New Manufactured Homes Future Weatherization Retrofit or Market Transformation Opportunity?

Michael Lubliner, Ken Eklund
WSU Energy Program

Building Science Corporation
2012 Westford Symposium
Westford, MA

BA-PIRC

Washington State University Extension Energy Program

Northwest Power and Conservation Council

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Pacific Northwest Partners

ECOTOPE Consulting Research Design

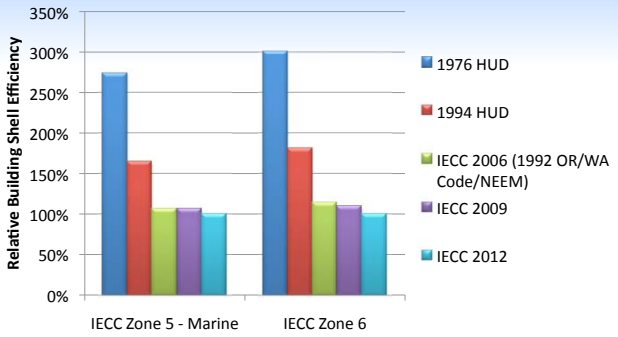
Bonneville Power Administration

Northwest Energy Works, Inc.

HUD Manufactured Home - Background

- Manufactured Housing Construction Safety Standards (MHCSS) preempts state energy codes
- MHCSS first effective in 1976, but updates to energy efficiency requirements occurred only once (1994) in the past 36 years
- Section 413 of the Energy Independence and Security Act of 2007 (EISA) requires the Department of Energy to establish "standards for energy efficiency in manufactured housing" within 4 years (by December 2011 – they're overdue).
- Overall MHCSS is based on National Fire Prevention Association (NFPA) Manufactured Housing Standard which is updated regularly.
- Manufactured Housing Consensus Committee (MHCC) – 2008
- USDOE Building America Research, Development and Deployment of teams & national labs

HUD Energy Efficiency Requirements Lag Far Behind State Energy Codes & the IECC



Problem Statements

- The housing stock of inefficient HUD-code manufactured homes continues to grow.
- Many new manufactured home meeting the 1994 energy requirements in MHCSS are weatherization candidates as they leave the factory.
- Industry "affordability" focus on sales price to dealer selling cheap "trailers" to buyers many who can barely afford to heat and maintain after financing with high interest, shorter term chattel* mortgages.

*A chattel mortgage is a mortgage that provides for a security interest in assets other than real estate to secure the loan. In the event of a default in payments, the lender has a lien on the assets used as collateral for the loan.

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Problem Statements (continued)

- NW has been focused on manufactured housing market for over two-decades
  - Over 155,000 or 68% of all new manufactured homes built since 1989 have constructed to high efficiency standards .
- Despite a $1000 per home corporate tax credits for Energy Star, little market transformation has occurred outside PNW
- Market transformation progress in the PNW is sliding due to market pressure from outside the region.

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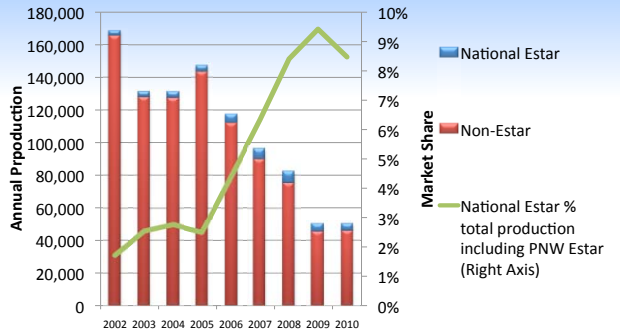
National Energy Star Market Share



Of the over 40,000 Energy Star Manufactured Homes since 2002, half were built in the Pacific Northwest

