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Light Commercial HVAC

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Final Report

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Light Commercial HVAC Market Assessment

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Executive Summary

A market characterization study was completed for light commercial (< 25 tons)[1] HVAC equipment in the Pacific Northwest[2]. The objective was to develop a better understanding of the supply-side of the light commercial market, and specifically identify the key players, relationships, and approximate market size. The Northwest Energy Efficiency Alliance (Alliance) expressed an interest in obtaining information that would be beneficial in planning market transformation programs for light commercial equipment in general. The Alliance was specifically interested in data relevant to indirect evaporative cooling products.

The approach for the project was to make direct contacts with HVAC equipment manufacturers, distributors, mechanical contractors, and industry allies. Telephone and/or e-mail contacts were made with 46 individuals at 31 unique office locations. In some cases, multiple office locations were contacted for the same manufacturer or equipment distributor. Based on the contacts, a total of 14 detailed interviews were conducted (nine in-person and five by e-mail / telephone) with distributors, mechanical contractors, and industry allies that have direct involvement in the light commercial HVAC market in the Pacific Northwest.

There are over 5,700 companies involved in the HVAC market in the Pacific Northwest. This estimate is based on a Dun and Bradstreet (D&B) search of four-digit SIC codes that cover HVAC businesses. The D&B data do not distinguish between light commercial companies and those that serve other market segments (e.g., residential or large commercial). However, it is reasonable to assume that many of the smaller companies that employee fewer people serve the residential market, while those companies with larger payrolls serve the light commercial and larger market segments. A D&B search of HVAC companies with 10 or more employees revealed that there are approximately 850 companies that potentially serve the light commercial HVAC market segment in the Pacific Northwest. Approximately 800 of these companies are contractors and 50 are distributors. A breakdown of the HVAC companies with 10 or more employees by state is shown in **Figure ES-1**.

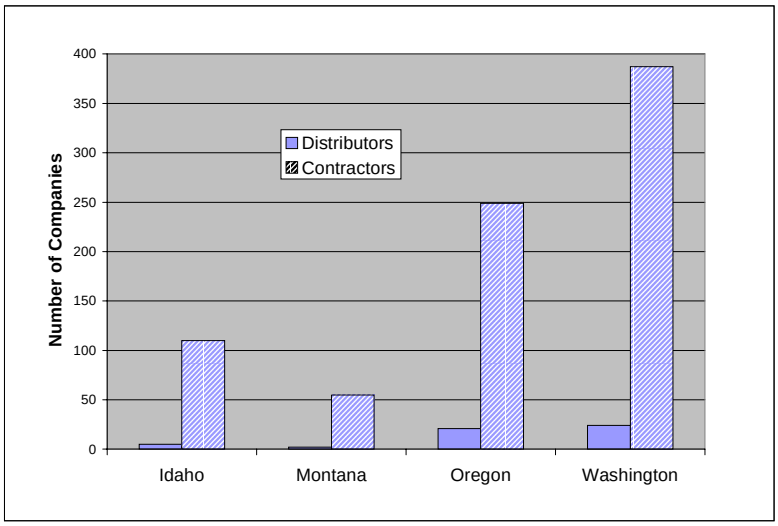


Figure ES-1. HVAC Companies in the Pacific Northwest (10 or more employees)

[1] For this study, light commercial equipment includes any packaged HVAC product up to 25 tons installed in a non-residential building.
[2] The Pacific Northwest region includes the four states of Oregon, Washington, Idaho, and Montana.

There are five well known manufacturers of commercial HVAC equipment: Carrier, Lennox, McQuay, Trane, and York. McQuay produces relatively large HVAC equipment and is not a significant participant in the light commercial sector. Based on the results of this study, the "Big Three" manufacturers for light commercial HVAC products in the Pacific Northwest are Trane, Carrier, and Lennox. As indicated in **Figure ES-2**, Trane is estimated to have 50% of the market share, followed by Carrier (30%), and Lennox (15%). Other manufacturers, mainly York, are estimated to have 5% of the light commercial market share.

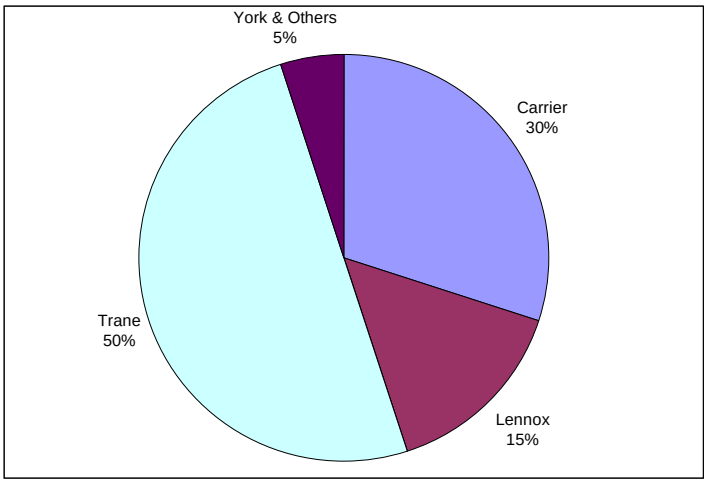


Figure ES-2. Approximate Market Share for Light Commercial HVAC Products in the Pacific Northwest

The majority of the information gathered for this project was obtained from distributors and mechanical contractors located along the I-5 corridor between Portland and Seattle. These respondents generally indicated that Carrier, and Lennox in particular, appear to be gaining market share in the light commercial market due to both product performance and price. A few respondents identified new generation light commercial products from Lennox and Carrier that are reliable and easy to maintain. An estimate of the installed base and recent shipments by manufacturer is shown in **Figure ES-3**.

