



The Most Sustainable Ways to **Heat** and **Cool** Your Home

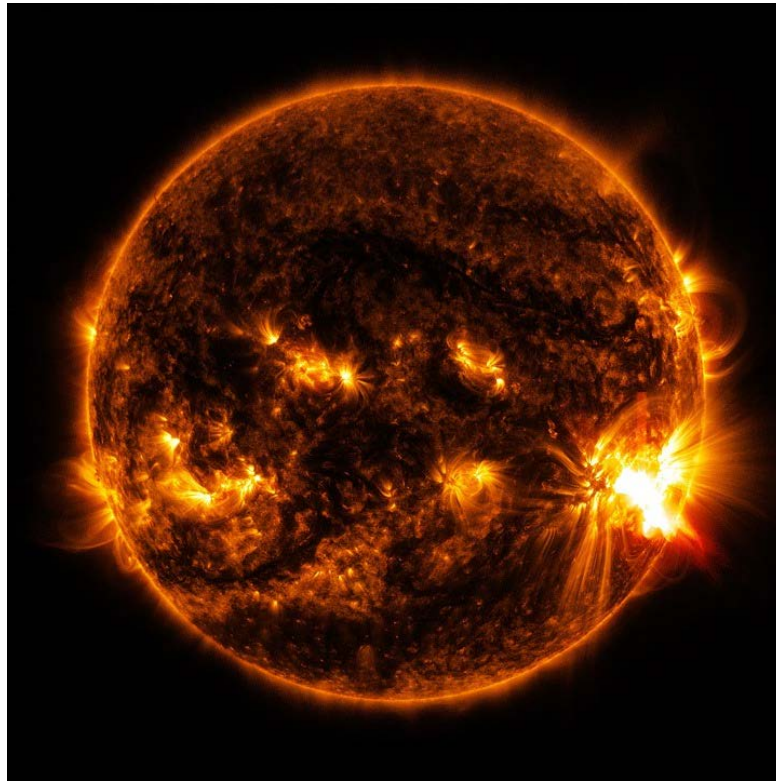
OSU Green Home Workshop 5-16-17

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Heating and Cooling Our Homes Takes Energy



Credit: [Pixabay](#)

What kind of energy?



Fossil



[Flickr](#)

Renewable

Renewable = Electric



Go Renewable Today For Almost Nothing.

Google PUCO. Select your supplier.



Ohio.gov State Agencies | Online Services

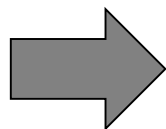
[Home](#)[Compare Offers](#)[About Choice](#)[Electric](#)[Natural Gas](#)[FAQs](#)[Contact Us](#)

Apples to Apples: Electric

[RESIDENTIAL ▸](#)[SMALL COMMERCIAL ▸](#)[LARGE COMMERCIAL/INDUSTRIAL ▸](#)

Go Renewable Today For Almost Nothing.

Select 76-100% renewable content. Switch.



American Electric Power : Residential										
Search	Click to Compare	Supplier	\$/KWh	Rate Type	Renew. Content	Intro. Price	Term. Length	Early Term. Fee	Monthly Fee	Promo. Offers
10 RECORDS FOUND <input checked="" type="radio"/> American Electric Power My Current Rate (Optional) <input type="text"/> Price per kWh: From \$ <input type="text"/> to \$ <input type="text"/> Term Length (months): From <input type="text"/> to <input type="text"/> Early Termination Fee: From \$ <input type="text"/> to \$ <input type="text"/> Monthly Fee From \$ <input type="text"/> to \$ <input type="text"/> Renewable Content 76 - 100 % Rate Type All Electric Supplier Listing All <input type="button" value="FILTER RESULTS"/> <input type="button" value="CLEAR FILTER"/>	<input type="checkbox"/>	AEP Energy Inc 155 West Nationwide Blvd. Suite 400 Columbus, OH 43215 (877) 648-1922 Company Uri Offer Details Terms of Service Sign Up	0.0599	Fixed	100%	No	12 mo.	\$10 details	\$0	No
	<input type="checkbox"/>	IGS Energy 6100 Emerald Parkway Dublin, OH 43016 (800) 280-4474 Company Uri Offer Details Terms of Service Sign Up	0.0659	Fixed	100%	No	12 mo.	\$99 details	\$0	Yes details
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All Electric = Heat Pumps

Heat pumps are air conditioners that can heat as well as cool.

