



Application Guideline

The Evolution® V variable speed heat pump provides a flexible alternative to high-priced variable speed systems on the market today, as well as a competitive option compared to 2-stage products currently being offered. Its highly efficient, smaller and lighter design offers many benefits to dealers and homeowners alike. This document outlines the recommended application guidelines and differences from other products.

Overview

The Evolution® V is an inverter-driven variable speed heat pump designed for the ducted residential market. Its size and weight advantage makes it easier for dealers to handle and stock, and allows for high-efficiency installations in tighter spaces than previously possible. It is designed to complement the dealer's product offering by adding a second variable speed option at a lower performance level and price compared to the Evolution® Extreme.

Benefits of Variable Speed

Variable speed systems provide several benefits to the homeowner. The capacity range of the system allows it to more closely match the home's needs as conditions change. This increases indoor comfort by running longer comfort cycles at lower speeds thus eliminating up and down temperature swings. Longer cycles at lower speeds also translate into higher efficiency, and lower overall sound levels both indoors and outside. The wide capacity range also improves zoning and dehumidification capability compared to 2-stage and 1-stage systems.

Choosing the Correct Variable Speed Heat Pump System

With the introduction of the Evolution[®] V heat pump, a second variable speed choice is now available. Choosing the correct system should be based on the customer's needs and wants. If the customer desires top of the line system with highest efficiency, heating performance and full capacity modulation, the Evolution[®] Extreme is the right choice. If the customer desires variable speed but their budget does not allow for the highest performing system, or space requirements are tight; Evolution V is the right choice.

The chart below shows the major differences between Bryant's Evolution[®] heat pump line.

	Evolution[®] Extreme	Evolution[®] V with Connex[™] Control	Evolution[®] 16 SEER 2-stage HP
SEER	Up to 20.5	Up to 18	Up to 17
EER	Up to 16	Up to 12.5	Up to 13.3
HSPF	Up to 13	Up to 11	Up to 9.5
Compressor Type	Variable-speed Scroll	Variable-speed Rotary	2- stage Scroll
Compressor Stages	Fully modulating – 1% increments as low as 40%	5 stages as low as 25%	2 stages as low as 70%
Line length	Up to 250ft equivalent length	Up to 100ft. equivalent length	Up to 250ft equivalent length
Fan motor	ECM with module attached	Compact ECM(Brushless DC) No module attached Inverter driven	Standard PSC
Ambient range	Cool: 55°-125°F (12.8°-51.7C) Heat: -15 - 66 °F(-26.1°-18.9C) Low ambient cooling capable with Evolution Control	Cool: 40°-115°F communicating (4.4°-46.1°C) Cool: 55°-115°F non-communicating (12.8-46.1°C) Heat: 10 - 66°F(-12.2-18.9 °C) Not initially qualified for Low ambient cooling	Cool: 55°-125°F (12.8°-51.7C) Heat: -20 - 66 °F (-28.9°-18.9C) Low ambient cooling capable with without Evolution Control or kit
Sound	58dBA – 76 dBA	55dBA-73 dBA	68dBA – 73dBA
Basepan sizes	35"x35" all tonnages	2 and 3 ton - 23"x23" 4 and 5 ton – 31.25" x 31.25"	35"x35" all tonnages
AHRI Ratings with	Evolution Communicating indoor for full variable speed functionality with Connex [™] Control	Evolution Communicating indoor for full 5 stage functionality with Connex [™] Control Preferred [™] 2-stage indoor for 2-stage functionality with non-communicating 2-stage thermostat	Evolution Communicating indoor 2-stage functionality with Connex [™] Control Preferred [™] 2-stage indoor for 2-stage functionality with non-communicating 2-stage thermostat

Evolution® V Heat Pump System Matching

This heat pump unit provides the most customer benefit and highest efficiency **when installed as a complete Evolution system including Evolution Connex™ Control.** Acceptable system combinations will be listed in the AHRI and in My Bryant Ratings database on HVACpartners.

For increased system flexibility, and increased replacement opportunities, this outdoor unit is also designed to work with standard non-communicating thermostat inputs. Combination ratings are available with some non-communicating 2-stage indoor units such as the FV4C fan coil. When utilizing this type of indoor unit, a standard non-communicating 2-stage thermostat is required, and the system will operate with 2-stage functionality.