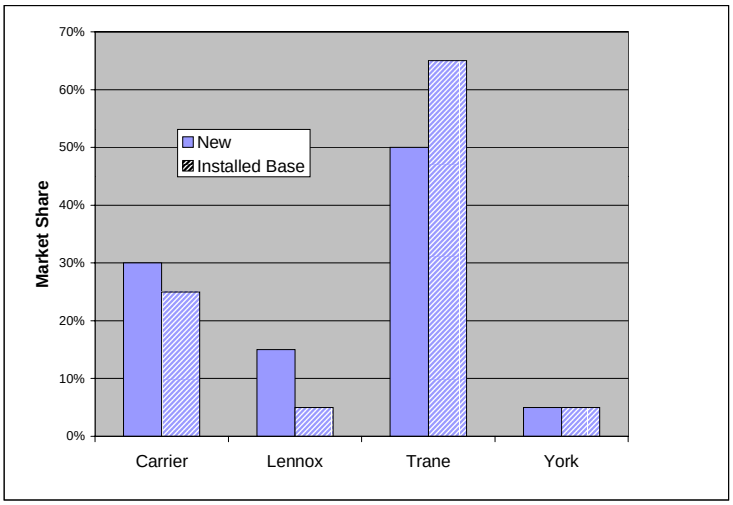


Figure ES-3. Light Commercial Market Share Trends (estimates for Pacific Northwest)

A representation of the light commercial HVAC market structure is shown in **Figure ES-4**. Manufacturers distribute equipment through regional sales offices that are owned and operated by the manufacturers or through independent distributors. In most cases, the distribution offices (either factory owned or independent) have an exclusive sales territory for a specific geographic region. Manufacturers frequently have national or "house" accounts with customers such as "big box" retail stores and large restaurant chains (e.g., WalMart and McDonalds). With these accounts, the sale is negotiated directly between the manufacturer and the customer, with little or no involvement from the distributor. For the Pacific Northwest, it is estimated that 1-2% of light commercial sales go through national accounts and the remainder (98-99%) go through distributors.

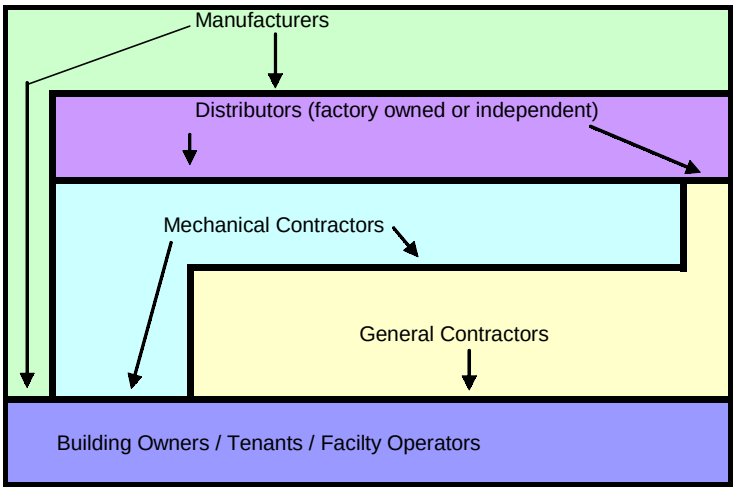


Figure ES-4 Light Commercial Market Structure

In the light commercial market, distributors generally sell directly to licensed HVAC mechanical contractors. While not universal, distributors tend not to sell to general contractors or get involved with architectural or engineering firms in the light commercial sector. In fact, several of the distributors contacted for this project indicated that they only sell to licensed HVAC mechanical contractors. For light commercial HVAC equipment, it is estimated that 90-95% of the sales from distributors go to HVAC mechanical contractors and the balance (5-10%) goes to general contractors.

Distributors and mechanical contractors were asked to provide a breakdown of the light commercial market by new versus existing construction. Nine quantitative responses were received, and an average of these responses suggests that 53-60% of light commercial equipment is currently being placed in new construction, and the balance (40-47%) is being sold to replace HVAC systems in existing commercial buildings.

Distributors and mechanical contractors were asked to provide estimates of light commercial installations by building type. Eight detailed responses were received, and an average of these responses is shown in **Table ES-1.** As indicated, the top four building categories, in order of demand, are small commercial (29%), small retail (20%), medium / large commercial (19%), and large retail (13%). These four building categories are estimated to account for 81% of the demand for light commercial equipment.

Table ES-1. Light Commercial HVAC Market Breakdown

Building Type	Sales (based on number of units)
Small Commercial (<10,000 sf)	29%
Small Retail (strip mall, etc.)	20%
Medium / Large Commercial (>10,000 sf)	19%
Large Retail (big box, etc.)	13%
Schools / Churches	11%
Hospitals / Clinics	2%
Restaurants	2%
Other	4%
	100%

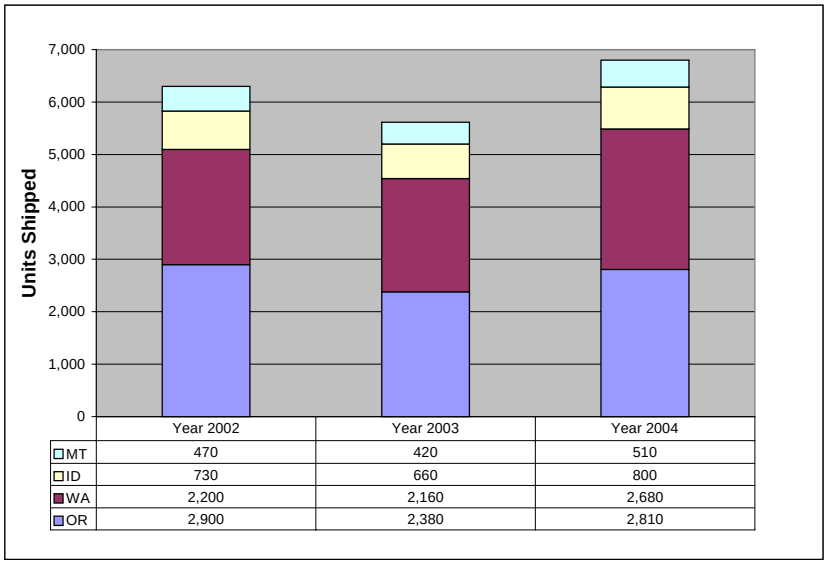
Distributors and contractors indicated that they generally promote energy efficient products. However, it is clear that distributors and contractors regard the light commercial market as highly competitive, and first cost, not energy efficiency, is typically a more important factor. In general, distributors and mechanical contractors are motivated to make an immediate sale, and they bid projects with this goal. If a high efficiency product is viewed as a competitive advantage, then this equipment will be offered as an alternative to standard HVAC equipment in the bid. However, if a high efficiency product offers no competitive advantage or is believed to complicate or delay the buying decision, then this equipment will not be included as an alternative to standard equipment in the bid. Several respondents indicated that utility rebate programs – such as the economizer rebate programs currently offered by Puget Sound Energy and Seattle City Light – play an important role in influencing customers to choose more efficient light commercial HVAC products.

