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SOUTHWEST ENERGY EFFICIENCY PROJECT

Electrify your home in 2023

February 16, 2023

HEAT PUMP WEBINAR

February 16 12pm MT

Electrify your home in 2023!

NEIL KOLWEY

Building Electrification Specialist, SWEEP

RACHEL ELLIS

Communications Fellow, SWEEP

DAVID PETROY

Founder, NTS Energy

ROB FOLEY

Technical Solutions Specialist, ICAST

swenergy.org

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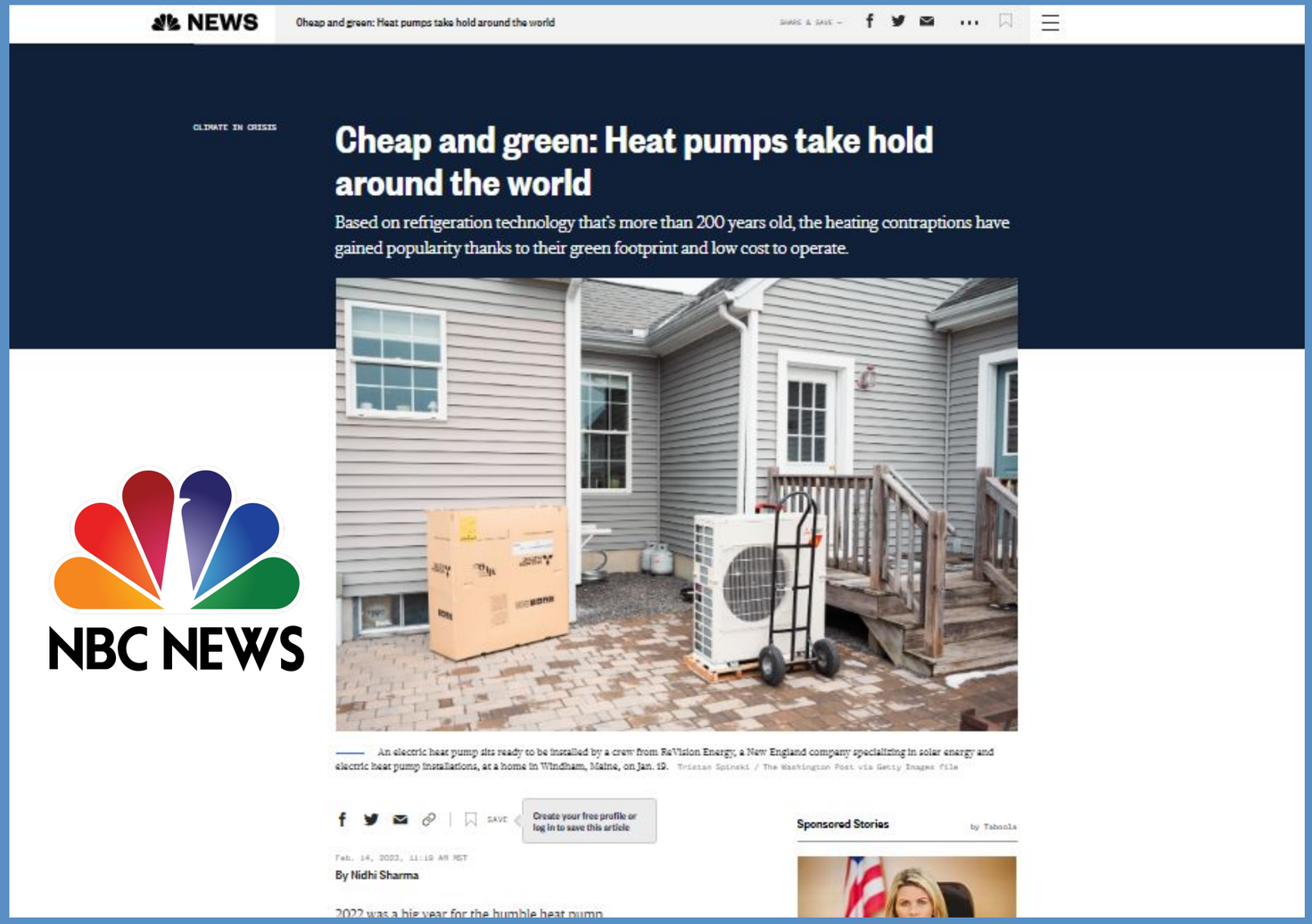
NBC News, Feb 14, 2023