Compatibility with existing indoor equipment (also see attached flowchart)

Because this unit is designed to work with communicating or standard thermostat inputs, it opens up opportunities for replacement applications. However, the indoor components must be of suitable size and configuration.

Existing Evolution® communicating indoor equipment

The Evolution V is backward compatible with all Evolution communicating indoor equipment. However, the old style Evolution wall control is not compatible with the Evolution V unit in communicating mode (see Figures 1 and 2 below). The software in the old style control will not recognize the outdoor unit. For full system capability with older indoor equipment, the wall control must be upgraded to the Evolution Connex™ control with appropriate software.

Figure 1. Old style control



Figure 2. Connex™ control



Check ratings for system matches with FE fan coil. These ratings can be applied to old and new FE fan coils units.

NOTE: The 2 and 3 ton Evolution V models are **NOT** compatible with the FE4ANB006 due to the large size of the indoor coil

For Hybrid Heat™ dual fuel systems, the furnace must have a suitable blower size. Indoor coils built in 2006 or newer may be straight matched to the outdoor unit tonnage or one size larger*. A Puron® refrigerant TXV is required on the indoor coil. Indoor coils built between 2005 and 1992 must be one or two tonnage sizes larger than the outdoor unit tonnage*. A Puron refrigerant TXV must be added to the indoor coil.

Existing 2-stage indoor equipment

The Evolution® V is capable of operating with a standard 2-stage thermostat and non-communicating 2-stage indoor equipment. In this case, the outdoor unit will be wired as a 2-stage system, and will operate as a 2-stage system. Combination ratings will be available with FV4C fan coils and some furnace/coil combinations. These ratings will apply to both new and existing equipment of like model numbers.

An older FV4(A,B) of like size may be used. The model plug in the outdoor unit must be changed for proper matching of airflow to compressor speed in low stage heating. See outdoor unit Product Data for model plug part number.

An older FK4 or 40FK fan coil of like size may be used with the addition of a Puron refrigerant TXV. The model plug in the outdoor unit must be changed for proper matching of airflow to compressor speed in low stage heating. See outdoor unit Product Data for model plug part number.

NOTE: In replacement situations, the 2 and 3 ton Evolution V heat pump models are **NOT** compatible with the FV4(A,B,C) 006 size, or FK4/40FK 006 size.

For existing Hybrid Heat™ dual fuel systems, the furnace must have a suitable blower size and staging capability. Indoor coils built in 2006 or newer may be straight matched to the outdoor unit tonnage or one size larger*. A Puron refrigerant TXV is required on the indoor coil. Furnace coils built between 2005 and 1992 must be one or two tonnage sizes larger than the outdoor unit tonnage*. A Puron® refrigerant TXV must be added to the suitable indoor coil.

Set furnace high stage airflow at 350-400 cfm/ton
Set furnace low stage airflow at 70-80% of high stage

* Examples:

- Straight matched to outdoor unit tonnage- 3-ton Evolution V with 3-ton furnace or fan coil
- One size larger indoor – 3-ton Evolution V with 3.5 ton furnace or fan coil
- 2 sizes larger indoor – 3-ton Evolution V with older 4 ton furnace coil

Existing 1-stage indoor equipment

The Evolution[®] V will work with a 1-stage thermostat as a 1-stage system with suitable indoor coil and fan until the indoor components can be upgraded to provide full variable speed functionality.

Fan coil application – if the fan coil was built in 2006 or after, it may be straight matched or one size larger than the outdoor unit tonnage*. If built between 2005 and 1992, the fan coil must be one size larger than the outdoor unit tonnage*. A Puron[®] refrigerant TXV is required on the indoor coil.

Furnace coil application – if the furnace coil was built in 2006 or after, it may be straight matched or one size larger than the outdoor unit tonnage*. If built between 2005 and 1992, the furnace coil must be one or two sizes larger than the outdoor unit tonnage*. A Puron refrigerant TXV is required on the indoor coil.

Set airflow at 350-400 cfm/ton

Line set limitations

The Evolution V is qualified for line sets up to 100ft equivalent length.

Lift limitations:

Outdoor above indoor: 100 ft.