On the topic of evaporative cooling, respondents indicated that little evaporative cooling equipment is used in the light commercial market. Direct evaporative cooling is used in commercial kitchen vent hood applications that have high outside air flows. However, none of the distributors contacted in this project sold direct evaporative equipment for light commercial applications. If an evaporative cooling system is required for a restaurant application, this equipment is procured from a third party vendor (e.g., Goettl). When asked about opportunities for an innovative high efficiency indirect evaporative cooling product, respondents generally expressed interest. However, caution was provided suggesting that any new product for the light commercial market would need to be cost competitive. Life-cycle cost is important, but first cost is often a more important consideration for customers that buy light commercial HVAC equipment. Reliability and ease of maintenance are also important to customers that buy light commercial HVAC products.

The size of the light commercial market in the Pacific Northwest has been previously estimated to be 9,000 to 9,600 units per year[3]. However, ARI data collected during this project suggests that the light commercial market in the Pacific Northwest is smaller, and is closer to 7,000 units per year (6,800 estimated for 2004). One distributor interviewed for this project supplied specific light commercial shipment data for the year 2002 for Oregon and Washington and estimates for changes in the years 2003 and 2004. Based on this data, and scaling based on population for Idaho and Montana, estimates for 2002 through 2004 were developed as shown in **Figure ES-5**. As indicated, the market declined in 2003

[3] Two previous light commercial HVAC market estimates developed by the Alliance were examined. One used a commercial building stock assessment (CBSA) as an indirect measure of HVAC market size, and the other used national ARI data scaled by census for the Pacific Northwest.

relative to 2002, but rebounded in 2004. Based on discussions with distributors and contractors, this rebound is expected to continue in 2005.



	Year 2002	Year 2003	Year 2004
MT	470	420	510
ID	730	660	800
WA	2,200	2,160	2,680
OR	2,900	2,380	2,810

Figure ES-5. Light Commercial Market Size by State

1. Introduction

This report presents the results of a light commercial heating, ventilating, and air-conditioning (HVAC) market characterization study that was completed for the Northwest Energy Efficiency Alliance (Alliance). This market study was completed by Energy and Environmental Analysis (EEA) and covers the four-state region of Oregon, Washington, Idaho, and Montana (collectively referred to as the Pacific Northwest). The analysis is focused on the supply-side of the market for packaged HVAC products up to 25 tons capacity that are installed in non-residential buildings.

1.1. Objective

The primary objective was to gain a better understanding of the supply-side market structure for light commercial HVAC products sold in the Pacific Northwest. More specific goals were to identify key players, relationships, and the approximate market size for packaged HVAC products used in light commercial applications in the Pacific Northwest.

A secondary objective was to evaluate market perceptions in the Pacific Northwest related to indirect evaporative cooling. The Alliance expressed an interest in market perceptions for this type of HVAC technology to help support an evaluation of an innovative high efficiency indirect evaporative cooling product.

1.2. Approach

The approach for characterizing the light commercial market was to make direct contacts with HVAC equipment manufacturers, industry allies, distributors, and mechanical contractors. The proposed plan called for making 38 contacts as outlined in **Table 1**. As indicated, a total of 46 individuals – representing 31 unique companies or office locations – were actually contacted. As a result of these contacts, 14 in-depth interviews were completed.

Table 1. Number of Contacts and Interviews

Category	Contacts			Interviews
	proposed	Actual		
	unique office or company	unique office or company	personnel	
Manufacturer[4]	5	3	4	---
Industry Ally[5]	3	7	7	3 *(3 by e-mail / tel)*
Distributor	30 (combined for both categories)	13	24	8 *(6 in person, 2 by e-mail / tel)*
Mechanical Contractor		8	11	3 *(3 in person)*
	38	31	46	14

[4] The manufacturers contacted were Carrier, Lennox, and Trane.

[5] The allies contacted were Aspen Systems, Energy Trust of Oregon, Puget Sound Energy, Seattle City Light, ARI, Encorp, and the University of Illinois at Chicago.

To guide the discussions, a questionnaire was prepared and reviewed with Alliance staff concerning the desired information. For distributors and contractors, the questionnaire contained approximately 20 questions divided into the following categories (a shorter questionnaire was used for industry allies and manufacturers):

- Market Structure (product channels and relationships)
- Market Data (size and share)
- New Products (including evaporative cooling)

Manufacturers and industry allies were contacted by telephone or e-mail, and were mainly asked to comment on the market size and market share for light commercial HVAC equipment in the Pacific Northwest. Three manufacturers were reached – Carrier, Lennox, and Trane – but market estimates were not provided by these manufacturers. Confidentiality concerns and time requirements required to obtain the requested data are believed to be the primary factors that limited responses from manufacturers. Three allies – Energy Trust of Oregon (including input from Aspen Systems), Puget Sound Energy, and Seattle City Light – provided detailed responses. These allies provided input primarily on incentive programs that they administer for light commercial HVAC equipment in the Pacific Northwest.

Distributors and mechanical contractors were initially contacted by telephone or e-mail. For distributors located in the Portland or Seattle areas, meetings were requested to review the questionnaire in-person. As listed in **Table 2**, a total of 11 distributors or contractors completed questionnaires.

Table 2. Distributors and Mechanical Contractors that were Interviewed

Type of Business	HVAC Equipment Offered	Company[6]
Distributor	Carrier	D1 (Kent)
	Lennox	D4 (Clackamas)
		D4 (Kent)
	McQuay	D5 (Portland)
	Trane	D6 (Portland)
		D7 (Tacoma)
	York	D8 (Tacoma)
		D8 (Vancouver)
Mechanical Contractor	Carrier, Lennox, Trane	MC1 (Kent)
	Carrier, Lennox, Trane	MC2 (Seattle)
	Carrier, Trane	MC3 (Redmond)

The majority of the conclusions presented in this report are based on the information gained through the 11 interviews with distributors and mechanical contractors. The quality of the data provided by the distributors and mechanical contractors is regarded as good. All 11 companies that provided data for the interviews have been serving the HVAC market for many years, and each showed a high level of understanding concerning the HVAC market. There were knowledge variations depending on the level of experience of the personnel that participated in the interviews, but overall, the individuals that helped complete the interviews were senior people with many years of HVAC experience. With the exception of Distributor D5, all of the companies interviewed showed a high level of engagement in the light

[6]Distributors and mechanical contractors provided input in confidence. Therefore, generic names are used throughout this report. The city location for the office that provided input is shown in **Table 2**. Note that distributors and large mechanical contractors generally have offices in multiple cities.

