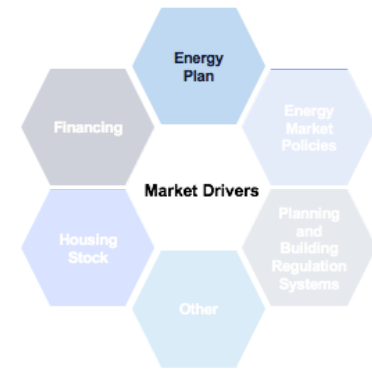
Barrier	Solutions
Specific energy updates may be required to use the LIHTC	<ul style="list-style-type: none"> • Develop reference for CTCAC requirements and T24 Energy Code requirements • Reach out to owners that decline to participate; determine which requirements deterred them from REALIZE
Application process for LIHTC burdensome and costly <ul style="list-style-type: none"> • Need large scale to make tax credits work 	<ul style="list-style-type: none"> • Focus on portfolios that already utilize LIHTC

REALIZE: SF Bay Area Business Model - **Energy Plan**

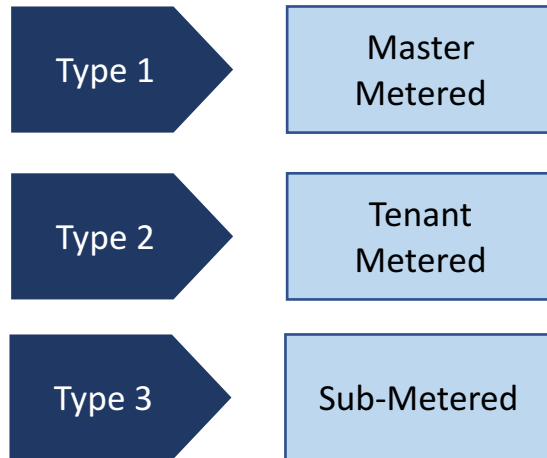
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Current Practice: Metering Models

The type of metering system determines how properties charge tenants rent and energy costs, and significantly impacts the strategy REALIZE will take for each metering system.



Types of Metering Systems



Common Attributes

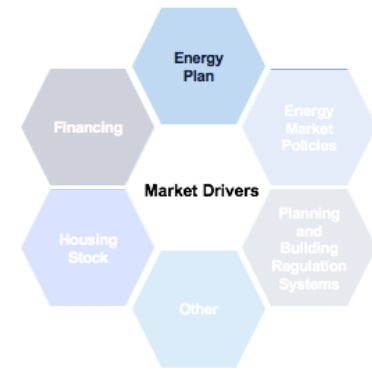
Max Tenant Income	60% Area Median Income (AMI)
Tenant Rent Cap	No greater than 30% of tenant income

Differentiating Attributes

- Restrictions on how rent and utilities are calculated and charged, and whether a UA is included in the calculation
- Who pays energy costs
- Who is responsible for energy cost overruns
- Who is incentivized to update energy efficiency
- Who is incentivized to reduce energy use

Current Practice: Utility Allowance (UA)

The calculation and the ability to commit energy cost savings to project finance is key to the business case for an energy retrofit.



Utility Allowance

- Represents the amount the Public Housing Association determines is necessary to cover a resident's reasonable utility costs
- Applies to tenant metered and sub-metered properties, not master-metered

2 Options to Calculate UA

HUD Matrix

CA UA Calculator (CUAC)

- Approximately 95% of developers use HUD matrix to determine UA
- Local authorities interpret the HUD rules and apply it to their region
- Currently, 5% of California developers use software to calculate UA
- CUAC is currently limited to participants in a single incentive program, but is expected to expand in late 2017



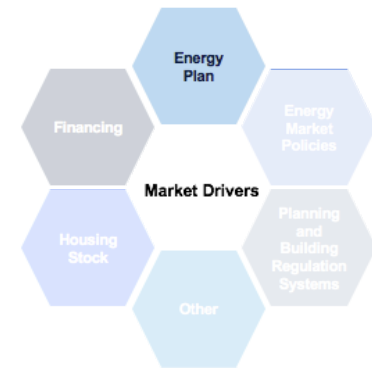
Difficult to switch from HUD matrix option to CUAC option

Retrofits must be funded by the PG&E Multifamily Affordable Solar Housing (MASH) program to be granted access to adjust UA after energy performance is improved

The policy that requires projects to use MASH in order to adjust their UA is set to change by Fall 2017. The new policy is believed to grant a wider range of projects access to adjust their UA

Current Practice: Tenant Metered Properties

Owners can have a direct incentive to improve their energy efficiency if they can capture a tenant's reduced UA. Tenants are also incentivized to keep their utility expenditures low.



Housing Authority

LIHTC



Tenants

Shelter

\$400



Owner

Actual
Utility Cost



Utility



Current Situation

- Owner charges tenant “Rent Cap” less “UA”
- Households are individually metered, directly pays utility for energy costs



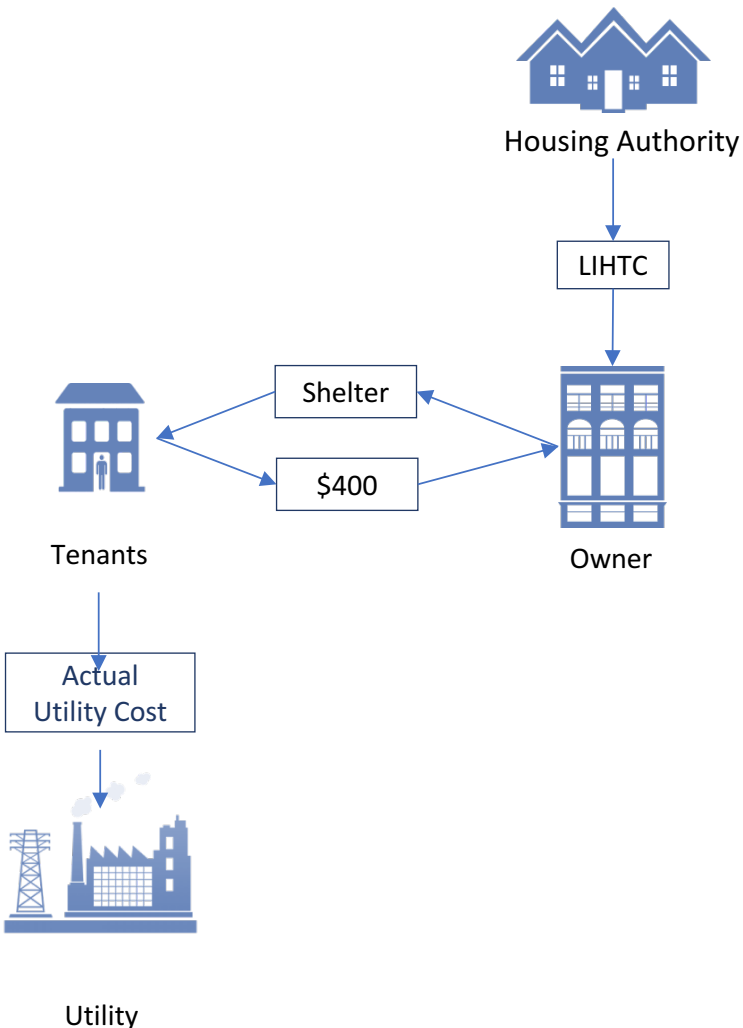
Impact of Current (Bespoke) Energy Retrofit