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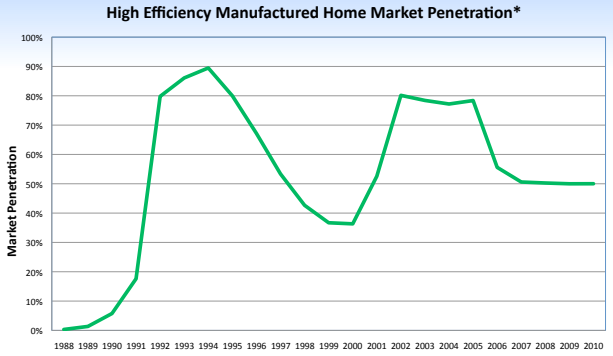
PNW High Efficiency Manufactured Home Market Share



*NW market penetration pre-2002 are Super Good Cents/NEEM/Natural Choice and post-2001 are Energy Star

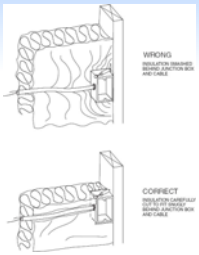
Significant Improvements in the Energy Efficiency of New Manufactured Homes are Practical and Cost-Effective

- PNW Programs and Energy Star Demonstrated "Constructability/Affordability"
  - Improved thermal shell
  - Improved duct systems
  - Improved heating and cooling equipment
  - Improved lighting and appliances
  - Improved quality control through performance testing

R33 Blown Floor Insulation

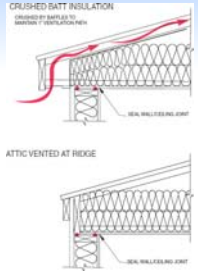
Minimum HUD Current Practice
R7-R22

R21 2x6 Wall Insulation



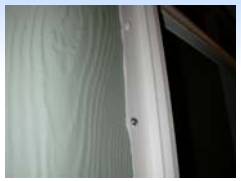
Minimum HUD Current Practice
R11 – ignores installation details
Can install 3.5" R11 in 2x6 wall

R38-49 Ceiling Insulation



Minimum HUD Current Practice
R19-R30

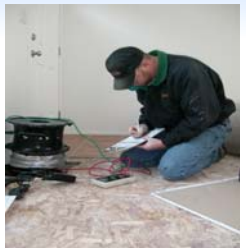
U = >.35 Windows & R5 Doors



Minimum HUD Current Practice
Cheap trailer door & aluminum single or with interior storm windows, no flashing or WRB required

Plant and Site Duct Leakage Testing

Requires ducts to leak less than 6% cfm 50PA (~ per ft2 floor



MHCC approved in-plant testing in 2009, waiting for HUD to implement

Many plants started testing for Estar requirements and to reduce mold in hot humid climates

PNW Certification & Tracking & QA

Plant submits per home design approval via Web

In plant QA per Manual + 3rd Party Quarterly Visits by NEEM staff

Where do we go from here? Energy Efficiency Technology Options

Future of the industry?

Noji Gardens - built in 2002 as Affordable Housing in Seattle, WA

1300-1400 ft², HUD-code home sold for 10-15% less than site built.

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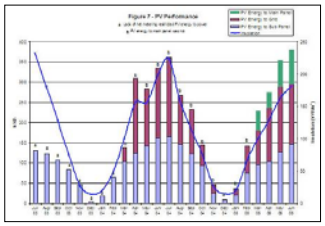
USDOE Building America

- Systems engineering *"low-hanging fruit"*
- HVAC and envelope interactions (Vinyl drywall/AC)
- Improve envelope, (Hi-R walls foam, 24"OC)
- Smaller HVAC $ (Crossover ducts, ducts inside, DHP)
- IAQ improved (62.2, test ducts/mastic, CO alarms)
- Improved durability (WRB, Window Flashing?)