Outdoor below indoor:

2 ton	3 ton	4 ton	5 ton
80ft	80ft	70ft	60ft

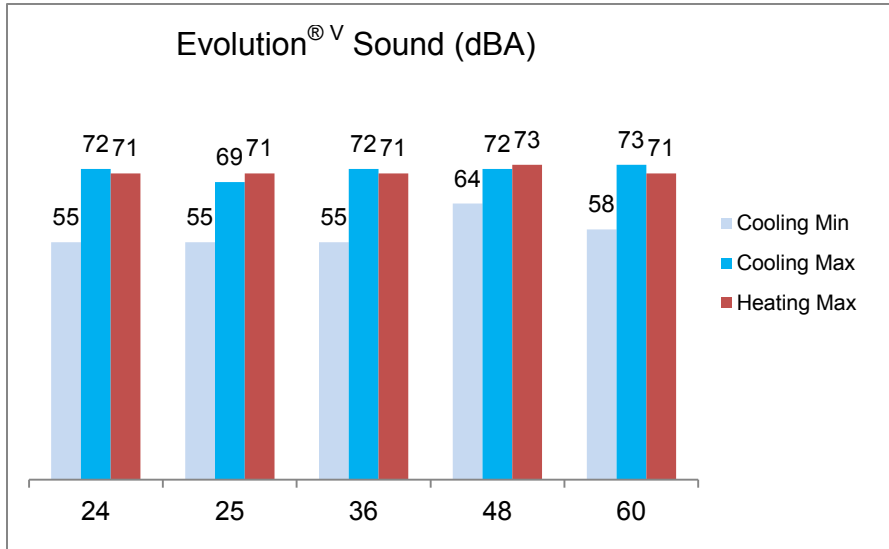
See Product Data for line set diameter requirements

* Examples

- Straight matched to outdoor unit tonnage- 3-ton Evolution V with 3-ton furnace or fan coil
- One size larger indoor – 3-ton Evolution V with 3.5 ton furnace or fan coil
- 2 sizes larger indoor – 3-ton Evolution V with older 4 ton furnace coil

Sound

The Evolution[®] V Variable Speed heat pump adjusts its operating speed through 5 available stages. The operating stage will depend on the load demand of the home as well as outdoor temperature. The operating sound can vary significantly between cooling to heating modes; from as low as 55 dBA in minimum cooling stage to 73 dBA in maximum heating stage. The unit will operate at low stages the majority of the time and increases to maximum speed only at cold outdoor temperatures. See chart below for sound ranges.



The Evolution V heat pump will operate extremely quietly in cooling mode and will likely receive only complements from customers regarding its sound. In heating mode, the unit will operate at higher compressor RPM's at cold outdoor temperatures and the sound may be noticed by the customer while it was totally inconspicuous during the summer. Make the customer aware of these sound differences and let them know that the higher speed in heating mode helps the system deliver high efficient and comfortable heating.

Another sound that may be heard by customers is the equalization of pressures in the off-cycle. This unit contains a pressure equalizer valve that is designed to allow easier starting of the rotary compressor (see Figure 3 below). It will energize in the off-cycle to equalize pressure across the compressor. A hissing sound may be heard during this process. This sound is normal, but the customer should be made aware to avoid nuisance callbacks.

Figure 3. Pressure Equalizer Valve



To avoid sound complaints, the following guidelines should always be followed:

Sound DO's

1. Explain the sound range to the customer so that they understand the differences they will hear throughout the year. The higher speeds in heating, while happening for minimal time periods, help produce comfortable and efficient heating during times of more extreme cold.
2. Explain the defrost cycle to customers. The Evolution[®] V has a defrost cycle like any heat pump and the sound may be noticeable during winter months. Explain that this is normal for heat pump and required for efficient operation
3. Explain the equalization sound described above to customers to avoid nuisance callbacks.

Sound Don'ts

1. Do not install this heat pump, or any other heat pump, outside bedroom windows. The defrost cycle will likely be heard through the window during winter and may cause customer complaints
2. Due to the wide operating range of this unit in heating mode, it is particularly important to follow published installation guidelines regarding refrigerant lines. **Do not** attach refrigerant piping to structural joists or beams in the home. This can transmit vibration and sound into the home which can cause customer complaints. If the lineset is hard mounted to structural members, an accessory vapor line muffler is recommended to minimize transmitted sound. See Product Data for muffler part number.

