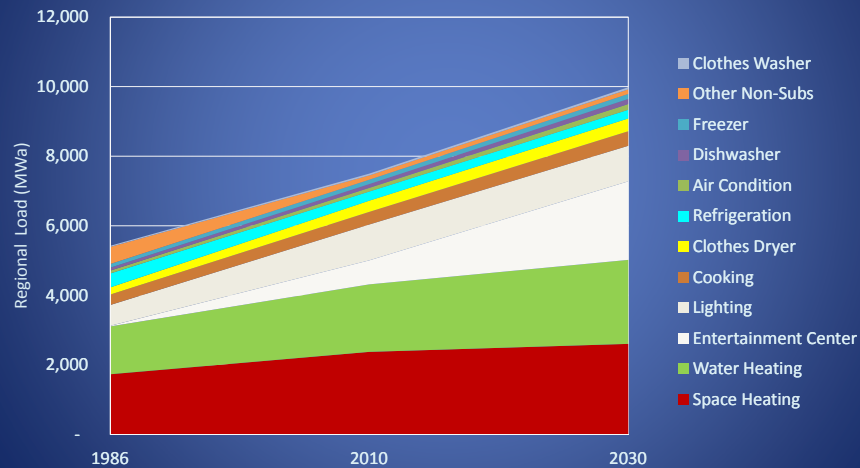


Residential Building Stock Assessment (RBSA) Manufactured Housing

Tom Eckman
&
Massoud Jourabchi
April 9, 2013

1

Estimated Regional Residential Sector Electric Load by End Use Pre-6th Plan Efficiency Impacts



2

The Chances of Making A Better Decision Increase With Accurate Data

- Council's load forecast and assessment of conservation potential rely on current and detailed data about housing and appliance characteristics
- Conservation program planners rely on market data to inform program design and evaluations
- Acquisition of statistically meaningful data is both essential and expensive

3

RBSA Study Objectives

- Characterize Residential Sector Building Stock
 - Single Family (Four-Plex and below)
 - Multifamily (Five-plex and above, less than four stories)
 - Manufactured Homes (Federal regulated by US Department of Housing and Urban Development – HUD)
- Provide Representative Samples
 - By state and region
 - By BPA customer service area
 - Designed to permit individual utilities to “oversample” to provide utility level representation
- Characterize Buildings
 - Detailed On Site Energy Audit, including lighting survey
 - Basic Demographics
 - Billing Histories for both electric and gas consumption

How This Data Will Be Used

- Supports both Load Forecasting and Assessment of Conservation Potential
 - Provides Baseline Building Characteristics
 - Updates Heating and Cooling Equipment Market Shares
 - Revises Appliance Saturations and Characteristics
- Key input into determination of “non-programmatic” efficiency improvements (i.e., what consumers did on the own)
- Assist in program design & implementation

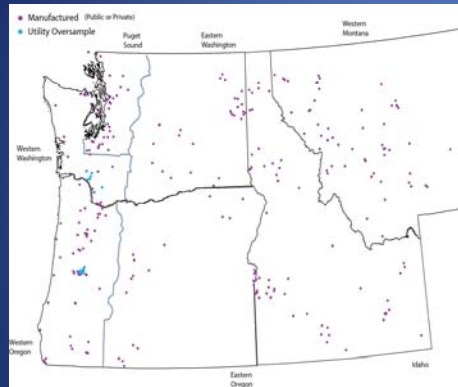
5

Data Sources on Manufactured Housing used in the 6th Power Plan

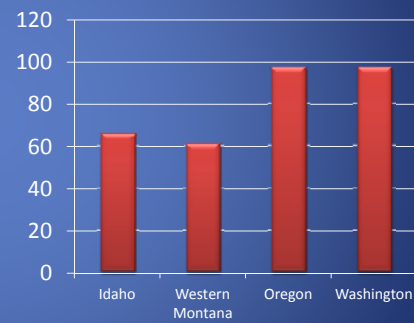
- 1992 Pacific Northwest Residential Energy Survey (PNWRES92)
- Residential Construction Demonstration (RCDP) 1986-1989
- Manufacturing Home Acquisition Project (MAP) 1995
- Super Good Cents (SGC) 1997-1998
- SGC Manufactured Homes 2000-2001
- Northwest Energy Efficiency Housing Program (NEEM) 2006

6

RBSA Study MH Coverage



RBSA Manufactured Home Field Audit Sample by State



Last Comprehensive Regional Survey of Residential Customer Characteristics Was Conducted in 1992

7

What is a Manufactured Home?