“After buying an electric vehicle or taking the bus more often or carpooling to reduce their travel-related emissions, maybe people hear about heat pumps. The next-biggest-impact thing they can do personally is to install a heat pump to reduce their emissions from heating their home,” said Neil Kolwey, Building electrification specialist at the Southwest Energy Efficiency Project. “And hopefully they save a little money on their heating bill at the same time.”



NEWS

Cheap and green: Heat pumps take hold around the world

CLIMATE IN CRISIS

Cheap and green: Heat pumps take hold around the world

Based on refrigeration technology that's more than 200 years old, the heating contraptions have gained popularity thanks to their green footprint and low cost to operate.

NBC NEWS

An electric heat pump sits ready to be installed by a crew from ReVision Energy, a New England company specializing in solar energy and electric heat pump installations, at a home in Windham, Maine, on Jan. 19. Tristan Spinski / The Washington Post via Getty Images file

SAVE

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Feb. 14, 2023, 11:19 AM MST

By Nidhi Sharma

2022 was a big year for the humble heat pump

Sponsored Stories by Taboola

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Tech specs

- Enter questions into the Q&A box and we will try to get to most them at the conclusion of the presentations.
- A recording of this webinar will be available.
- Full slide deck will be available.

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About SWEEP

Founded in 2001, the Southwest Energy Efficiency Project (SWEEP) is a public interest organization promoting greater energy efficiency and clean transportation in Arizona, Colorado, Nevada, New Mexico, Utah, and Wyoming.

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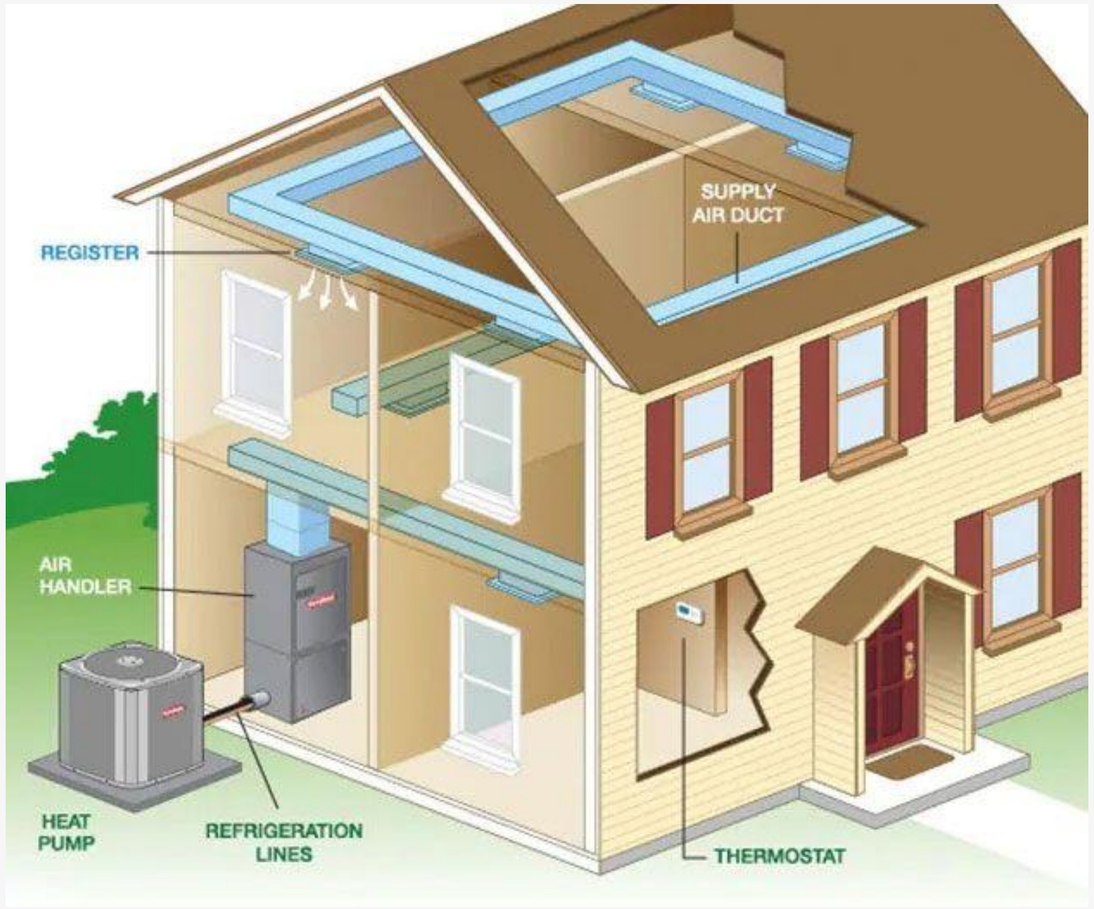
Webinar overview

