NORTHWEST RESIDENTIAL HVAC MARKET TRENDS
BPA WEBINAR
SEPTEMBER 1, 2022
Why Res HVAC?

RAPIDLY EVOLVING MARKET

- Heat pump technologies
- Demand for cooling
- Weatherization & thermostats

10% of total regional load*

- Residential HVAC: 10%
- Other Residential: 29%
- Non-Residential: 61%

*2018 Consumption in the 2021 Power Plan
What do we mean by the **Res HVAC** market?

- **Electric consumption**
- **In-unit technologies that affect heating and cooling**
- **Single Family Manufactured Multifamily**
- **Dwelling Unit**
- **Oregon Washington Idaho Western Montana**

2015 - 2021
Total regional residential HVAC electric consumption has **increased**

<table>
<thead>
<tr>
<th>Year</th>
<th>Consumption (aMW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>2,528</td>
</tr>
<tr>
<td>2016</td>
<td>2,548</td>
</tr>
<tr>
<td>2017</td>
<td>2,575</td>
</tr>
<tr>
<td>2018</td>
<td>2,601</td>
</tr>
<tr>
<td>2019</td>
<td>2,632</td>
</tr>
<tr>
<td>2020</td>
<td>2,665</td>
</tr>
<tr>
<td>2021</td>
<td>2,696</td>
</tr>
</tbody>
</table>
WHAT TRENDS ARE BEHIND THAT HVAC ENERGY CONSUMPTION?
The increase in consumption comes from **added cooling**

<table>
<thead>
<tr>
<th>Year</th>
<th>Cooling Consumption (aMW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>280</td>
</tr>
<tr>
<td>2016</td>
<td>287</td>
</tr>
<tr>
<td>2017</td>
<td>297</td>
</tr>
<tr>
<td>2018</td>
<td>311</td>
</tr>
<tr>
<td>2019</td>
<td>328</td>
</tr>
<tr>
<td>2020</td>
<td>351</td>
</tr>
<tr>
<td>2021</td>
<td>372</td>
</tr>
</tbody>
</table>
By 2021, **72%** of homes have a form of cooling and **46%** have whole-home cooling.
Fortunately, equipment ratings of new CACs are **going up**

- **SEER 16 or more**
  - 2015: 6%
  - 2016: 52%
  - 2017: 6%
  - 2018: 10%
  - 2019: 67%
  - 2020: 10%
  - 2021: 67%

- **SEER 14 - 15.99**
  - 2015: 42%
  - 2016: 1%
  - 2017: 22%
  - 2018: 0%
  - 2019: 22%
  - 2020: 0%
  - 2021: 22%

- **SEER 12 – 13.99**
  - 2015: 42%
  - 2016: 52%
  - 2017: 42%
  - 2018: 42%
  - 2019: 42%
  - 2020: 42%
  - 2021: 42%

- **Less than SEER 12**
  - 2015: 1%
  - 2016: 1%
  - 2017: 1%
  - 2018: 1%
  - 2019: 1%
  - 2020: 1%
  - 2021: 1%

**2021 Market Average:**
- SEER 14.5
- **2023 Federal Standard:**
  - SEER 14
ASHP market average SEER has exceeded 2023 Federal Standard.
VCHP sales have reached a \textbf{fifth} of the ASHP market

\textbf{Variable Capacity (or speed) Heat Pumps} \\
Compressor speed varies based on demand \\
Not tied to SEER/HSFP
We’re still a **heating-dominant** region
Demand for cooling has led to heating efficiency gains

<table>
<thead>
<tr>
<th>Year</th>
<th>Heating Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>2,247 aMW</td>
</tr>
<tr>
<td>2016</td>
<td>2,261 aMW</td>
</tr>
<tr>
<td>2017</td>
<td>2,278 aMW</td>
</tr>
<tr>
<td>2018</td>
<td>2,291 aMW</td>
</tr>
<tr>
<td>2019</td>
<td>2,304 aMW</td>
</tr>
<tr>
<td>2020</td>
<td>2,314 aMW</td>
</tr>
<tr>
<td>2021</td>
<td>2,324 aMW</td>
</tr>
</tbody>
</table>

SF Per-Home: 6,954 kWh/year

SF Per-Home: 6,552 kWh/year
More than a quarter of homes use ASHPs and DHPs for primary heating.

### Number of Homes with ASHP and DHP as Primary Heating Technology

<table>
<thead>
<tr>
<th>Year</th>
<th>ASHP</th>
<th>DHP</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>779,886</td>
<td>212,541</td>
</tr>
<tr>
<td>2016</td>
<td>822,284</td>
<td>244,895</td>
</tr>
<tr>
<td>2017</td>
<td>869,000</td>
<td>285,826</td>
</tr>
<tr>
<td>2018</td>
<td>917,115</td>
<td>332,872</td>
</tr>
<tr>
<td>2019</td>
<td>972,258</td>
<td>379,877</td>
</tr>
<tr>
<td>2020</td>
<td>1,041,630</td>
<td>434,571</td>
</tr>
<tr>
<td>2021</td>
<td>1,111,012</td>
<td>489,264</td>
</tr>
</tbody>
</table>
When people purchase ASHPs, we see heating ratings **improving**
Most DHPs are in Single Family homes with Electric Zonal heat.

Multifamily homes installing DHPs faster than manufactured homes.
Heat pumps primarily replace eFAF and zonal electric

- Zonal Electric: 36% in 2015, 28% in 2021
- eFAF: 7% in 2015, 4% in 2021
- Gas FAF: 39% in 2015, 41% in 2021
- DHP: 4% in 2015, 8% in 2021
- ASHP: 13% in 2015, 18% in 2021
Interestingly, share of gas furnaces in the stock has held steady.
WHAT ELSE IMPACTS HVAC ENERGY CONSUMPTION?
Building shell conditions are improving, but there are still **plenty of opportunities**.
We’ve seen growth in Advanced Smart Thermostats, but **could see more**
Efficient equipment and non-equipment upgrades drive market savings

- Energy consumption without market savings drivers
- Actual energy consumption

140 aMW savings
Programs have paved the way
WHERE ARE OPPORTUNITIES FOR THE FUTURE?
ASHPs and DHPs will continue to be a crucial technology.

This allows us to ride the cooling wave for opportunities and benefits.
Where does the research go from here?

- RBSA III
- New HVAC Sales Data
- VCHP and Tech-Specific Studies
- RTF Measure Updates
For more information, visit
https://www.bpa.gov/energy-and-services/efficiency/market-research-and-momentum-savings/hvac-market-research

Questions? Contact
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