Living in a Manufactured Home



What Most People Think It Means



What Some People Think it Means



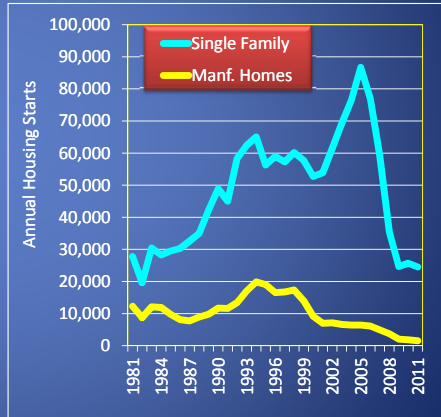
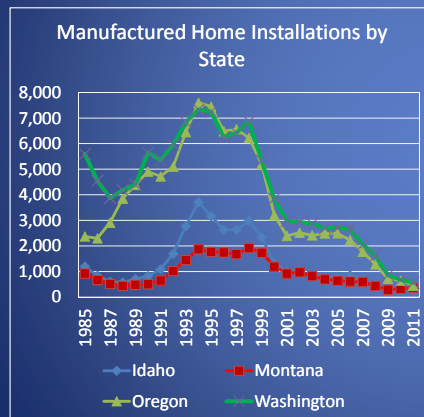
What People That Have Never Been Around
A Manufactured Home Think It Means



What It Really Means

MobileHomeLiving.org

Regional Manufactured Home Installations Peaked in the mid- 1990's



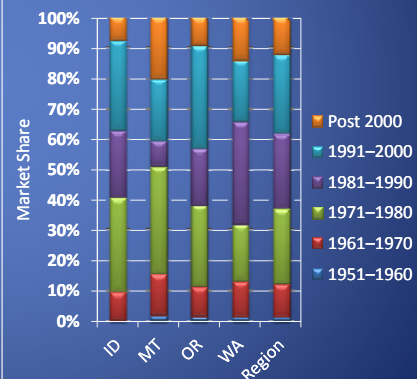
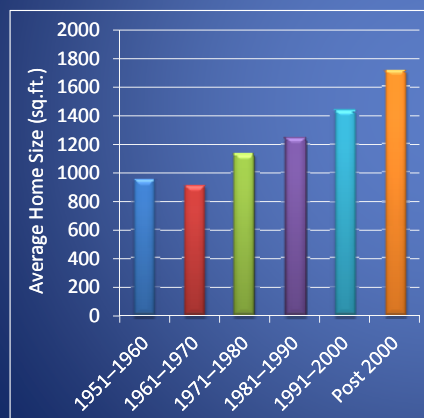
2013 Manufactured Home Jeopardy

11

Category: Manufacture Home Vintage

This State has the largest share of older manufactured homes

Answer: What is Montana?

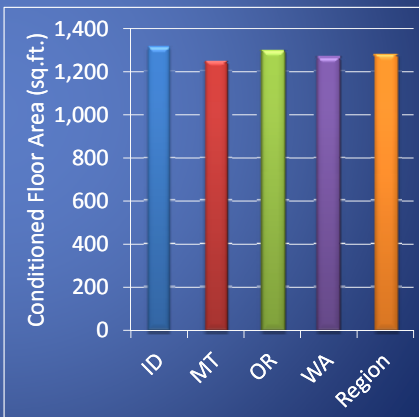
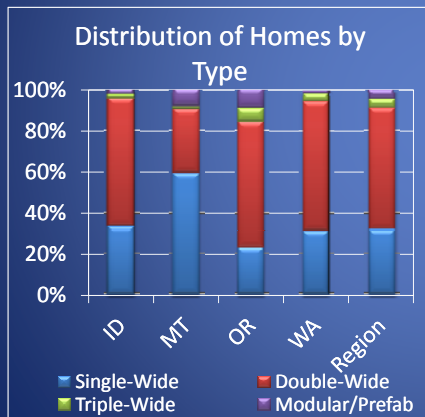


12

Category: Manufactured Home Size

This state has the *smallest* average size manufactured homes

What is Montana?

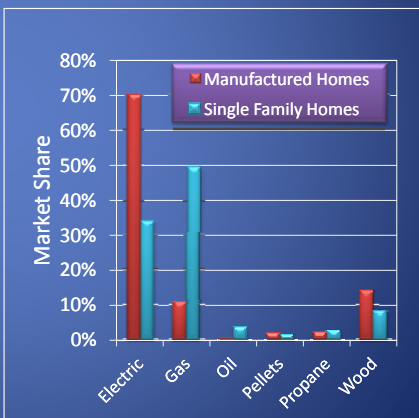
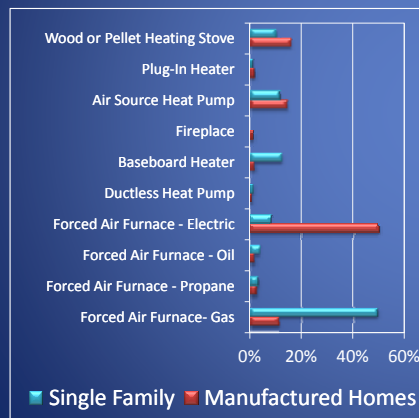


13

Category: Primary Heating Fuel

This space heating energy type is used by more manufactured homes than any other

What is electricity?