Show me the money!
Neil Kolwey, SWEEP

Success stories
Rachel Ellis, SWEEP

Heat pump technical tips
Dave Petroy, NTS Energy

Multi-family success stories
Rob Foley, ICAST



Heat pump basics

- Like a reversible air-conditioner – they cool the home in the summer and heat it in the colder months.
- Can be either ducted or ductless (or a hybrid of the two).
- “Cold-climate” heat pumps are designed to operate efficiently down to -5 F or lower.

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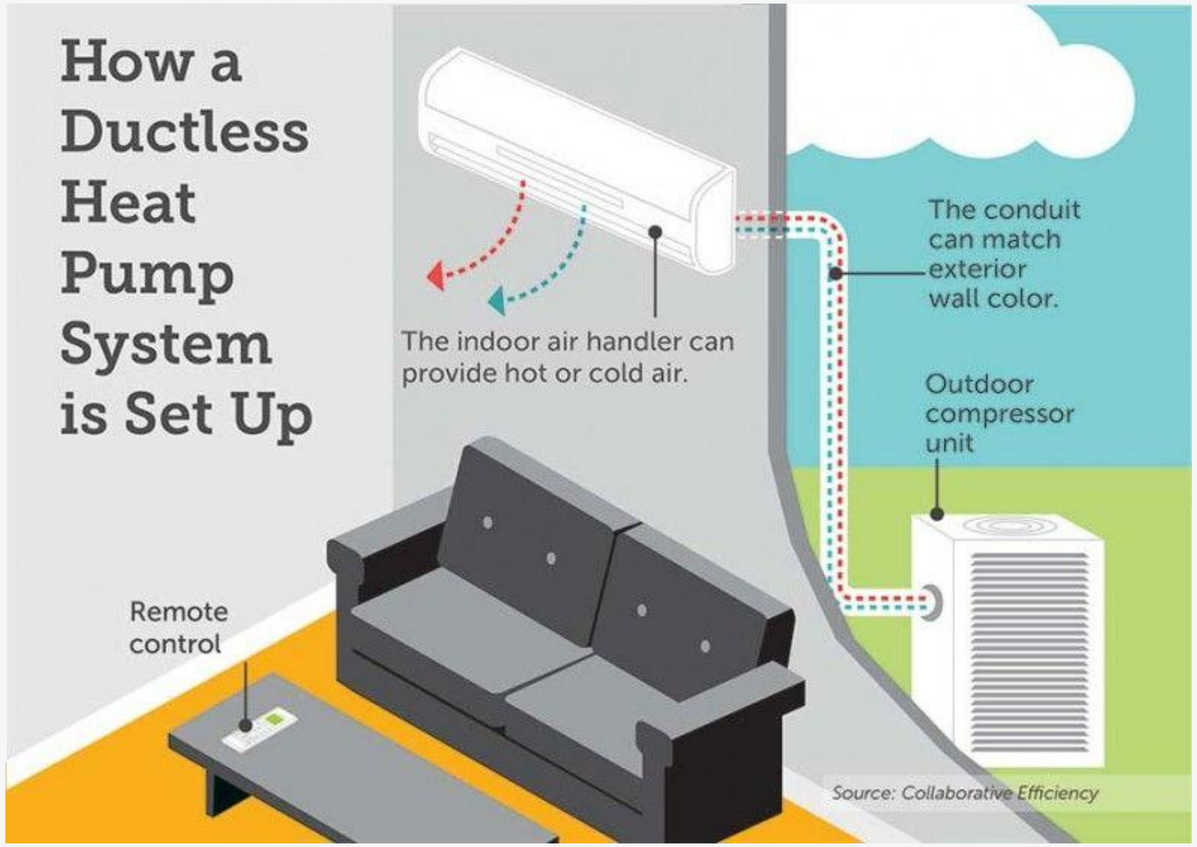