- If UA can be reduced, building owner can charge higher rent
- Tenant continues to be responsible to pay utility for energy costs that exceed UA and is thus incentivized to use less energy
- Owner has the ability to secure additional project financing by linking project cash flows to increases in rent

REALIZE Energy Plan: Tenant-Metered Properties



REALIZE retrofits would redirect the UA to finance the retrofit. The centerpiece is the Energy Plan - An agreement where the REALIZE retrofit supplier commits to providing each housing unit with enough renewable electricity to offset the energy use of a standardized package of comfort and operating services – fixed pricing for set services, analogous to a cell phone plan.



Pre-REALIZE Situation

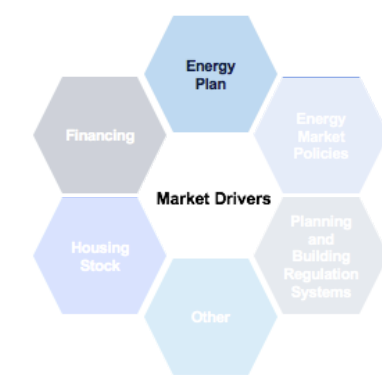
- Owner charges tenant “Rent Cap” less “UA”
- Households are individually metered, directly pays utility for energy costs



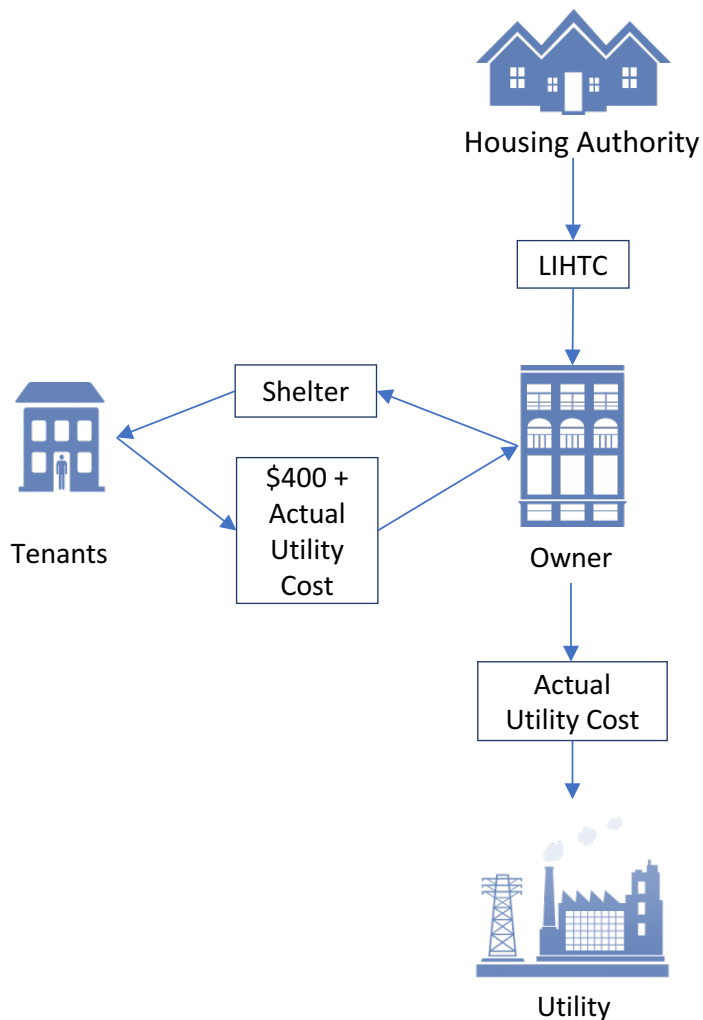
REALIZE Retrofit

- Owner contracts with retrofit supplier to receive an Energy Plan – Where onsite renewable energy generates enough power to deliver: X gallons hot water per day, Y thermal comfort range, and Z kWh for plug loads
- Tenants’ total housing cost remains the same, equal to rent cap
- Owner receives higher rent
- Tenant continues to be responsible for energy costs that exceed UA/Energy Plan and is thus incentivized to use less energy
- Owner qualifies for additional project financing based on cash flow from increased rent

Current Practice: Sub-Metered Properties



Similar to tenant metered properties, owners have a direct incentive to improve their energy efficiency if they can capture a tenant's reduced UA. Tenants are also incentivized to keep their utility expenditures low.



Current Market Dynamics

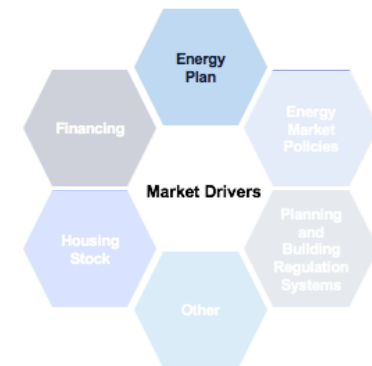
- Owner charges tenant "Rent Cap" less "UA" plus "Utility Bill"
- Households are individually metered, and pay owner for actual energy costs, owner then pays utility for energy costs
- Tenant is responsible for overages of utility bill over UA
- Owner: Financial incentive to make energy improvements and lower UA
- Tenant: Incentivized to use less energy



