



veic



# California Mobile & Manufactured Housing Market Characterization

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# Presentation Outline

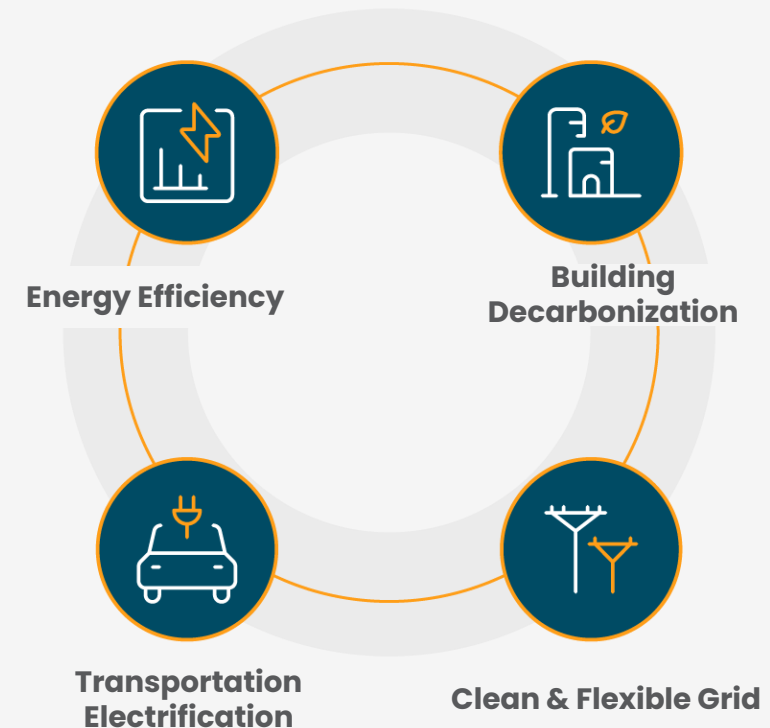
- Intros
- CalNEXT Mobile & Manufactured Housing Market Characterization
  - Study Objectives & Goals
  - Methodology
  - Key Learnings
- Challenges, Resources & Takeaways for Other States
- Next Steps for VEIC & AESC

# VEIC offers high-impact energy solutions that decarbonize buildings, transportation, and utility grids, today.

We help our clients meet their clean energy goals through innovative and equitable solutions that benefit them, their partners, and their communities.

- **Nonprofit founded in 1986** with a mission to generate the energy solutions the world needs
- **National consulting practice working across over 75% of the country** advising states, utilities, Federal agencies, nonprofit organizations, and private industry
- **Program design & implementation for award winning energy efficiency and clean energy programs** including program administrator for Efficiency Vermont & the DC Sustainable Energy Utility; on administration team for California TECH, CalNEXT (statewide electric emerging tech), Hawaii Energy, and Focus on Energy (WI)

Making an impact within each dimension of energy



# What We Do



**30+**

Supported/Administered  
Utility EE Programs

**120+**

Energy and Water Audits  
Performed Annually

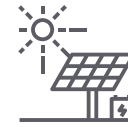
**2,500+**

Engineering Calculation  
Reviews Annually



## Engineering

- Energy Studies and Consulting
- Project Development and Design
- Program Engineering Support
- Advanced Measurement & Verification (M&V)
- Training Services



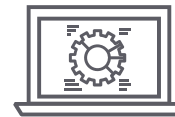
## Technologies

- Emerging Technologies
- Distributed Energy Resources
- Building and Transportation Electrification
- Virtual Power Plants
- Grid Intelligence and Integration
- Wastewater Treatment