Ductless heat pumps

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Current state of the heat pump market

Who We Are News & Updates Events

Love Electric

Why Love Electric Get Plugged In New Homes Resources info@loveelectric.o

Home — Heating & Cooling

Heating & Cooling

Installing an efficient electric heat pump will help you reduce your energy costs (in many cases) and reduce your carbon footprint, while improving indoor air quality and comfort in your home.

https://loveelectric.org/new-homes/

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Tax credits and rebates for existing homes

Federal/IRA rebates and tax credits for existing homes

30% tax credit up to $2,000 per taxpayer, for heat pumps and heat pump water heaters (HPWH), meeting minimum efficiency standards (next slide); 30% tax credit up to $1200 for home energy efficiency improvements.

In 2024 (at some point), either a or b may also apply (not both):

- (HEEHR)* If homeowner is income-qualified, there are additional rebates on heat pumps and HPWHs. Levels determined later by the state energy office.
- (Hope for HOMES) If doing a comprehensive set of energy efficiency improvements, there are additional rebates. Amounts based on energy savings, and to be determined later by the state energy office.

*HEEHR – High Efficiency Electric Homes Rebates

Heat pump minimum efficiency requirements for IRA tax credits

Northern States
Colorado, Utah, Wyoming

- Cold-climate heat pump (on NEEP list) with HSPF 9.5+/10.6+, SEER 16.0+/16.8+ (ducted/ ductless)

(Note: For come applications we might suggest an efficient heat pump that does not necessarily qualify for the IRA tax credit.)

Southern States
Arizona, Nevada, New Mexico

- High efficiency heat pump (not necessarily cold-climate), HSPF 9.2+/10.0+, SEER 16.0+/16.8+ (ducted/ductless)

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State tax credits for existing homes

Colorado

For equipment cost of heat pumps and heat pump water heaters (HPWHs):

- 10% state income tax credit
- Exempt from state sales tax (2.9%)

New Mexico

- $1,000 for Energy Star heat pump
- $350 for Energy Star heat pump water heater

Utility rebates for heat pumps

(Rebates go to homeowner)

Tri-State Member Co-ops

- For “tier 1” (efficient, non-cold-climate) heat pump >2 tons – rebate of $1800.

Holy Cross Energy

- For heat pumps, rebates of 25% of project cost up to $5,000. (Heat pumps must meet Holy Cross’ criteria.)

Xcel Energy

- For Tier 1 (efficient, non-cold-climate) heat pump – rebate of $1500 (when/if new plan is approved).

Several local governments and nonprofits have additional rebates (e.g., Boulder, CORE).

All utility and local rebates listed at loveelectric.org/rebates

Summary of rebates for heat pumps for existing homes

1. Federal tax credit: 30%, up to $2,000
2. State tax credit plus sales tax exemption (12.9%) on equipment costs
3. Utility and local rebates in addition

   Example: 4-ton heat pump with equipment cost of $8,000:

Federal tax credit:	$2,000
State tax breaks:	$1,030
Utility (Tri-State):	$1,800
Total:	$4,830

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Financing options

- The Colorado Clean Energy Fund RENU loan program provides low-interest loans to homeowners for energy efficiency or clean energy upgrades (including heat pumps).

