Agenda

1. Methodology
2. Residential market intelligence
3. Commercial market intelligence
4. Big cross-sector changes and drivers
Method

1. Distributor sales data
2. Interviews with market actors
3. Discussions with BPA program staff
4. Secondary data
5. 2016 AHR Trade Show Interviews
RESIDENTIAL MARKET INTELLIGENCE
ELECTRICALLY-HEATED HOMES

55%

HAVE DUCTS
REGIONAL PROGRAMS REBATE
10-12% OF ALL ASHP SALES
80% of ASHP sales are below 9.0 HSPF.
HEAT PUMPS LAST FOR 15+ yrs.
INSTALLATION PRACTICES

86% OF HEAT PUMP SAVINGS
HIGH-EFFICIENCY HVAC SALES MAY NEED A BOOST
SUPPLY CHAIN

Manufacturers

Distributors

Contractors & Builders

End Users
Consolidated MARKET PLAYERS

Manufacturers

Distributors
Fragmented
MARKET PLAYERS

Contractors
& Builders

End Users
BRING IN
Distributors + Manufacturers
WELCOME
When do you need a new heat pump?
When units get OLD, ~56% of sales...
When New Homes are built, approximately 44% of sales occur.
COMMERCIAL MARKET INTELLIGENCE
ELECTRICALLY-HEATED BUILDINGS HAVE DUCTS

70% HAVE DUCTS
97% OF ASHP SOLD WERE STANDARD EFFICIENCY
82% of packaged AC sold were standard efficiency.
SUPPLY CHAIN

Manufacturers

Distributors

Contractors & Builders

Commercial Buildings

Manufacturer Representative
DECISION CHAIN

2 APPROACHES

PLAN + SPEC
- OWNER/OWNER’S REPRESENTATIVE
  - ARCHITECT/ENGINEERING FIRM
    - MECHANICAL CONTRACTOR

DESIGN-BUILD
- OWNER
  - DESIGN-BUILD FIRM
    - DISTRIBUTOR
BUILDING SPECIFIERS
INFLUENCE
PLAN + SPEC
DISTRIBUTORS & DESIGN-BUILD FIRMS
INFLUENCE DESIGN-BUILD PROJECTS
WHAT ABOUT NATIONAL ACCOUNTS?
STANDARDS ARE RAISING THE BAR
The industry is excited about DUCTLESS

- YORK
- HITACHI
- Goodman
- Daikin
- Midea
- Lennox
- Carrier
- Toshiba
- Trane
- Mitsubishi

- Daikin acquired Goodman
- Lennox announced VRF line December 2013
- Carrier launched VRF January 2015
- Trane Launched VRF May 2013
- Brand is strong enough in US to stand alone

Ducted Partner
Ductless Partner
$1 Billion
TECHNOLOGY
Market actors WAY UP the supply chain
So what’s NEXT?
Learn More!

Bonnie Watson
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www.bpa.gov/goto/HVAC
WHY THESE NUMBERS ARE DRAFT

- Incomplete sales data
- Prevalence of conversions vs. upgrades
- Installation context by home type
What is the Market?

Newly installed ducted air source heat pumps in single family and manufactured homes in the entire four state region.
SAVINGS FROM THE UNIT ITSELF (AKA “BOX SAVINGS”) ARE THE FOCUS OF THIS ANALYSIS

ASHP Conversions

- 91% CC&S and Duct Sealing
- 9% Box Savings

ASHP Upgrades

- 86% Box Savings
- 14% Our focus for this analysis

Our focus for this analysis
How BIG is the Market?

HVAC units sold per year from 2010-2014 using stock turnover model calibrated to AHRI data.

QUESTION 2
FLOW

STOCK
INSTALLED STOCK IN 2010
STOCK TURNOVER MODEL OVERVIEW

Shipments

Stock
KEY CONCEPT: CONVERSION VS. UPGRADE

Conversion = Electric Forced Air Furnace

Upgrade = Air Source Heat Pump

Upgrade = Air Source Heat Pump
KEY CONCEPT: CONVERSION VS. UPGRADE
CONVERSIONS SAVE MORE

Conversion

Electric Forced Air Furnace

Air Source Heat Pump
HSPF 7.7

41.5% kWh Reduction

Upgrade

Air Source Heat Pump
HSPF 7.7

Air Source Heat Pump
HSPF 8.5

4.8% kWh Reduction
HVAC UNITS REPLACING ELECTRIC FURNACES

CONVERSIONS ~26% PER YEAR

Units Shipped

- E-FAF to E-FAF
- E-FAF to Gas-FAF
- E-FAF to ASHP Conversions

2010 2011 2012 2013 2014
THE MAJORITY OF ASHP SALES ARE INSTALLED AS UPGRADES (2014 DATA)

MANUFACTURED HOMES

- 42% Conversions
- 58% Upgrades

SINGLE FAMILY HOMES

- 15% Conversions
- 85% Upgrades
QUESTION 3

What are the total market savings?
KEY CONCEPT: UNIT ENERGY CONSUMPTION (UEC)
BASELINE EFFICIENCY MIX

ACTUAL EFFICIENCY MIX
UEC FOR RESIDENTIAL HVAC EQUIPMENT (SINGLE FAMILY)

Heating Consumption (kWh/yr)

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Heating Consumption</th>
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<tbody>
<tr>
<td>Electric FAF</td>
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<tr>
<td>HSPF 7.7</td>
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<tr>
<td>HSPF 8.5</td>
<td>6,000</td>
</tr>
<tr>
<td>HSPF 9.0</td>
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<td>HSPF 9.5</td>
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<td>HSPF 10.5</td>
<td>5,000</td>
</tr>
<tr>
<td>HSPF 11.5</td>
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PNW Region

- 41%  
- 16%
QUESTION 3a

What was the energy use when the Power Plan was written?

Calculated baseline consumption according to baseline efficiency mix from the Sixth Plan.
TOTAL UNITS SHIPPED BY EFFICIENCY LEVEL – BASE CASE

<table>
<thead>
<tr>
<th>Year</th>
<th>HSPF 7.7</th>
<th>HSPF 8.5</th>
<th>HSPF 9.0</th>
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<td>2014</td>
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QUESTION 3b

What was the energy use in following years?

Calculated actual consumption using distributor sales data representing roughly half of the market.
RESIDENTIAL AIR SOURCE HEAT PUMP SALES BY EFFICIENCY CATEGORY

n=number of distributors reporting
c = count of units represented

% of Sales

2010 (n=1, c=648)
2011 (n=3, c=4122)
2012 (n=4, c=4172)
2013 (n=5, c=16798)
2014 (n=5, c=19475)

QUESTION 4

What are the program savings?

<table>
<thead>
<tr>
<th>Year</th>
<th>BPA</th>
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<tbody>
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<td>0.68</td>
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<tr>
<td>2014</td>
<td>0.58</td>
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MOMENTUM SAVINGS = TOTAL MARKET SAVINGS - PROGRAM SAVINGS
TOTAL MARKET SAVINGS FROM THE RESIDENTIAL ASHP MARKET

<table>
<thead>
<tr>
<th>Year</th>
<th>Program Savings (aMW)</th>
<th>Momentum Savings (aMW)</th>
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</thead>
<tbody>
<tr>
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<td>1.3</td>
<td>0.1</td>
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<td>1.0</td>
</tr>
<tr>
<td>2014</td>
<td>1.1</td>
<td>2.1</td>
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TOTAL MARKET SAVINGS (aMW)
DATA GAPS AND FUTURE PLANNED RESEARCH
Enhance sales data

Understand prevalence of conversions vs. upgrades

Understand installation context by home type