## Programs

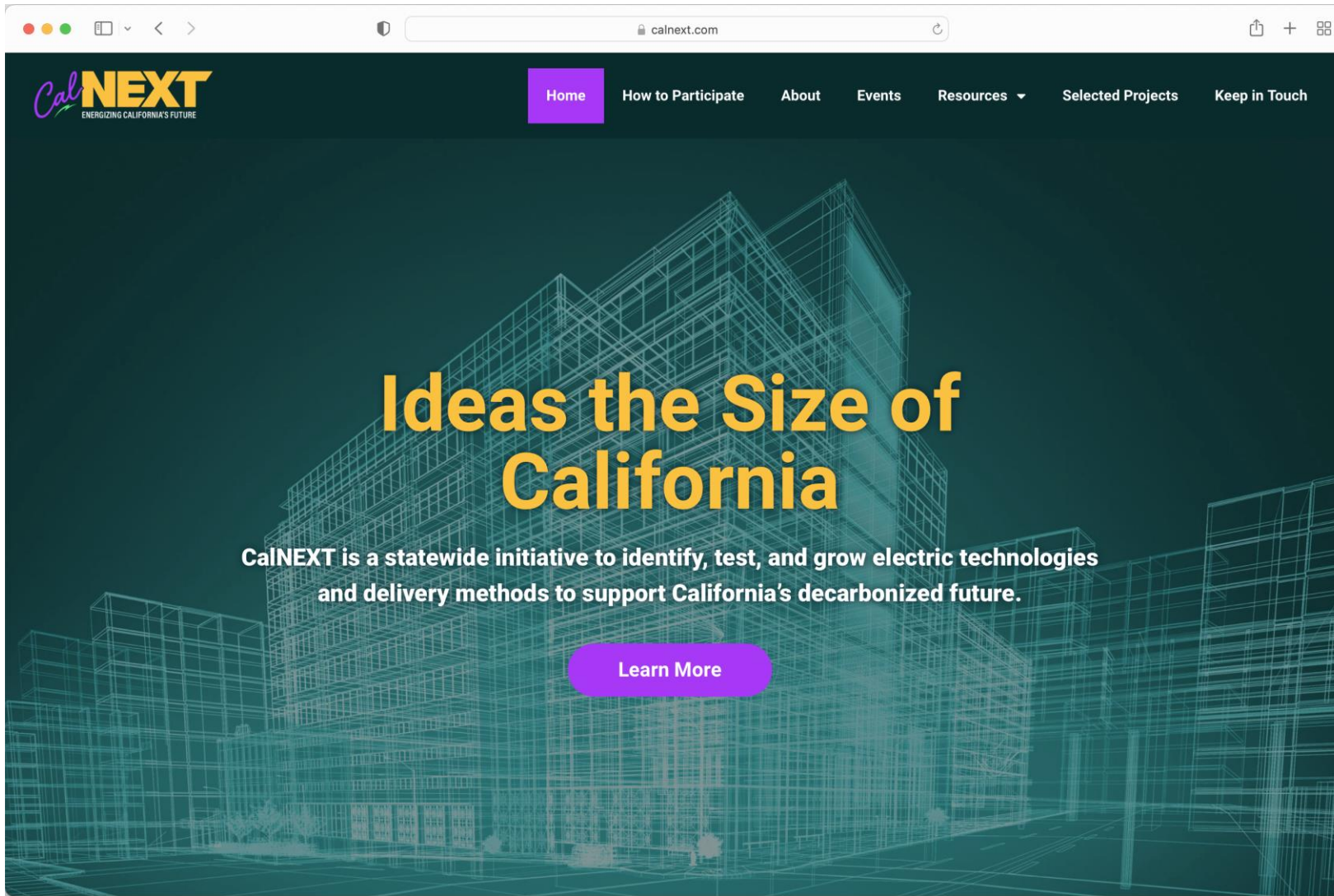
- Meter-Based Savings Programs
- Strategic Energy Management (SEM)
- Wastewater Optimization Program
- Statewide CA State Agency Energy Support
- CA Self-Generation Incentive Program (SGIP)
- CalNext Emerging Technologies Program



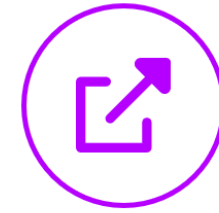
## Software

- "Praxis" Energy Management Platform
- Application Processing
- Online Audits
- Meter-Based M&V
- Custom Software Development

# Overview of CalNEXT

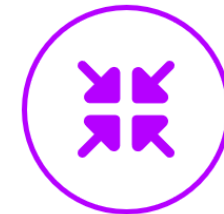


Learn more at <https://calnext.com/>



## Technology Support Research

Projects focused on addressing market barriers or developing the commercial capability of *market-ready technologies*.



## Technology Development Research

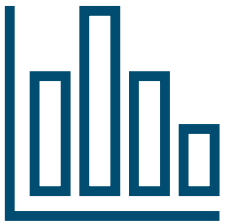
Projects focused on addressing market barriers or developing the commercial capability of *early-stage technologies*.