- Some heat pump equipment manufacturers provide financing – ask your HVAC contractor.

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Tax credits and rebates for new homes

IRA rebates and tax credits for new homes

The **builder/developer** can receive these tax credits:

a. $2500 for Energy Star certified home.
b. $5,000 for DOE Zero-Energy Ready home.
c. for multi-family buildings, these tax credits are per unit.

In 2024, the HEEHR program will have additional rebates for **low-income buyers** of new homes with heat pumps.

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State tax credits for new homes

Same as for existing homes, but credits go to buyers of new homes.

Colorado

For equipment cost of heat pumps and heat pump water heaters (HPWHs):

- 10% state income tax credit.
- Exempt from state sales tax (2.9%).

New Mexico

- $1,000 for Energy Star heat pump
- $350 for Energy Star heat pump water heater

Utility rebates for heat pumps for new homes

1. **Tri-State Member Co-ops**
   a. Same rebates as for existing homes, but for new homes they go to the builder.
   b. E.g., for “tier 1” (efficient, non-cold-climate) heat pump >2 tons: rebate of $1800.
2. **Holy Cross Energy**
   a. Same rebates as for existing homes, but for new homes they go to the builder.
   b. For heat pumps, rebates of 25% of project cost up to $3,000 for homes heated with electricity, 25% of project cost up to $4,000 for homes heated with gas or propane.
3. **Xcel Energy**
   a. Rebates to builder based on energy savings compared to code requirements.
   b. For example, for home with heat pump and HPWH and 10% energy savings compared to 2018 IECC: rebate of $500.

Summary of rebates for heat pumps for new homes

1. Federal tax credits go to the builder
2. Utility rebates go to the builder
3. State tax credits go to the homebuyer

Example: new home with 3-ton *cold-climate* heat pump and HPWH with total equipment costs of $12,000.

- Rebates to home-buyer: state tax exemptions of $1,550.
- Rebates to builder (assuming served by Tri-State co-op): $2,150 for heat pump and HPWH.

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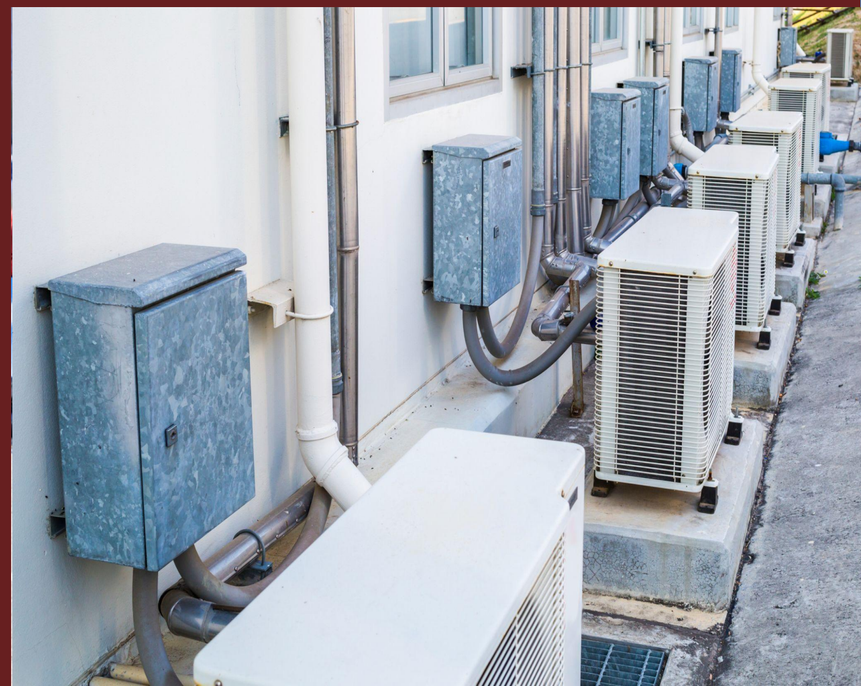
Case studies of existing homes