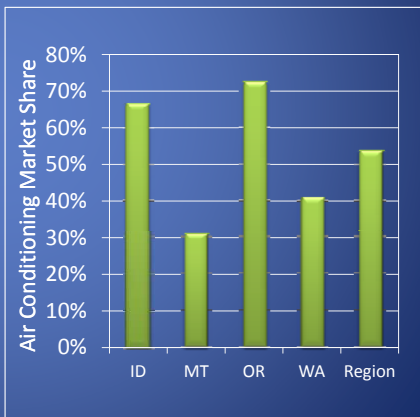
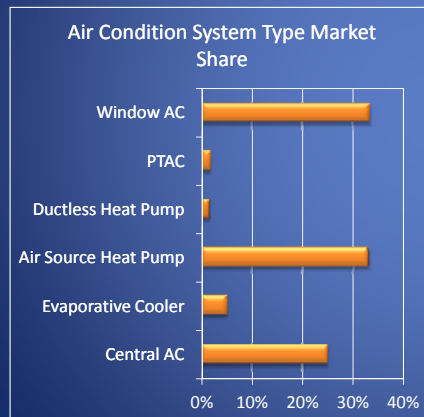


14

Category: Space Cooling

This state has the largest share of manufactured homes with air conditioning

What is Oregon?

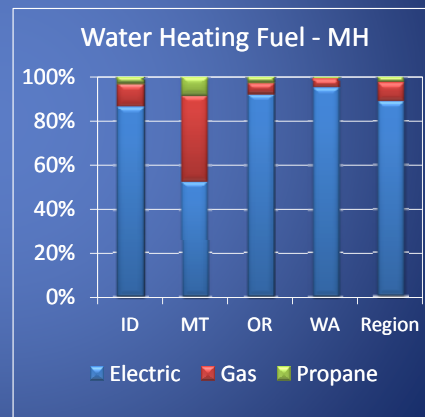
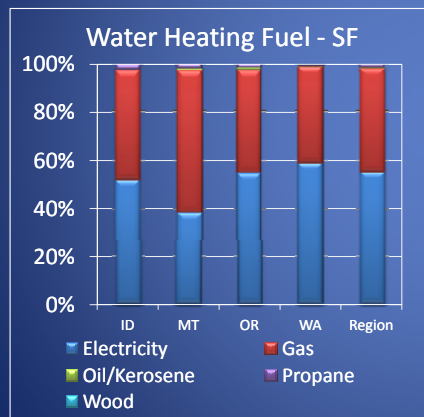


15

Category: Water Heating

This fuel heats the most hot water in Manufactured homes

What is electricity?

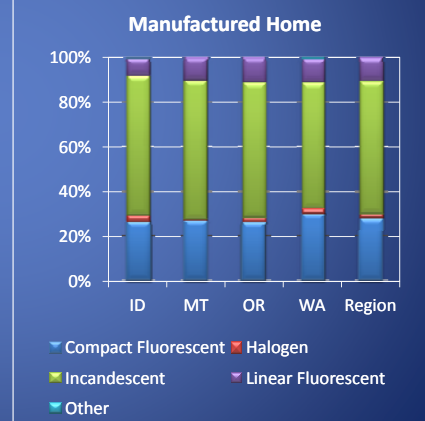
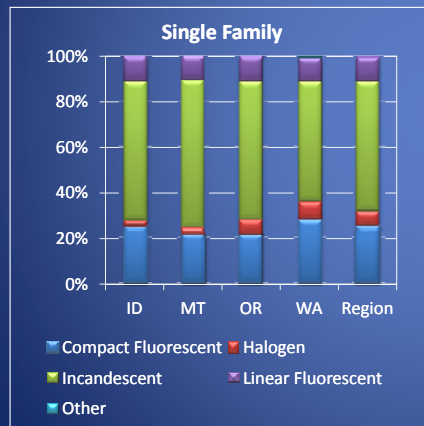


16

Category: Lighting Efficiency

This state's manufactured homes have the most CFLs

What is Washington?

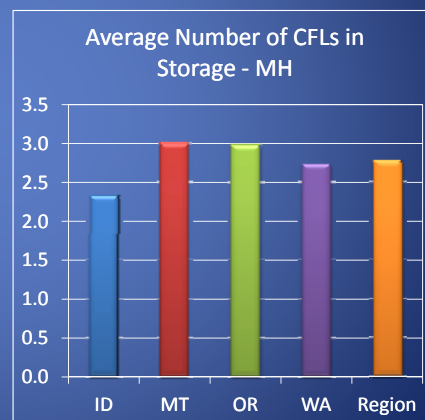
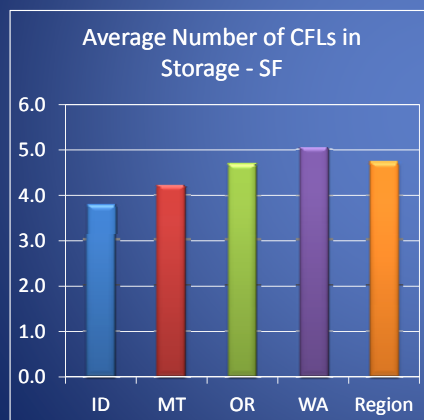


17

Category: Lighting Storage

Residents of manufactured homes in these two states store the most CFLs

What are Montana and Oregon?