# Study Objectives & Goals

- Reaching lower-income and hard-to-reach customers are policy drivers in California; mobile and manufactured homes often difficult to reach and impacts often limited
- Gain a better understanding of the existing stock of mobile & manufactured housing in California
  - What are the physical characteristics of these homes and how do they perform from an energy perspective?
  - Where are these homes located and what are the regional differences?
  - What are the resident demographics and how does that impact how we think about the opportunities and barriers to implementing programs in this space?
- Assess the policy, regulatory, and programmatic landscape impacting this market sector
- Identify barriers and opportunities to electrification and energy efficiency retrofits
- Identify when whole-home replacement may be a better investment

# Methodology

## Market Assessment



- Analysis of Census and DOE data
- Review of HUD & CA-specific codes & regulations
- Review of existing retrofit, energy efficiency, and decarb programs serving the market sector

## Stakeholder Engagement



- Outreach and in-depth interviews with key stakeholders
- Confirm understanding of the market sector and fill gaps in public data sources

## Energy Modeling



- Model electrification of existing housing stock & new construction (HUD baseline, ENERGY STAR, ZERH standards) by climate zone, vintage, baseline systems, etc.
- Assess energy, peak load, carbon, and cost impacts of energy efficiency & decarbonization packages

# Key Market Learnings

- **Stock:** CA has ~500,000 MMH, representing 3% of housing stock. Most units owned, not rented. However, most located in private mobile home parks on leased land.
- **Age:** More than half built pre-1976 HUD standards, many are in disrepair and are inefficient.
  - In Hot/Mixed-Dry climates, EUI is ~30 percent higher than SFD homes.
  - In Cold climate zones, EUI is nearly 60 percent higher than SFD homes.
- **Location:** 75% located in Hot-Dry climate; half located in large (100+ lot) mobile home parks
- **Heating Fuel:** 57% natural gas, 26% electricity, 9% propane, 6% wood or other.\*
- **Water Heating Fuel:** 90% natural gas, 7% propane, 2% fuel oil.\*
- **Cooking Fuel:** 73% natural gas, 15% electricity, 9% propane, 2% dual fuel (natural gas and electric).\*
- **Income:** Between 40%-70% residents meet income requirements for at least one income-qualified energy program; 28% located in Disadvantaged Community Census tracts.

\*Estimates based on small sample sizes  
Sources: 2021 ACS, 2020 RECS, 2022 HILFD, DOE LEAD Tool



# Stakeholder Engagement / Interviews

## Program Implementers

- MMH Targeted Programs
- Low Income Programs Serving MMH
- Electrification Pilots Serving MMH
- California IOU PMs

## State Agencies

- California Dept of Housing and Community Development
- California Public Utilities Commission
- California Energy Commission

## Other

- MMH Manufacturer
- California Manufactured Housing Institute
- MMH Park Owner

# Relevant Program Landscape

- Multiple targeted investor-owned utility (IOU)-funded programs providing mostly direct install measures (e.g., light fixtures, low-flow showerheads, faucet aerators, pipe wrap) and some more comprehensive efficiency measures to mobile and manufactured homes (PG&E Direct Install for Mobile & Manufactured Homes, [SCE Comprehensive Manufactured Home Program](#), [SoCal Gas Manufactured Home Program](#))
- CPUC program addressing mobile home park utility infrastructure in IOU territories through IOU implemented conversion programs to separately meter homes ([Mobile Home Park Utility Conversion Program](#))
- HCD program addressing mobile home park and individual home remediation needs ([Manufactured Housing Opportunity & Revitalization Program](#))
- Statewide income-qualified programs (not specifically targeted to mobile and manufactured homes) providing more comprehensive energy efficiency/decarbonization measures for individual homes ([Energy Savings Assistance Program](#), [Weatherization Assistance Program](#), [Low-Income Weatherization Assistance Program—Farmworker Housing](#))
- Program data is separately housed and is difficult to access.

# Key Stakeholder Learnings

- Retrofitting older mobile homes particularly challenging – poor insulation, difficult to insulate, hard-to-access ductwork, old electrical wiring, small closet sizes, small and cluttered lots and structural problems can severely limit the measures that can be installed.
- Master metering in most parks presents challenges:
  - Split incentive issues related to units that may be owned, but utilities are master-metered
  - <100amps electrical service and panels limit electrification
  - Huge interest among mobile home parks to convert to direct metering through CPUC program – long waitlists, only upgrading to 100amp service currently
- Multiple programs are fragmented and can be confusing for owners.
- Utility program measures have baselines that may not reflect MMH and deemed savings that don't reflect actual savings potential
- Park owners are gatekeepers to programs – some open and accessible, others pose challenging barrier
- Promising new construction options from manufacturers, leveraging DOE incentives.

