

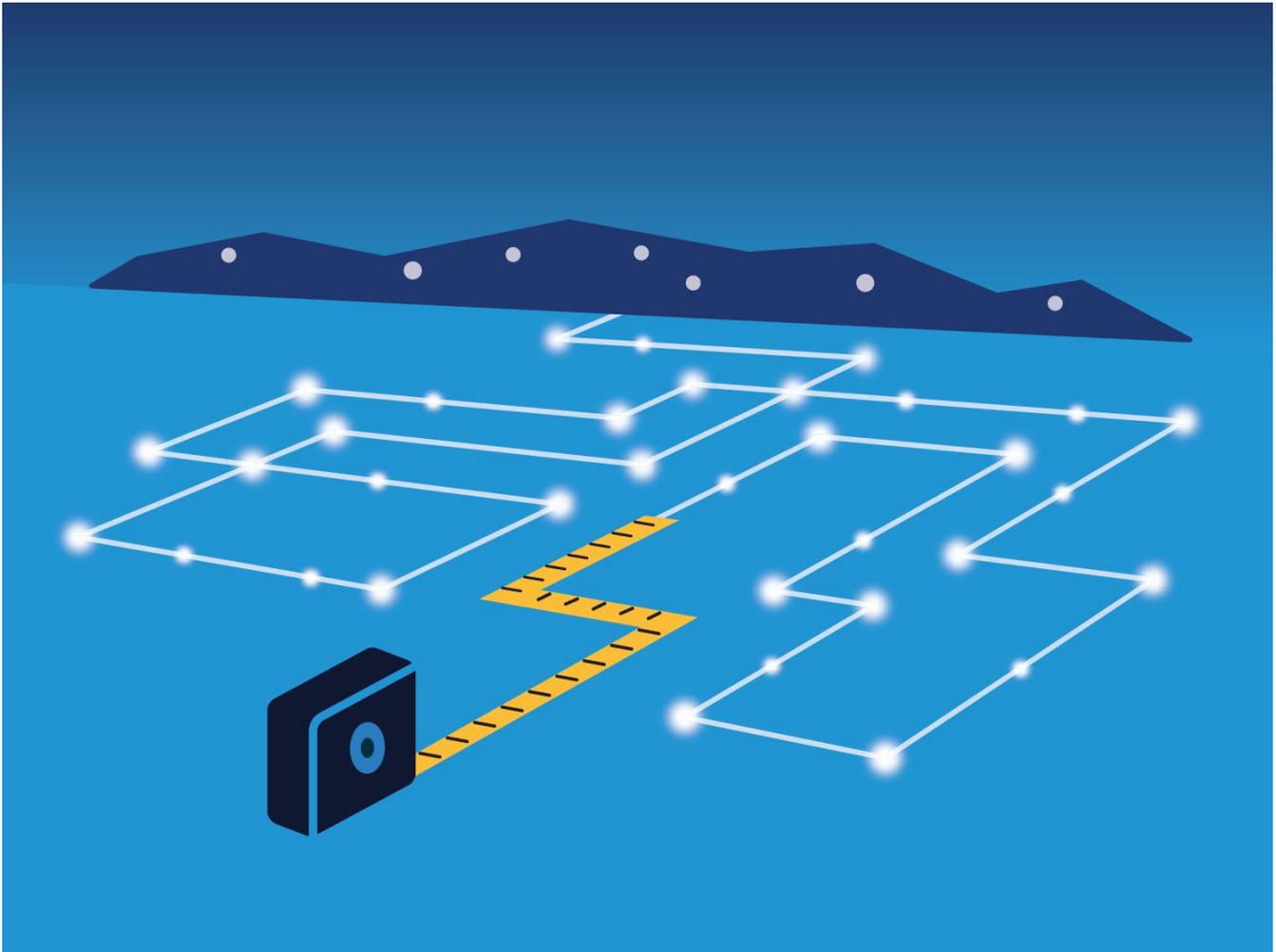


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Ameren Illinois' Market Effects Pilot – HVAC Market Characterization Report

Final
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1. Executive Summary

The Evaluation Team conducted a study to understand the current residential market size for different HVAC equipment, describe the HVAC supply chains in AIC service territory, and characterize market trends such as the drivers and barriers to energy efficient HVAC sales to support efforts to test a framework for delivering market effects savings from AIC's Midstream HVAC Initiative.

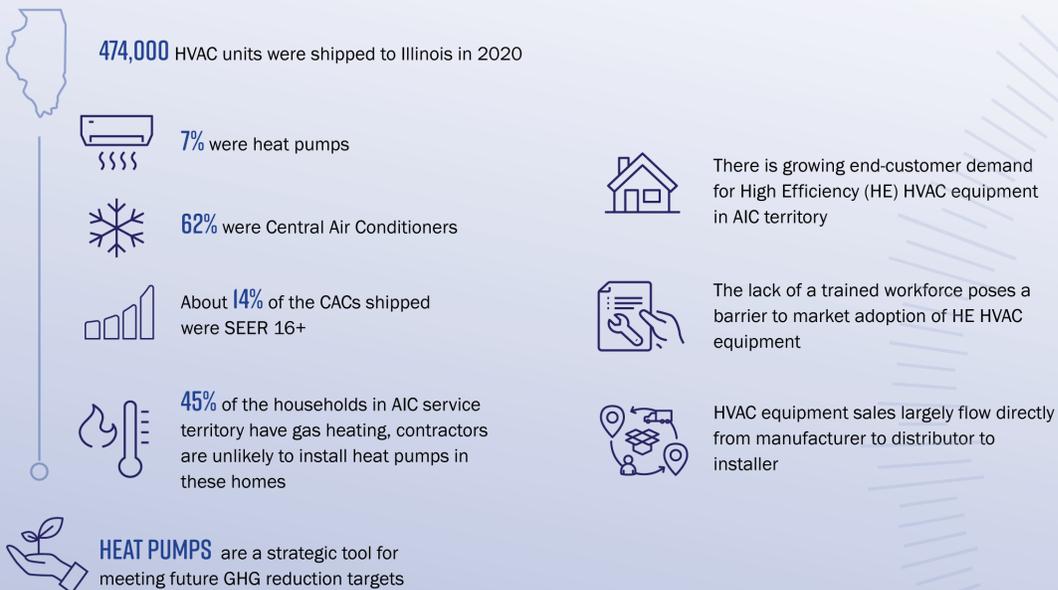
We used two main data sources to support the market characterization. First, we completed a literature review of technology briefs, evaluation reports, and market data sources including Heating, Airconditioning & Refrigeration Distributors International (HARDI) data for the State of Illinois to augment our understanding of dynamics related to the residential HVAC market. After this review, we completed a supply chain map to illustrate the distribution channels through which HVAC equipment are sold. Second, we conducted 17 in-depth interviews with three types of market actors in AIC territory: HVAC equipment manufacturers (1), distributors (6), and installers (10). These interviews asked about their experiences with heat pumps and efficient CAC installations as well as other HVAC equipment, their perceptions of customer barriers to efficient equipment adoption, the influence of utility incentives, and training they have received or need. The interviews also helped to complete our understanding of the market structure for efficient HVAC equipment in AIC service territory.

The Evaluation Team triangulated results from these research efforts to identify several opportunities for AIC to adjust the Midstream HVAC Initiative design to ensure the Initiative optimally captures and generates market effects. We summarize these results in the following infographic.

METHODS



KEY FINDINGS AND OPPORTUNITIES (MARKET)



KEY FINDINGS AND OPPORTUNITIES (MARKET ACTORS)

 <p>DISTRIBUTORS:</p> <ul style="list-style-type: none"> Are learning about the Midstream HVAC Initiative from other distributors and desire more engagement from AIC Sell directly to contractors, train them about HE HVAC equipment, and influence their purchasing decisions Have recommendations for Midstream HVAC Initiative design improvements 	 <p>INSTALLERS:</p> <ul style="list-style-type: none"> Have mis-perceptions of cold climate heat pump performance and other aspects of HE HVAC equipment See room for growth in AIC's incentive offerings 	 <p>END-CUSTOMERS:</p> <ul style="list-style-type: none"> While customer awareness of HE HVAC equipment is growing, it still remains low End-customers are interested in HE HVAC equipment for operational savings, warranties, and environmental benefits
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2. Introduction

The Evaluation Team conducted a study to characterize the residential retrofit and new construction energy efficient HVAC market in AIC service territory. The Evaluation Team also provided a characterization of the HPWH market in a previous report. This research effort is part of a larger Market Effects Framework Test Pilot Effort that AIC is completing in collaboration with the advisory firm; Brio; Opinion Dynamics; and the AIC portfolio implementer, Leidos. This larger effort is designed to identify the overall needs, risks, and opportunities for capturing market effects savings in AIC's portfolio and to test a framework for delivering market effects savings from AIC's resource acquisition programs.

We sought to help AIC and Brio understand the current HVAC residential market size, describe the HVAC equipment supply chains in AIC service territory, characterize market trends, and explore the potential key performance indicators for market change. This work will help AIC and Brio identify the potential for further market effects and inform the Midstream HVAC Initiative design. We used the following research questions to guide this research:

- What is the market size for HVAC in AIC service territory?
- What is the market share by manufacturer for residential HVAC product categories?
- What is the HVAC supply chain in AIC's service territory, from manufacturer to installation? What are the distribution channels?
- What are the drivers and barriers to distributors stocking and selling HVAC products?
- What are the drivers and barriers to installers selling HVAC products?
- What are the drivers and barriers to end-customers purchasing HVAC products?
- What are the future opportunities for AIC to capture market effects through the Midstream HVAC offering?

3. Methods

To explore the research questions specified above, we conducted a structured and rigorous secondary data review and in-depth interviews with key HVAC market actors. In tandem with these research efforts, we characterized the supply chain for HVAC products in AIC service territory.

3.1 Secondary Data Review

We completed a literature review of existing information available in HVAC market assessments, emerging technology briefs, evaluation reports, and market data sources, including Heating, Airconditioning & Refrigeration Distributors International (HARDI) data for the State of Illinois to augment our understanding of key details necessary to execute the HVAC market characterization. We summarized key results from this effort in a memo delivered to AIC in December 2020 (Appendix B) and incorporated key highlights in this report for context.