Upgrades to existing home in Boulder, CO

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Quick facts

- Home Size: 1600 sq. ft
- Upgrades: New heat pump system and gas furnace
- Costs: $20,000 including rebates from Xcel Energy and City of Boulder

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Benefits

- Roughly 80% reduction in gas consumption for heating
- Reduced carbon emissions
- Quiet system
- Comfortable both in heating and cooling modes

Upgrades to existing home in Lakewood, CO

Quick facts

- Home Size: 2670 sq. ft.
- Upgrades: New heat pump system to replace gas furnace system
- Costs: $14,300 after rebates

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Benefits

- Excellent comfort and quiet
- Reduced carbon emissions
- Greater cost savings on energy
- Reduced risk of carbon monoxide

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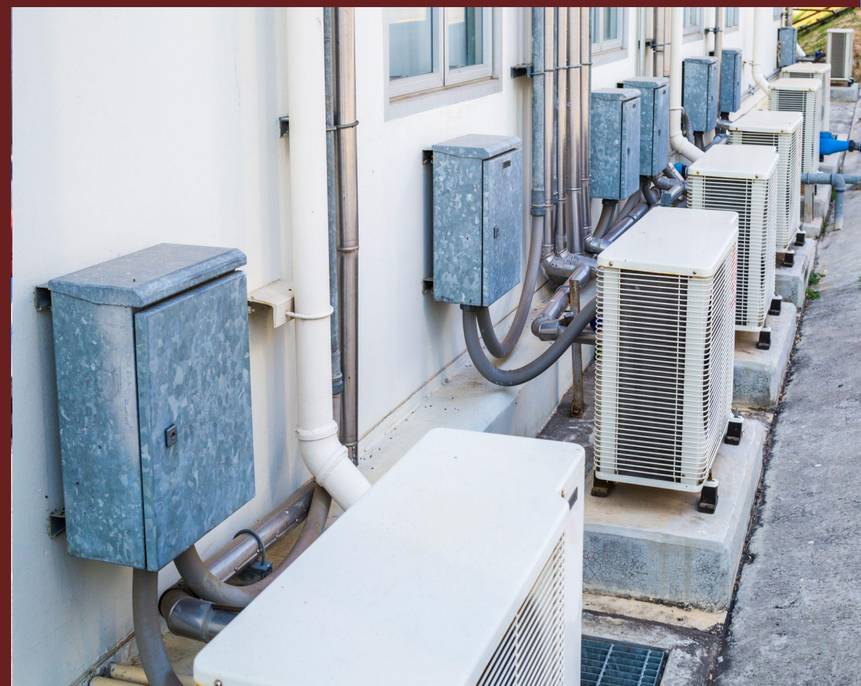
Case studies of new homes



Affordable townhome in Basalt Vista, CO

Quick facts

- Home Size: 1600 sq. ft. townhome
- Electric features: Air source heat pump, induction cooktop/electric range
- Electric features: Solar PV, heat pump water heater
  - *DOE Net Zero Energy

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Benefits

- Low energy costs, at most $15-$20 in a given month
- Comfortable, consistent temperatures even in cold weather
- High performing induction cooktop
- Better indoor air quality

Custom townhomes in Golden, CO

Quick facts

- Home Size: 2300 sq. ft. townhome
- Electric features: Air source heat pump, induction, solar, water heater

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Benefits

- Lower energy costs
- Reduced carbon footprint
- Comfortable, better indoor air quality
- Positive example for his three sons (pictured here)

Conclusion

These case studies show us that...

- There is a growing demand for HVAC companies and architects to do this work.
- If you own or are looking to own a home, you have the power to make it a more efficient one.
- Heat pump technology is dependable and can be made affordable for folks in Colorado and the Southwest.

For a deeper dive into these case studies and additional examples, go to **loveelectric.org/case-studies**

Recommendations for utilities and policymakers

Utilities

- Consider more generous rebates to builders for heat pumps in new homes, and possibly bonuses for zero energy or all-electric new homes.