# Energy Modeling Results: Potential Impacts of Electrification

## Modeling Scenarios

- Two retrofit scenarios: (1) electrification only (2) electrification + weatherization; applied to 1976 HUD and 1994 HUD vintages only
- Four new construction scenarios: (1) proposed 2022 HUD Code update, (2) ENERGY STAR, (3) ZERH minimum specs, (4) ZERH target specs
- Modeled four climate zones; single-section & multi-section units; compared to pre-HUD, 1976 HUD, and 1994 HUD gas & electric heat baselines
- Used statewide average utility rates (2022)
- Key assumptions: typical weather, all equipment operating per design specs (reality often differs)

## Key Findings (Hot-Dry, Single Section)

- Site Energy Impacts: 79% decrease to 3% decrease
- Utility Bill Impacts: 74% decrease to 30% increase
- Summer Peak Load Impacts: 62% decrease to 11% decrease
- Winter Peak Load Impacts: 85% decrease to 64% increase

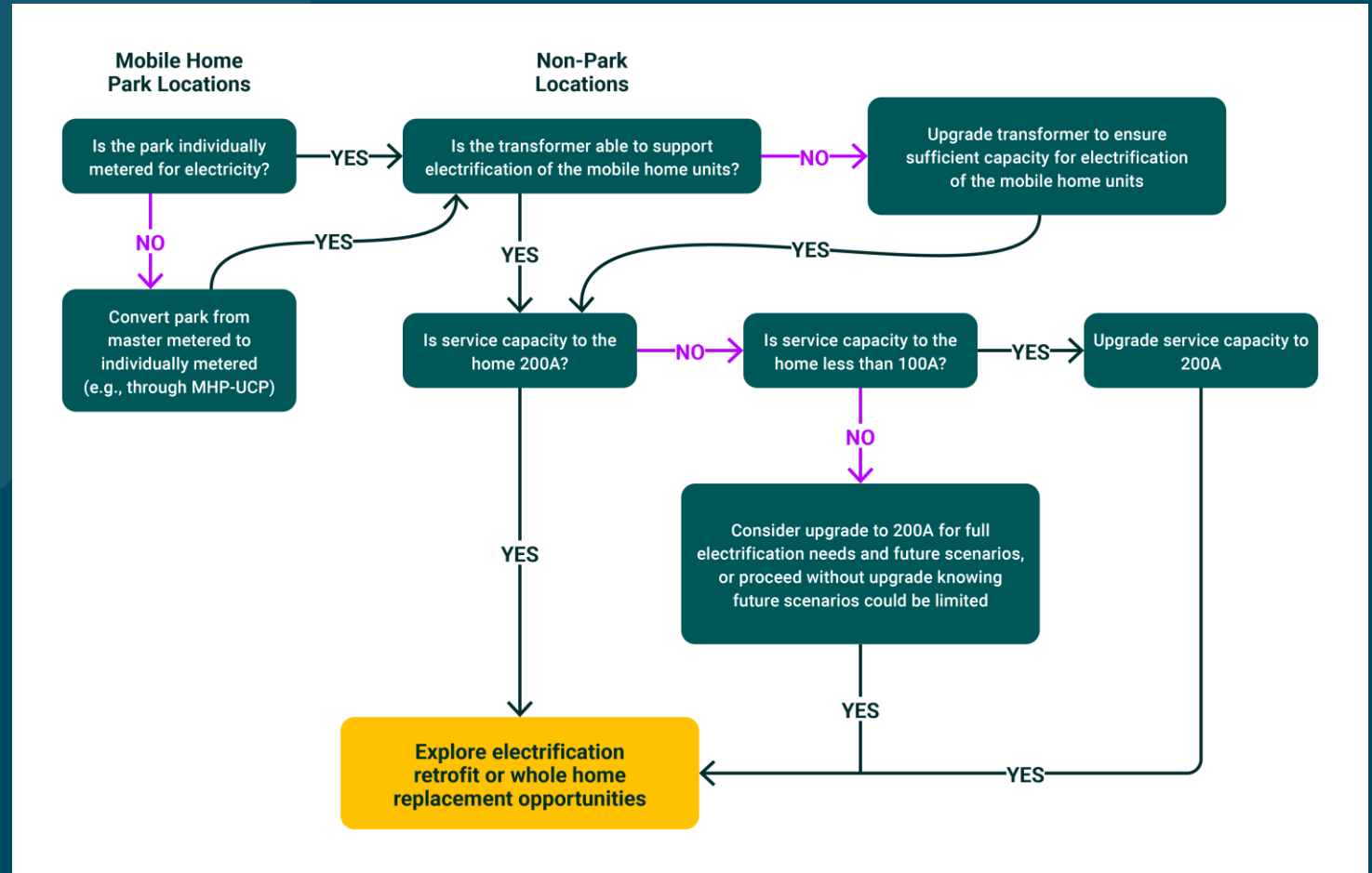
# Example: Potential Utility Bill Impacts

