HEAT PUMP TECHNICAL AND MARKET ADVANCES 2010-2023

EFFICIENCY IMPROVEMENTS OF 16 TO 28%

IMPROVED DEFROSTING & CAPABILITY TO PROVIDE HEATING BELOW 0 F

HIGHER CAPACITIES AND EFFICIENCIES BELOW 30F

GOING FORWARD

MAKE THE THE HEAT PUMP PURCHASING PROCESS EASY.

HEAT PUMPS BECOME THE STANDARD SYSTEM FOR HOMES.

GREATLY EXPANDED HEAT PUMP PRODUCT OFFERINGS

GREAT FINANCIAL SUPPORT

MORE BALANCED NG/ELECTRIC FUEL PRICES

SIMPLE HEAT PUMP SOLUTION OPTIONS

Building a new home

Existing homes with ducts

Existing homes without ducts.

- Radiant in-floor, baseboards or wall units.

NEW HOMES GENERAL PRINCIPLES

Always Cold Climate Heat Pump in Colorado

- Size the heat pump system correctly (Manual J) so it has the capacity for 100% house heating at 10F outdoor or lower.
  - This minimizes the use of supplemental heat.

With well built insulated homes air systems are as comfortable as radiant systems.

A fresh air heat recovery system is essential.

Consider the basement, main floor and 2nd floor needs as three puzzle pieces of the whole house.

If you are in an area where winter power outages are a concern, there are several backup options

- Fireplace, pellet stove, wood stove. Blowers will need a small battery backup system.
- Heat pump system with a furnace (dual fuel). Furnace blower will need battery backup.

NEW HOMES - 3 HEAT PUMP CENTRIC HVAC STRATEGIES

Ducted Heat Pump System(s)

- Lowest installed cost
- No neighborhood pollution or very low pollution (dual fuel system).
- Ducting takes up more space
- Easy to add filtering to the system
- Easy to add fresh air and humidification.
- More difficult to have many zones. Minimum 1 zone thermostat per floor

Multi-zone ductless mini-split heat pump system(s) with electric radiant for small rooms.

- Middle installed cost
- No neighborhood pollution
- No ducting saves space
- Filtering built-in to indoor units
- Requires separate fresh air and humidification system.
- Easy zoning flexibility.
- Side note: Ductless mini-splits are also a good strategy for new additions to existing homes.

Combo ductless multi-zone ductless mini-split heat pump system and radiant in-floor boiler system

- Highest installed cost
- Some neighborhood pollution depending upon balance of heat pump and boiler use.
- No ducting saves space
- Filtering included where mini-splits are used
- Requires separate fresh air and humidification system.
- Maximum zoning flexibility.

Three floors three puzzle pieces example. Basement: small electric heaters, Main: Ducted, Second Floor: Ductless

Given the same efficiency level of cold climate heat pump for each of the above scenarios the annual heating and cooling costs and GHG emissions over a 15-year lifespan will very close.

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EXISTING HOMES WITH DUCTS

3 HEAT PUMP SYSTEM OPTIONS

Cold climate heat pump system properly sized to heat down to ~10F (CO) with supplemental furnace (Dual fuel).

- Heat Pump ~85%+ of heating. 9-10 months of the year.

High efficiency heat pump system properly sized to heat down to ~20F (CO) with supplemental furnace (Dual fuel).

- Heat pump ~75%+ of heating. 7-8 months of the year.

Cold climate heat pump system properly sized to heat down to ~10F (CO) with fan coil supplemental electric.

- Likely will require electrical panel upgrade.

Existing Homes with Ducts – Heat Pump Replaces Air Conditioner

Air Conditioner

- Failure needs replaced
- Aging AC (12+yrs) planned replacement
- Add a new AC

Furnace less than 13 years old

Heat Pump Solution - Keep furnace.

- Add a cold climate or high efficiency heat pump.
- Lean toward the same brand as your existing furnace
- Get quotes for both heat pump options.

Furnace 13-18 years old

Heat Pump Solution

- Get quotes for both all options
  - Keep furnace or replace furnace
  - Cold climate or high efficiency heat pump.

Furnace greater than 18 years old

Heat Pump Solution – Replace furnace

- Replace both the furnace and air conditioner.
- Three options.
  - Cold climate and new furnace.
  - High efficiency and new furnace.
  - Cold climate heat pump system with fan coil
- Get a matched heat pump system of the same brand

Existing Homes with Ducts – Heat Pump Replaces Furnace

Furnace

- **Failure needs replaced**
- **Aging Furnace (20+yrs) planned replacement**

Natural gas furnace

Propane or electric furnace

AC less than 7 years old

AC greater 8+ years old or no current Air Conditioner

Replace furnace and keep AC.