Never buy an air conditioner again. Only heat pumps.





Heat Pumps

Moving heat.

Not making heat.

Making Heat



Moving Heat

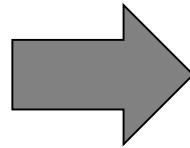
Cold air
contains heat!



Making Heat



= 2x to 5x the
energy of



Moving Heat





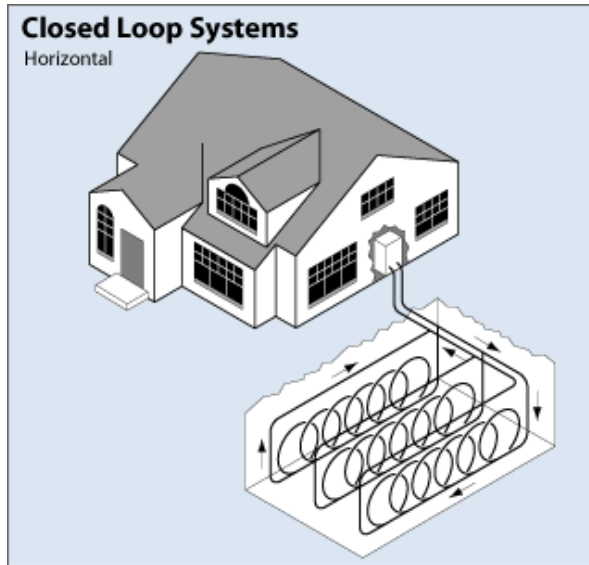
Conclusion:

Heat Pumps Rock!

Moving heat.

Not making heat.

Two Options



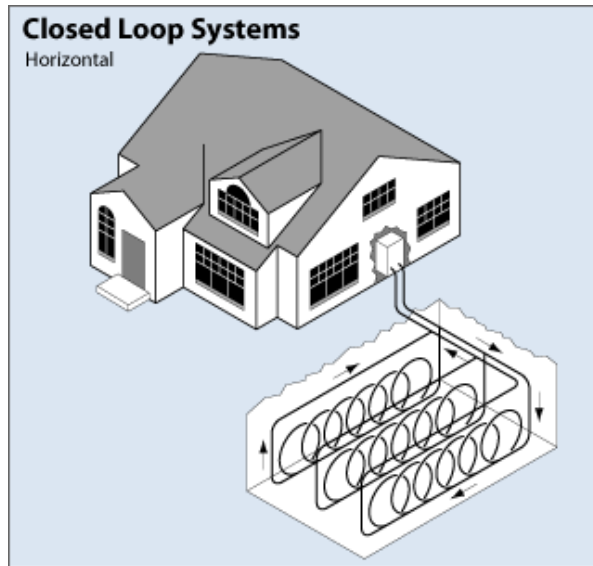
[Wikipedia](#)

Ground Source
aka Geothermal



Air Source

New Development: Efficiencies are getting much closer.



[Wikipedia](#)

Ground Source
aka Geothermal

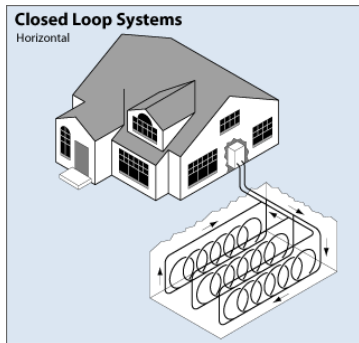


Air Source

Ground Source

Pros

- More efficient*
- No outdoor unit, less noise



Cons

- \$ = 2x-3x air source
- Tax credit expired
- Not enough \$ for other upgrades
- Few qualified techs
- Digging required for some repairs
- Energy Savings???