	Existing Home Upgrade		New Construction Replacement			
	Electric Heat		Electric Heat			
<b>Baseline Condition</b>	Electrification Only	Electrification + Wx	2022 HUD	ENERGY STAR MH-v3	ZERH-MH-v1	ZERH-MH-v1-Target
<b>Replacement Scenarios</b>						
Pre-HUD Gas Heat	n/a		-16%	-23%	-34%	-53%
Pre-HUD Electric Heat	n/a		-54%	-57%	-63%	-74%
<b>Upgrade and Replacement Scenarios</b>						
<b>1976 HUD Gas Heat</b>	-27%	-33%	17%	7%	-8%	-34%
1976 HUD Electric Heat	-51%	-55%	-22%	-28%	-38%	-56%
1994 HUD Gas Heat	-25%	n/a	30%	19%	2%	-27%
1994 HUD Electric Heat	-44%	n/a	-3%	-11%	-23%	-46%

# California Utility-Side Considerations for Electrification Retrofit vs Whole-Home Replacement

## Process Model Components

- Metering setup
- Transformer capacity
- Electrical service to lots

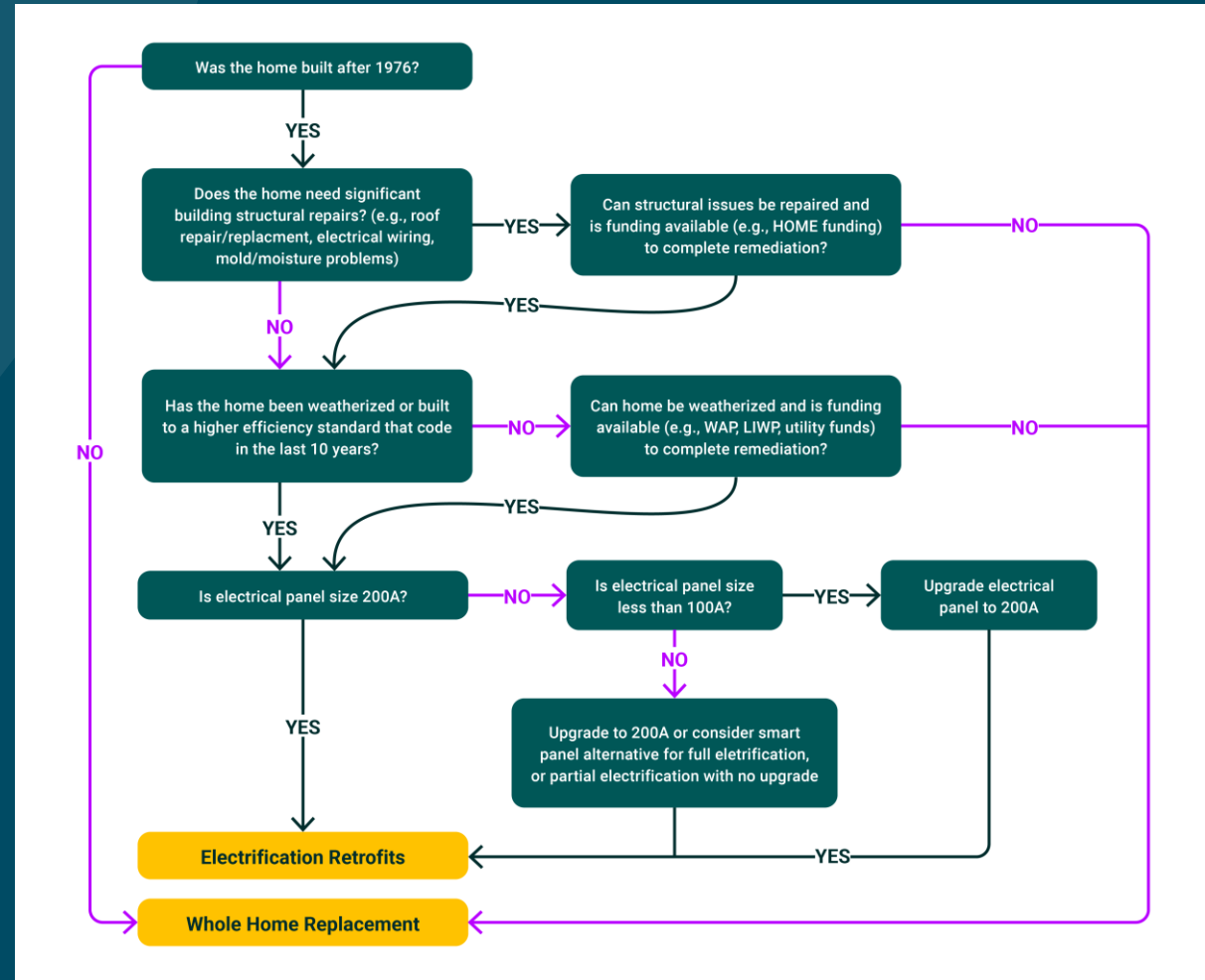


Source: CalNEXT Mobile and Manufactured Housing Market Characterization Study

# California Customer-Side Considerations for Electrification Retrofit vs Whole-Home Replacement

## Process Model Components

- Vintage
- Structural/electrical repair needs & availability of funding
- Envelope efficiency & availability of funding
- Electrical panel capacity



# Challenges, Takeaways & Resources

- Challenges & Takeaways
  - Energy modeling can help assess potential impacts; getting measured (not deemed) energy savings data from programs treating manufactured homes is important for fine-tuning those modeling results
  - (Good) cost data can be hard to get for this market segment but are hugely valuable for understanding the opportunity and designing a solution
  - Lots of publicly-available data sources available but sample sizes may be limited for smaller states/require regional analysis
  - Stakeholder engagement is key, but some stakeholders will be easier to engage than others – tap into trusted networks to engage mobile home parks and residents (e.g., community organizations, existing program implementers)
- Resources: CalNEXT Mobile & Manufactured Housing Market Characterization [Final Report](#)



# Next Steps for VEIC & AESC

- Ongoing research on how offsite construction (including manufactured housing) can be used to develop affordable homeownership opportunities for LMI households