EER Rating vs. Equipment payback

The published EER rating represents efficiency of cooling products at peak load, or 95°F (35°C). This rating is driven by utility companies that are concerned with power consumption at peak demand periods. In most locations, peak load is experienced for a very short time during a year (see charts below). The Evolution® V system is designed for high efficiency at lower load conditions, which represents the vast majority of the cooling and heating season. This is why the SEER and HSPF ratings are high, but the EER is not as high as other high-efficiency products. Focusing on SEER allows the smaller unit design, and competitive price compared to high EER variable speed products. Some local rebates contain an EER requirement, while others do not.

A cost payback analysis should be done to compare benefit of rebate with EER component vs. initial cost and energy savings. Things to consider regarding rebates containing EER requirements:

(Cost of qualifying EER equipment) – (rebate amount) = _____

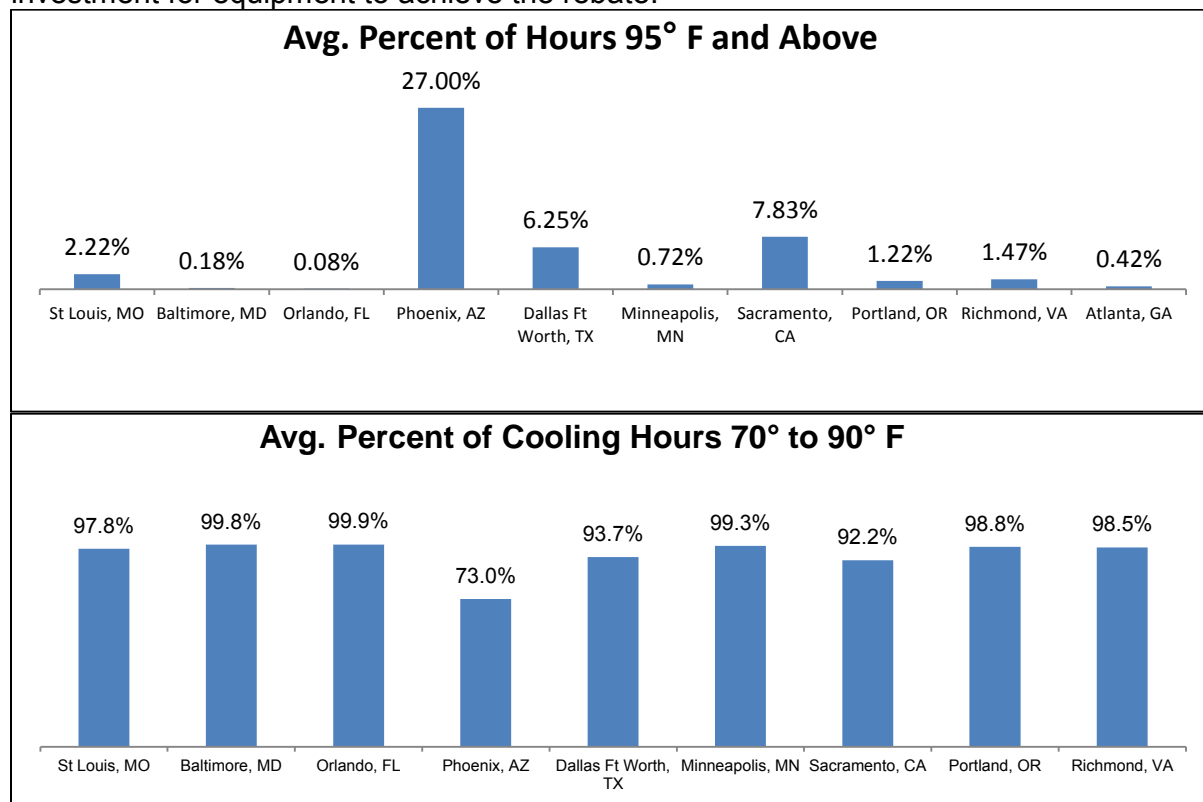
Cost of Evolution V equipment = _____

Yearly operating cost of qualifying EER equipment using Opcost calculator = _____

