Zero Net Energy Modular to Replace Manufactured Homes

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Getting to Zero October, 2016
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• 14 years at VEIC
  ➢ Seven years with Efficiency Vermont thinking about buildings
  ➢ Seven years with VEIC Consulting thinking about programs

• Focus Areas:
  ➢ Zero energy commercial and residential new construction
  ➢ Zero energy planning
  ➢ Technical Resource Manuals
Introduction to VEIC

• Mission-driven nonprofit
• 28 years of reducing economic and environmental costs of energy use
• Energy efficiency, renewable energy, and transportation
• Consulting and implementation
• 3 utility-scale implementation programs
Mobile
Manufactured
Modular

Definitions
Mobile Home

- Structure built before 1976 on a metal chassis fitted with wheels
- No construction code compliance
- Usually not considered real property
- Owned land, co-ops, or private, for-profit communities
- Financed with personal loan or cash purchase
Manufactured Home

- Structure built after 1976 on a metal chassis fitted with wheels
- HUD Construction Code Compliant. New units have been certified to meet ENERGY STAR and DOE Zero Energy Ready Homes
- Usually not considered real property
- Owned land, co-ops, or private, for-profit communities
- Usually financed with personal loan or cash purchase
Modular Home

- Factory built, meets local construction codes
- Real property
- Permanent foundation
- Financed with a mortgage

Zero Energy Modular

- Modular home sized to replace a manufactured or mobile home
- Produces as much energy as it uses
Deficiencies of Mobile and Manufactured Housing

Manufactured Housing
- Lower quality, short life
- High energy bills
- Energy cost uncertainty
- Often depreciates

Location
- Unstable community ownership
- Short-term land leases
- Possibly outdated infrastructure

Financing
- Financed as personal property
- Short terms, high rates
- Predatory lending
The Energy Penalty

- 20 million Americans live in manufactured housing
- 22% are at or below federal poverty level (US Census)
- Low upfront costs, but high energy bills (nearly 2x energy per square foot compared to site-built)
- LIHEAP historically provided 50% more assistance per square foot to those living in manufactured homes
- WAP Deferrals – in Delaware, 50 percent deferral rate for mobile homes
Mobile home parks are critical affordable housing neighborhoods & 20 million Americans live in mobile homes

Source: US Census
Tropical Storm Irene 2011

- 17 severely flooded mobile home parks
- 15% of MHs in state damaged
Let’s not make same mistake twice.

“The Awful Odyssey of FEMA’s Hurricane Katrina Trailers . . . spending $2.7 billion on 145,000 trailers and mobile homes . . . Even worse, an estimated 42% of them emitted toxic levels of formaldehyde.”

http://www.nytimes.com/2006/06/06/washington/27katrina.html?_r=0
Moving to a Solution
Two programs, same goal...

Provide alternative to manufactured housing by using modular construction

- Superior indoor air quality
- Secure land tenure
- Long term, low rate financing
- Zero energy
- Durable
- Affordable
Key Program Functions

- Affordable Housing Developer
- EE & RE Incentives
- Post Occupancy Support
- EE & RE Certifications
- Financing
- Modular Factory
- Program Management
zero energy bills
100-year home
healthy home
zero energy modular - future of affordable homeownership
Building Envelope

Typical Manufactured Home

- FLOOR R-18
- WALLS R-19
- ROOF R-25

- Vinyl wallboard and ceiling board
- Roof truss (fiberglass, R-22)
- 2x6 wall, 5.5” cavity (fiberglass, R-19)
- Particle board sheathing
- Leaky ducts in floor assembly
- 2x6 floor, 5.5” cavity (fiberglass, R-19)
- Fabric underbelly
- Cinder block piers

High Performance Modular Home

- FLOOR R-40
- WALLS R-43
- ROOF R-60

- 14” roof truss (fiberglass, R-60)
- Airtight ducts inside house
- 1 foot overhang
- 5/8” sheetrock & low emitting paints
- Double stud walls, 10” cavity (fiberglass, R-43)
- Plywood decking and sheathing without added formaldehyde
- 9.5” floor system (fiberglass, R-40)
- Frost protected foundation/pier

Triple pane windows
Mechanical and electrical systems

- LED lighting
- ENERGY STAR appliances
- Cold climate heat pump
- Heat pump water heater
- CERV – Conditioning Energy Recovery Ventilator
Solar PV

7kW roof mounted PV size to generate annual electric use
Program Support

- $8,500 Zero Energy Modular Home incentive
- $10,000 incentive to remove and recycle old mobile home
- $35,000 0% interest deferred loan
- Multiple mortgage lenders including USDA RD loan with 1% to 3.25% interest rate for 30 years
- Multiple affordable housing developers
- Appraiser training

- $15,000 Zero Energy Modular Home incentive
- $25,000 0% interest deferred loan
- Home qualifies for all mortgage products in Delaware
- Working with USDA RD in Delaware to bring USDA RD loan with 1% to 3.25% interest rate for 30 years
- Multiple affordable housing developers
- HUD Homebuyer Seminars
Costs and Cash Flow

Monthly Cost Comparison

$472/month

$424/month

Energy Costs
- Energy Costs are based on energy modeling

Mortgage
- $37,500 Principle Loan
- 6.50% Interest Rate
- 20 year term

- $97,500 Principle Loan
- 3.25% Interest Rate
- 30 Year Term

Typical Manufactured Home

VERMOD / USDA loan
Results to date

In Vermont
  • Program running for 5 years
  • 40 units deployed and occupied
  • Occupied units performing as expected (energy, IAQ and comfort)
  • Factory pipeline full!

In Delaware
  • Three year pilot program approved and funded
  • Pilot program partners recruited
  • Launch October, 2016
  • First model home to be place by end of 2016
  • Goal of pilot 25 units occupied by end of 2019
Questions?

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Thank you!