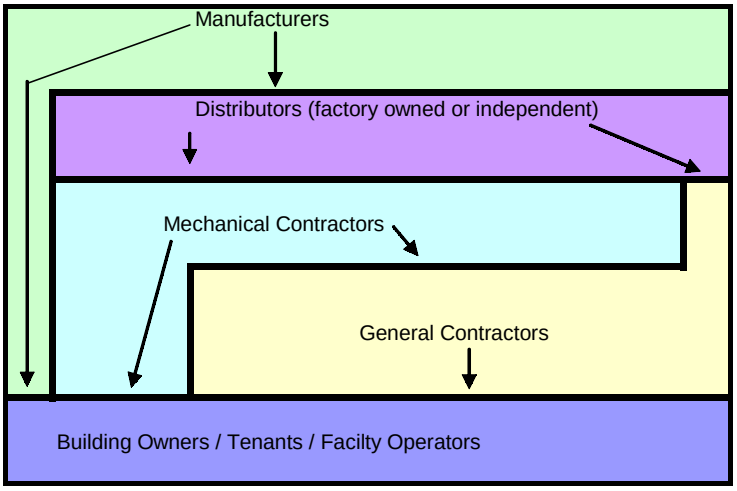
commercial HVAC market (D5 sells equipment that is typically larger than that used in light commercial applications).

While the companies interviewed showed a high level of knowledge, they did not always share this knowledge. For example, questions concerning market share and estimated sales were often viewed as confidential and were not released. In other cases, general estimates, rather than detailed values, were provided. In some cases, general estimates were likely provided because the interview participants did not have the time or resources to track down the detailed information desired.

The information obtained from distributors is regarded to be representative of the entire Pacific Northwest. While the distributors interviewed did not necessarily cover the entire Pacific Northwest, they generally showed a confident understanding of light commercial equipment sold throughout the region. Compared to distributors, the information obtained from mechanical contractors is viewed as being representative of the Puget Sound area, and not necessarily the entire Pacific Northwest. Three mechanical contractors were interviewed, and each of these contractors showed detailed knowledge concerning the market in the Puget Sound region, but expressed a limited understanding of light commercial HVAC markets outside this region.

2. Market Structure

A representation of the light commercial HVAC market structure is shown in **Figure 1**. Manufacturers distribute equipment through regional sales offices that are owned and operated by manufacturers or independent distributors. In most cases, distribution offices (either factory owned or independent) have an exclusive sales territory for a specific geographic region. Manufacturers frequently have national or "house" accounts with customers such as "big box" retail stores and large restaurant chains (e.g., WalMart and McDonalds). With these accounts, the sale is negotiated directly between the manufacturer and the customer, with little or no involvement from the distributor. For the Pacific Northwest, it is estimated that 1-2% of light commercial sales go through national accounts and the remainder (98-99%) go through distributors.



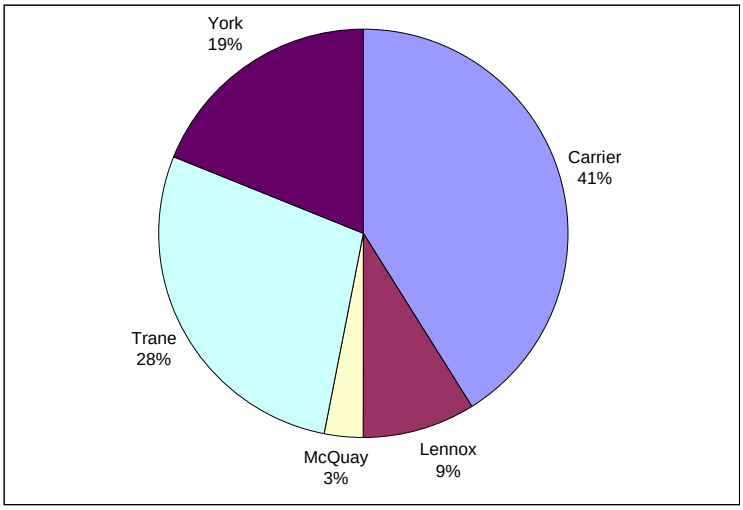
Note: Not to scale

Figure 1. Light Commercial Market Structure

In the light commercial market, distributors generally sell directly to licensed HVAC mechanical contractors. While not universal, distributors tend not to sell to general contractors or get involved with architectural or engineering firms in the light commercial sector. In fact, several of the distributors contacted for this project indicated that they only sell to licensed HVAC mechanical contractors. It is estimated that distributors sell 90-95% of light commercial HVAC products to mechanical contractors and the balance (5-10%) to general contractors.

2.1 Manufacturers

There are five well known manufacturers of commercial HVAC equipment: Carrier, Lennox, McQuay, Trane, and York. The estimated national market share for commercial and industrial HVAC equipment combined is shown in **Figure 2.** As indicated, Carrier, Trane, and York account for nearly 90% of the HVAC products that are classified as commercial / industrial (C/I).



Source: Wisconsin State Report, 2003

Figure 2. National Commercial / Industrial HVAC Market Share

The market share numbers for light commercial HVAC equipment are noticeably different compared to commercial/industrial market share figures. McQuay produces relatively large HVAC equipment and is not a significant participant in the light commercial sector. Based on the results of this study, the "Big Three" manufacturers for light commercial HVAC products in the Pacific Northwest are Trane, Carrier, and Lennox. As indicated in **Figure 3**, Trane is estimated to have 50% of the market share, followed by Carrier (30%), and Lennox (15%). Other manufacturers, mainly York, are estimated to have 5% of the light commercial market share.

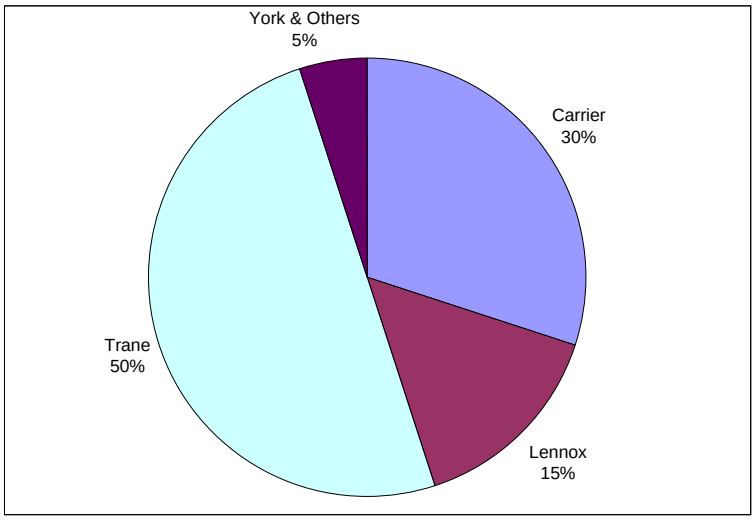


Figure 3. Pacific Northwest Light Commercial HVAC Market Share

The majority of the information gathered for this project was obtained from distributors and mechanical contractors located along the I-5 corridor between Portland and Seattle. These respondents generally indicated that Carrier, and Lennox in particular, appear to be gaining market share in the light

commercial market due to both product performance and price. A few respondents identified new generation light commercial products from Lennox and Carrier that are reliable and easy to maintain. An estimate of the installed base and recent shipments by manufacturer is shown in **Figure 4**.