Air Source

Pros

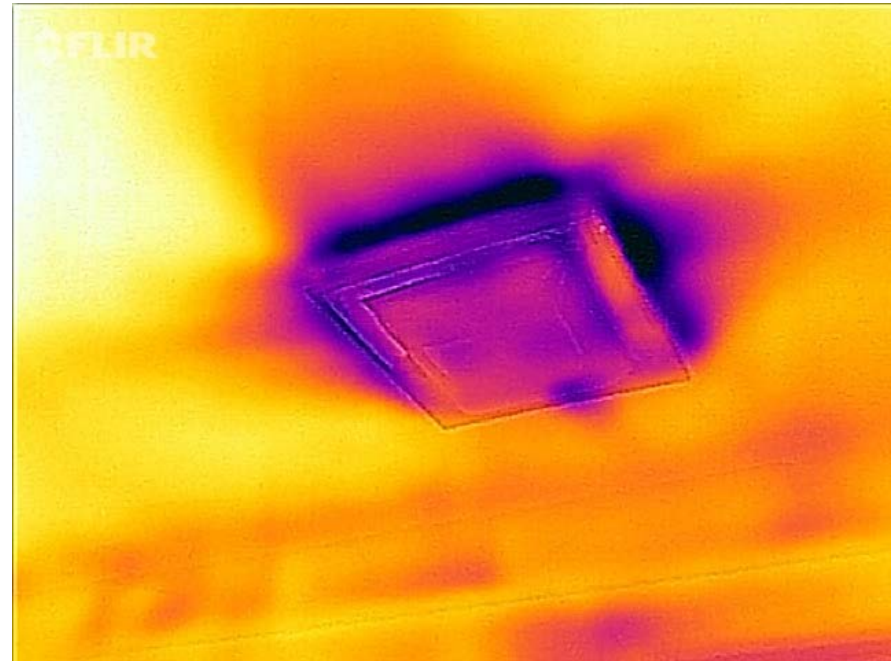
- Amazing comfort
- Much less \$
- Higher end is quiet
- Easier to get service

Cons

- Performance declines on cold days
- Outdoor Unit

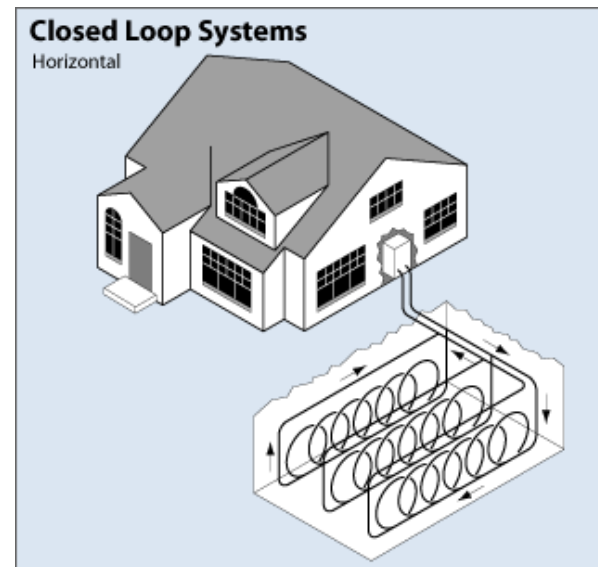
Ground Source Example

Uncomfortable Home, No \$ left



Conclusion:

Ground source may be worth considering for very large homes and commercial buildings, but not for smaller homes



[Wikipedia](#)

Air Source: Two Options



Mini Split



Standard Split

Mini Split



Inside



Outside



Mini Split

Pros

- No ductwork required
- Good for large open spaces
- Good cold weather performance

Cons

- Poor filtration
- No fresh air capability
- Not a good whole house option
- Not a good replacement option

Standard Split: Two Options



Heat Pump Only



Hybrid: Heat Pump
On Top of Furnace

Standard Split: Heat Pump Only



Heat pump
looks like
furnace

Inside



Heat pump is
on legs to
stay above
snow

Outside

What Happens On *Really* Cold Days?

Backup Heat

- Like the element in an electric oven
- Can be staged with HP
- All electric
- Only a few days per year if designed well
- You won't freeze!