3.2 Supply Chain Characterization

Understanding the supply chain is essential for identifying and understanding market effects, how those effects will manifest through different market actors, and ultimately what data are necessary for measuring the effects. Using the information collected in the secondary data review and recommendations gathered from AIC and Brio, we developed a map of the HVAC supply chain in AIC service territory. We used this map to inform which questions we asked market actors. We then obtained quantitative data from secondary sources and qualitative insights from the market actor interviews to overlay estimates of the flow of HVAC products through the supply chain in AIC service territory.

We used HARDI data for the State of Illinois as a starting point to understand the size of the residential HVAC market in terms of shipments and sales, characterize efficient versus less efficient shipments and sales by product category type, and map shipments and sales into sectors and across key market actors. We then further characterized the HVAC market by equipment type in AIC service territory by completing interviews with market actors that serve AIC customers. We asked market actors about their sales and stocking practices for HE HVAC equipment incentivized through the Initiative including ducted and ductless Heat Pumps and SEER 16+ CACs, and we also asked about HVAC equipment that is not incentivized through the Initiative.

3.3 Interviews with HVAC Market Actors

The Evaluation Team conducted interviews with three types of HVAC market actors to confirm the accuracy of the supply chain maps and to discuss industry trends affecting the HVAC market in Illinois. In addition, these interviews illuminated the drivers and barriers to market actors selling this equipment and for customers buying this equipment. The objectives of these interviews were to:

- Identify market actors' perceptions of the HVAC market;
- Characterize HVAC market trends including market size and structure, distributor stocking practices and the types of equipment that distributors and installers recommend to their customers;
- Describe market actors' perceptions of benefits and drawbacks associated with residential HVAC product categories;

- Understand market actors’ perceptions of customer awareness and interest in efficient HVAC equipment;
- Characterize market actors’ perceptions of customer concerns;
- Confirm the accuracy of supply chain maps;
- Understand market actors’ perceptions of utility incentive programs; and
- Understand what energy efficient HVAC training market actors have had and still desire.

We utilized the supply chain maps developed through the Supply Chain Characterization research task to ground our interviews, which enabled us to move from asking broad questions about the market to more nuanced and grounded questions about the details of the market dynamics.

We collaborated with AIC and Leidos to develop a recruiting list that included major manufacturers, distributors, and installers. We contacted these market actors via a combination of email and phone calls, contacting each up to five times. We targeted installers who had familiarity with heat pumps, both ducted and ductless, and SEER 16+ CACs (see Appendix A for instruments). We conducted a total of 17 interviews with HVAC manufacturers, distributors, and installers (Table 1). These interviews lasted between 45 and 65 minutes, and respondents received a \$150 gift card as a token of our appreciation for taking the time to participate in this research. We analyzed the data to uncover themes and patterns in the respondents’ answers.

Table 1. Interviews by Market Actor

Market Actor Type	Number of Interviews
HVAC Manufacturer	1
HVAC Distributor	6
HVAC Installer	10

The ten installers reported having installed a total of 2,611 HVAC units in 2020. Of these installations, about 899 were CACs or heat pumps with a SEER rating of 16 or higher (712 CACs, 140 ducted HP, 47 ductless HPs).

4. Overall HVAC Market Detailed Findings

4.1 Market Size

Heating, Air-conditioning and Refrigeration Distributors International (HARDI) for the State of Illinois in 2020 reports that roughly 11,000,000 HVAC units were shipped in the US, with about 474,000 sent to Illinois. Within Illinois, about 35,000 (7%) were heat pumps and 292,000 (62%) were central air conditioners (CACs); about 14% of the CACs shipped were SEER 16 and above.

To supplement HARDI data at the state level, we leveraged interviews with market actors to identify the relative proportions of HE equipment types installed in AIC service territory.

Table 2 shows the weighted percent breakdown of HVAC equipment sales in 2020 for the interviewed installers, distributors, and 2020 HARDI Data. The HVAC equipment sold in AIC service territory in 2020 consisted of electric (53%), natural gas (45%), and a small percentage of liquid propane (LP; <3%).

Four installers reported that 2020 was representative of a typical year; five stated that they had lower overall sales than a typical year, while one said that they had higher sales.

Table 2. Breakdown of HVAC Sales

Equipment Type	Sales Percent in AIC Territory		HARDI Data 2020
	Installers (n=10)	Distributors (n=4)*	
Propane Furnace	2%	0%	<0.01%
Propane Boiler	<1%	0%	0%
Natural Gas Furnace	44%	46%	31%
Natural Gas Boiler	1%	2%	0%
Electric Furnace	6%	2%	No Info
Heat Pump	8%	3%	7%
Geothermal	8%	3%	No Info
Ducted	71%	46%	29%
SEER 16+	91%	33%	33%
Below SEER 16	9%	67%	66%
Ductless	22%	51%	69%
SEER 16+	100%	99%	87%
Below SEER 16	0%	1%	13%
CAC	38%	47%	62%
SEER 16+	72%	19%**	14%
Below SEER 16	28%	81%**	79%

Note: The percentages for installers and distributors have been weighted by the percent of sales they represent. The answers of those representing more sales are weighted proportionally to reflect that. We summed the total number of HVAC sales in the last year and then calculated the proportion of those sales for each respondent. Then, we weighted each person's answers per that proportion.

* Two distributors interviewed could not provide information on market size and are thus not included in the above calculations

** One distributor was excluded from the calculation. This distributor represented over 60% of the sample population sales and reported that 100% of CAC sales were SEER 16 or higher. When the distributor was included, 69% of CACs were SEER 16+ and only 31% were below SEER 16.

Installers reported that about 8% of total HVAC sales in 2020 were heat pumps; this feedback was similarly reflected in the HARDI data, which reported that heat pumps represented 7% of distributor HVAC sales in 2020. The interviewed distributors reported that only about 3% of total sales came from heat pumps. The percentage of heat pumps that were ducted versus ductless differed between the two market actors. Installers reported installing more ducted heat pumps than ductless (71% and 22%, respectively), while distributors reported selling more ductless systems than ducted (51% and 46%, respectively). The distributor report more closely matched what was observed in the HARDI data, with relatively more ductless (69%) units being sold than ducted (29%).

Installers consistently reported installing higher percentages of high efficiency (HE) equipment than what was reflected in the HARDI data and distributors' self-reported sales for all equipment types, especially for CACs and ducted heat pumps. There are several possible explanations for this divergence. AIC has built a network of HVAC trade allies in AIC service territory and has been educating them about HE HVAC equipment for several years. Such engagement might explain why these percentages are higher for installers in AIC service territory than the state average; however, there are several other explanations which likely indicate that installers' reported percentages of HE equipment installations are biased upwards.¹ In response to this uncertainty about the source of the divergence, Opinion Dynamics plans to continue to ask installers about their sales of HE HVAC equipment by equipment type when we conduct interviews for future Midstream HVAC Initiative evaluations. This will help increase our sample size and provide a more representative perspective on installer sales of HE HVAC equipment.

Heat Pump Installations

Ducted heat pumps are ideal in the new construction context for all-electric homes and in existing homes with ductwork in good condition. Ductless heat pumps are best for additions, spot heating/cooling, second stories, or for situations where it is difficult to run ductwork. One installer explained,

“There's a ton of different ways to utilize a mini split system. We put in more and more of them everyday. They're great for upstairs, in hunting cabins, finished garages, man caves. I've even put it in basements for additional heat. Or finished second stories that don't have a convenient way for duct work.”

Ductless heat pumps are typically installed in homes that did not previously have cooling, while ducted heat pumps are more so installed in homes that have already had central cooling. On occasion, heat pump installation results in the addition of cooling to a home where there was none before--installers estimated encountering this scenario 14% of the time. In those instances, installers typically furnished ductless units. In general, heat pump installations were primarily motivated by homeowners updating their heating equipment or replacing an older heat pump system, which required changing the heating and cooling at the same time.

¹ Possible explanations for this divergence include: 1. Most of the interviewed installers install the majority of their HVAC equipment in single family homes, which tends to involve more expensive equipment in comparison to multifamily homes 2. Three interviewed installers, accounting for 28% on installations focused on holistic weatherization insulation services. For their CAC jobs, these installers installed SEER 16+ CACs 99% of the time. Excluding these 3 installers reduces the share of SEER 16+ CAC installations from 72% to 57%. 3. Installers may be subject to reporting bias when asked about high efficiency equipment installations.

Eight respondents commented on Ground Source Heat Pumps (GSHPs) (five installers and three distributors). Most (n=5) said that the federal tax incentives had contributed to increased GSHP sales, but since they have gone away, they have dropped in demand. Three described GSHP as “the most efficient” way to heat and cool, stating it was a missed opportunity to not rebate GSHP. The upfront cost barrier is significant and limits the demand for this equipment type—though one rural co-op reportedly does customer educational marketing and an installer said they see “pretty strong demand where we’re at and when people understand it.” Two mentioned that GSHPs are more common in new construction homes.