Local Governments

- Consider “electric-preferred” requirements in building code updates.

HVAC manufacturers and distributors

- Encourage heat pumps over AC
- Increase training and marketing for heat pumps.

Heat Pump System Recommendations and Tips for Homeowners

David Petroy
NTS Energy LLC

DPETROY@NTSENERGYCO.COM
WWW.NTSENERGYCO.COM

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.

DAVID PETROY
NTS ENERGY LLC

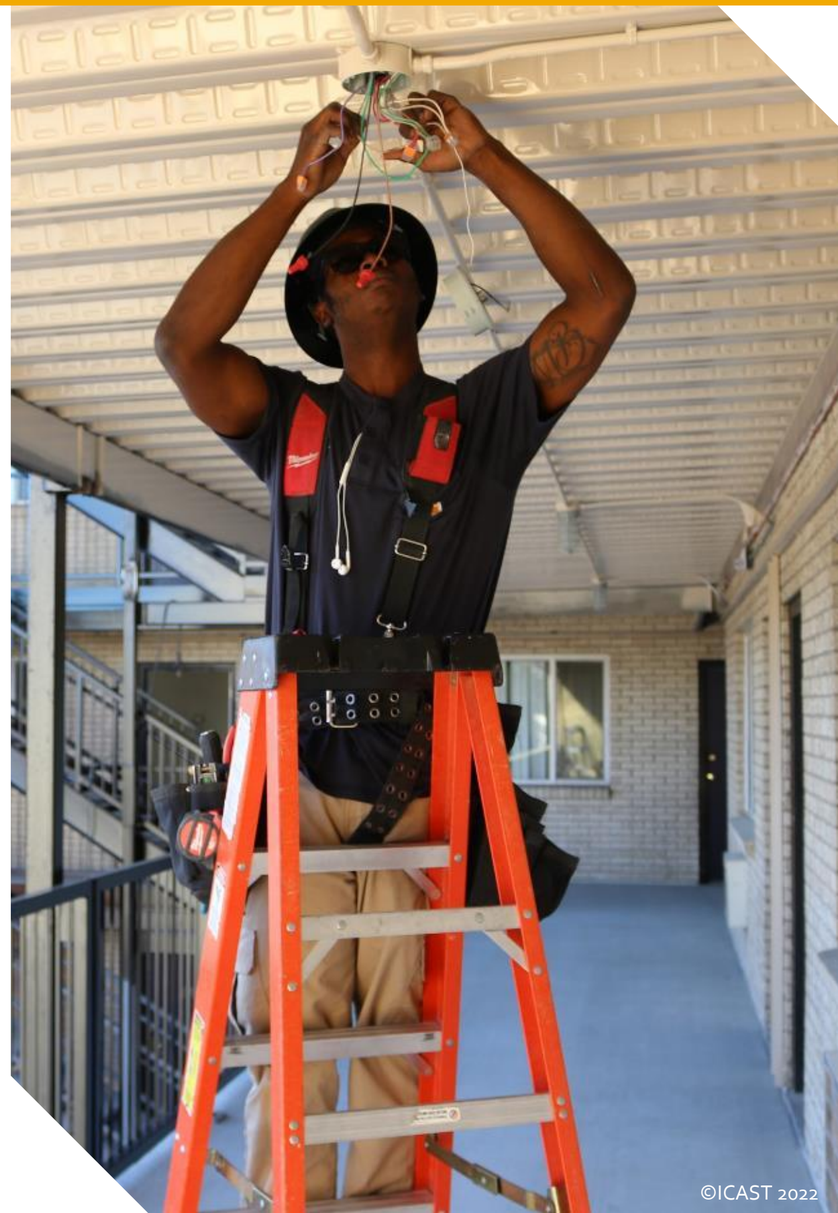
DPETROY@NTSENERGYCO.COM
WWW.NTSENERGYCO.COM

Heat Pumps For Multifamily Buildings

ICAST

Who We Are

- 501C3 national nonprofit
- **Population Served:** Low-to-Moderate Income
- **Market Served**: Multifamily Properties *(cluster of 4+ units under single ownership)*
- **Mission**: Provide economic, environmental, and social benefits to LMI communities
- **Motivation**: Affordability of Housing, Climate Change and Economic Development



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What We Do

- Green retrofits of existing MF properties
  - ✔ One-Stop-Shop for DER installs
- Over 15,000 HP HVAC installs

Case Study

556 23rd Apartments

The Problem:

Tenant complaints – 1) high utility costs; 2) inability to put furniture in desired locations due to the small size of the units.