Yearly operating cost of Evolution V equipment using Opcost calculator = _____

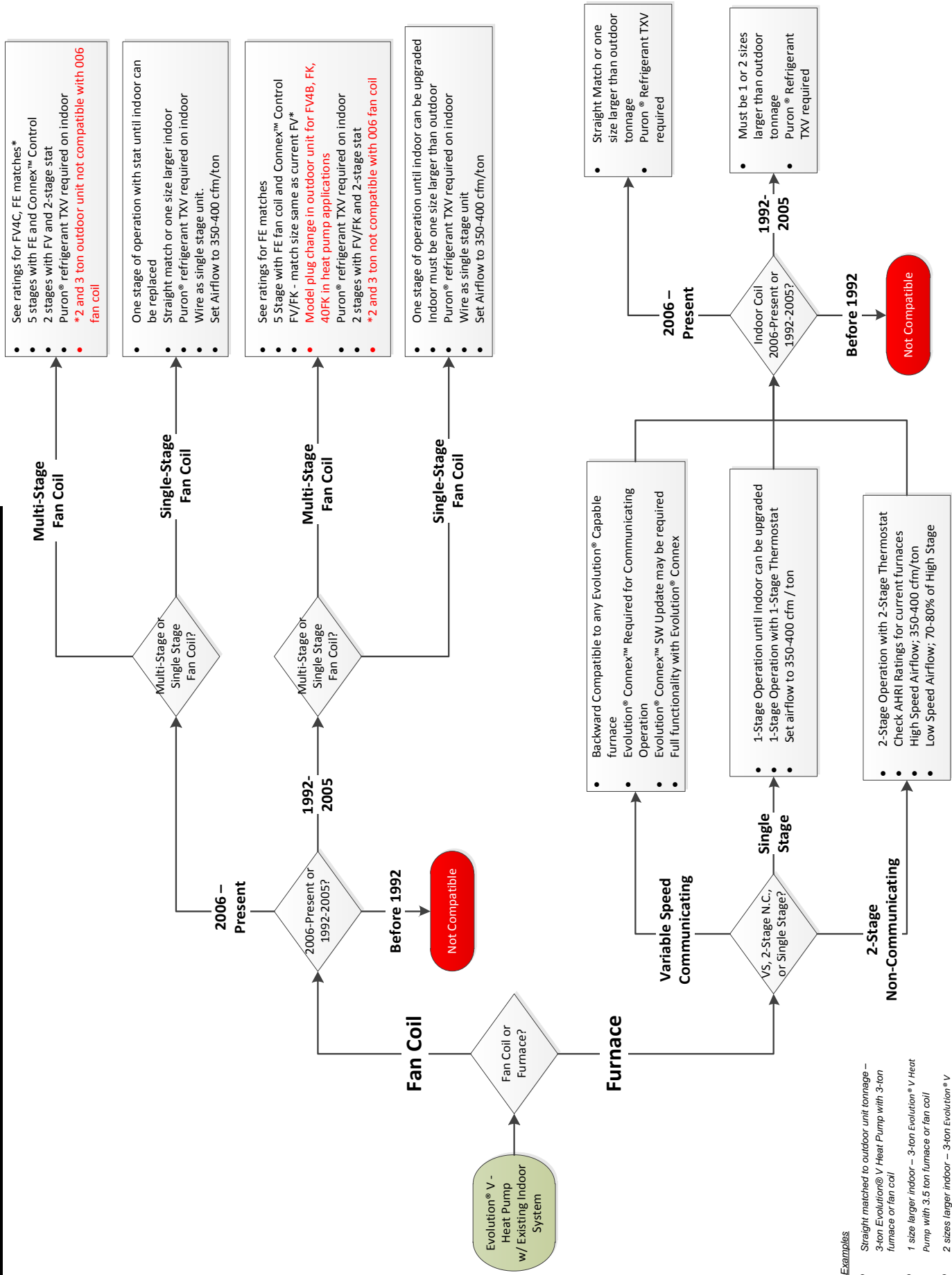
(Difference in system cost) / (yearly operating cost of Evolution V – yearly operating cost from high EER equipment) = _____

The end number above represents number of years for payback of the additional investment for equipment to achieve the rebate.



Source: TMY3 (typical meteorological year) data sets derived from the 1991- 2005 National Solar Radiation Data Base (NSRDB) update

Evolution® V Heat Pump System Matching with Existing Indoor Equipment



* Examples

- Straight matched to outdoor unit tonnage – 3-ton Evolution® V Heat Pump with 3-ton furnace or fan coil
- 1 size larger indoor – 3-ton Evolution® V Heat Pump with 3.5 ton furnace or fan coil
- 2 sizes larger indoor – 3-ton Evolution® V Heat Pump with older 4 ton furnace coil