Heat Pump Only

Pros

- No fossil fuels with renewable electricity
- Replace current HVAC
- Fabulous comfort
- Healthy Home
 - Good filtration
 - Fresh air
 - Dehumidification

Cons

- Requires design
 - Blower door test
 - Load calculation
- May require Home Performance project
- Good installation
 - Thoughtful installer
 - Good thermostat

Standard Split: Hybrid



Heat pump
on top of
furnace
instead of AC

Furnace

Inside



Same
outdoor
unit

Outside

Hybrid System

Pros

- Fewer fossil fuels
- Replace current AC
- Good comfort
- Healthy Home
 - Good filtration
 - Fresh air
 - Dehumidification

Cons

- Still uses fossil fuels
- May require furnace replacement anyway
- Gas backup can't stage with heat pump the way grid heat can.

Don't Heat Pumps Cost More?

A Tale of Two Similar Houses



Furnace



Heat Pump Only

Don't Heat Pumps Cost More?

A Tale of Two Similar Houses



- Built 1915
- 1800 square feet
- 1 occupant
- Foamed walkup attic
- 1960 cfm50 leakage



- Built 1918
- 1700 square feet
- 1 occupant
- Foamed walkup attic
- 1860 cfm50 leakage

Don't Heat Pumps Cost More?

A Tale of Two Houses



Cost to Operate
12/15 - 12/16
\$1813.62
\$151/mo

Don't Heat Pumps Cost More?

A Tale of Two Houses



Cost to Operate
12/15 - 12/16
\$1813.62
(\$151/mo)



Cost to Operate
12/15 - 12/16
\$1730.00
(\$144/mo)

What about a mild winter?

A Tale of Two Houses



Cost to Operate
4/16 - 4/17 (Mild Winter)

\$1706.59
(\$142/mo)



Cost to Operate
4/16 - 4/17 (Mild Winter)

\$1450.68
(\$121/mo)

Don't Heat Pumps Cost More?

A Tale of Two Houses



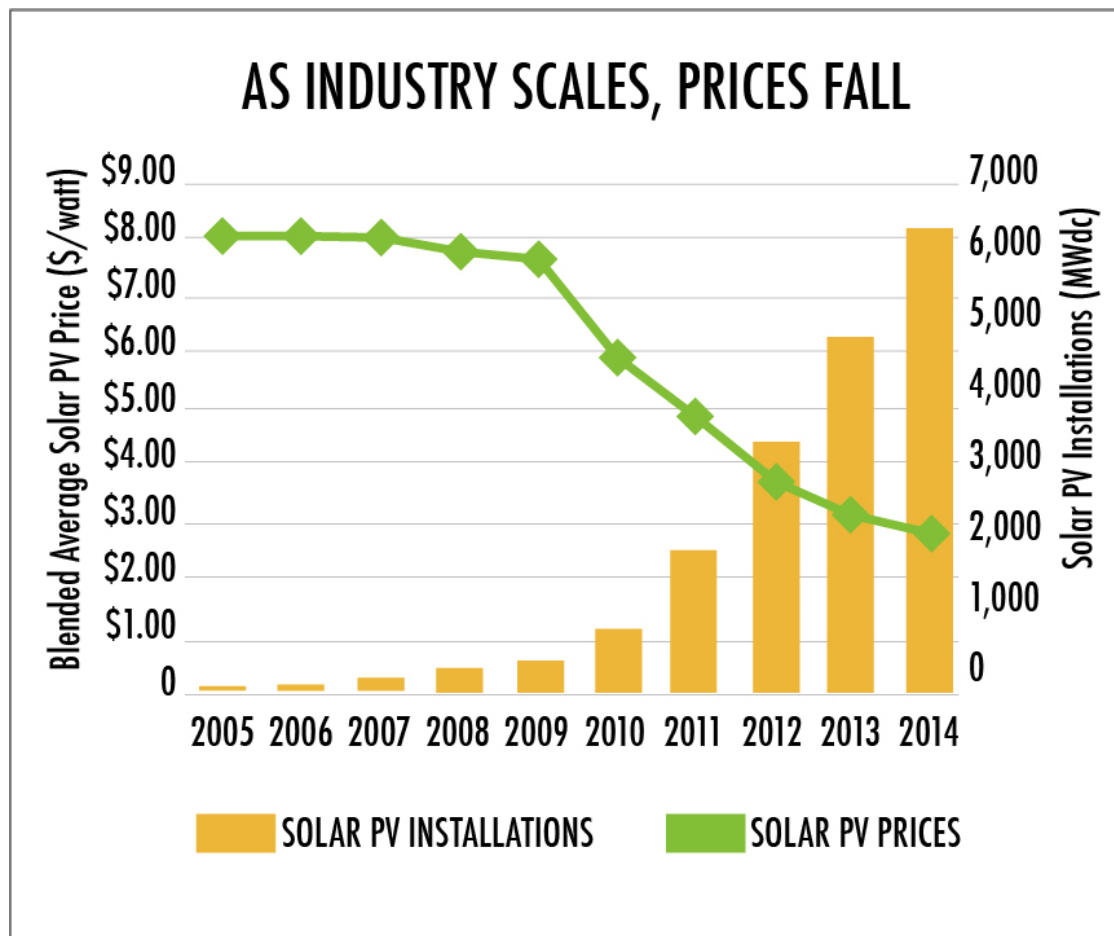
This is with natural gas at record low prices.