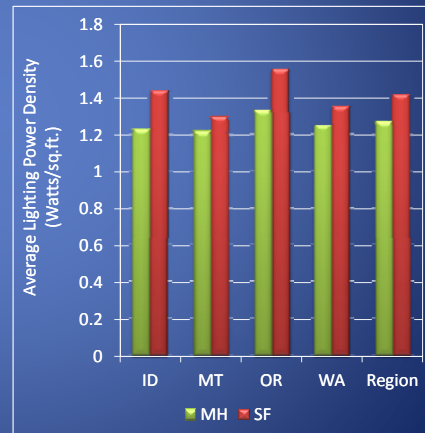
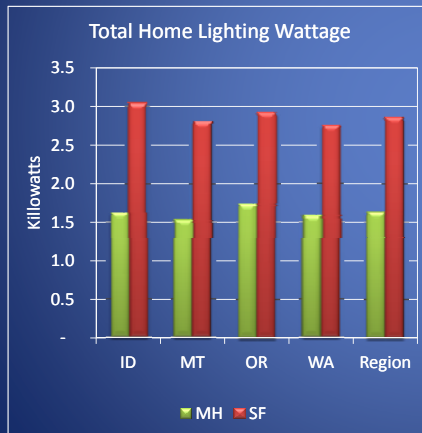


18

Category: Lighting Efficiency

This home type has the highest share of energy efficiency lighting

What are Manufactured Homes?

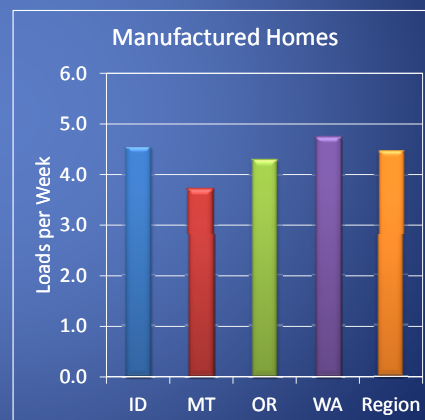
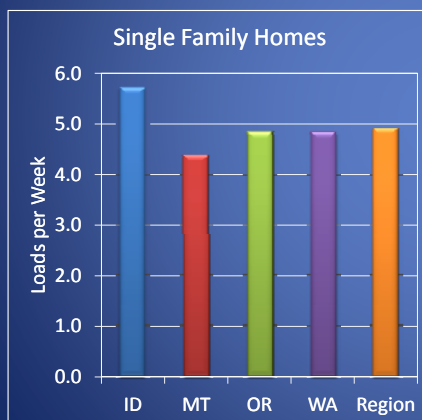


19

Category: Appliances

Residents of manufactured homes do this nearly five times per week

What are wash clothes?

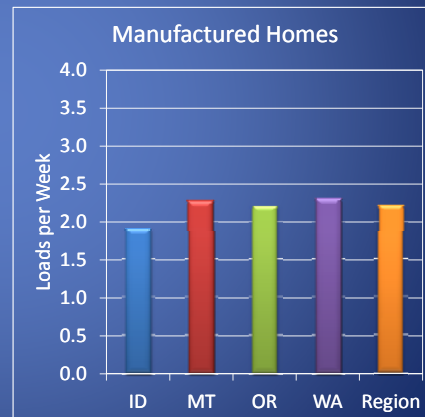
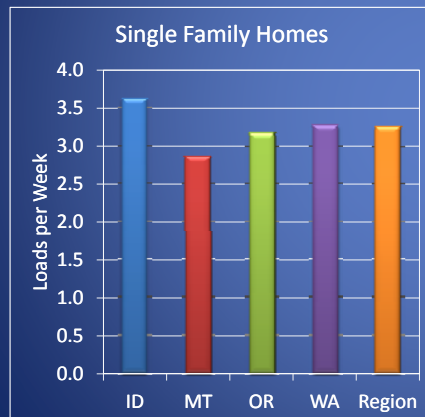


20

Category: Appliances

Residents of manufactured homes say they do this just over twice per week

What is wash dishes in dishwasher?

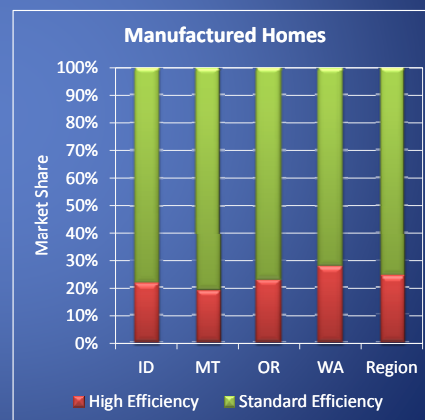
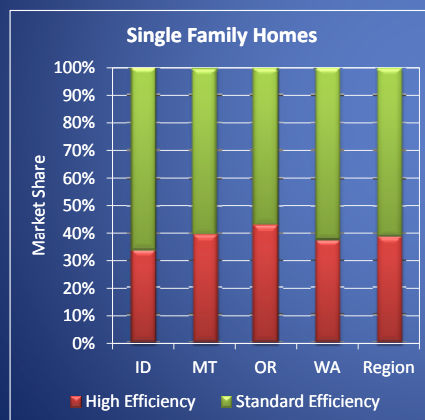


21

Category: Appliances

Residents of manufactured homes in this state have the most efficient clothes washers

What is Washington?