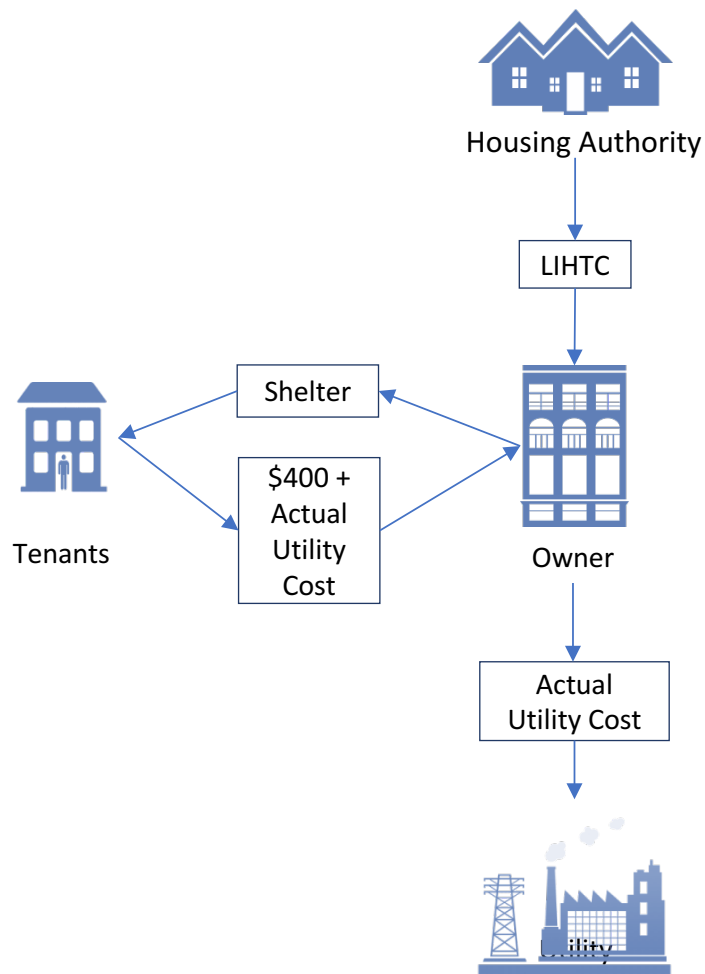
Impact of Energy Retrofit

- If UA can be reduced, building owner can charge higher rent; tenant continues to be responsible to pay utility for energy costs that exceed UA
- Owner has the ability to secure additional project financing by linking project cash flows to increases in rent

REALIZE Energy Plan: Sub-Metered Properties



Similar to tenant metered properties, REALIZE retrofits redirect the UA to finance the retrofit, and the retrofit supplier delivers an Energy Plan to provide each housing unit with enough renewable electricity to offset the energy use of a standardized package of comfort and operating services – a fixed price for a consistent set of services.



Current Market Dynamics

- Owner charges tenant “Rent Cap” less “UA” plus “Utility Bill”
- Households are individually metered, and pay owner for actual energy costs, owner then pays utility for energy costs
- Tenant is responsible for overages of utility bill over UA
- Owner: Financial incentive to make energy improvements and lower UA
- Tenant: Incentivized to use less energy

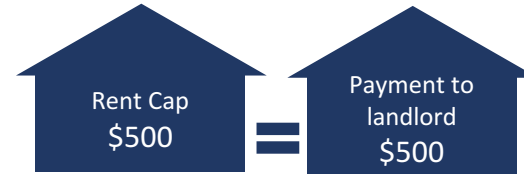
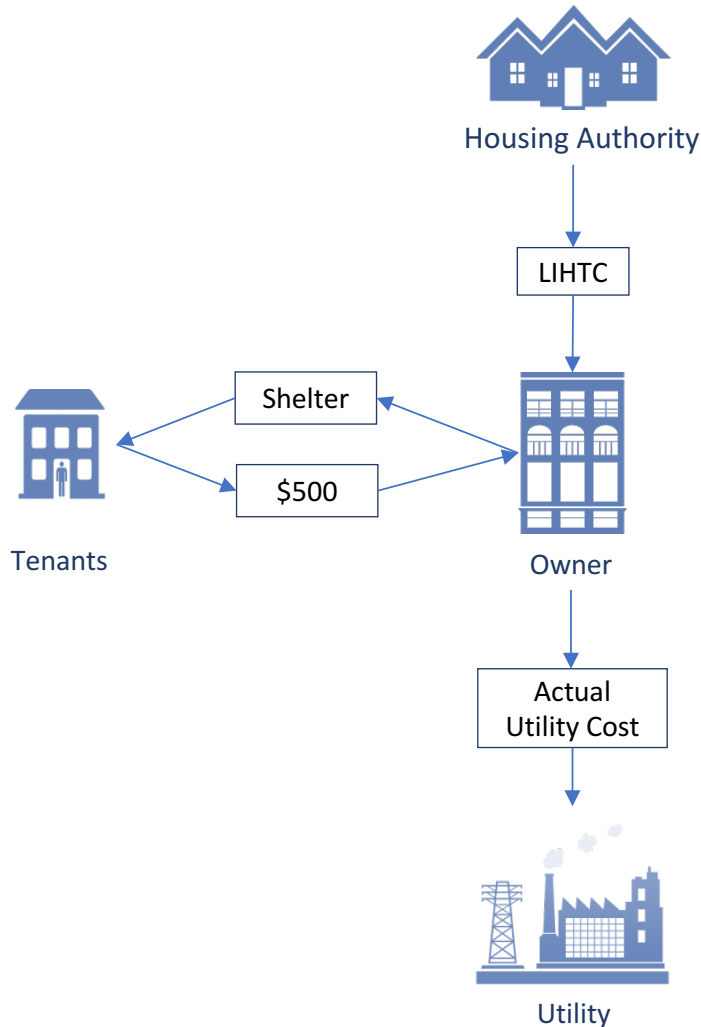


REALIZE Retrofit

- Owner contracts with retrofit supplier to receive an Energy Plan *for each unit* – Where onsite renewable energy generates enough power to deliver: X gallons hot water/day, Y thermal comfort range, and Z kWh plug loads
- Tenants’ total housing cost remains the same, equal to rent cap
- Owner receives higher rent
- Tenant continues to be responsible for energy costs that exceed UA/Energy Plan and is thus incentivized to use less energy
- Owner qualifies for additional project financing based on cash flow from increased rent

Current Practice: Master-Metered Property

Master metered properties provide a direct incentive for property owners to improve their energy efficiency, but typically do not provide incentives for tenants to reduce their energy use.