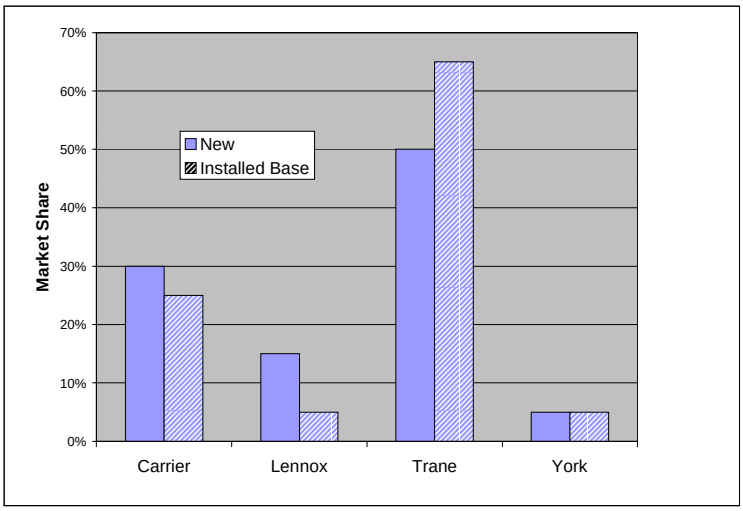


Figure 4. Light Commercial Market Share Trends (estimates for Pacific Northwest)

2.2 Distributors and Contractors

There are over 5,700 companies involved in the HVAC market in the Pacific Northwest. This estimate is based on a Dun and Bradstreet (D&B) search of two four-digit SIC codes that cover HVAC businesses. The results of the search are shown in **Table 3**. The two SIC codes (5075 and 1711) are not clearly divided into distributors and contractors. However, SIC 5075 is described to be HVAC wholesale operations, whereas SIC 1711 is described to be retail operations. These divisions are expected to parallel the definitions used for distributors and contractors used in this report. A chart of HVAC distributors and contractors with 10 or more employees by state is shown in **Figure 5**.

Table 3. D&B Results for Distributors and Contractors

State	Type of HVAC Business			
	Number of Distributors (SIC 5075)		**Number of Contractors** (SIC 1711)	
	Number of Employees		Number of Employees	
	<10	>=10	<10	>=10
Idaho	28	5	710	110
Montana	15	2	519	55
Oregon	65	21	1,330	249
Washington	86	24	2,161	387
Total	**194**	**52**	**4,720**	**801**
	246		**5,521**	
	5,767			

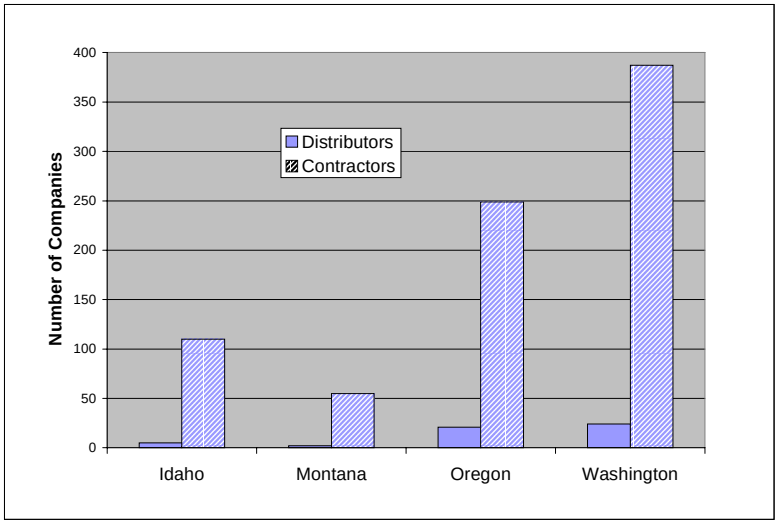


Figure 5. HVAC Distributors and Contractors (10 or more employees)

The D&B data do not distinguish between light commercial companies and those that serve other market segments (e.g., residential or large commercial). However, it is reasonable to assume that many of the smaller companies that employee fewer people serve the residential market, while those companies with larger payrolls serve the light commercial and larger market segments. As indicated in **Table 3**, there are 853 companies (52 in SIC 5075, 801 in SIC 1711) with 10 or more employees.

The D&B search counts each office as a unique distributor or contractor. However, several of these companies have multiple offices, and it is believed that there are significantly fewer than 853 (801 contractors, 52 distributors) companies that serve the light commercial HVAC market in the Pacific Northwest. For example, in the case of distributors, the results obtained through interviews in this project show that there are six major distributors that supply Carrier, Lennox, Trane, and York light commercial equipment in the Pacific Northwest. These major distributors are:

- D1
- D3
- D4
- D6
- D7
- D8

To preserve confidentiality, generic names are used for distributors (D#) and mechanical contractors (MC#).

Distributors D1, D3, D7, and D8 are independent companies that distribute equipment for manufacturers. Distributor D4 is an exclusive corporate distributor for Lennox products. Lennox distributes all products exclusively through corporate distribution centers. Distributor D6 is a corporate non-exclusive distributor for Trane light commercial products. In the Pacific Northwest, Trane light commercial HVAC products are available through corporate distribution centers and one independent distributor with offices throughout the region (D7). **Table 4** shows the equipment sold by these distributors throughout the Pacific Northwest. This table is divided into 11 geographic markets that represent the entire four-state Pacific Northwest region.