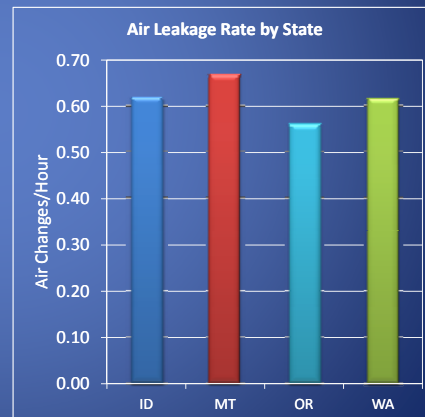
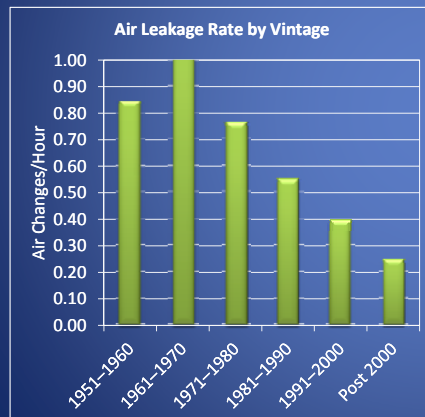


22

Category: Air Tightness

The manufactured homes in this state lose more heat through air leakage than any other state

What is Montana?

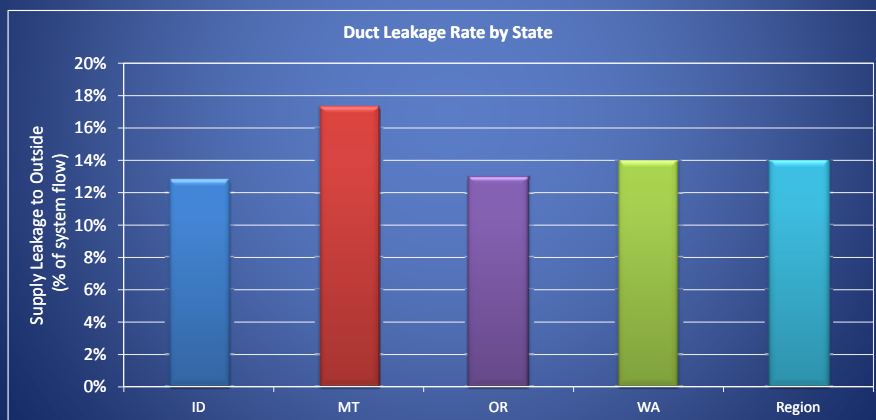


23

Category: Duct System Tightness

The manufactured homes in this state lose more heat through duct leakage than any other state

What is Montana?

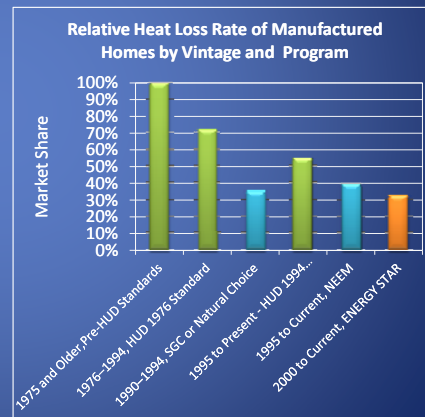
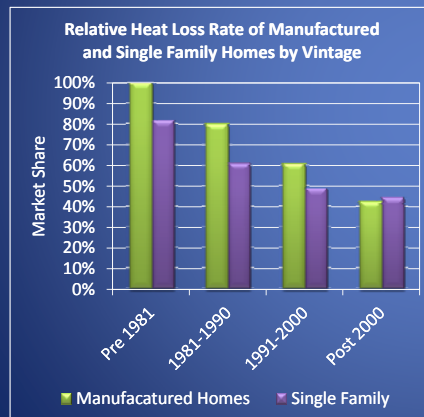


24

Category: Thermal Integrity

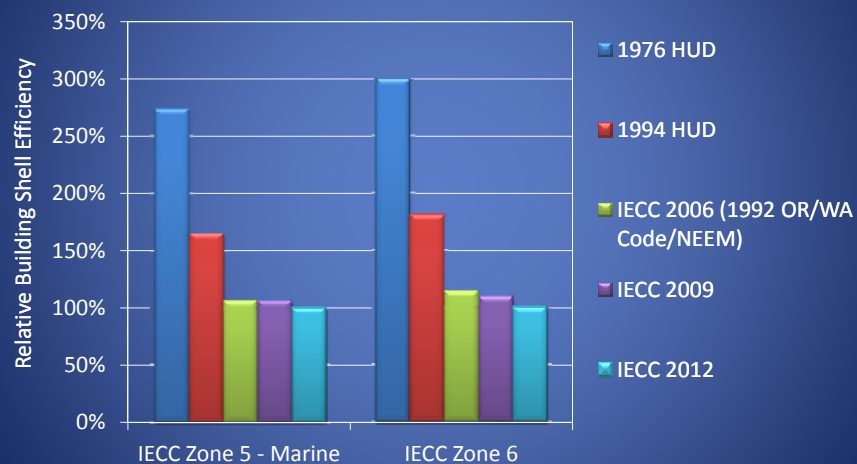
The energy efficiency of manufactured homes in the region is primarily a result of this factor

What are utility programs?