Current Market Dynamics

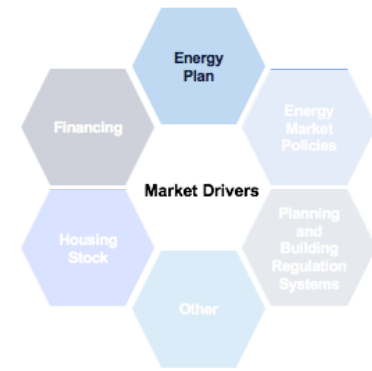
- Owner charges tenant full “Rent Cap”
- Tenant’s responsibility for energy cost are included in their payment to landlord (no UA to subtract)
- Owner directly pays utility for energy costs
- Owners: Financial incentive to make energy improvements
- Tenants: No incentive for energy improvements or energy use reduction



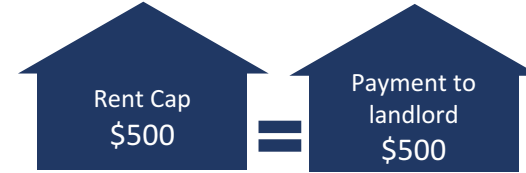
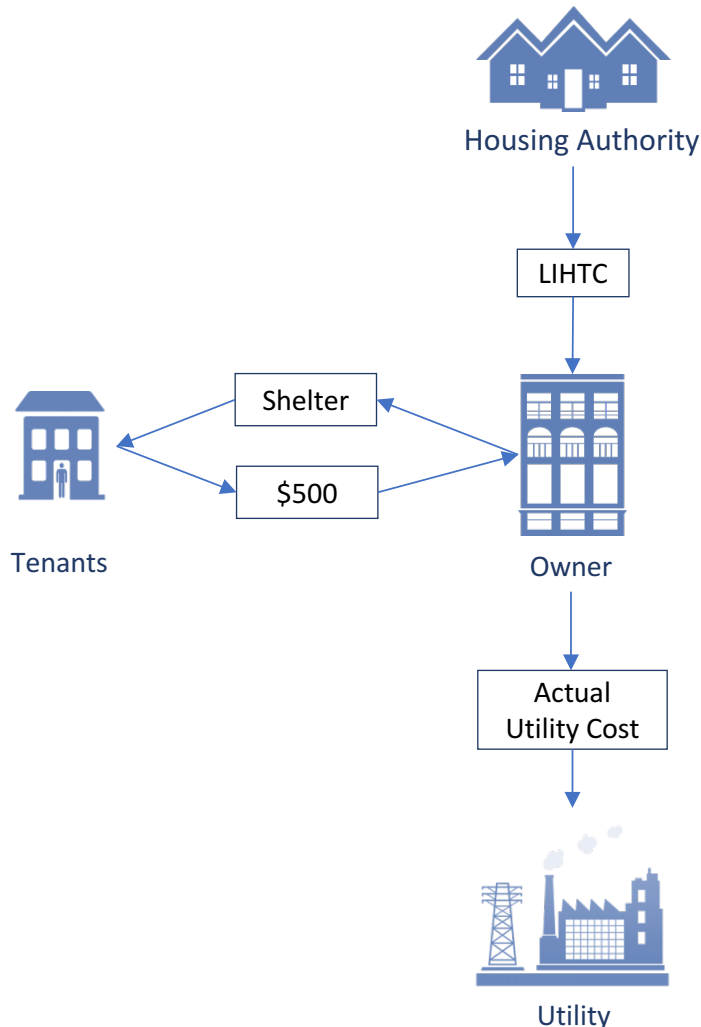
Impact of Energy Retrofit

- Efficiency improvement enables building owner to increase net income by maintaining the same level of rent collected, while reducing the amount paid to the utility for energy costs
- No adjustment to rent or utility charges necessary for owner to profit
- Ability to secure additional financing by linking to “projected energy savings” is generally limited to 50% of projected energy savings

REALIZE Energy Plan: Master-Metered Property



*REALIZE depends upon on redirecting utility costs to retrofit finance, and an Energy Plan to supply a fixed baseline of energy-requiring services fat a fixed cost per housing unit. **Properties that are currently master-metered should generally be sub-metered.** Where site conditions prevent full sub-metering (such as central systems), the owner assumes responsibility for payment of usage in excess of Energy Plan terms.*