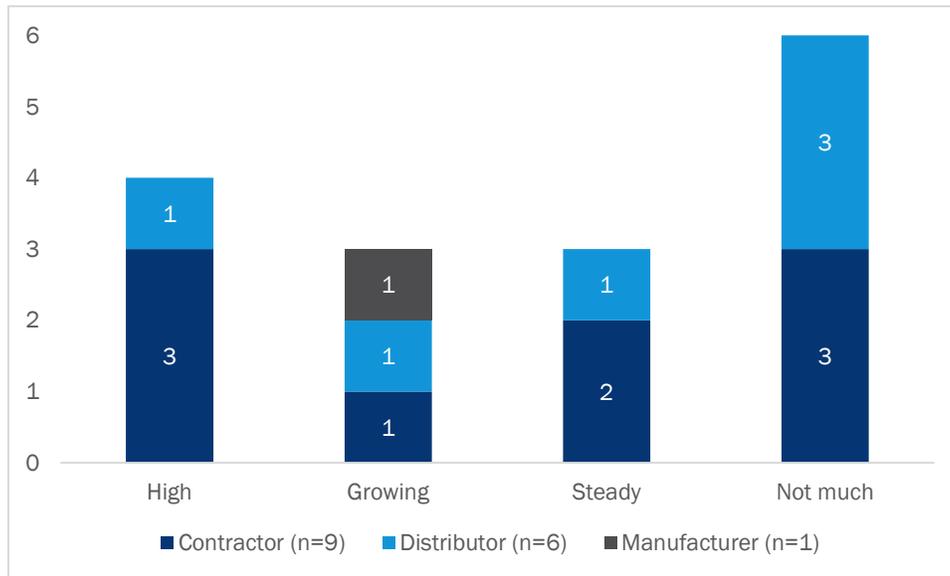
Although the incidence of natural gas HVAC is lower than in incidence of natural gas water heating (45% for HVAC versus 80% for water heating), it still poses a limitation to the market of homes that are likely to adopt heat pumps. Given the barriers to installing high efficiency gas homes, we recommend that AIC and Leidos focus on targeting the Midstream HVAC Initiative towards customers with electric heating and cooling.

4.2 Market Demand

There is growing end-customer demand for HE HVAC equipment in AIC territory² and all installers and distributors expect their sales of HE HVAC equipment to grow over the next five years. While six market actors characterized the market in AIC territory as having low demand for residential HE equipment, four characterized the market as having high demand and three more said demand was growing (Figure 1). In fact, four described a key market trend over the last five years of growing demand for HE equipment, including ductless heat pumps. Consumers of all ages are interested in HE HVAC equipment, but homeowners aged 40 and above are most likely to purchase such equipment. Market actors agreed that younger consumers are interested in the HE equipment for environmental benefits, including energy savings, electrification, and the opportunity to use solar energy to power their HE equipment. However, younger customers are also less likely to be able to afford it than older homeowners. Some wealthy homeowners will buy HE equipment because it is the highest quality and reportedly do not care as much about the energy savings. Incentives were seen as a primary driver for the market (n=6) as well as state and federal decarbonization policies (n=4). Growing customer awareness of HE equipment was also reported as leading to increased sales (n=3), but two mentioned that the recent population loss in Illinois would negatively affect sales.

² We define HE equipment as that rated SEER 16 or higher.

Figure 1. Description of Current Demand for HE HVAC Equipment (n=16)*



*One installer did not answer this question.

Market actors who expected a large increase in sales said the steady growth of sales in HE equipment over the last decade will continue (n=6). One distributor reported, “Once we get to 16 SEER and higher, that’s where all of our bells and whistles get thrown into the package, and that’s what the consumers are going to demand nowadays.”

The demand for ductless heat pumps might be growing faster than the demand for other HE equipment. The manufacturer reported, “As a company, we continue to experience double digit growth year over year. I mean, it’s been explosive for the six and a half years I’ve been here, and we almost can’t keep up with market demand [for ductless heat pumps].” An installer reported that their GSHP sales have declined as their ductless heat pumps sales have grown.

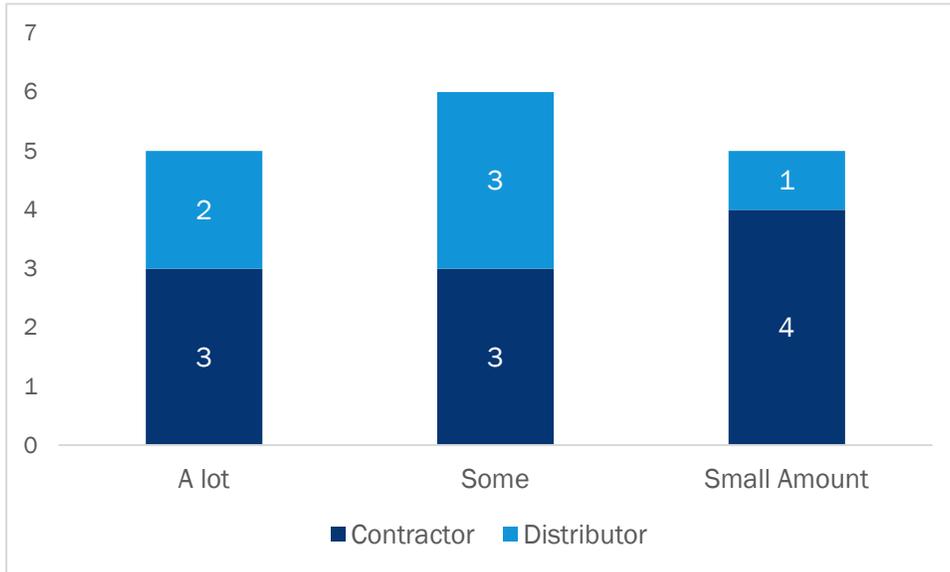


The current nascent state of the HE HVAC equipment market reflects opportunity for AIC to claim both resource acquisition and market effects savings, especially for ductless and ducted heat pumps. However, trends that show the market for HE HVAC equipment is likely to continue to grow even without incentives poses risks to disentangling market effects from the Midstream HVAC Initiative from natural market growth. AIC, Leidos, Brio, and Opinion Dynamics should continue to work together to ensure that Midstream HVAC Initiative interventions are well-documented so they can be measured over time to isolate market effects resulting from the Midstream HVAC Initiative.

The availability of trained HVAC technicians may limit the growth potential of efficient HVAC equipment. The market actors who expected slower growth said lack of a qualified installer workforce will limit the potential for them to grow the HE HVAC side of their business (n=5). One interviewee said, “It’s [the growth is] market-driven because of the availability of properly trained technicians. Employment’s probably one of our biggest hurdles.” They claimed the workforce challenges are becoming more severe as the HE equipment becomes

more complex. A distributor reported, “We have a lot of older installers that are set in their ways. If we had a younger group of installers, I probably would have said way more [growth]. But I feel that a lot of them feel that they can make more money on the low-end stuff.”

Figure 2. Expected Growth of HE HVAC Sales in Next Five Years (n=16)*



*The manufacturer was not asked this question.

Most distributors (4 of 6) did not anticipate there being a robust enough installer workforce to meet the increased demand. One said, “We have a serious issue in the industry. Last figure I heard, we were short nation-wide 100,000 HVAC technicians for service.” Another added that it is a “struggle” to find workers and thought it will become even harder to find qualified labor if the “infrastructure bill” gets passed. One of the distributors who thought there may be enough workers added that “As long as nobody has to be certified to get a license there's a lot of people that'll install it.” However, Illinois does have a certified installer requirement for any measure that receives an incentive greater than \$300 or requires an electrical connection, which may pose another workforce barrier. Finally, the last distributor who said there should be enough workers expected only “some” growth in their sales.³

Other reasons given to explain low growth expectations were perceptions that the payback on the higher upfront cost was too long and that AIC was not doing enough to incentivize HE equipment.



The HVAC industry is currently experiencing a “gray tsunami,” a metaphor that is used to describe the retirement of a significant portion of the workforce. This trend is coupled with fewer individuals entering the HVAC industry. Given this trend, we recommend that AIC consider supporting HVAC internships and consider strategies aimed at educating high school students about HVAC career options and their benefits.

³ <https://amerenillinoisavings.com/installers/installer-recertification/>

There is not much residential new construction in AIC territory, but code minimum equipment may be more prevalent in new construction homes. Five respondents asserted that new homes tend to use the code-minimum HVAC equipment. Two interviewees reported that prospective homeowners are paying attention to the quality of the HVAC equipment and builders putting in HE equipment in new homes because of these codes. When heat pumps are used in new construction, ducted is more common than ductless. One installer reported that 95% of their GSHP sales are for new construction. All market actors agreed that there is relatively little new construction in AIC territory and most had little experience with it. Three market actors said there were no differences in the equipment installed between new construction and retrofit scenarios.

Multifamily apartments use code minimum equipment while nicer condominiums may use higher efficiency equipment. Six respondents commented on the multifamily market and three of them said that multifamily properties use code-minimum equipment and that higher efficiency equipment will go into single-family homes. One installer reported that in their area, the multifamily duplexes and condos “are all pretty nice and those people tend to go with more efficient equipment.” Two installers reported no differences in the equipment installed between multifamily and single-family homes.