The Solution:

1) High-efficiency, high wall-head, heat pump HVAC; 2) Incentives to get the desired high-efficiency equipment to work within their budget.

- ✔ Very high- efficiency heat pump HVAC systems
- ✔ Higher Insulation
- ✔ Smart thermostats
- ✔ LED lighting

$39,278 | In Total Rebates From Utilities

48-unit affordable apartment community

Annual Utility Savings **~ $15,056**

Project Payback - **5 years**

Total Project Cost **- $119,596**

Annual kWh Savings **- 130,926**

Carbon Saved Annually **- 120.44 Tons**

Case Study *Stansbury Condos*

The Problem:

A very old and inefficient central boiler and chiller system, with high repair and utility costs paid by all tenants through their HOA dues.

The Solution:

1) Central electric HVAC & unitary heat pump-based HVAC units in each apartment reducing HOA dues for each tenant; 2) Leverage incentives to reduce energy financing costs.

✔ Replacing central boilers and chillers with 75 new very high efficiency heat pump HVAC systems

299,581 | kWh Saved Annually

75-unit market-rate apartment community

Annual Utility Savings **~ $35,950**

Project Payback - **9 years**

Total Project Cost **- $399,800**

Total Rebates **- $74,895**

Carbon Saved Annually **- 275 Tons**

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Lessons Learned

Any complex replacing A/C units is a perfect target

- ✔ No one should ever replace any central A/C unit with anything but a heat pump for the foreseeable future
- ✔ We must make the most of our bite at the apple (replacement cycle timing)
- ✔ Sometimes those replacement cycles come every 30 years!

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Lessons Learned

Since Gas prices have doubled……

- ✔ High efficiency Heat Pumps have operational cost parity with gas

Lessons Learned

IRA incentives will drive scale for retrofits

- ✔ MF market extremely price sensitive
- ✔ Stack incentives where applicable
- ✔ Mini Split type units can also be ducted!
- ✔ Mini Split units provide value price/performance
- ✔ Unitary product lines have a ways to go

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Lessons Learned

Proper Sizing is critical

Like for Like replacements is many times a bad strategy

- ✔ Do Shell improvements first
  - ✔ Insulation
  - ✔ Windows
  - ✔ Air Sealing
- ✔ Have Contractor do Manual J based on improved shell

Lessons Learned

Dual Fuel (80% approach) makes sense

- Where client has hesitancy, gas as back up allays those fears
- It's all about capital cost for owners, so when they are replacing their air conditioners, we should be selling heat pumps.
- Economic Balance Point setting guarantees the cheapest fuel is always used

Lessons Learned

All Electric New Construction has already achieved cost parity

- You don’t have to install gas infrastructure
- More than covers the incremental additional cost of Heat Pumps
- Incentives make Heat Pumps Less expensive than Gas
-
- IAQ becomes a selling point with all electric

Lessons Learned

Contractors MUST be on board with Heat Pumps

- ✔ Most replacement decisions are largely guided by the Mechanical Contractor
- ✔ Many older Mechanical Contractors had negative experiences with Heat Pumps and mut be converted
- ✔ Essential to train contractors in best design/install practices for HP equipment

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Lessons Learned

When doing large projects always do a test install!

Thank You!

Rob Foley
Senior Project Manager, ICAST
505-280-4273 / robertf@icastusa.org

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Thanks!

Any questions?

nkolwey@swenergy.org
rellis@swenergy.org
dpetroy@ntsenergyco.com
robertf@icastusa.org