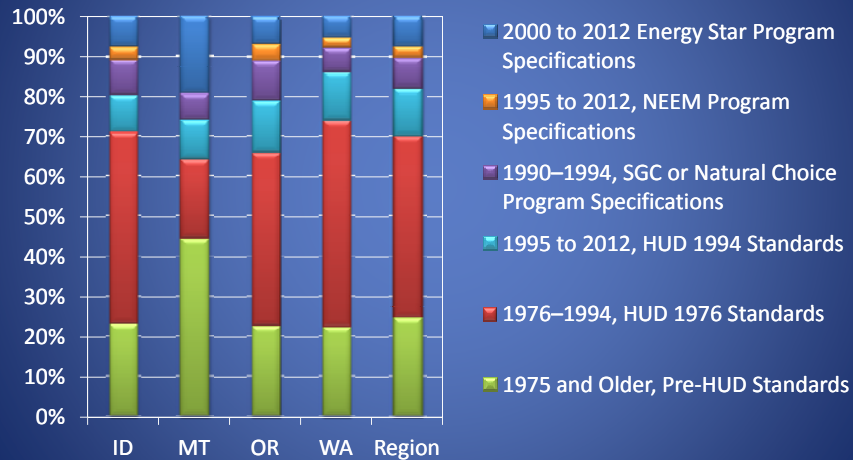


25

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

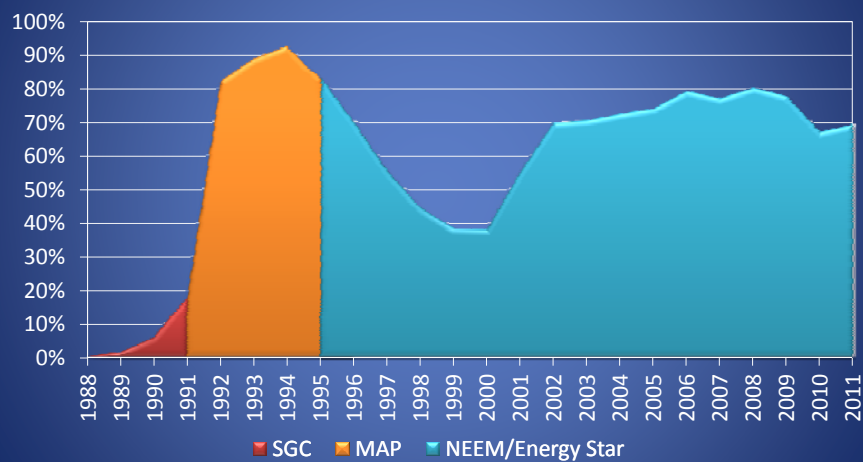


Distribution of Homes by Vintage and Standards/Specifications and State

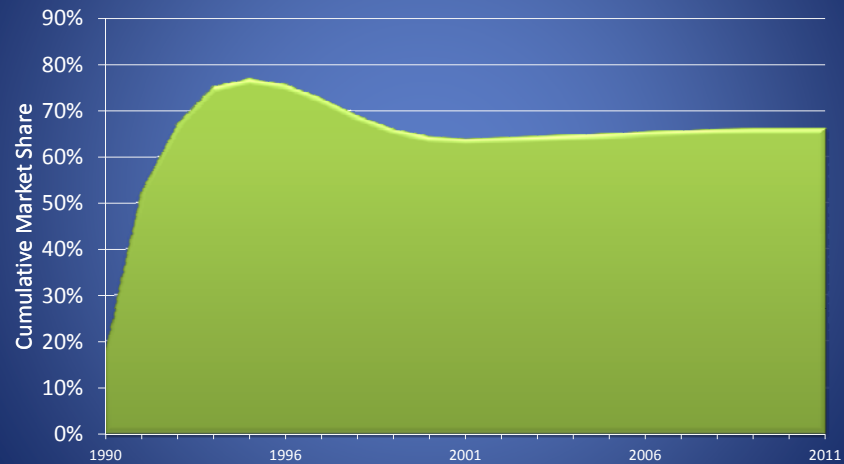


27

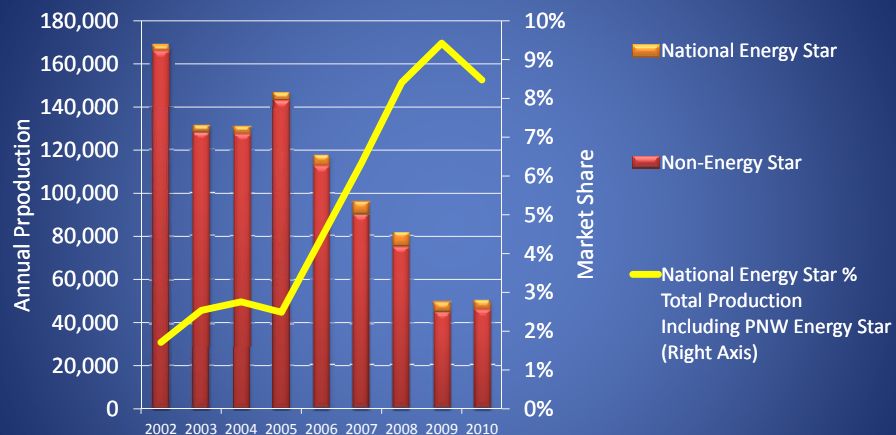
Utility Programs Significantly Altered the Efficiency of New Manufactured Homes



Since 1990 Two-Thirds of New Manufactured Homes Produced in the Region Have Been Built to Utility Efficiency Specifications



National Energy Star Market Share

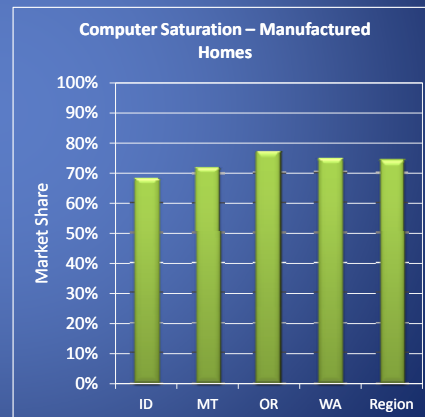