Current Market Dynamics

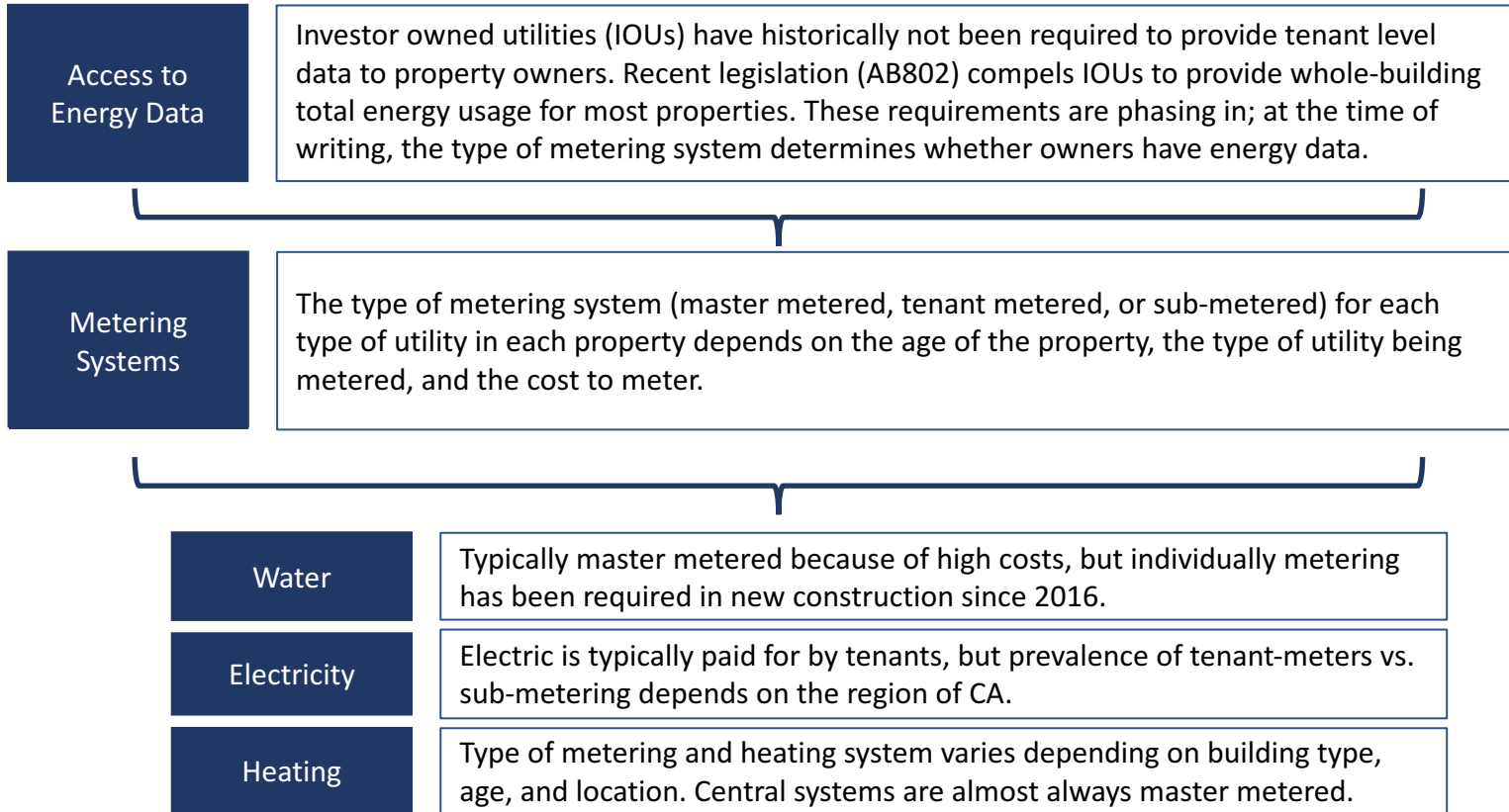
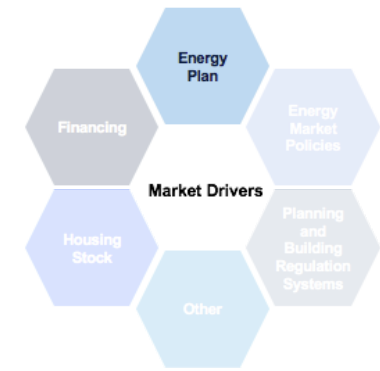
- Owner charges tenant full “Rent Cap”
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REALIZE Retrofit

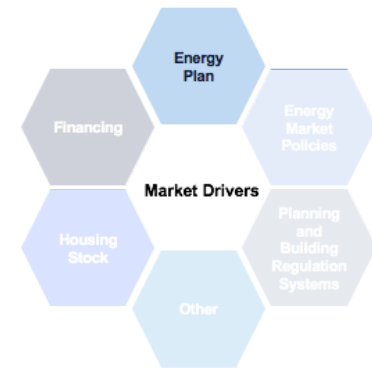
- Owner contracts with retrofit supplier to receive an Energy Plan *for the sum of units on the meter* – Where onsite renewable energy generates enough power to deliver: X gallons hot water/day, Y thermal comfort range, and Z kWh plug loads per unit
- Owner pays for usage in excess of Energy Plan
- Tenants’ total housing cost remains the same, equal to rent cap
- Owner increases operating income
- Owner’s additional operating income is 100% underwritable due to performance guarantee of Energy Plan
















Current Practice: Energy and Metering Systems





Energy Plan: Metering Systems Compared

Each metering system offers a unique set of attributes that will influence the difficulty of applying the REALIZE offering in initial PILOT projects.



Metering Systems		Needs Adjustments to Tenant Leases	Owner Incentivized to Perform Retrofit	Tenant Incentivized to Reduce Energy Use After Retrofit	Portion of Savings That Can Be Underwritten	Guaranteed Access to Building Energy Data
Metering Systems	Master Metered	 No	 Yes	 No	 50%	 Yes
	Tenant Metered	 Yes	 Yes	 Yes	 100%	 Maybe
	Sub-Metered	 Yes	 Yes	 Yes	 100%	 Yes

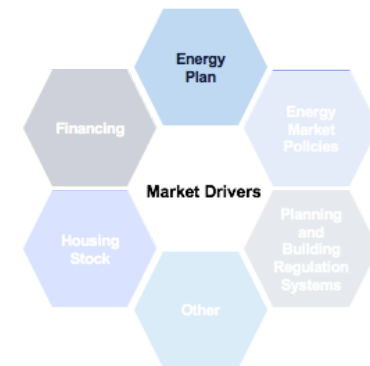
 Attractive
  Unattractive

Energy Plan: Barriers & Solutions



Barrier	Solutions
<p>Whole building and unit-level performance guarantees not common due to:</p> <ul style="list-style-type: none"> • Can't control tenants behavior (plug load) • Expense of third party M&V • Insurance products rarely hold up because M&V requirements difficult to fulfill 	<ul style="list-style-type: none"> • Solar installation company can guarantee level of energy production • Energy Plan structured to separate tenant behavior from system performance, and assign cost of tenant behavior to tenants, and cost of system non-performance to the retrofit supplier
<p>Imprecise and expensive M&V leads to inability to determine who is responsible for energy overruns</p>	<ul style="list-style-type: none"> • Focus on properties with sub-metering for initial demonstration • Study results of first-party metering (metering by Energy Plan supplier) in the Netherlands; document track record of new model • Require ongoing maintenance plan • Partner with researchers to collect and analyze Energy Plan microdata – demonstrate success, and inform adjustments
<p>Lack of a contractual link between the guarantor (ESCO or solution provider) and the consumer (tenant)</p>	<ul style="list-style-type: none"> • Energy Plan provides baseline of energy-consuming service that is cost-neutral to tenant compared to current practice
<p>Inability to control tenant behavior in master metered systems</p>	<ul style="list-style-type: none"> • For central systems, the Energy Plan supplies the <i>owner</i> rather than the tenant with the specified service. Owner does bear the cost of excess usage, but differentiating between tenant behavior and system performance helps control cost and performance risk

Energy Plan: Barriers & Solutions (continued)