4.3 Market Structure

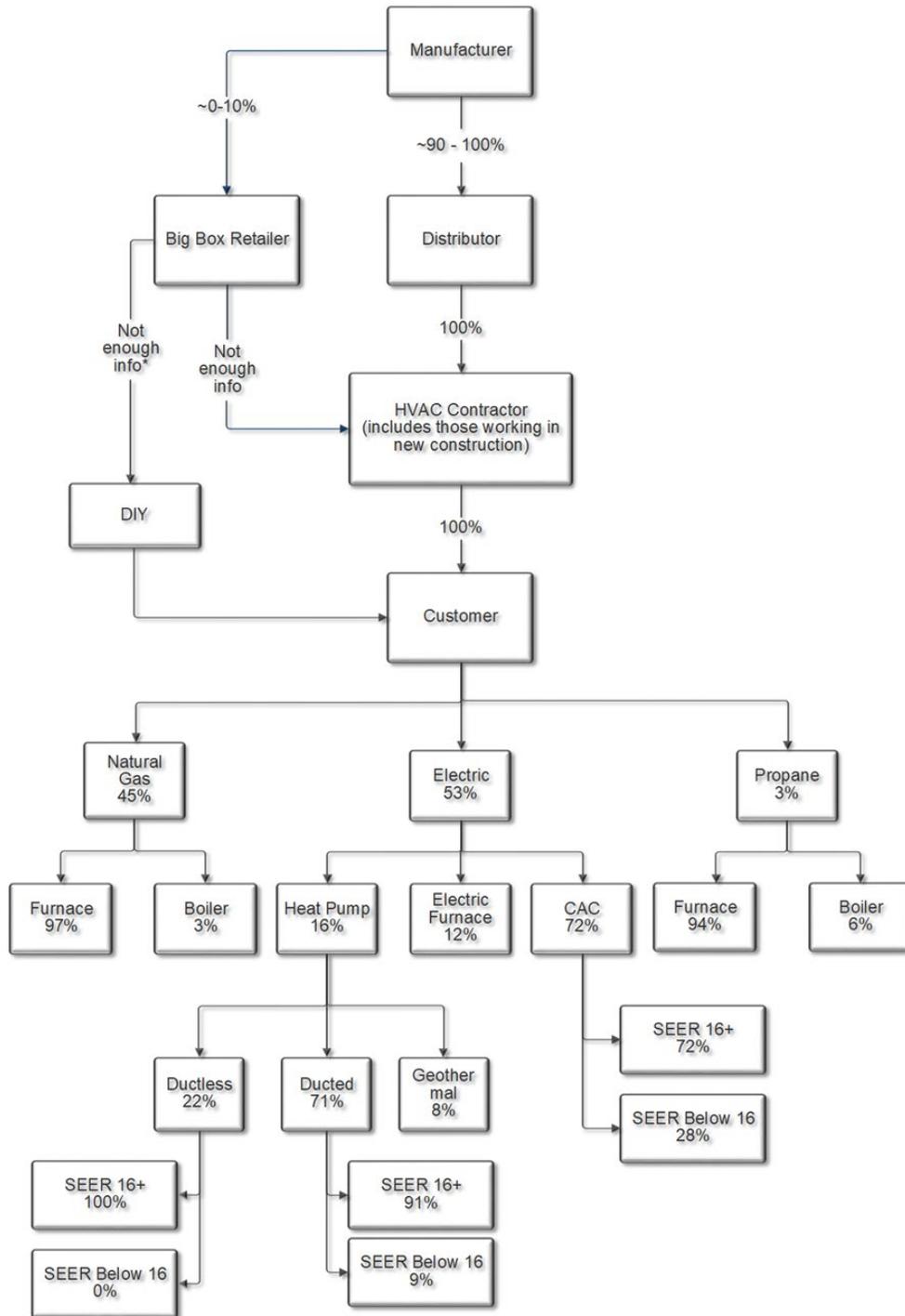
HVAC equipment sales largely flow from manufacturer to distributor to installer. All interviewed installers purchased their HVAC equipment exclusively from distributors (Figure 3). The distributors sold exclusively to professionals and none sold equipment to homeowners. The majority of the distributors’ sales were to installers for the replacement market (85%), and they sold comparatively less equipment to new construction builders (15%). The manufacturer we spoke with sold only through their approved distributor network.

One distributor had insight into how their manufacturer distributed equipment and reported that they will have models on display at retail stores, but a homeowner would need to contact an approved installer to purchase the equipment and have it installed. The actual proportion of HVAC equipment sales at retailers is unknown, though one installer estimated it at 10%. One respondent elaborated on the role of online sales. They mentioned knowing of websites that sell directly to homeowners, particularly for ductless mini-splits and do-it-yourself kits, and said the brand is Mr. Cool. We further investigated Mr. Cool, as well as Pioneer, and there does appear to be a market channel in which homeowners are able to purchase DIY ductless mini-splits through big-box retailers.



As originally designed, the Midstream HVAC Initiative directed end-customers seeking HE HVAC equipment to distributors. Given these results show that installers own the relationship with the end-customers, we recommend that future efforts to engage and educate end-customers should come from the installer or directly from AIC.

Figure 3. Market Distribution Channels⁴



⁴ This graphic is populated with self-report data from distributors as we believe this data source is most reflective of actual trends in AIC service territory.

4.4 Distributor Stocking and Promotions

Distributors forecast what they predict they will sell based on market demand and order their equipment based on those predictions. All distributors were open to stocking more HE equipment as long as the demand was there. Two distributors credited the AIC incentive with stimulating customer demand for efficient equipment, which had influenced their stocking practices. One distributor who personally had concerns about the cost and complexity of HE equipment reported, “If they [installers] didn't ask for it, I don't know that I'd carry it to be honest with you.”

Changes in distributor stocking practices are a key indicator of market effects. We asked distributors about their current stocking practices to establish a baseline from which to measure future market charges. Distributors reported that about 12% of their current total stock was heat pumps. In general, distributors report stocking more ducted units than ductless. Of the six distributors, four reported that 100% of their heat pump stock were cold-climate heat pumps. About 45% of distributor stock were CACs and of these, 40% were rated SEER 16 or higher. On average, distributors stocked 13 different models of ducted heat pumps, 18 ductless heat pump models, and 16 CAC models. Of the 16 CAC models, 28% were rated SEER 16 or higher.⁵

None of the six distributors had plans to add any new heat pump or CAC brands to their stock. The interviewed distributors sold 10 brands of ducted heat pumps, 9 brands of ductless heat pumps, and 11 brands of CACs; a full list of the brands can be found in Appendix C. It is rare for distributors to change or add to the brand(s) of equipment they offer. However, one distributor was looking into potentially adding brands because of the long lead times for acquiring the equipment they experienced in the last year. They wanted to ensure that they would have enough supply for their customers over the summer.

Despite not changing the brands they offered, five out of the six distributors reported that they began keeping more heat pumps in stock over the last few years. Reasons for the increase included the desire to have enough in stock to meet the higher customer demand amid increased lead times. Additionally, four distributors reported their stock of efficient CACs is also increasing, while two saw no change in CAC stocking practices. Table 3 shows the number of interviewed distributors that stocked equipment types within different SEER ranges. All distributors stocked all equipment types in the 16 – 19 SEER range but lower SEER heat pumps were less commonly stocked than lower SEER CACs.

Table 3. Distributors' Equipment SEER levels (n=6)*

Equipment Type	13 SEER or Below	14 - 15 SEER	16 - 19 SEER	20+ SEER
Ducted Heat Pump	0 out of 6	4 out of 6	6 out of 6	5 out of 6
Ductless Heat Pump	1 out of 5	2 out of 5	5 out of 5	3 out of 5
CAC	5 out of 6	4 out of 6	6 out of 6	4 out of 6

*Not all distributors answered for all equipment types.

Most distributors (5 of 6) promote their HE equipment to installers and do not promote their lower efficiency equipment.⁶ Distributors inform and educate the installers about the HE equipment who, in turn, promote products to the end-user. Distributors provide sales training and sales tools to the installers that offer information about financing options and the price after rebates. They prepare the installer to have the “kitchen table conversation” with the customer because that is where the decision is made about SEER rating and equipment type. Distributors also promote HE equipment via a combination of in-store promotions, flyers, and emailed newsletters. Distributors said they are only willing to invest time in promoting their HE equipment (and

⁵ Again, one distributor was excluded from the calculation. This distributor represented over 60% of the sample population sales and reported that 100% of their CAC sales were SEER 16 or higher.

⁶ The sixth distributor did not promote any equipment. They said, “We don't market it. Our customers dictate what they want.”

not baseline equipment) because HE equipment is more valuable to the consumer and helps the company's gross sales figures, because they are able to sell the equipment at a higher margin.

The distributors influence the installers' equipment purchases. One distributor said it happened rarely, about 15% of the time, while the other five said it was common. One described their inside sales team as having a "significant" influence on installer decisions and another said the influence was "huge." In addition to educating them on efficiency and being prepared to talk to the customer, they also help ensure the installer has the right coil size and matchup per AHRI specifications. Given that distributors reported having significant influence on installers' sales practices, tracking changes in the recommendations that distributors provide to installers will be an important metric for assessing market effects for the Midstream HVAC Initiative.

Of the five distributors who promote HE equipment, all increased their promotional efforts in recent years. They increased promotions so that their installers were well-informed of the HE equipment and could be a salesforce for the equipment. They saw having an informed installer base as a way to stay competitive in an era of increased demand for HE equipment. One distributor added that they had paused promotions when supply was limited due to COVID affecting the market supply of equipment. None of these distributors had plans to change the way they market their equipment in the future.



AIC and Leidos have plans to partner with manufacturers, builders, and distributors to offer HE equipment training to installers. As distributors are motivated to sell HE equipment to installers and installers trust the information that distributors provide, AIC should consider focusing training efforts on working with distributors to educate installers. Providing distributors with information they may not be able to get elsewhere including market data and the installer and end-customer selling points listed in this report can also be effective strategies for helping distributors with their sales tactics.

4.5 Barriers

A variety of barriers limit HE equipment sales. On a large scale, COVID negatively affected the supply of HE HVAC equipment for distributors and installers. Installers are reluctant to install heat pumps as a sole source of heating because they understand heat pumps require back-up heating despite manufacturer claims that backup heating is not needed, and many believe that natural gas is more cost-effective to operate. Installers' main challenge with HE CACs was their larger size. For end-customers, their limited awareness of heat pumps and CAC efficiency ratings make it hard for them to justify the upfront cost of the equipment without understanding the benefits.

4.5.1 Availability

COVID-19 impacted the availability of HVAC equipment, with 80% of installers, 100% of distributors, and 100% of manufacturers interviewed reporting that they experienced COVID-related supply challenges. One of the installers who reported that they did not experience supply challenges stated that they knew others who had and that it particularly impacted those in new construction. The impact of COVID on the supply chain was industry wide and across all equipment types. Some market actors specified different equipment types that they had the most trouble with, notably, 50% of distributors reported that higher end/higher efficiency equipment was more of a problem. Table 4 shows the percent of market actors in each category that reported different impacts from COVID.