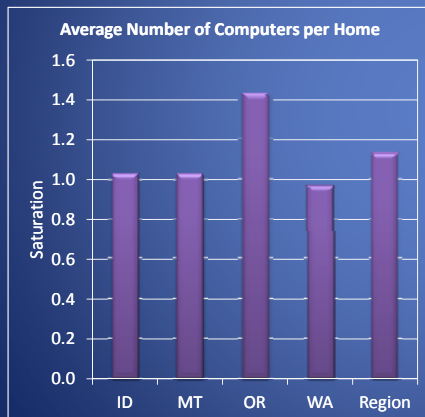


Of the over 40,000 Energy Star Manufactured Homes since 2002, half were built in the Pacific Northwest

Category: Consumer Electronics

Three out of four manufactured homes own one of these

What is a computer?

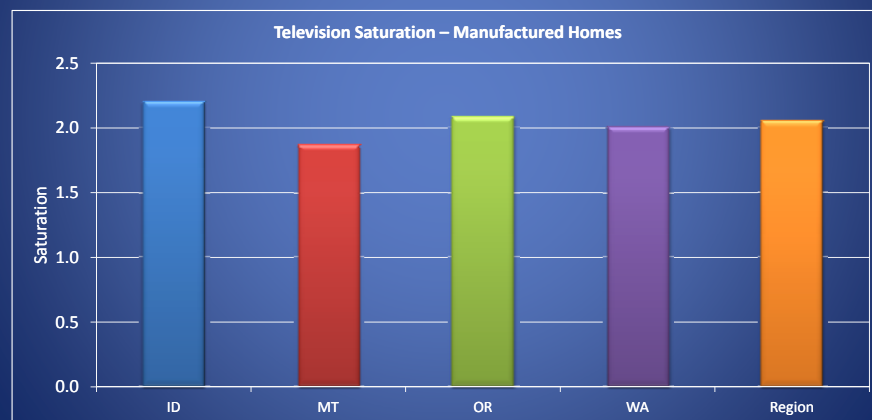


31

Category: Consumer Electronics

Residents in manufactured homes in this state own the fewest TVs

What is a Montana?

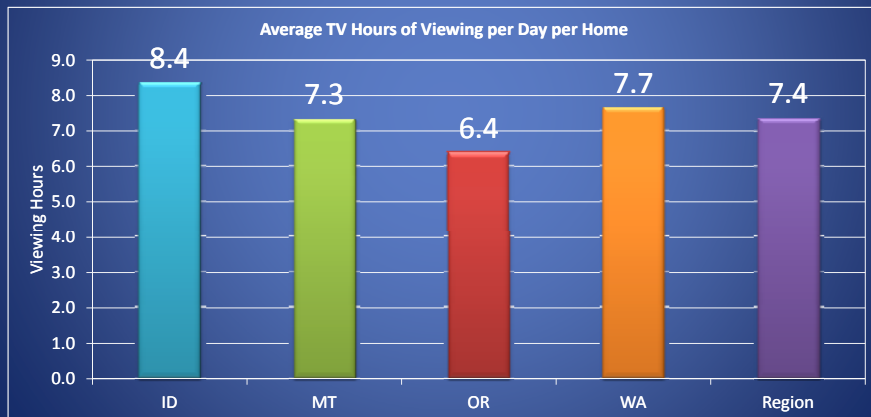


32

Category: Consumer Electronics

Residents in manufactured homes in this state spend one third of their day watching TV

What is a Idaho?