Building America
U.S. Department of Energy
Research Toward Zero Energy Homes

ZEMH – Cold Climate: 60% Benchmark



Washington State University
Extension Energy Program

Bonneville Power Administration

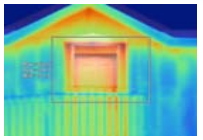
Building America
U.S. Department of Energy
Research Toward Zero Energy Homes

NIST Manufactured Home Research Lab

Gaithersburg, Maryland

PNNL Lab Homes
Matched Pair Retrofit Demonstrations

Graham Parker, Project Manager
Sarah Widder, Principal Investigator



Where do we go from here? Policy and Program Options

"One in 12 new homes in the United States is a manufactured housing unit (147 million in 2005). To qualify for a federally insured mortgage, a new HUD code home should be required to meet or exceed the efficiency levels of IECC. This will assure that federal taxpayer funds are not used to underwrite inefficient new homes with higher utility bills."
ASE 2007 Senate Testimony

"Although the high efficiency of Energy Star Homes improves comfort, lowers monthly energy bills and total home ownership and results in lower carbon emissions that are good for the environment, it has been slow to gain wide spread market acceptance in the factory built housing industry. Higher first cost remains the single greatest market barrier." **Manufactured Housing Institute's *Modern Homes*, March/April 2007**

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2007 EISA Section 213 - Manufactured Housing

- DOE must publish new standards for energy efficiency in manufactured housing within four (4) years
- Opportunity for comment by all interested parties
- Base the energy efficiency standards on the most recent version of the International Energy Conservation Code (IECC)
- Must be life-cycle cost-effective
  - Chattel Mortgage interest skews analysis
  - Manufacturers concerned about first cost

The "Oracle of Omaha" Speaks: Warren Buffet's 2003 to Shareowners

- An industry "awash with problems."
  - Delinquencies continue high
  - Repossessed units still abound
  - The number of retailers has been halved.
- "A different business model is required"
  - Eliminate the ability of retailer…to pocket substantial money by making sales financed by loans…destined to default.
- "Proper model…would require significant down payments and shorter-term loans."
  - Industry would likely be smaller than it was in the 90s.
  - It will deliver to home buyers an asset in which they will have equity, rather than disappointment, upon resale.

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Cost Implications of Retrofit vs. Replacement of Manufactured Housing

- It costs $9,576 to retrofit a double wide manufactured home built after 1976. The annual heating load in Seattle is 11,924 kWh.
- It costs $10,388 incremental to go from 1994 HUD Code (Uo .076) to the new proposed PNW standard (Uo .040)with a ductless heat pump and heat pump water heat on the same size home. The annual heat load in Seattle is 1,724 kWh.
- The incremental cost of super efficiency is 8.5% greater than the retrofit cost.
- The super efficient heating load is 15% of the retrofitted home load. And the hot water load is going to be about half of the retrofit hot water load.

Paper available at:
http://www.energy.wsu.edu/Documents/RetrofitvsReplacementPNNLReport.pdf

Future PNW Program Specifications

Component	NEEM (Base)	NEW-HPM
Ceiling	R-40	R-45
Floor	R-30	R-38
Wall	R-21	R-26 (with R-5 foam)
Window	U=0.35	U=0.22
Door	R-5	R-5
Duct Leakage	6% of Supply	None
Target Uo	0.054	0.040
Heating System	Furnace	DHP/ Elec. Res. Zonal
Lighting	1.4 W/sf	0.7 W/sf
Infiltration	0.25 ACH (natural)	0.21 ACH (natural)
Ventilation	Whole House (0.1 ACH added)	HPWH (0.14 ACH added)
DHW (EF)	0.90 (Std)	2.0 (HPWH)
Appliance	Standard	Estar+

Let's Talk

- Sharing NW expertise/experience & Market Transformation models
- Strategies to increase Energy Star market share
- Interest in collaborating on federal standards rulemaking in 2012!!!!
- Want to be informed on rulemaking open for public comment? (fall 2012?)

Contact Information

- Mike Lubliner - Technical Assistance
- Ken Eklund - Policy Initiatives
- Tom Eckman – Market Transformation