Table 4. Geographic Coverage for Distributors of Light Commercial HVAC Products[7]

HVAC Mfr	Company	Washington				Oregon			Idaho		Montana	
		Seattle Metro	Spokane	Tri-cities	V'couver	Portland Metro	Southern	Eastern	Northern	Southern	Western	Eastern
Carrier	D1 (Kent) *	X										
	D1 (Tualatin)				X	X	X	X				
	D1 (Spokane)		X	X					X		X	X
	D2 (Bellevue) [8]											
	D3 (Boise)								X	X		
Lennox	D4 (Clackamas) *				X	X	X	X	X		X	
	D4 (Kent) *	X	X	X	X				X		X	
	D4 (Salt Lake City)									X		X
McQuay	D5 (Portland) *					X	X					
Trane	D6 (Redmond)	X										
	D6 (Portland) *				X	X	X	X				
	D7 (multiple WA offices) *	X	X	X	X							
	D7 (multiple OR offices)					X	X	X				
	D7 (Boise)								X	X		
	D7 (Billings)											X
	D7 (Missoula)										X	
York	D8 (Tacoma) *	X										
	D8 (Vancouver) *				X	X	X	X				
	D8 (Spokane)		X	X					X			
	D8 (Nampa)									X		
	D8 (Billings)										X	X

[7] Interviews were held with eight distributors. These distributors are marked with an "*" in this table and are listed in **Table 2**.
[8] Distributor D2 generally sells Carrier products above 25 tons.

Distributors generally have an exclusive territory, but some overlap appears to occur near boundaries. For example, D1 and D3 are both distributors for Carrier. The two companies have separate regions with the exception of Northern Idaho, which both companies claim to serve. Overlap also occurs for corporate distribution offices. For example, Lennox has three offices that serve the entire Pacific Northwest. The regions are generally separate, but overlap occurs in Vancouver, Washington, Northern Idaho, and Western Montana. There is an interesting situation with Trane for light commercial products. Independent distributor D7 is authorized to supply Trane dealers (generally companies that sell residential Trane equipment) throughout the entire Pacific Northwest. However, D7 can also quote light commercial HVAC equipment, similar to the equipment that is quoted by Trane corporate distribution offices.

Distributors provide equipment to contractors, and the D&B search indicated that there are 801 HVAC contractors with more than 10 employees (representative of those contractors that serve the light commercial market). Even though there are several hundred contactors, there is likely a relatively small group of contractors that install the majority of light commercial equipment. For example, the Lennox office that distributes equipment for the Seattle Metro region recommends three mechanical contractors. These three mechanical contractors are referred to as Lennox "Alliance" partners, and account for the majority of light commercial Lennox equipment installed in the Seattle Metro region. Similar recommendations for preferred contractors were not obtained from other distributors, but most distributors are believed to have preferred contractors.

3. Market Segments

As mentioned previously, a total of eight distributors and three mechanical contractors provided detailed information on market segments (see **Table 2**). Eight of the 11 respondents provided estimates of the percent of light commercial equipment they installed by building type. An average of the responses shows that the four largest building categories were (see **Table 5**) small commercial (29%), small retail (20%), medium / large commercial (19%), and large retail (13%).

Table 5. Light Commercial HVAC Breakdown by Building Type

Company	**Building Type** (categories do not overlap)								**Totals**
	small comm	small retail	med / large comm.	large retail	schools / churches	hospitals / clinics	Rest'rnt	other	
D1 (Kent)	30%	25%	15%	15%	5%	5%	5%	0%	**100%**
D4 (Clackamas)	40%	18%	18%	15%	2%	0%	7%	0%	**100%**
D5 (Portland)	10%	0%	30%	0%	40%	10%	0%	10%	**100%**
D6 (Portland)	35%	0%	40%	25%	0%	0%	0%	0%	**100%**
D7 (Tacoma)	40%	20%	15%	10%	10%	2%	2%	1%	**100%**
D8 (Tacoma)	25%	25%	15%	15%	5%	5%	5%	5%	**100%**
MC1 (Kent)	25%	20%	20%	20%	5%	0%	0%	10%	**100%**
MC2 (Seattle)	25%	50%	0%	0%	18%	0%	5%	2%	**100%**
Average	**29%**	**20%**	**19%**	**13%**	**11%**	**2%**	**2%**	**4%**	**100%**

For the building categorization, small commercial was defined to be a one to three story office building with a maximum size of 10,000 square feet. Small retail was defined to be a relatively small stand-alone store or strip mall. Medium to large commercial included office buildings with more than 10,000 square feet, and large retail represented relatively large stores (including big box).

Respondents were asked to estimate the typical size range of equipment that they install in these buildings. Eight responses were received, ranging from a low of 3 tons to a high of 15 tons. The average reported range was 4.4 to 9.6 tons (see **Table 6**).

Table 6. Typical Size Range for Light Commercial Equipment

Company	**Size Range (tons)**	
	(min)	(max)
D1 (Kent)	5	10
D4 (Clackamas)	4	10
D4 (Kent)	3	12
D7 (Tacoma)	3	10
D8 (Tacoma)	7.5	15
MC1 (Kent)	5	10
MC2 (Seattle)	3	5
MC3 (Redmond)	---	5
Minimum	**3**	**---**
Maximum	**---**	**15**
Average	**4.4**	**9.6**

Concerning new versus existing construction, a wide range of responses was received, particularly from the three mechanical contractors. A total of nine responses were obtained, and the average for all nine is 53% new construction and 47% existing construction. The average for the six distributors, excluding the mechanical contractors, is 60% new construction and 40% existing construction.

Table 7. Comparison of New and Existing Construction

Type of Business	Company	Type of Construction	
		(new)	(existing)
Distributor	D4 (Clackamas)	70%	30%
	D4 (Kent)	70%	30%
	D5 (Portland)	85%	15%
	D6 (Portland)	35%	65%
	D7 (Tacoma)	40%	60%
	D8 (Tacoma)	60%	40%
Mechanical Contractor	MC1 (Kent)	25%	75%
	MC2 (Seattle)	85%	15%
	MC3 (Redmond)	5%	95%
	Average (distributors & contractors)	**53%**	**47%**
	(distributors only)	**60%**	**40%**

It became apparent during the interviews that mechanical contractors tend to specialize in new construction or the replacement / service business. The type of business has a strong influence on a particular contractor's view of whether light commercial equipment is installed in existing or new buildings.

Distributors and mechanical contractors were asked to comment on costs for light commercial equipment. Distributors generally agreed that the cost at which they sold light commercial equipment to contractors was in the range of $400-$800 per ton. Mechanical contractors tended to provide a tighter range, stating that they purchased light commercial equipment from distributors in the range of $350 to $550 per ton.[9] The installed cost can vary a great deal depending on job requirements. However, the installed cost for light commercial HVAC equipment was reported to be in the range of $1,000 to $1,750 per ton.

[9] One mechanical contractor reported a higher range, but this contractor is more focused on residential equipment and this higher estimate was not factored into the cost range reported.