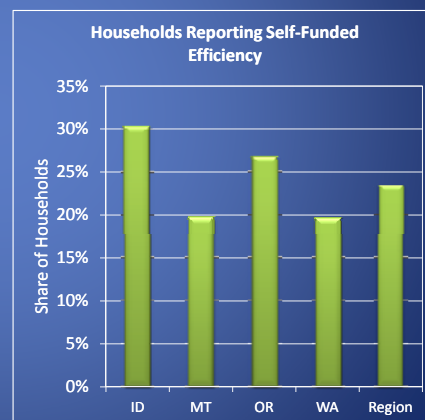
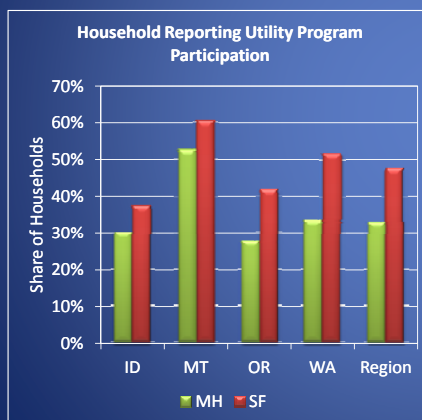


33

Category: Energy Efficiency

Residents of manufactured in this state say they funded the most conservation on their own

What is a Montana?

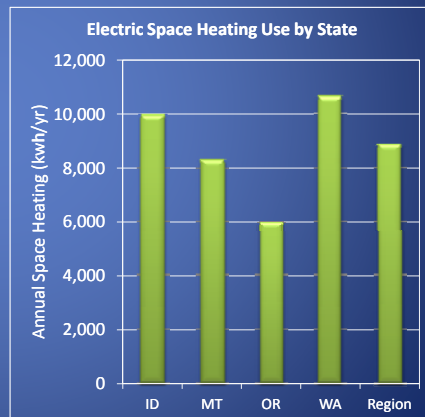
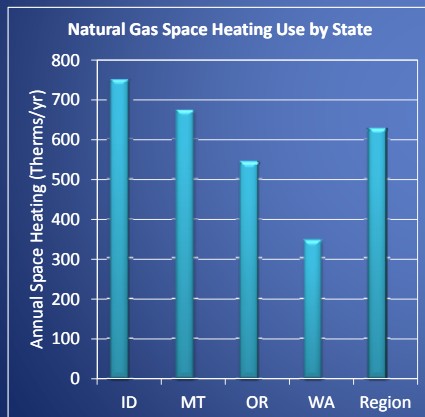


34

Category: Energy Use

This states manufactured homes that use electricity for space heating use more than any other state

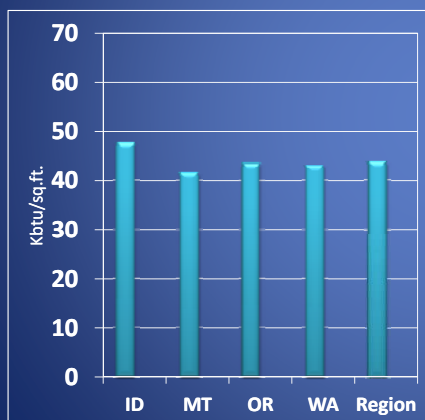
What is a Washington?



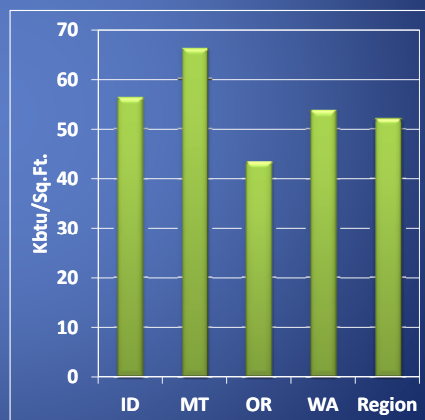
35

Energy Intensity Weather Normalized KBTU/Sq.Ft.

Single Family



Manufactured Housing



36

Final Jeopardy

Answer: Many areas

Question: what is impact of
RBSA on Council's Planning

Special thanks to:

NEEA team

Utility teams

NEET (working group 1)

Measuring what matters

Better Baseline for 7th plan

Load Forecasting

Conservation assessment

Program design &
implementation

37

Almost 40% of the Region's Manufactured Homes Were Built Prior to 1980

- Due to their unique construction (i.e. metal siding and roofing materials, I-beam floor framing), upgrading insulation levels requires specialized tools and skills
- The following slides depict the installation of floor, ceiling and wall insulation in typical pre-1980 manufactured homes







Accessing the ceiling truss cavity through the roof ridge allows the installer to insulate the entire cavity







A Specialized Stuffing Tool #1

MOBILE HOME SIDEWALL RETROFIT