Conclusion:

Air source heat pumps aren't necessarily more expensive to run than gas furnaces.

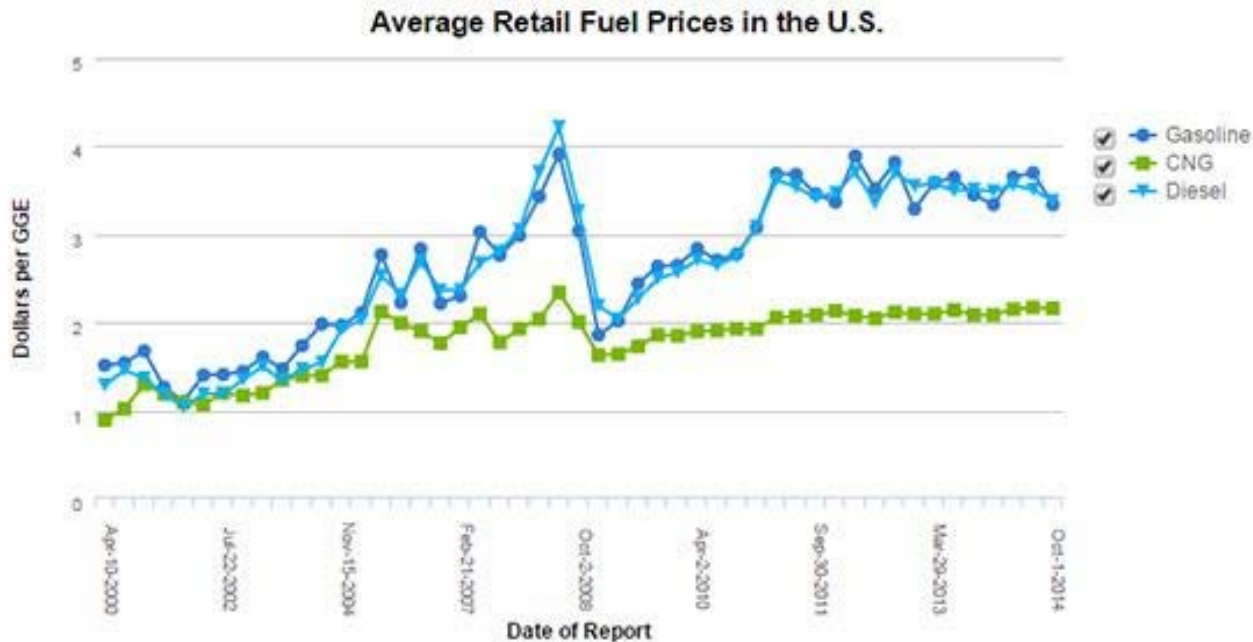


Energy Price Volatility?