4. Market Size

This section provides a discussion of the light commercial HVAC market size in the Pacific Northwest. The section is organized as follows:

4.1 – Regional Air-Conditioning and Refrigeration Institute (ARI) shipment data (information collected as part of this project)

4.2 – Comparative estimates (previous studies)

4.3 – Discussion

4.1 Regional ARI Shipment Data

EEA prepared the estimate shown in **Table 8** for the annual market size for light commercial packaged HVAC equipment in the Pacific Northwest based on feedback from one equipment distributor. This distributor provided ARI shipment data for Washington and Oregon for 2002. The 2002 estimates for Idaho and Montana were based on scaling by state population data. Washington and Oregon estimates for 2003 and 2004 were based on year-to-year market growth or decline in each state (rates of change provided by distributor based on ARI estimates). Idaho and Montana estimates for 2003 and 2004 were based on national data of shipments for heat pumps and unitary air conditioners from ARI publications.

As indicated in **Table 8** (and **Figure 6)**, the light commercial market declined from 2002 to 2003, and then rebounded in 2004, ending the year with approximately 6,800 total light commercial HVAC shipments. Discussions with contractors and distributors indicate that 2005 sales are continuing to increase, and shipments for 2005 are expected to exceed 2004.

Table 8. Light Commercial Market in the Pacific Northwest

State	Estimated Shipments (number of units)		
	2002	2003	2004
Washington	2,200	2,160	2,680
Oregon	2,900	2,380	2,810
Idaho	730	660	800
Montana	470	420	510
Total	**6,300**	**5,620**	**6,800**

National ARI shipment data for light commercial equipment were examined, and these data showed that the weighted average for light commercial HVAC equipment is approximately 8.6 tons. These data are discussed in more detail in the following section under the census data discussion. Using this weighted value of 8.6 tons per unit leads to an estimated capacity of 58,480 tons in the Pacific Northwest in 2004 based on the shipment value of 6,800 units.

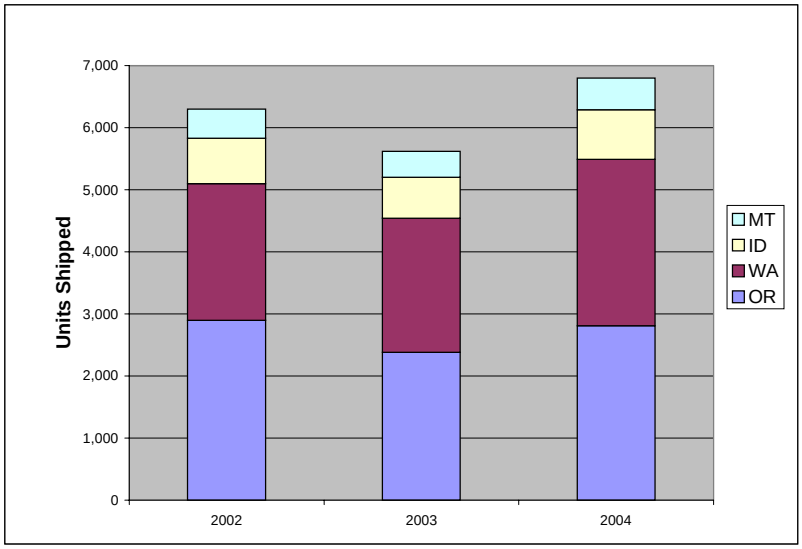


Figure 6. Light Commercial Market Size by State

4.2 Comparative Estimates

The ARI shipment data for the Pacific Northwest discussed in the preceding section were compared to two studies that used indirect approaches for estimating the size of the light commercial HVAC market in the Pacific Northwest. The other two studies used the following methods:[10]

- Commercial building stock assessment and estimated cooling requirements
- National ARI shipment values scaled by census data

Commercial Building Stock Assessment (CBSA)

This methodology uses the total estimated cooled commercial floor space, and the rule-of-thumb that one ton will cool 400 square feet. The number for square feet of cooled commercial floor space in the Pacific Northwest is based on data in the report, "Assessment of the Commercial Building Stock in the Pacific Northwest," prepared by KEMA-XENERGY.

Table 9 illustrates the calculation approach. As indicated, the calculation starts with a commercial building stock estimate of 2.4 billion square feet. New unit sales are based on an annual growth rate of commercial buildings of 3%, and an annual demolition rate of commercial buildings of 0.5%. Replacement of installed packaged HVAC systems is based on the tons of installed HVAC in commercial buildings and an estimated life of packaged HVAC units of 30 years.

According to this methodology, the total capacity of packaged HVAC units required in the Pacific Northwest is 82,688 tons per year. Using a weighted average of 8.6 tons per unit (from the census data analysis described in the following section), the number of units required is 9,615 per year.

[10] The approach and results from these comparative studies were provided to EEA by the Alliance.

Table 9. Commercial Building Stock Estimate

Type of Data	Parameter	Variable	Value	Units	Comment
Input	Commercial building stock	A	2.4 billion	sq ft	Based on KEMA report
	Percent of buildings cooled	B	64	%	Based on KEMA report
	Percent of buildings with packaged HVAC (as % of buildings cooled)	C	34	%	Based on KEMA report
	Cooled floor space per ton of cooling	D	400	sq ft / ton	Assumption
	Life of packaged HVAC units	E	30	Years	Assumption
	Growth rate of commercial buildings	F	3	%	Assumption
	Demolition rate of commercial buildings	G	0.5	%	Assumption
Output	Commercial building stock cooled with packaged HVAC	H	522,240,000	sq ft	= A x B x C
	Installed HVAC in commercial buildings	I	1,305,600	tons	= H / D
	Net growth of commercial buildings	---	2.5	%	= F – G
	New commercial buildings built each year	J	72,000,000	sq ft	= A x F
	New commercial buildings built each year cooled with packaged HVAC	K	15,667,200	sq ft	= H x F
	Packaged HVAC replaced each year	L	43,520	tons	= I / E
	Packaged HVAC installed in new commercial buildings each year	M	39,168	tons	= K / D
	Total packaged HVAC installed per year	**---**	**82,688**	**tons**	= L + M

National ARI Data (scaled by census)

The census data approach is based on evaluating publicly available ARI national shipment data and then scaling this data by the population for the Pacific Northwest. The Pacific Northwest accounts for 4.1% of the population in the United States, and the results of scaling the national ARI shipment data by 4.1% are shown in **Table 10**. Note that the ratio of the total capacity to the number of units is 8.6 tons/unit (77,240 / 9,020). This weighted average of 8.6 tons per unit is used to correlate total capacity and number of units for both the CBSA and ARI data sets.