- **Plan to replace AC with heat pump in few years**

Heat Pump Solution

- **Replace both the furnace and air conditioner**
- **Three options.**
  - **Cold climate heat pump and new furnace**
  - **High efficiency heat pump and new furnace**
  - **Cold climate heat pump system fan coil and no furnace.**
- **Get a matched heat pump system of the same brand**

Existing Homes with Ducts – Reduce my energy use & GHG footprint

Aging Furnace (12+yrs) and Air Conditioner (8+ years)

- **Planned replacement**

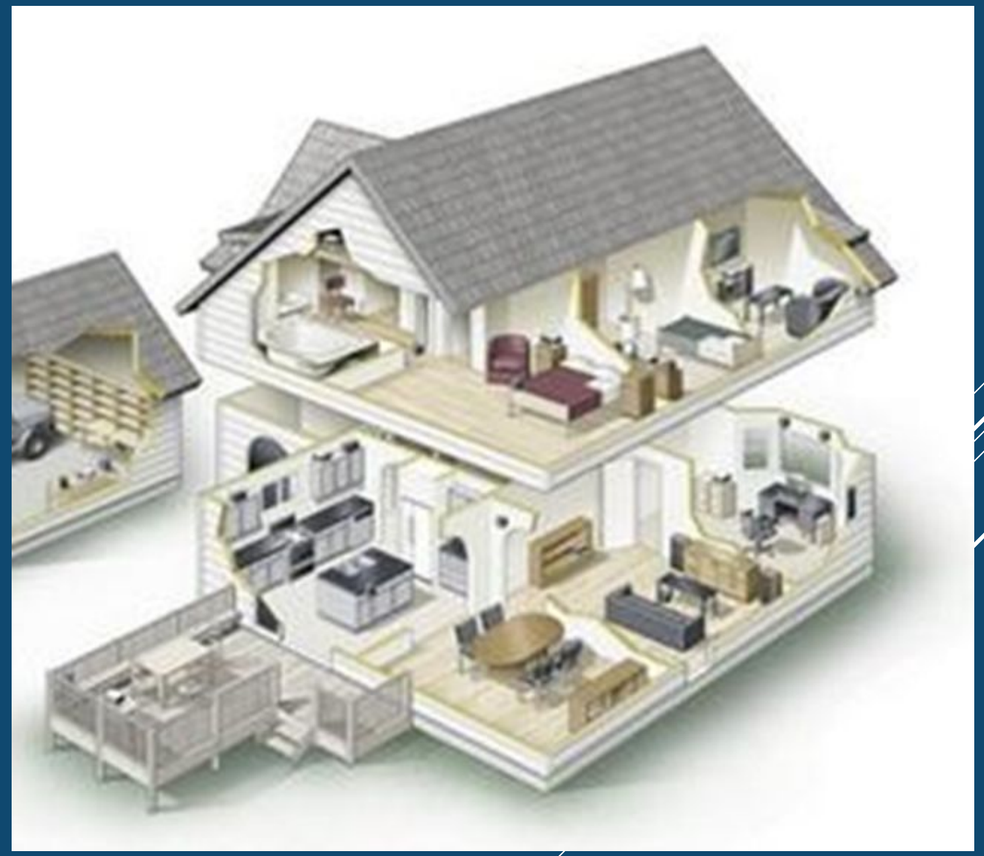
Heat Pump Solution

- **Replace both the furnace and air conditioner.**
- **Three options.**
  - **Cold climate heat pump system fan coil**
  - **High efficiency heat pump and new furnace**
  - **Cold climate heat pump and new furnace**
- **Get a matched heat pump system of the same brand**

Ductless Mini-Splits for Radiant Heated Homes & Additions

Your priority determines the best strategy

- Savings on your heating bill and emissions reduction.
  - Especially for electric or propane heated homes. 60+% savings.
- Cooling and increased comfort.



Savings and Emissions Reduction

- What are the largest volume room(s) in your home that can be served with 1(2) indoor units?
- Maximize volume for each indoor unit for best value

Cooling and comfort

- How many rooms are uncomfortable.
- Can I use to a slim ducted unit for a couple of bedrooms.

Cold Climate or High Efficiency Heat Pump

- Existing system electric heat or propane. Cold climate heat pump.
- Existing system natural gas. High efficiency or cold climate heat pump.

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DEAR HOMEOWNER

Insist on heat pump options.

There are many resources to help you.

Get 2-4 quotes.

Pricing in Colorado is widely variable.

Equipment brand

Carefully compare system parts, labor and compressor warranties.
Should have a distributor in Colorado that carries the product line.

Contractor experience

With the brand.
With the type of equipment; ducted or mini-split ductless.

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David Petroy has over 15 years of experience in a range of renewable energy/sustainability and business roles.

- Founder/President of Blue Valley Energy a successful HVAC and ground source heat pump engineering design and installation company in Boulder, Colorado.
- Project lead; sales and system design of solar and energy power systems for residential and small commercial businesses at RMS Electric.
- Energy and sustainability manager for Golden Aluminum Industrial Rolling Mill.
- He received an MS in Geophysics from Washington University in St Louis.

He is founder NTS Energy a consulting company focused on HVAC and energy solutions for homeowners and small commercial/industrial companies. Our goal is to ensure you know the benefits and costs of all options before deciding on a system for your home or commercial facility. Customized services to meet your needs, from feasibility study to project oversite.