[Solar Tribune](#)

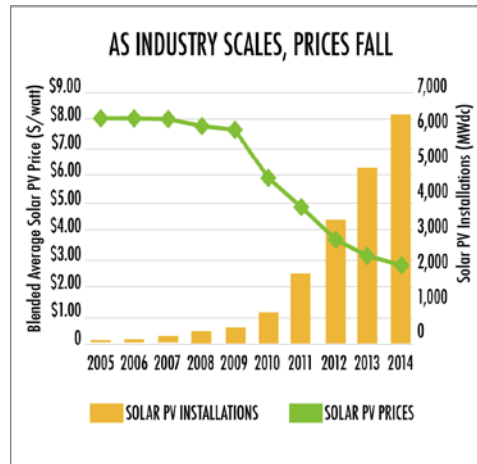
Energy Price Volatility?



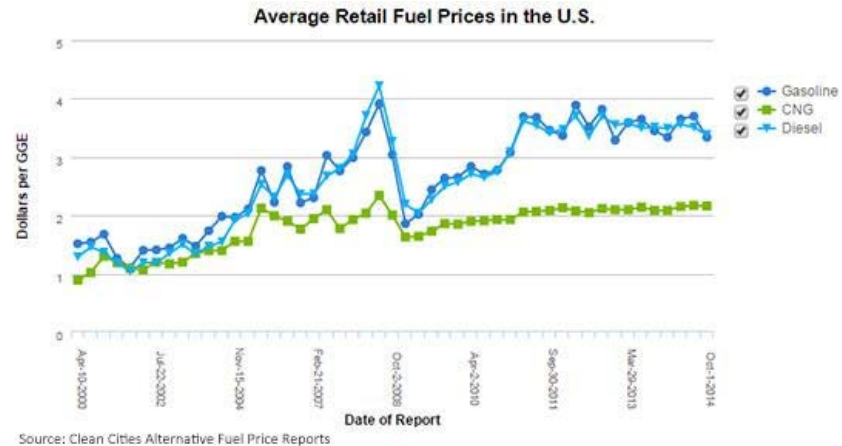
Source: Clean Cities Alternative Fuel Price Reports

[NGV America](#)

Energy Prices?



[Solar Tribune](#)

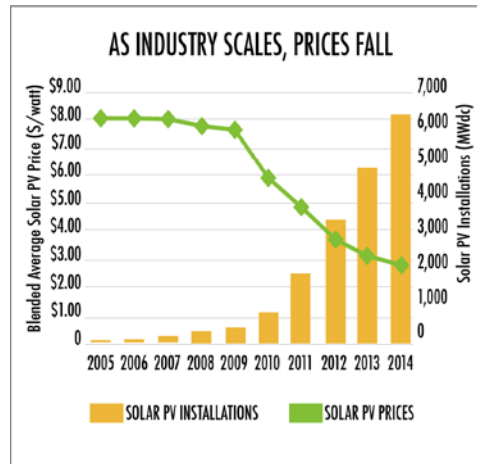


[NGV America](#)

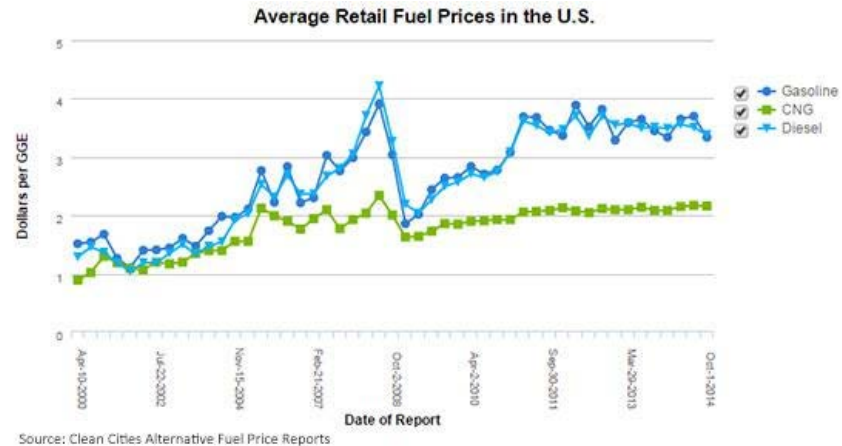
Will electricity costs go down while fossil fuel costs go up?