Table 10. National ARI Shipment Values Scaled by Census Data

Size Range (tons)	Shipments in Pacific Northwest	
	Number of Units	**Capacity** (tons)
4.6 – 5.4	3,526	17,630
5.4 – 11.2	3,690	30,627
11.2 – 15.3	1,025	13,581
15.3 – 20.8	533	9,621
20.8 – 26.2	246	5,781
Total	**9,020**	**77,240**

4.3 Discussion

Table 11 provides a summary of the results from the reported ARI data and the two comparative studies. As indicated, there is significant variation. One reason for the variation could be fluctuations due to economic conditions. For example, the CBSA estimate, which is 82,688 tons per year, is based on a commercial building growth rate of 3%. If this growth rate is reduced to 2%, then the annual capacity is reduced to approximately 70,000 tons. Note that actual commercial building growth rates were not determined in this project, and a reduced value of 2% is only conjecture.

Table 11. Comparison of Light Commercial HVAC Market Size Estimates

Methodology	Market Size		Applicable Year
	(units)	(tons)	
Regional ARI Data	6,800	58,480	2004
CBSA Estimate	9,615	82,688	2002
National ARI Data (scaled by census)	9,020	77,240	2002
Average	**8,478**	**72,803**	

Another possible factor for differences is potential overlap between large residential and light commercial HVAC installations. For example, the national ARI data do not make a clean distinction between light commercial and residential equipment, and it is possible that some residential shipments are included in the estimate of 9,020 units. The crossover is most likely to occur in the smaller capacities of 4.6 to 5.4 tons (see **Table 10**). This range includes over 3,500 units, and the total shipment estimate of 9,020 units could be significantly smaller if a fraction of the 3,500 units in the smaller capacity range actually apply to residential, not light commercial, installations.

5. Perceptions of Energy Efficiency and Evaporative Cooling

The light commercial market is highly competitive. The three primary manufacturers – Carrier, Lennox, and Trane – offer products that compete head-to-head in nearly every light commercial application. The products from the manufacturers tend to have similar features and performance, and the buyers of light commercial equipment tend to regard the equipment as a commodity product.

Distributors and contractors that participated in this project indicated that they generally promote energy efficient products. However, they indicated that it is often difficult to sell higher priced energy efficient products in an environment where buyers often select equipment based on first cost. From the perspective of distributors and contractors, buyers occasionally look at life cycle costs, but are generally interested in purchasing the lowest cost light commercial HVAC product that will not be a maintenance problem.

Distributors and contractors identified the importance of rebate programs – such as the economizer rebate programs currently offered by Puget Sound Energy and Seattle City Light – as having a significant impact on promoting energy efficient products. Participants in this study all supported rebates as having a positive impact on the adoption of more efficient light commercial HVAC equipment.

On the topic of evaporative cooling, respondents indicated that little evaporative cooling equipment is used in the light commercial market. Direct evaporative cooling is used in kitchen make-up air systems that have high outside air flows. However, none of the distributors contacted in this project sold direct evaporative equipment for light commercial applications. Respondents indicated that if an evaporative cooling system is required for a restaurant application, this equipment is procured from a third party vendor (e.g., Goettl).

It is important to note that the majority of input for this study was obtained from respondents based west of the Cascade mountain range. All 11 distributors and mechanical contractors that were interviewed were based along the I-5 corridor between Seattle and Portland. However, several of the distributors had territories that included regions east of the Cascades. The climate east of the Cascades may be more conducive to the use of evaporative cooling (either direct or indirect) compared to the west side, and HVAC personnel that are located and focused on markets east of the Cascades may show more familiarity with evaporative cooling equipment than those based in western regions. While the climate east of the Cascades may be more conducive for evaporative cooling, it is important to note that the majority of people in the Pacific Northwest live west of the cascades. Approximately 12 million people live in the Pacific Northwest, and about 70% live west of the Cascades.

When asked about opportunities for an innovative high efficiency indirect evaporative cooling product, respondents generally expressed interest. However, there appeared to relatively little knowledge of how these systems work. Distributors and contractors expressed caution that any new product for the light commercial market would need to be cost competitive. They also indicated that buyers would need to have assurances that evaporative systems would be reliable and have low maintenance needs (similar requirement for all light commercial HVAC products).

6. Conclusions

One objective of this study was to examine the key players and supply chain relationships in the light commercial market sector. A few conclusions related to this objective are:

- Based on ARI shipment data, the light commercial HVAC market size in 2004 was estimated to be near 6,800 packaged units per year (about 58,000 tons). Two market estimates completed prior to this project were evaluated for comparative purposes. These prior market estimates used indirect metrics (commercial building stock and census data) and yielded market estimates in the range of 9,000 to 9,600 light commercial units per year. One explanation for the difference could be economic fluctuations. Another could be overlap between large residential and small light commercial equipment.

- In the light commercial HVAC market in the Pacific Northwest, the "Big Three" manufacturers are Trane, Carrier, and Lennox. These manufacturers supply approximately 95% of the light commercial equipment for this region.

- The results of this study show that there are six major distributors of light commercial HVAC products in the Pacific Northwest. These distributors have multiple offices throughout the region. Trane light commercial products are available through Trane factory distribution offices and one independent distributor. Carrier products are offered through independent distributors, and Lennox products are distributed exclusively through Lennox factory distribution centers.

- The number of manufacturers and distributors is relatively small, but there are several hundred contractors in the Pacific Northwest who buy light commercial HVAC products from distributors and then install this equipment. It is estimated that there are about 800 contractors involved the light commercial HVAC industry in the Pacific Northwest.

- Even though there are several hundred contactors, there is likely a relatively small group of contractors that install the majority of light commercial equipment. For example, the Lennox office that distributes equipment for the Seattle Metro region recommends three mechanical contractors. These three mechanical contractors are referred to as Lennox "Alliance" partners, and account for the majority of light commercial Lennox equipment installed in the Seattle Metro region. Similar recommendations for preferred contractors were not obtained from other distributors, but most distributors are believed to have preferred contractors.

A second objective was to examine market perceptions related to the introduction of energy efficient products such as indirect evaporative cooling systems. The distributors and contactors that participated in this project had relatively little experience with evaporative cooling. None of the distributors or contractors interviewed sold evaporative cooling equipment, other than the occasional evaporative unit for kitchen make-up air systems. The distributors and contractors did offer suggestions, though, regarding the possible introduction of an innovative new product, such as an indirect evaporative cooling system:

- The light commercial market is typically first cost driven, and products need to be competitive on a first cost basis.

- Low maintenance requirements are important for light commercial equipment. When maintenance is required, the units need to be easy to service.

- Utility rebate programs can play an important role in reducing the first cost of innovative energy efficient products, thereby helping these products gain market share.

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