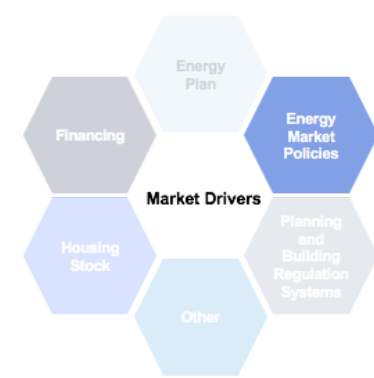
Barrier	Solutions
Limitations to adjusting the UA <ul style="list-style-type: none"> UA adjustments only accessible to properties that use MASH Timely and costly for properties to switch from the HUD matrix utility calculator to CUAC 	<ul style="list-style-type: none"> CTCAC rules to allow CUAC to apply to all rehabs Link ability to adjust UA to other energy efficiency programs, or specific energy improvements Investigate whether CUAC application process can be streamlined for REALIZE projects, due to alignment with the intent of providing affordable, high-quality, comfortable housing
Process to add Energy Plan to existing leases is not clear	<ul style="list-style-type: none"> Creation of lease templates must be a task within the Energy Plan work plan
Difficult for insurance companies to price insurance on unfamiliar technologies, which may be costly to remove or repair	<ul style="list-style-type: none"> If insurance is not economical, explore leveraging a guarantor that is financially strong and unlikely to become insolvent over the lifetime of the contract
If tenants systematically exceed Energy Plan and the property has increased “net rent,” the property may surpass HUD income limits – requiring UA correction or risking loss of LIHTC funding	<ul style="list-style-type: none"> Energy efficiency improvements in combination with Energy Plan reduce risk of non-performance, and provide forensic data to differentiate tenant-behavior from system performance If UA is calculated per HUD regulations, Owners have time to correct the situation, with no immediate penalty for energy cost above UA
Some components of retrofit technical solutions have life expectancy less than 30 years	<ul style="list-style-type: none"> Energy Plan must be complemented by Maintenance Warranty – specifying planned maintenance including component replacements Focus on 15 or 20 year guarantee instead of 30 year

REALIZE: SF Bay Area Business Model - **Energy Market Policies**

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Energy Market Policies – Market Conditions

CA energy markets and policies are critical context for achieving net zero carbon via REALIZE



Net Metering Eligibility	<p>Must meet the following requirements:</p> <ul style="list-style-type: none"> • Be a retail customer of an electric utility or Community Choice Aggregator (CCA) in CA • Generate at least some of your electricity using solar or wind energy or other qualified generating technologies on your premise • System's peak capacity output is 1,000 Kilowatt (kW) or less
Time of Use Rates	<ul style="list-style-type: none"> • Retail rates for CA electricity users are commonly dependent on the time of use, and some tariffs are seasonal • Higher rates are charged during peak demand hours
Time Dependent Valuation (TDV)	<ul style="list-style-type: none"> • The TDV method is developed to allow performance-based tradeoffs when complying with CA Title 24 Energy Code • The TDV concept is that energy efficiency measure savings should be valued based on which hours of the year the savings occur, to better reflect the actual costs of energy to consumers, to the utility system, and to society • TDV encourages designs that perform better when energy costs are high; pricing-based approach favors natural gas (consistent cost) over electricity (compatible with renewables) • A specified level of TDV improvement (i.e. progress toward compliance with current energy code) is required for a variety of finance and regulatory programs
Community Choice Aggregation	<ul style="list-style-type: none"> • Allows cities and counties in CA to procure electricity for groups of customers within a defined jurisdiction; CCA is most commonly used to procure renewable energy on behalf of the community • Gives eligible CA customers a choice of retail energy providers

Energy Market Policies – Barriers & Solutions



Barrier	Solutions
<p>Energy code does not encourage deep energy retrofits</p> <ul style="list-style-type: none"> • Code is not outcome based • Incentives not allowed to bring buildings up to code • Code software is biased towards using natural gas 	<ul style="list-style-type: none"> • REALIZE aligns with California’s Long Term Energy Efficiency Strategic Plan Zero Net Energy goals • Separate initiatives are addressing each of these issues; there is enough space for REALIZE to operate under current conditions
<p>Some sites are not suitable for generating 100% of electricity needs onsite, even after deep retrofits</p>	<ul style="list-style-type: none"> • Omitting cost of solar energy systems reduces project cost • Consider either: <ul style="list-style-type: none"> • “Virtual” Energy Plan, with systems designed for same site energy use as other REALIZE projects, owner pre-pays CCA or utility for a monthly utility budget, and tenants pay for usage in excess of Energy Plan, OR • Owner captures less than 100% of Utility Allowance, and carbon is reduced • Design participation options for use of community solar, CCA, and/or other means of supplying 100% renewable electricity
<p>Onsite renewables have pricing certainty due to fixed up front costs. Rates for offsite 100% renewable electricity from investor-owned utilities and CCAs are slightly higher than baseline utility offerings, and utility rates generally increase over time</p>	<ul style="list-style-type: none"> • CCA are new; the cost premium for 100% RE electricity compared to basic/RPS offering is declining with cost of new renewable generation and legal efforts to increase the RPS toward 100% RE (CA Senate Bill 100) • CCAs are creating programs that allow combining 100% RE and NEM • Monitor CA regulations. California frequently creates new dedicated off-site generation programs – Current examples: Community Shared Solar, Virtual Net Metering, Green Tariff Shared Renewables ...
<p>Energy efficiency programs are complicated to navigate</p>	<ul style="list-style-type: none"> • Support efforts (such as Energy Efficiency for All) to collaborate with utilities and municipalities to develop bundled packages of incentives and streamline application processes • If necessary, develop streamlined offering specific to REALIZE, or otherwise act as incentive concierge

Energy Market Policies – Barriers & Solutions (continued)



Barrier	Solutions
If a CCA program approach is implemented, there is currently no restriction that requires consumers to stay in the program long-term	<ul style="list-style-type: none"> • Determine feasibility of requiring REALIZE properties to remain in CCA programs for extended period of time, in return for an incentive or service • CA Renewable Portfolio Standard may ultimately move to 100% renewable energy, mitigating this issue • GHG savings from designing to NZE-equivalent efficiency levels are considerable, even if standard grid electricity is used
Current net metering policies allow building owners to essentially use the grid as if it was storage system, which is problematic at scale, since the wholesale value of electricity in California is declining and even negative at times when renewable output is greatest (“duck curve”).	<ul style="list-style-type: none"> • Prepare to incorporate energy storage in the REALIZE package • Problem is more long-term than immediate

REALIZE:

SF Bay Area
Business
Model -

**Planning &
Building
Regulation
Systems**

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Planning and Building Regulation Systems – Market Conditions

Local governments and property owners often have first-order concerns that must be addressed before energy cost and carbon reductions can be prioritized.