If heat pumps make sense today, what about when electricity is cheaper?

Energy Prices?



[Solar Tribune](#)



[NGV America](#)

When you buy a furnace, you are making a 15-20 year commitment to fossil fuels.

Are you sure that's wise?

*I could be completely wrong here, too...

Here's my future bet: Heat Pump Only



Most Sustainable Way to **Heat** and **Cool** Your Home: Heat Pump Only



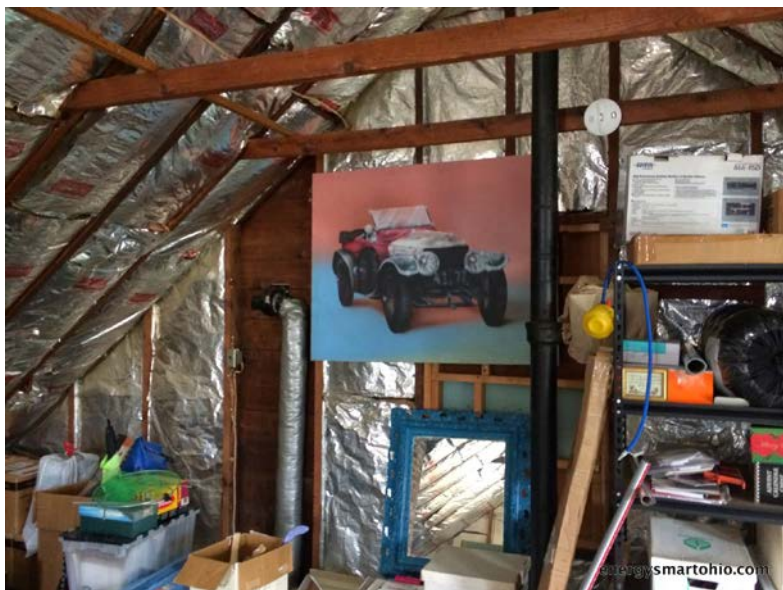
But.



It requires design.



The Home Performance Project



Before Foam w/ Heat Pump
Leaky: 4610 cfm50
24,289 kWh/yr



After Foam w/ Heat Pump
Tight: 1860 cfm50
12,161 kWh/yr

The Home Performance Project

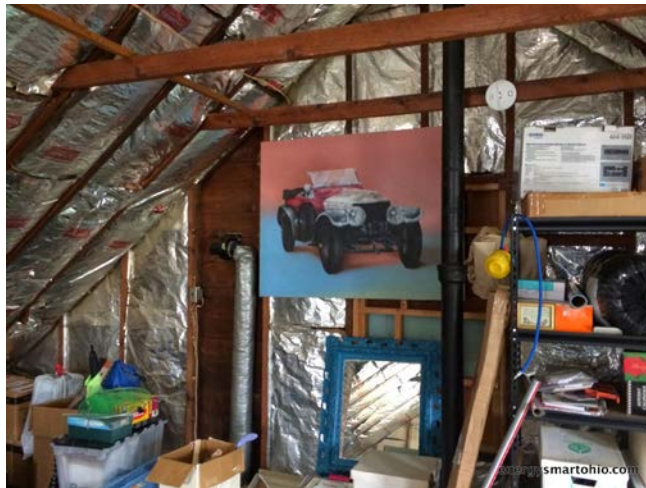


50% less usage after air sealing!
(To be fair, it was a harsh winter vs. a mild one.)

Conclusion:

Design and air sealing are critical for optimum HVAC performance.

Work with a Home Performance Specialist.



Best Paths to **Heat** and **Cool** Your Home Sustainably

First, switch electric suppliers to a 100% renewable one. Google PUCO.

Ohio.gov State Agencies | Online Services

Energy Choice Ohio
powered by choice.