Table 4. COVID Impact on Different Market Actors

	Installers (n=10)	Distributors (n=6)	Manufacturer (n=1)
Reported increased demand	70%	100%	100%
Reported supply challenges/ equipment shortages	80%	100%	100%
Equipment most affected	Specialty equipment Ductless heat pumps AC units	High efficiency equipment Ductless mini splits Ducted Heat pumps	

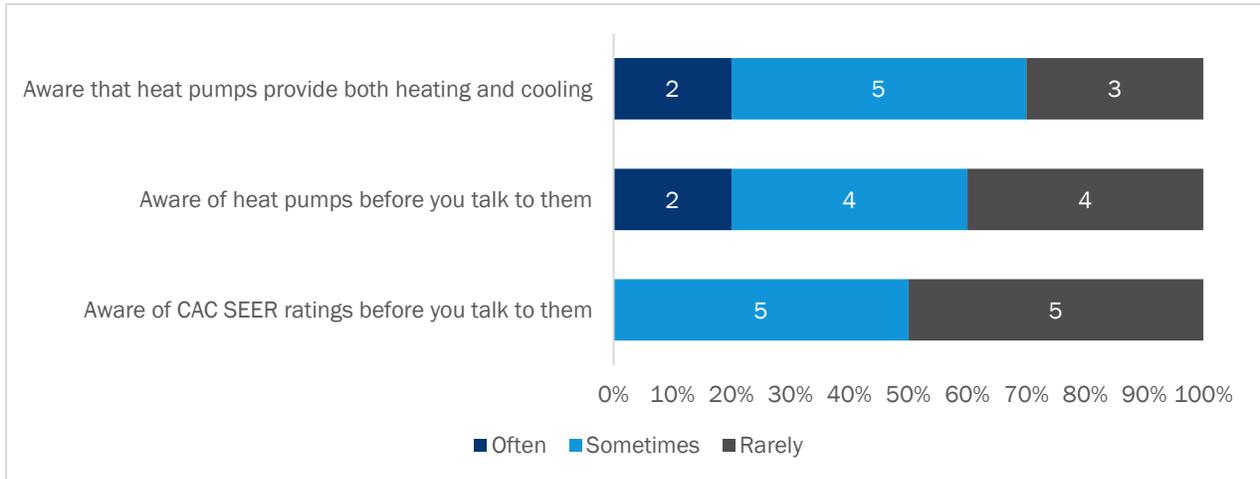
Increases in demand, also activated by COVID, exacerbated the supply chain issues on the availability of HE equipment. All distributors and manufacturers interviewed as well as 70% of installers reported that there was an increase in the demand of HVAC services in response to COVID. Nearly all respondents attributed this to the fact that people were home more. Being home meant that customers were more aware of issues with their HVAC system, the indoor air quality of their home and were thinking more about ventilation. It also meant that their HVAC systems were running more, which might have caused parts to break down leading to increased upgrades and replacements.

Despite the increase in demand, the supply challenges led five installers to have lower HVAC sales than a typical year. Four saw no change in HVAC sales and one saw an increase in sales, this was a respondent who reported experiencing no supply chain challenges. Most market actors interviewed (16 of 17) reported that they were still feeling the impacts of COVID in 2021. Fourteen of the market actors stated that they were still experiencing equipment scarcity issues with six of them saying that the problems were slowly improving. One distributor said that “We couldn't get a lot of products and still can't.”

4.5.2 End-customer Barriers to Adoption

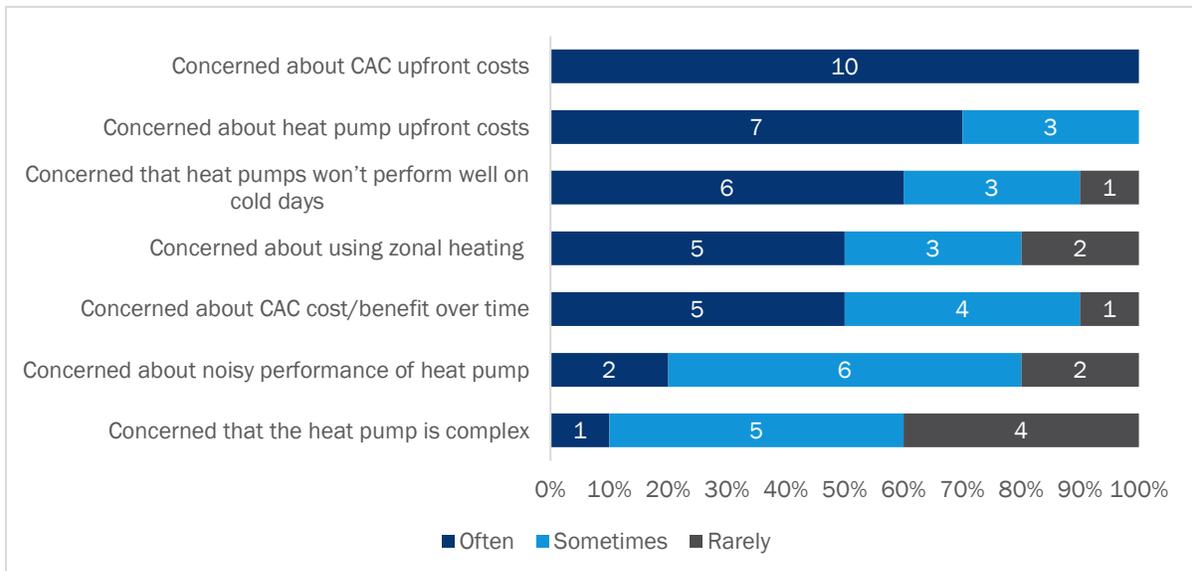
Limited awareness of heat pumps and efficiency ratings may limit customer demand. Most contractors stated they always recommend HE equipment to end-customers, sometimes in a good, better, best scenario. Contractors who did not recommend HE equipment provided a variety reasons for not doing so including customers’ budget limitations, home characteristics, and technical considerations. Most installers (8 of 10) reported that their customers are not often aware of heat pumps or that heat pumps provide heating and cooling features before they recommend the equipment (Figure 4).

Figure 4. Customer Awareness According to Installers (n=10)



According to the interviewed installers, the upfront cost of HE CACs and heat pumps is a primary concern for customers and acts as a barrier to purchases (Figure 5). Half of installers reported that customers have both concerns and positive opinions about using the zonal heating feature of ductless heat pumps, which means independent heating systems for separate rooms. Some customers don't like that the zonal heating creates large temperature differentials between rooms, whereas other customers like this feature because they don't have to heat the whole house when only using one room. In addition to the concerns in Figure 5, one installer added that they get questions on the aesthetics of ductless heads. They reported, "The visuals often come up. Because usually I'm talking to a husband and wife or the couple in the house. And I'll say at least one of them is concerned about what it's going to look like and sometimes even what color it is." In addition, one installer reported that with HE CACs, sometimes customers will be concerned that the equipment requires more maintenance.

Figure 5. Installers' Perceptions of Customer Concerns (n=10) ^a



^a The survey question asked installers: "Using the terms often, sometimes, or rarely, how often are customers..."

4.5.3 Installer Barriers to Selling Efficient HVAC Equipment

According to distributors, there are few drawbacks to installers offering HE equipment. Two said there are no drawbacks to offering it, but that it must be sized and installed correctly for the customer comfort and energy savings benefits to be realized. The drawbacks, mentioned by one distributor each, were that HE systems are more complex and “more can go wrong” with them; larger HE CACs can sometimes be difficult to fit; heat pumps require a back-up heating system; and installers might feel pressured to compete with other installers’ lower priced, less-efficient systems because they don’t want to lose a sale.

Installers strongly believe that the Illinois climate requires supplemental back-up heating for heat pumps. Even though many were aware that heat pumps run effectively down to five degrees Fahrenheit, half of the sample programmed the system to switch to back-up heat at 30 degrees or warmer.⁷ The coldest temperature an installer reported letting a heat pump run by itself as a primary heating source was 5 degrees Fahrenheit, with the average lowest temperature being 26.4 degrees. Without backup heat for the heat pump, they saw serious risks occurring such as the customer holding the installer accountable for pipes freezing. Another installer reported:

The Western states do not experience our frigid temperatures. It's not a life or death [for them]. Here, it is. Somebody could die if you don't have it right. And a lot of our places out here are rural. They'd rather just pay a big propane bill and make sure they got heat or cut down a tree and throw it into the fireplace before they put themselves on the line with the heat pump.

Another installer stated:

To be honest with you, the performance and delivery of a heat pump system in the heating mode out here - it's very ineffective in its heating in our winters. Even though it will go down to low temperatures, the performance and the capacity diminishes incredibly in the heating side of it.

Two installers noted that the colder a heat pump is rated to perform at, the more expensive they are. One installer added that in the new construction context, they size the system so that it could maintain 72 degrees inside on a zero-degree day.

All but one installer includes back-up heat for the heat pump 100% of the time. The last installer said that about 40% of their ductless heat pumps are used for spot heating, and they do not install back-up for those because they are not heating the whole house. Installers commonly left the existing system in as backup, while one said they always replace the backup system. Others reported that the decision depends upon the customer’s budget or informed the customer they needed backup and recommended a generator or space heaters.

The back-up heating selected by installers varied. About half of the installers (n=4) reported using electric backup heat because heat pumps are more common in areas without natural gas service. For one installer, propane was the most common back-up fuel. Five preferred a natural gas furnace backup because it was perceived as cheaper to operate in cold temperatures or would provide heating in case of an electric power

⁷ Installers use thermostats to have the heat pump and backup system communicate and use smart thermostats where possible, such as Nest or Ecobee.

outage. Finally, one installer added that if the home does not have ductwork and uses a ductless heat pump, they recommend portable electric space heaters as the backup system.