- Scoping a manufactured housing market characterization for Vermont that will build off of the California research
- Potential field demonstration(s) through CalNEXT or other programs of promising emerging technologies identified in the California research (e.g., intelligent power management technologies)



## Get in touch

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 **California**



**Q&A**



New federal program  
An opportunity for your state?  
1-26-24

# Zero Energy Ready Homes

- DOE standards and certification
  - Single Family Housing
  - Multifamily Housing
  - Manufactured Housing
- Significant Federal Tax Incentives

<https://www.energy.gov/eere/buildings/section-45l-tax-credits-zero-energy-ready-homes>

# Market Response



Corporate News | May 8, 2023

**Clayton® Commits to Build All Residential Manufactured Homes to DOE Zero Energy Ready Home™ ...**

<https://www.manufacturedhomes.com/blog/clayton-commits-build-manufactured-homes-doe-zero-energy-specifications-january-1-2024/>

<https://www.claytonhomes.com/studio/zero-energy-ready-homes/>

# MH Practitioners Looking for Partners

## Representatives

- Lenders
- Developers of MH subdivisions (affordable homes)
- Resident Owned Communities
- MH Dealers
- MH Manufactures

# Opportunities for States to Make a Difference

- Assess existing MH market in your state
  - Role in affordable housing supply
  - Economic impact of lower utility bills for low-income families
  - Climate benefits of ZERH and ZERH+ solar
  - Barriers and opportunities
  - Leveraging of both housing and climate funding



# MH Practitioners Straw Proposals for Programs that work with existing supply chain

- Increase % of ZERH-MH purchased at all income levels
- Facilitate installation of solar with financing & pre-approved vendors program
- Financing for qualified low-income households' for ZERH & ZERH + Solar
- Facilitate ZERH Replacement pre-1990 occupied MH using fossil fuels with financing and pre-approved vendors program.

# Thank you!

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**Q&A**