Search Website

Home Compare Offers About Choice Electric Natural Gas FAQs Contact Us

Apples to Apples: Electric

RESIDENTIAL ▶ SMALL COMMERCIAL ▶ LARGE COMMERCIAL/INDUSTRIAL ▶



American Electric Power: Residential

Click to Compare	Supplier	\$/KWh	Rate Type	Renew. Content	Inters. Price	Term. Length	Early Term. Fee	Monthly Fee	Promo. Offers
19 RECORDS FOUND									
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Best Paths to **Heat** and **Cool** Your Home Sustainably

Home Performance Process

- List Problems
- Develop Budget
- Diagnose Problems (Energy Audit)
- Develop Plan (Including Load Calculations)
- Fix House
- Install Heat Pump or Hybrid
- Tweak to Perfection

Best Paths to **Heat** and **Cool** Your Home Sustainably

Heat Pumps

Ground Source

Air Source

Mini Split

Standard Split

Hybrid

Heat Pump Only

Best Paths to **Heat** and **Cool** Your Home Sustainably

Hybrid

- Keep furnace, replace AC with heat pump
- Can do to any home with forced air
- Still uses fossil fuels
- 15-20 year commitment to fossil fuels

Heat Pump Only

- Most sustainable option
- Requires design if you want certainty of low operating costs
- Home Performance project is likely required
 - Air sealing
 - Insulation
 - HVAC design/install

Best Paths to **Heat** and **Cool** Your Home Sustainably

Don't forget to design for a Healthy
Home/Good Indoor Air Quality

- Fresh Air
- Filtered Air
- Humidity Controlled Air

Want to know more?

See our case studies



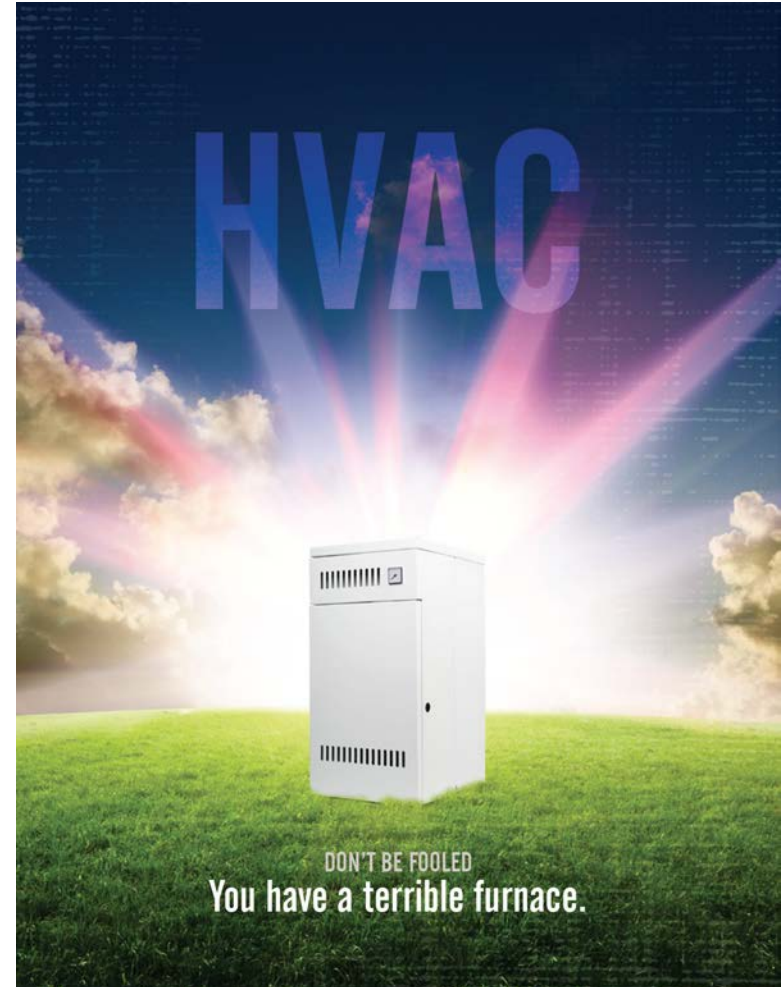
1915 Case Study



1918 House of the
Future Case Study

Want to know more?

Get our free HVAC guide.





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