Consider working with distributors to host trainings for installers on the cold weather performance of heat pump equipment to mitigate the need for installation of back-up systems and to ensure the back-up systems to be set to switch at the proper setpoints. Suggestions for possible training content include:

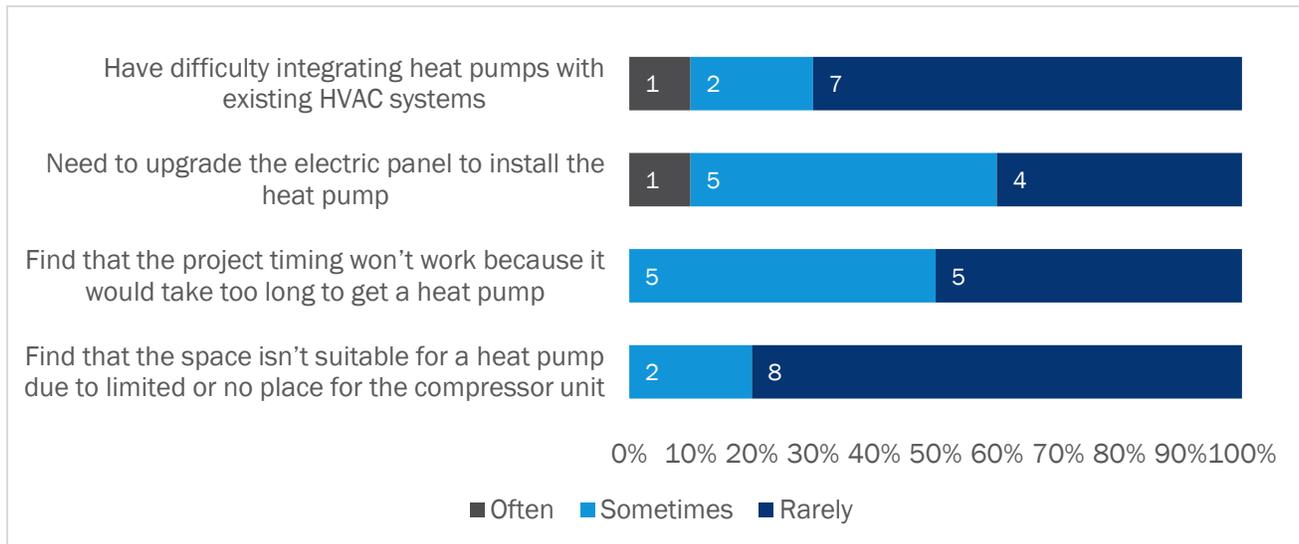
- Partnering with manufacturers to showcase the cold weather performance specifications of their equipment and provide training about scenarios where backup systems are needed and how they should be configured.
- Compensating an installer from another cold climate with high heat pump penetration (e.g. Vermont, New York, or elsewhere in the Midwest) that has a depth of knowledge and success installing heat pumps without backup systems to share out their experience and attest to the heat pump cold weather performance.

All installers understood that heat pumps were very energy efficient, but almost half of installers (n=4) said that a natural gas furnace would be cheaper to operate due to the low cost of natural gas. A distributor voluntarily mentioned that heat pumps are more efficient than natural gas only if they are sized properly and installed correctly. Two installers specified that GSHP were a better choice than Air Source Heat Pumps (ASHP), particularly for heating in the wintertime, because they are not influenced by the outside air temperature.

Installers mentioned two other concerns about heat pumps that could be overcome with training. First, two installers noted that the temperature of the hot air that comes out of a heat pump is not as hot as with a furnace. As one installer said, "You're not going to have the warm and fuzzy feeling that you had with the electric resistance furnace or gas furnace." The other said they might shy away from heat pumps for elderly customers because they are more "susceptible to colder temperatures that a heat pump brings." Second, one installer asserted that heat pumps do not last as long as equipment that only heats or only cools. A distributor reported, "That's a common misunderstanding - that it's not going to last as long because it's running with your furnace as well as during cooling season."

Installers did not report significant challenges to installing heat pumps (Figure 6). Installers rarely had difficulty integrating heat pumps with existing HVAC systems and seldom had limited space for the compressor unit. Half of the interviewed installers sometimes found the timeline to install a heat pump to be a limiting factor because it would take too long to order and receive the heat pump and installations that required an electrical panel to accommodate the heat pump also resulted in extended timelines. One manufacturer noted that electrical panel upgrades were more common in multifamily projects than single-family projects.

Figure 6. Installer Challenges when Installing a Heat Pump (n=10)



4.6 Motivations

Customers want to buy the most efficient and reliable equipment they can afford, and installers want to satisfy their customers; to this end, installers provide energy bill savings, ensure thermal comfort, and assist customers in meeting their home electrification goals.

End Customers

Illinois customers typically are determinedly cost-conscious, buying the most efficient equipment they can afford. Customers consider the upfront cost, the operating cost, and the equipment warranty when deciding on HVAC equipment. Installers conclude that making the financial argument of operational savings is the best way to convince a homeowner to install a heat pump or HE CAC. Customers also care about equipment reliability and product warranties. As one installer said, "Due to COVID and unsure economics and budgets, we're seeing a larger increase in our business because of our offerings of warranties, lifetime warranties, keeping these things from breaking down." Besides economic factors, installers reported that some customers were interested in heat pumps because they were electrifying their homes (n=4). One distributor added, "A lot of people liked them because they're quiet and efficient. [...] And for the energy savings and the comfort that a heat pump brings."

Table 5. Customer Interests in HE HVAC (n=12)*

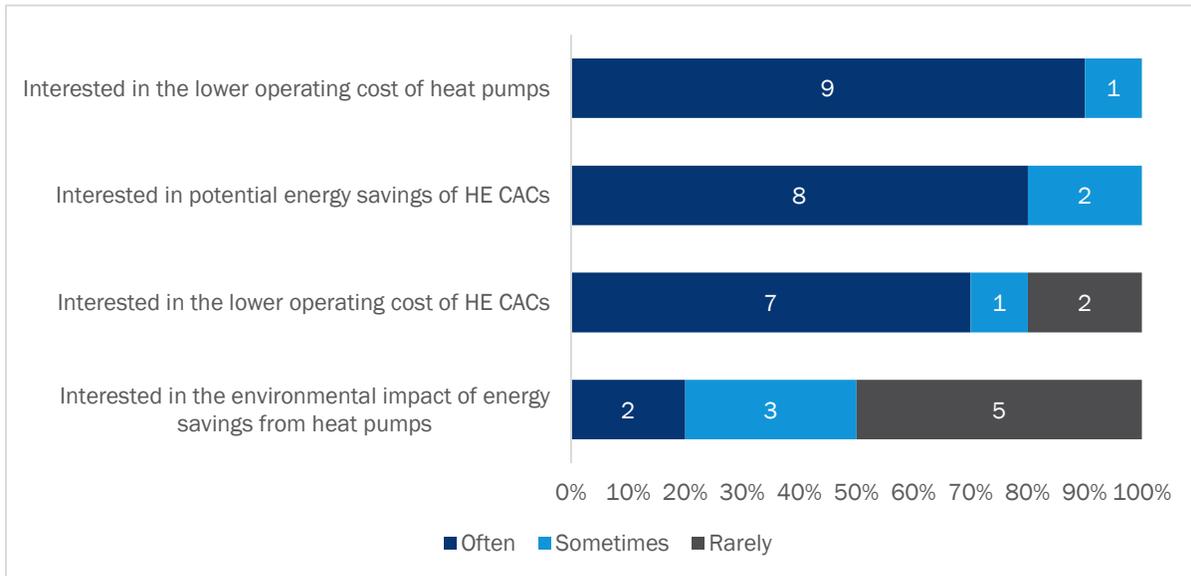
Customer Interests	Number of Respondents
Driven by saving money	8
Reassured by warranties	4
Want to electrify their home	4
Enjoy dehumidification benefits	2
Interested in financing	2
Want reliable equipment	2
Like comfort benefits	2

Customer Interests	Number of Respondents
Want ease of operation/smart controls	1
Enjoy quietness	1

*10 installers' and 2 distributors' answers contributed to this table.

The data in Figure 7 also support the finding that Illinois customers are most interested in operational savings of HE HVAC equipment and are interested in the environmental benefits, but to a lesser extent.

Figure 7. Customer Interests for CAC and Heat Pumps According to Installers (n=10)



When talking with the customer, installers explain numerous advantages of HE CACs and heat pumps (Table 6). They noted that the primary disadvantage of HE equipment is the upfront cost but explain to the customers that they can save on operational costs over time, particularly with HE CACs. They also cite the environmental benefits of HE equipment as well as their reliability and comfort benefits. Zonal heating of ductless heat pumps was described as a benefit they market to customers. The manufacturer also mentioned this benefit and said, “I think people are really liking that (ductless mini-split heat pump) technology and the ability to not have to condition the whole home just to have the master bedroom cool while sleeping, for example.” One installer pushes heat pumps for customers looking to electrify their homes or avoid the dangers with natural gas. Installers saw few drawbacks of HE equipment. Besides upfront cost, the only disadvantages installers mentioned were that HE CACs can take up more room and can be hard to fit in shallow basements. A distributor reported that “Just occasionally the bigger coil or bigger air conditioner won't physically fit, but that's pretty rare.”

Table 6. Advantages and Disadvantages of HE CACs and Heat Pumps as Explained by Installers to Customers (n=10)

HE CAC				HEAT PUMPS			
ADVANTAGES	#	DISADVANTAGES	#	ADVANTAGES	#	DISADVANTAGES	#
SAVE ON OPERATING COSTS	9	UPFRONT COST	4	OPERATIONAL COST SAVINGS	4	UPFRONT COST	4
ENVIRONMENTAL BENEFITS	3	TAKES UP MORE SPACE	1	COMFORT	3	NEED BACK-UP WHEN COLD	3
RELIABLE	3			HUMIDITY CONTROL	2	NOISY	1
COMFORT	2			ZONAL HEATING	2	SHORTER LIFESPAN	1
REBATES	1			ENERGY SAVINGS	1		
				A WAY TO ELECTRIFY	1		
				NO EXPLOSIVE GAS	1		
				ENVIRONMENTAL BENEFITS	1		



This year represents an opportune time to educate end-customers and influence their purchase decisions as there is likely to be higher rates of equipment turnover due to pent up demand from supply chain shortages in 2020. AIG and Leidos should consider focusing end-customer marketing and outreach efforts on highlighting the benefits of HE HVAC equipment that are most appealing to end-customers, including operational savings and environmental benefits. As customers are used to staying at home more, marketing efforts should also focus on the equipment comfort benefits, reliability and cold weather performance, and the dual heating and cooling features of heat pumps.

