hello
MY NAME IS

Agenda

• Team staffing update (5 min)
• Updates on HVAC research (5 min)
• Learnings from 2020 AHR Expo (30 min)
• Updated meeting information (5 min)
Team Staffing Updates

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Coming soon

NEW STAFF
Project Lead
Updates on HVAC

• Commercial HVAC
  • Feasibility assessment completed in early 2020
  • Working on finalizing methods now
  • 2016-2021 permit data collection starting soon
  • Permit database available summer 2021
  • Model development in 2021

• Residential HVAC
  • 2016-2018 sales data and AHR Expo
  • 2019 sales data and market intelligence
  • Insulation market study
  • Model update in 2021
2020 AHR Expo Findings
Research performed by Cadeo
GOALS FOR ATTENDING AHR

Identify key trends in HVAC from the manufacturer perspective

› Where is the market changing?
› What is driving market change?
› Where are the future opportunities?

Confirm and verify existing market model estimates and assumptions
METHODOLOGY

- 5 Manufacturer Interviews
- Additional Booth Scans, Sessions, and Networking
- 10 Targeted Booth Interviews
- BSRIA Market Trends Session
Findings are based on statements from manufacturers interviewed at the AHR Expo held in early February 2020 (pre-COVID).

Any numbers and percentages presented are anecdotal, unless otherwise cited.
The HVAC market is getting more efficient, but not quickly

Codes and standards have had bigger market impacts than emerging technologies

Trends on the horizon include electrification, better integrated systems, and increased connectivity
The HVAC market is getting more efficient, but not quickly. Codes and standards have had bigger market impacts than emerging technologies. Trends on the horizon include electrification, better integrated systems, and increased connectivity.
RESIDENTIAL SPLIT SYSTEMS ARE GROWING
TRENDS IN PORTABLE AC

Increase in portable cooling in previously non-cooling focused markets (BSRIA)

Manufacturers reported a trend away from portable cooling and toward ASHPs and DHPs
VRF continues to grow in commercial market

VRF showed largest growth of any technology in 2019

Changes in refrigerant requirements could introduce uncertainty

Consistent with 2018 and 2019 findings
VRF VS. DHP IN COMMERCIAL APPLICATIONS

VRF

› Simultaneous heating and cooling
› Low incremental cost vs. multi-zone DHP

DHP

› Single zone areas without ducting
WATER-SOURCE HEAT PUMPS VS. VRF

WSHP are a small percent of sales and relatively flat.

More traction in high-rise and multifamily buildings.

WSHP manufacturers focus on future electrification trends and the need for non-refrigerant solutions.
Standard efficiency isn’t going away anytime soon

Consistent with 2018 and 2019 findings
The HVAC market is getting more efficient, but not quickly

Codes and standards have had bigger market impacts than emerging technologies

Trends on the horizon include electrification, better integrated systems, and increased connectivity
What’s preventing market change?

Manufacturers offer energy efficient products, but there is a gap in installation/specifying:

› Lack of installer knowledge
› Architects/engineers not specifying EE equipment

› So, what moves the market forward?
CODES, STANDARDS, AND REGULATIONS SHIFT THE MARKET FROM THE BOTTOM UP.

Consistent with 2018 and 2019 findings
Codes causing rise in DOAS

VRF/DOAS manufacturer distribution partnerships are emerging

› Mitsubishi & Trane
› Fujitsu & Rheem
› Midea & Carrier
Codes causing rise in heat recovery

HRV/ERV Efficiency Ranges:
› Low efficiency: 40-50%
› Average efficiency: 50-70%
› High efficiency: 70-80+%

› Wheels
  › Make up most of the market (80% estimated)
  › Easier to clean/maintain and achieve higher efficiencies

› Plate HEX
  › Crossflow HEX make up the majority of plate HEX
  › Few counterflow plate HEX featured
  › Manage odor control and cross-contaminants better
MISCONCEPTIONS ABOUT CODES, STANDARDS, AND REGULATIONS

- **Refrigerants**: Fears about refrigeration requirements changing/upcoming bans
- **RTUs**: 2023 Commercial Unitary System Standard Update
- **VRF**: Changes to VRF test procedure
WHAT’S NEXT?

The HVAC market is getting more efficient, but not quickly

Codes and standards have had bigger market impacts than emerging technologies

Trends on the horizon include electrification, better integrated systems, and increased connectivity
Electrification is a hot topic...

“You won’t be able to install gas.”

“VRF is the solution to electrification.”

High efficiency electric manufacturers using it as a selling point, especially VRF manufacturers.

Is electrification of heating driving sales towards ASHP, DHP, VRF?
...But gas manufacturers aren’t worried

› Gas RTUs, furnaces, and boilers are still a huge market and not going away quickly.