Structural	Existing buildings have deferred maintenance that are complex, and must be addressed for safety: Pest infestations, water damage, "soft story" seismic vulnerability, etc.
Fire	Dependent on building size and location, fire safety upgrades may be necessary. Sometimes major upgrades are required, such as sprinklering existing buildings
Accessibility	Upgrades may be necessary, and project scopes expanded, to ensure Universal Access and comply with Americans with Disabilities Act (ADA) and related accessibility requirements
Preservation	Designated historic resources and buildings in historic districts may have additional requirements – most frequently restricting alterations that are visible from the street
Zoning	Properties built to the lot line or existing setbacks generally cannot expand beyond existing dimensions, limiting options for envelope improvements

Planning and Building Regulation Systems – Barriers & Solutions



Barrier	Solutions
Zoning, building, and design regulations restrict whole house solution options (e.g. prevent extending beyond curtilage of a property, roof weight limits, cladding, etc.)	<ul style="list-style-type: none"> • Prioritize sites with minimal design limitations • Develop clear guidelines on how REALIZE retrofits can be developed to work within existing permitted development rights • Consider seeking standardized variance for REALIZE projects within specified limitations, based in part on project volume and economic benefit • Facilitate development of scenario-specific technical solutions, including internal installation of insulation, and/or retrofits focused primarily on mechanical & lighting systems • Systems analysis on fire code and moisture management
Retrofit applications for CA affordable housing can be costly and lengthy	<ul style="list-style-type: none"> • Create consistent template applications to accompany development and planning requests • Ordinances could be used to reduce uncertainty in the planning permission process by providing blanket approval for certain types of retrofits

Planning and Building Regulation Systems – Barriers & Solutions (continued)

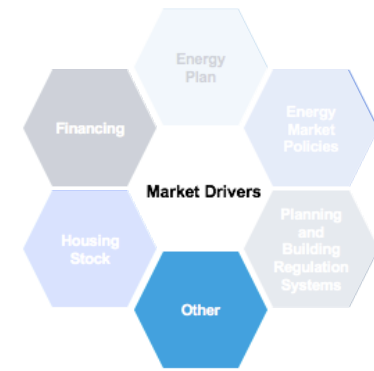


Barrier	Solutions
Limitation of contractor desire; highly litigious state	<ul style="list-style-type: none"> Develop large scale contracts to help balance risk/reward, and attract frontrunner contractors capable of delivering volume
General contractors of scale don't work well with wood retrofits	<ul style="list-style-type: none"> Develop large scale contracts to help balance risk/reward, and attract front runner contractors Consider initial focus on properties without wood framing or façade
Energiesprong model does not incorporate storage and other advanced innovations	<ul style="list-style-type: none"> Use competitive bidding processes to challenge solution providers to meet project needs

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Other – Barriers & Solutions



Barrier	Solutions
REALIZE partners do not have marketing savvy or service orientation	<ul style="list-style-type: none"> REALIZE is facilitating a market; solution providers are responsible for marketing their products
The US construction sector will need to adopt new technologies to drive down the cost of retrofits	<ul style="list-style-type: none"> REALIZE works with participants to develop performance criteria underlying large scale deals; it does not require specific technologies Large deals provide scale to attract research investment from solution providers
Market is unfamiliar with Energiesprong concept; it is challenging to build understanding and acceptance of a different approach	<ul style="list-style-type: none"> Identify frontrunner stakeholders with credibility and appetite Measure and be transparent about results – in Energy Plan details, energy performance, technologies, and cost curve
High cost of metering and measurement	<ul style="list-style-type: none"> Instrumentation is limited to specific control points required to differentiate between tenant behavior and system performance. Further document projects' experience to date in the Netherlands, where 5 points per housing unit are monitored, plus the electricity meter Include metering in RealIZE participation specifications Most properties already have unit-level electric meters

Resource Planning

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REALIZE – Resource Planning



Regional REALIZE Team

Organizing a market requires an entrepreneurial and neutral entity – not a vendor, academic, or regulator but a facilitator



- *Transition Zero* market development teams:
 - 5-8 members, with individuals responsible for specific work plans
 - Work plans are designed to realign interests, facilitate large scale conceptual deals, and facilitate one significant hard commitments to purchase retrofits meeting the *Energiesprong* criteria
 - Duration of initial market development: 3 years
 - Minimum budget: \$3 million over 3 years per regional market development team, predominantly for staff
- REALIZE Regional Team:
 - REALIZE intends to apply lessons from *Energiesprong*, adapting only as required by local/regional conditions. Similar resources, approximately \$3 million over 3 years, would be necessary
 - No resource has been identified to bear the initial cost in full; therefore we have broken down work plan elements to match funding availability



REALIZE – Resource Planning

Workstream	Status	Duration	Resources Needed	Resources Raised
Management	Ongoing - critical for full operationalization of the concept in markets without adequate self-funding or know-how	Ongoing	\$250,000+ per annum	\$125,000 per annum for three years (15% exhausted) Noorda Foundation
Validating Business Model	Complete – barriers and required solutions have been assessed for the CA Bay Area market	June 2016-Sept. 2017		\$110,000 (100% exhausted) Carbon Neutral Cities Alliance
Mobilize Supply Chain	Initiated – major manufacturers socialized to the concept and mobilized to support demonstration projects	Ongoing	Ongoing mobilization included in “Create New Market Dynamics”	
Early Market Demonstrations	Initiated – resources secured for demonstration project in CA Bay Area and one other climate zone	Jan 2018-Jan 2020	\$500,000 (does not include project costs)	\$500,000 US Department of Energy
Large Scale Housing Deal (Mega Contract)	Planned – conversations with building owners at beginning stages. Market sizing research in progress	2019	\$675,000 over first three years	\$0
Create New Market Dynamics	Planned – market barriers and strategic levers identified	Ongoing as concept scales to new markets. Will begin in CA Bay Area	\$580,000* per annum	Partnership exploration in progress to design energy plan, lynchpin of the business model
Total			\$1.06 MM per annum (excluding capital or incentive costs for PILOT projects)	\$125,000 per annum

+ RMI staff only

*Includes 2 RMI, 1 SF, 1 PHIUS, and 1 NZEC FTE, with Energiesprong consultation

Glossary

- Acronym Key
- Introduction & Executive Summary
- Inspiration: Energiesprong Approach
- REALIZE: SF Bay Area Business Model
- Resource Planning
- **Glossary**