Installers

Installers consider both the home’s characteristics and the customer’s needs when deciding what equipment to recommend (Table 7). If a customer already has natural gas heating, they tend to propose natural gas equipment, while heat pumps make more sense for those with propane or electric heating. The installers must also consider the feasibility of installing equipment and whether it will fit in the customer’s home. At the same time, the installers want to ensure happy customers and take into account their budget, their equipment preference, and their comfort needs. In relation to CACs, one installer explained, “I usually try to reduce their amount of tonnage and go higher efficiency, because that will give them comfort at the lowest operational cost.” Economic factors were also important, as installers considered the equipment’s long-term operating cost given the fuel type and encouraged customers to install higher-efficiency equipment, helping them understand that higher efficiency equipment is an investment in their home.

Table 7. Factors Installers Consider When Deciding What Equipment to Recommend (n=10)

Factor	Number of Installers
Home's existing fuel	6
Equipment fit in home/placement	5
Customer budget/upfront price	5
Energy efficiency of unit	5
Operating cost	4

Factor	Number of Installers
Customer equipment preference	2
Customer comfort needs	2

Note: Installers provided their top three considerations when deciding on equipment. One installer provided two considerations, and thus the righthand column totals 29.

There are advantages for installers offering HE equipment. HE equipment is more expensive, and the installers can make higher margins off the HE equipment since the installation labor is the same. They can also earn more money by taking advantage of Sales Performance Incentive Funds (SPIFs) when selling HE equipment. Offering HE equipment also allows them to differentiate themselves in the marketplace. When they offer HE equipment and the homeowner feels confident they will save on operational costs, they are likely to tell their friends and grow the installer’s reputation. Additionally, the HE equipment “...is a better piece of equipment. A lot of it has smart HVAC controls installed with it. So overall, it’s a lot more attractive package” for the customer, which benefits the installer according to one distributor.

4.7 Training

Training received by installers: All but one installer had received training from distributors or manufacturers about HE equipment. Topics included sales training, installation, technical aspects, best practices, and troubleshooting. Some trainings were webinars and others were in-person and interactive. The trainings positively impacted the installers’ viewpoints on the equipment and made them more confident, comfortable, and proficient working with the systems. They mentioned that prior to the trainings, they were suspicious of equipment efficiency claims or were concerned HE equipment would be more difficult to install. The trainings assuaged their concerns. One explained, “Pretty much every time we attend classes it improves our willingness to accept the advancements in efficiency.” Another reported,

“The training really gives you a better idea of the system capabilities and bells and whistles. And when you understand bells and whistles, then you can explain that accurately to the homeowner and translate that into why this system is better than the previous model or the lower model.”

One installer also reported receiving training from AIC, and one also received training from the National Comfort Institute.

Training offered to installers: All the distributors worked with their manufacturer to provide substantial support and training to the installers. The trainings included technical training on installation and troubleshooting or sales training. Sales training included information about rebates and showing them the benefits of HE equipment. One said they “put together AHRI price books for the installers so that they can quickly see if it hits a SEER rating for a rebate.” Trainings were in the form of printed materials, workshops, presentations, online trainings, conversations with staff, or a “counter day.” The counter day is when the “...manufacturers come in and they get to speak with an installer one-on-one and show them what they have to offer, some of the new stuff that’s out, and if they had any questions about any products they tried or wanted to try in the future.” The distributors also offer full-service marketing support for the installers, helping them with their websites, printed advertisements, or even radio ads.

Distributors were also available to answer installer questions. Distributors frequently received the following questions from installers:

- How much can the customer save monthly from the HE equipment?

- How will this larger equipment fit in the home or how will the larger coil fit on the furnace?
- Are there complicated electronics or computer systems in the equipment and will that make it difficult to work on when something goes wrong?

Training received by distributors from manufacturers: Two distributors reported that the manufacturer does not offer much training other than online courses that are available. Others reported that the manufacturer offers “good” trainings or “plenty” of trainings online. In-person trainings were common prior to COVID.

4.8 Midstream HVAC Initiative Design Feedback

Overall, market actors had positive feelings toward the Midstream HVAC Initiative. Market actors expected the instant rebate and reduced paperwork for installers to increase HE HVAC equipment sales. As the interviewed manufacturer explained, “I think the midstream program is going to be a catalyst that helps change some of the stocking practices.” A distributor echoed this sentiment and said, “If we do a direct incentive for them [the installers] the way it's set up now, they would jump all over it. And it seems like that is going to start happening.”

Installers saw incentives (both from AIC and other sources) playing an important role in stimulating customer interest, but most installers reported that AIC’s incentive amounts were inadequate to generate customer demand. Installers appeared to have contradictory opinions about incentives. For example, one installer said, “If there aren't incentives there, then individuals are not going to move forward with a more efficient upgrade,” and then said that AIC’s incentives are inadequate for generating customer interest. Another reported “The incentives are so low it doesn't do anything to help the market barriers.” On the other hand, one installer found AIC’s heat pump incentives worthwhile enough that they do not offer CACs. They reported, “The only reason I won't offer AC only is because it literally is maybe \$20 more to get a heat pump instead of straight AC [after the rebate].” The experience of another installer was that the incentives have helped, but not in a significant way. One installer suggested an incentive amount that covered 30% of the equipment cost would be more impactful.

The installers saw advantages to offering incentives, saying that it allows them stay competitive over those who were not offering them. They also said incentives were helpful for attracting customers and helped their businesses grow. Though, three installers reported that they had always offered efficient equipment and that AIC’s incentives had not influenced their equipment selection decisions.



AIC and Leidos should continue to monitor market data and sales trends for HE HVAC equipment in Illinois and across the US to ensure incentive levels stay competitive and continue to encourage adoption of HE HVAC equipment.

In general, the most common support desired by market actors to install more high energy efficient HVAC equipment was incentives (12 of 17; 71%). One installer specified that it was not so much the question of the incentive dollar amount but rather the percentage of the product that the incentive covered. Others also stated that they would like to see AIC incentives extend to other equipment as well, such as GSHPs, residential steam traps and more whole home solutions. Some noted that in order to reduce customer loads, the AIC should also incentivize insulation and envelope improvements because a better insulated home improves the heat pump’s

coefficient of performance. Several (n=8) wanted to see more public education and marketing to drive customer awareness. Training and technical support as well as financing were also mentioned as potential support that market actors wanted to see. Some market actors identified the limitations of Ameren Illinois financing, such as the added burden to the installer, the consequence of missed payments for the customer and the requirement for the incentive to occur at the customer level. The breakdown of the desired support is included in Table 8.

Table 8. Support Desired from AIC (n=17)

Support Desired	Incentives	Public education /marketing	Financing	Technical support
Number of Market Actors	12	8	3	1

Distributors desire more outreach and engagement from AIC. Most interviewed distributors (5 of 6) are participating in AIC’s Midstream HVAC Initiative. The sixth distributor had not heard of it, and only one of the five distributors reported being contacted by AIC about the Initiative. The other four heard about the Initiative in other ways and reached out to AIC to sign up. When asked about support, both a distributor and a manufacturer mentioned their hope to engage more with Ameren Illinois citing that AIC was “operating in a silo” and one distributor said “The truth is, we’ve got customers asking us about it, we don’t know anything about it. No one from Ameren’s ever been in my store or came in or talked to me and said, ‘Hey, let me show you how this program works.’” They believe they can be more supportive of the programs if they have more engagement with AIC.



Consider updating the Midstream HVAC marketing plan to include a strategic plan for holistic industry engagement. Currently AIC and Leidos are using a phased approach to enrollment, by reaching out to groups of distributors over time. Distributor frustration about lack of Initiative outreach underscores the importance of developing a strategy to notify the entire HVAC industry of distributors and installers in AIC service territory before rolling out major design changes or offerings in the future. AIC and Leidos should consider following the process of 1) Identifying all market actors in AIC service territory 2) notifying all market actors about the Initiative or program design change 3) Hosting informational sessions so that interested market actors can learn more about the Initiative, and then 4) enrolling interested market actors. Providing all market actors with equal access information will eliminate the risk of AIC showing perceived favoritism and ensure that distributors are fully prepared to serve installers through the Initiative.



Consider following best practices for engaging distributors in Midstream HVAC Programs. While engaging installers and end-customers is important, building long-term relationships with distributors is critical to solidifying the success of the Initiative. Midstream HVAC evaluation results from other jurisdictions strategies for keeping distributors engaged with the program over time include soliciting feedback from distributors about market trends, incentive amounts, and program processes through monthly conference calls or in-person meetings. To the extent possible, AIC and Leidos may want to consider increasing in-person visits to distributor locations in alignment with their request to have more in-person engagement.

Some distributors have concerns about aspects of the Midstream Initiative design. There were some reservations about the Initiative design, expressed by three distributors.

- One said they would exhaust their \$20,000 allocation in a matter of a few weeks and were concerned that installers would come to them expecting a rebate, only to be out of funds.
- Another expressed that there was no way to verify a homeowner is a qualified AIC customer. They shared a story about how they gave an installer an instant rebate, and then after submitting the report to Ameren, found out the customer did not qualify and had to charge the installer for the rebate amount. They noted that the installer understand they were in error and will likely continue to use the Initiative but felt bad that the installer lost profit on this project due to not being able to confirm the customer was eligible.
- The last distributor was concerned that it could be up to 45 days before they are paid and was a little worried that they were not clear on exactly what customer data points they need to collect to qualify for payment. They noted they had multiple points of contact with the program, each saying different things. They reported the sales lead communicated to the distributor to collect five customer data points, but the accounting side reportedly required seven data points and needed the paperwork in a different order than the sales lead explained. The distributor said that the disconnect between the two points of contact has caused them issues. They were also under the impression that if the accounting department found an issue, the 45-day clock for payment would re-start and lengthen the time before receiving compensation.



Midstream HVAC programs in other jurisdictions provide customers with online portals that enable distributors to instantaneously allow distributors to check end-customer eligibility. Leidos may want to consider providing distributors and installers with access to a similar type of online portal to eliminate confusion about customer eligibility. In addition, Leidos and AIC may want to consider speeding up the timeline for distributor payment. Results from other jurisdictions show that distributors are generally satisfied when they receive payment within 2 weeks after submitting their application. AIC and Leidos should also consider streamlining the distributor points of contact and ensuring all Midstream HVAC Initiative representatives provide consistent information.