› Low gas prices continue to drive gas equipment sales.
Emerging technologies center around integration, operations, and controls

Very little buzz about “emerging technologies” that are actual technologies

Emerging opportunities are:

- Operation
- Design and Integration Improvements
- Controls
- Components

Consistent with 2018 and 2019 findings
Residential controls are all about **comfort** and **connectivity**

What’s hot:

› Phone-controlled “smart homes” driven by comfort, security, and entertainment

› Voice-integrated systems that control lighting, temperature, appliances, and other home features

Energy efficiency is a benefit and feature, but not the primary driver

What does that mean for smart thermostat energy savings?
Residential demand response is emerging but not mainstream

Two manufacturers (JCI and Mitsubishi) make demand-response-ready thermostats.

Vast majority of manufacturers did not showcase demand-response-ready thermostats and said “they were working on it.”

Residential water heaters had more products compliant with CTA-2045.
Commercial controls are also all about **comfort** and **connectivity**

Advanced sensors integrate occupancy-based controls with HVAC and other systems with a focus on remote control and diagnostics

› Focus on remote control and diagnostics

› Wired solutions remain more common than wireless

› Demand response not a commercial topic or area of focus
QUESTIONS?

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Updated WebEx for future quarterly calls!

Link to meeting information:
https://www.bpa.gov/EE/Utility/Momentum-Savings/Pages/Calls.aspx

See you on November 4th!
APPENDIX
SHIPMENTS AND DISTRIBUTION CHANNELS

Distribution channels consistent with current assumptions
Most residential product sales go through distributors

Residential product sales

- Major manufacturers go through distributors

- A small but possibly growing percent of sales go through retail or online as DIY
  - Smaller brands and a very small percent of total sales

Consistent with our past understanding of the market
Most commercial sales go through manufacturer reps

› Majority does not go through distribution

› AHRI collects commercial sales data from manufacturers

› Other third-party companies do sales data collection/reporting, but usually based on qualitative information, not actual sales data collection (like BSRIA)
RESIDENTIAL INSULATION MARKET CHANNELS

A large (undefined) percentage of the residential insulation market (batt, blown-in, board) goes towards the replacement market.

Bigger contractors buy directly from the manufacturer, not through distributors.

Don’t discount the retail market for insulation.

Programs are a big driver, but insulation has a good payback even without programs.
2020 BSRIA Presentation
Highlights
Decade of growth in US

2019

- VRF: CAGR + 19%
- Chillers: CAGR + 2%
- AHUs & Fan coils: CAGR + 3%
- Rooftops: CAGR + 8%
- Splits
  - CAGR + 11%
- Windows & Portables: CAGR + 5%

2009

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2020 BSRIA Presentation
Globally, how did the products perform in 2019?

<table>
<thead>
<tr>
<th>Product Type</th>
<th>2019</th>
<th>2018</th>
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</thead>
<tbody>
<tr>
<td>Ducted splits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ductless single splits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multi Splits</td>
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<tr>
<td>VRF</td>
<td></td>
<td></td>
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<tr>
<td>Room AC</td>
<td></td>
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<tr>
<td>Total Large Packaged</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chillers</td>
<td></td>
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<tr>
<td>Airside</td>
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</tbody>
</table>

Source: BSRIA

- Growth is continued albeit smaller than 2018
- Residential and light commercial favouring multi splits and VRF
- The world’s biggest ducted splits – US slowed down
- Double digit growth forecasted in ductless splits in US – market gradually shifting away from ducted and Room AC
- Healthy growth in chillers across the globe with newer lower GWP refrigerants
- Growth in modular/Oil Free Centrifugal Chillers

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Where is the sales coming from?

Application in 2018, by volume

- Room AC
- Ductless splits
- VRF
- Multi Split
- Roof tops
- Ducted splits (US style)
- Chillers

0% 20% 40% 60% 80% 100%

New Build | Refurbishment | Replacement

Shift from traditional systems to more energy efficient options

70%

Penetration of AC in residential

88%

Penetration of AC in Commercial Buildings

Improving the built environment, Delivering knowledge, Measuring compliance and performance, International

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Market Leaders Then and Now in US

Top 5 players in 2009, by volume

LG
GE
FRIGIDAIRE
Haier
Carrier

Top 5 players in 2009, by value

Carrier
Johnson Controls
Goodman

Top 5 players in 2018, by volume

Carrier
GE

Top 5 players in 2018, by value

DAIKIN
LG
FRIGIDAIRE

2020 BSRIA Presentation

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Recent JVs

January 2018: Trane & Mitsubishi Electric Ductless and VRF in US and selected LATAM countries

- Trane access to existing and emerging markets for ductless and VRF in US and LATAM
- In the US ME will be able to reach the Trane's dealership network grow their position in the US

September 2017: Carrier & Midea Residential Ductless HVAC Joint Venture in NA

- Carrier to become a strong player in the growing ductless market and Midea to have access to huge potential market

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