Glossary

Barrier	Solutions	Source
Area Median Income (AMI)	An economic measure that can be applied to one household, or aggregated across a large group such as a county, city, or the whole country. Commonly used by the US government and private institutions to describe a household's economic status or to track economic trends in the US.	Wikipedia.com
California Tax Credit Allocation Committee (CTCAC)	Administers the California federal and state Low-Income Housing Tax Credit Programs. Both programs were created to promote private investment in affordable rental housing for low-income Californians.	Treasurer.ca.gov
California Utility Allowance Calculator (CUAC)	Tool designed to calculate project-specific UA for low income housing projects.	Gosolarcalifornia.ca.gov
Census Tracts	A geographic region defined for the purpose of taking a census. Designed to be relatively homogeneous units with respect to population characteristics, economic status, and living conditions" and "average about 4,000 inhabitants.	Wikipedia.com
Community Choice Aggregation	Community choice aggregation allows communities to offer procurement service to electric customers within their jurisdictional boundaries. The purpose of this structure is to allow communities to deliver cleaner energy to residents and businesses who wish to consume more renewably produced electricity.	cal-cca.org cleanpowersf.org
Community Development Corporation (CDC)	A not-for-profit organization incorporated to provide programs, offer services and engage in other activities that promote and support community development. CDCs usually serve a geographic location such as a neighborhood or a town, and often focus on serving lower-income residents and the development of affordable housing.	Wikipedia.com
Community Renewable Program	Program that lets you work directly with a California developers to take part in a renewable energy project in your community.	Sce.com
Concept Deal	Contractors and housing associations commit to refurbish properties conditional on certain criteria being met.	Energiesprong Documents
Deed Restricted Properties	Deed restriction is placed on a property to preserve it as a low or moderate income housing unit. This means it can only be sold to a buyer whose household meets certain income requirements and at a price that is affordable to that household.	Wikipedia.com

Glossary (continued)

Barrier	Solutions	Source
Department of Energy (DOE)	Cabinet-level department of the US Government concerned with the US policies regarding energy and safety in handling nuclear material	Wikipedia.com
Eligible Basis	Total depreciable costs of completing the project, such as the cost of acquiring and rehabbing an existing building or constructing of a new building. Additionally, certain soft costs related to the project, such as architectural, engineering, legal and reasonable developer fees, may be included in the eligible basis. Notably, because the value of land is not depreciable, land acquisition costs cannot included in the eligible basis	Propertymetrics.com
Energy Performance Contract (EPC)	Also known as an Energy Savings Performance Contracts (ESPCs), these contracts are an alternative financing mechanisms designed to accelerate investment in cost effective energy conservation measures in existing buildings. They accomplish that by reducing upfront retrofit costs by allowing consumers to pay for overall costs over time through energy savings.	Wikipedia.com
Energy Performance Guarantee	To address the consumer risk that energy savings do not materialize after energy retrofits, energy performance guarantees can be incorporated into contracts with service providers, contractors or product suppliers, so that some or all of the performance risk is transferred to the supplier	www.energystar.gov
Energy Services Company (ESCO)	Commercial or non-profit business providing a broad range of energy solutions including designs and implementation of energy savings projects, retrofitting, energy conservation, energy infrastructure outsourcing, power generation and energy supply, and risk management	Wikipedia.com
US Department of Housing & Urban Development (HUD)	Cabinet department in the Executive branch of the US federal government. Its mission is to create strong, sustainable, inclusive communities and quality affordable homes for all. HUD is working to strengthen the housing market to bolster the economy and protect consumers; meet the need for quality affordable rental homes; utilize housing as a platform for improving quality of life; and build inclusive/sustainable communities free from discrimination.	Wikipedia.com
Investor Owned Utilities (IOUs)	A utility owned by private investors, as opposed to one owned by a public trust or agency; a commercial, for-profit utility as opposed to a co-op or municipal utility.	Energyvortex.com
Leadership in Energy & Environmental Design (LEED)	A rating system devised by the US Green Building Council (USGBC) to evaluate the environmental performance of a building and encourage market transformation towards sustainable design.	Concretethinker.com

Glossary (continued)

Barrier	Solutions	Source
Low Income Housing Tax Credits (LIHTCs)	Dollar-for-dollar tax credit in the US for affordable housing investments	Wikipedia.com
Low Income Weatherization Program (LIWP):	Installs PV, solar hot water heaters, and energy efficiency measures in low-income single family and multi-family dwellings in disadvantaged communities to reduce GHG emissions and save energy.	Csd.ca.gov
Memorandum of Understanding (MOU)	Nonbinding agreement between two or more parties outlining the terms and details of an understanding, including each parties' requirements and responsibilities. An MOU is often the first stage in the formation of a formal contract.	Investopedia.com
Measurement and verification (M&V)	Term given to the process for quantifying savings delivered by an energy efficiency measures. It demonstrates how much energy a property avoids, rather than the total cost saved	Wikipedia.com
Multifamily Affordable Solar Housing (MASH)	A program that provides business solutions to offset the costs of installing new solar energy systems on multifamily affordable housing in California	Pge.com
Passive House Institute US (PHIUS)	Non-profit organization committed to making high-performance passive building the mainstream market standard. They have released the only passive building standard on the market based upon climate-specific comfort and performance criteria	PREALIZEhous.org
Project Based Finance	Long-term financing of infrastructure and industrial projects based upon the projected cash flows of the project rather than the balance sheets of its sponsors	Wikipedia.com

Glossary (continued)

Barrier	Solutions	Source
Qualified Basis	Qualified basis is the amount of eligible basis that will be used to generate LIHTCs. The qualified basis is based upon the proportion of the property that will be used for affordable housing	Wikipedia.com
Refurbishment Solution provider (RSP)	The stakeholder that Energiesprong identifies as the leader of the overall process that delivers the energy retrofit and provide the performance guarantee	Energiesprong Documents
Time Dependent Valuation (TDV)	Energy efficiency measure developed for CA Title 24 Energy Code based on the idea that savings should be valued differently depending on which hours of the year the savings occur, to better reflect the actual costs of energy to consumers, to the utility system, and to society. Use of TDV encourages design professionals to design buildings that perform better during periods of high energy cost	Energy.ca.gov
Utility Allowance (UA)	Represents the amount the Public Housing Association determines is necessary to cover a resident's reasonable utility costs . Allowances are provided for tenant metered and sub-metered properties, not for master-metered, and include electricity, gas, water, sewage, and garbage collection	Hud.gov