5. Key Findings and Recommended Opportunities for AIC

The Evaluation Team analyzed key findings from the secondary data review and discussions with market actors to identify several opportunities for AIC to adjust the Midstream HVAC Initiative design to ensure the Initiative optimally captures and generates market effects. We highlighted these key findings and opportunities throughout the report, and we also summarize them below:

- **The current market for heat pumps is relatively nascent and has a large margin to grow. However, the current demand for HE HVAC equipment seems to be growing naturally. AIC's past Initiatives have contributed to this growth. Ductless heat pump sales are increasing and can be applied to many situations.** Although incentives expected to be the primary market driver for efficient HVAC equipment, demand is also accelerating naturally due to other market forces including state and federal decarbonization policies and increasing customer awareness of the equipment. In addition, three installers reported that they had always offered efficient equipment and that AIC's incentives had not influenced their equipment selection decisions.
- **Opportunity:** The current early state of the market reflects an opportunity for AIC to claim both resource acquisition and market effects savings, especially for ductless and ducted heat pumps. However, trends that show the market for HE HVAC equipment is likely to continue to grow even without incentives pose risks to disentangling market effects from the Midstream HVAC Initiative from natural market growth. AIC, Leidos, Brio, and Opinion Dynamics should continue to work together to ensure that Midstream HVAC Initiative interventions are well-documented so they can be measured over time to isolate market effects resulting from the Midstream HVAC Initiative.
- **The lack of a trained workforce poses a barrier to market adoption of efficient HVAC equipment.** The market actors who expected slower growth of HE equipment said lack of a qualified installer workforce will limit the potential for them to grow the HE side of their business and the workforce challenges are becoming more severe as the HE equipment becomes more complex. Most distributors (4 of 6) did not anticipate there being enough of an installer workforce to meet the increased demand for HE equipment.
- **Opportunity:** The HVAC industry is currently experiencing a "gray tsunami," a metaphor used to describe the retirement of a significant portion of the workforce. This trend is coupled with fewer individuals entering the HVAC industry. Given this trend, we recommend that AIC consider supporting HVAC internships and consider strategies aimed at educating high school students about HVAC career options and their benefits.
- **Installers are unlikely to sell heat pumps to the 45% of AIC households that have natural gas for heating and cooling.** The number one factor installers consider when making a recommendation for HVAC equipment is the home's existing fuel type. If a customer already has natural gas heating, installers tend to propose natural gas equipment, while heat pumps make more sense for those with propane or electric heating. Almost half of installers (n=4) said that a natural gas furnace would be cheaper to operate due to the low cost of natural gas.
- **Opportunity:** Although the incidence of natural gas HVAC is lower than the incidence of natural gas water heating (45% for HVAC versus 80% for water heating), it still poses a limitation to the market of homes that are likely to adopt heat pumps. Given the barriers to installing high efficiency gas homes, we recommend that AIC and Leidos focus on targeting the Midstream HVAC Initiative towards customer with electric heating and cooling.
- **Distributors inform and educate the installers about the HE equipment who, in turn, promote products to the end-user.** Distributors reported selling directly to installers and influencing their purchasing

decisions but never selling directly to homeowners. Distributors also promote their HE equipment to installers and train them to have the “kitchen table conversation” with the customer so that they can be a salesforce for HE equipment. All but one installer attended trainings on HE equipment and those who attended reported the trainings to positively impact the installers’ viewpoints on the equipment and make them more confident, comfortable, and proficient at working with the systems.

- **Opportunity:** AIC and Leidos have plans to partner with manufacturers, builders, and distributors to offer HE equipment training to installers. As distributors are motivated to sell HE equipment to installers and installers trust the information that distributors provide, AIC should consider focusing training efforts on working with distributors to educate installers. Providing distributors with information they may not be able to access elsewhere, including market data and the installer and end-customer selling points listed in this report, can also be effective strategies for helping distributors with their sales tactics.
- **Opportunity:** As originally designed, the Midstream HVAC Initiative directed end-customers seeking HE HVAC equipment to distributors. Given that these results show that installers own the relationship with the end-customers, we recommend that future efforts to engage and educate end-customers come from the installer or directly from AIC.
- **While customer awareness of HE HVAC equipment is growing, it still remains low. Illinois end-customers are cost-conscious and are interested in HE HVAC equipment for their operational savings and environmental benefits.** End-customers also have concerns about several aspects of HE HVAC equipment, including the upfront costs and technical aspects such as the zonal heating function and cold weather performance. End-customers are not often aware that heat pumps provide both heating and cooling benefits. In addition, COVID limited the availability of some HE equipment while, at the same time, increasing customer demand for HVAC services. Some installers reported seeing the increased demand extend into 2021.
 - **Opportunity:** This year represents an opportune time to educate end-customers and influence their purchase decisions as there is likely to be higher rates of equipment turnover due to pent up demand from COVID-induced supply chain issues. AIC and Leidos should consider focusing end-customer marketing and outreach efforts on highlighting the benefits of HE HVAC equipment that are most appealing to end-customers, including operational savings, warranties, and environmental benefits. As customers are used to staying at home more, marketing efforts should also focus on the equipment comfort benefits, reliability and cold- weather performance, and the dual heating and cooling features of heat pumps.
- **Distributors are learning about the Midstream HVAC Initiative from other distributors and desire more engagement from AIC.** Only one of the five distributors that are currently participating in the Initiative reported being contacted by AIC about the Initiative. The other four heard about the Initiative in other ways and reached out to AIC to sign up. Distributors also expressed frustration that installers had approached them about the program before they received information about it.
 - **Opportunity:** Consider updating the Midstream HVAC marketing plan to include a strategic plan for holistic industry engagement. Currently, AIC and Leidos are using a phased approach to enrollment by reaching out to groups of distributors over time. Distributor frustration about lack of Initiative outreach underscores the importance of developing a strategy to notify the entire HVAC industry of distributors and installers in AIC service territory before rolling out major design changes or offerings in the future. AIC and Leidos should consider following the process of 1) Identifying all market actors in AIC service territory 2) notifying all market actors about the Initiative or program design change 3) Hosting informational sessions so that interested market actors can learn more about the Initiative, and then 4) enrolling interested market actors. Providing all market actors with

equal access information will eliminate the risk of AIC showing perceived favoritism and ensure that distributors are fully prepared to serve installers through the Initiative.

- **Opportunity:** Consider following best practices for engaging distributors in Midstream HVAC Programs. While engaging installers and end-customers is important, building long-term relationships with distributors is critical to solidifying the success of the Initiative. Midstream HVAC evaluation results from other jurisdictions' suggest strategies for keeping distributors engaged with programs over time include soliciting feedback from distributors about market trends, incentive amounts, and program processes through monthly conference calls or in-person meetings. To the extent possible, AIC and Leidos may want to consider increasing in-person visits to distributor locations in alignment with their request to have more in-person engagement.
- **There is an urgent need to educate installers on cold climate heat pump performance and other misperceptions of heat pumps.** All installers supplemented their heat pump installations with backup heat, when manufacturer's specifications stipulate they operate effectively in freezing temperatures. In addition, a few installers also had concerns that heat pumps emit cooler air and that they don't last as long as other types of equipment.
- **Opportunity:** Consider working with distributors to host trainings for installers on the cold weather performance of heat pump equipment to mitigate the need for installation of backup systems and to ensure the backup systems to are set to switch at the proper setpoints. Suggestions for possible training content include:
 - Partnering with manufacturers to showcase the cold weather performance specifications of their equipment and provide training about scenarios where backup systems are needed and how they should be configured.
 - Compensating an installer from another cold climate with high heat pump penetration (e.g. Vermont, New York, or elsewhere in the Midwest) that has a depth of knowledge and success installing heat pumps without backup systems to share out their experience and attest to the heat pump cold weather performance.
- **Incentives are influencing the market, however installers also see room for growth in AIC's incentive offerings.** Installers saw incentives playing an important role in stimulating customer interest, but most installers reported that AIC's incentive amounts were inadequate to generate customer demand.
- **Opportunity:** AIC and Leidos should continue to monitor market data and sales trends for HE HVAC equipment in Illinois and across the US to ensure incentive levels stay competitive and continue to encourage adoption of HE HVAC equipment.
- **Some distributors have concerns about several aspects of the Midstream Initiative design.** One distributor each expressed concerns about having to wait 45 days before payment, a lack of clarity about the customer data points they were required to collect, and challenges verifying a homeowner is a qualified AIC customer. A distributor also noted they had multiple points of contact with the Midstream HVAC Initiative, and they received different information from the different points of contact.
- **Opportunity:** Midstream HVAC programs in other jurisdictions provide customers with online portals that enable distributors to instantaneously allow distributors to check end-customer eligibility. Leidos may want to consider providing distributors and installers with access to a similar time of online portal to eliminate confusion about customer eligibility. In addition, Leidos and AIC may want to consider speeding up the timeline for distributor payment. Results from other jurisdictions show that distributors are generally satisfied when they receive payment within 2 weeks after submitting their application. AIC and Leidos should also consider streamlining the

distributor points of contact and ensuring all Midstream HVAC Initiative representatives provide consistent information.

- **Our literature review demonstrated that heat pumps can be a strategic tool for achieving greenhouse gas emission reductions.**
 - **Opportunity:** Similar to our recommendation for HPWH, AIC should continue to evaluate how to optimally leverage this technology as the Illinois policy landscape evolves.

Appendix A. Instruments



Appendix B. Secondary Data Review Memo



Secondary Data
Review Memo.pdf

Appendix C. HVAC Brands Sold

Ducted Heat Pump Brands:

Champion, Comfort Maker, Johnson Control, Lennox, Luxaire, Rheem, Ruud, Tempstar (ICP), York

Ductless Heat Pump Brands:

Champion, Fujitsu, GE, Johnson Control, Lennox, Luxaire, Mitsubishi, Panasonic Samsung

Central Air Conditioner Brands:

Champion, Comfort Maker, Johnson Control, Lennox, Luxaire, Mitsubishi, Rheem, Ruud, Tempstar (ICP), York

Geothermal Heat Pump Brands

Bosch, Climate Master

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