

RATER FEST!

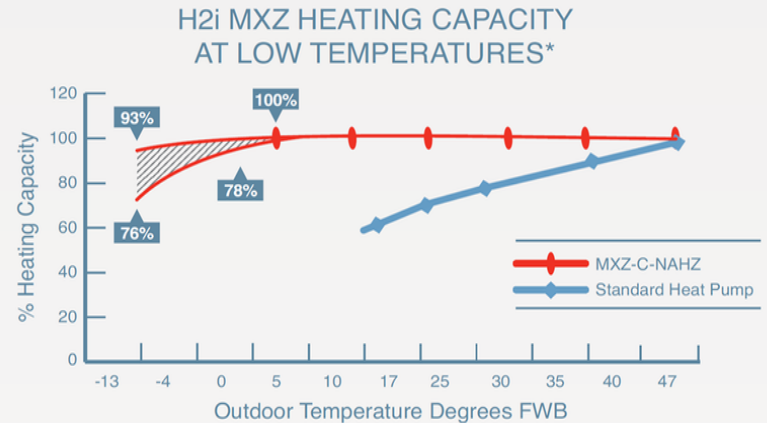
Heat Pumps are a Thing

9-23-2022

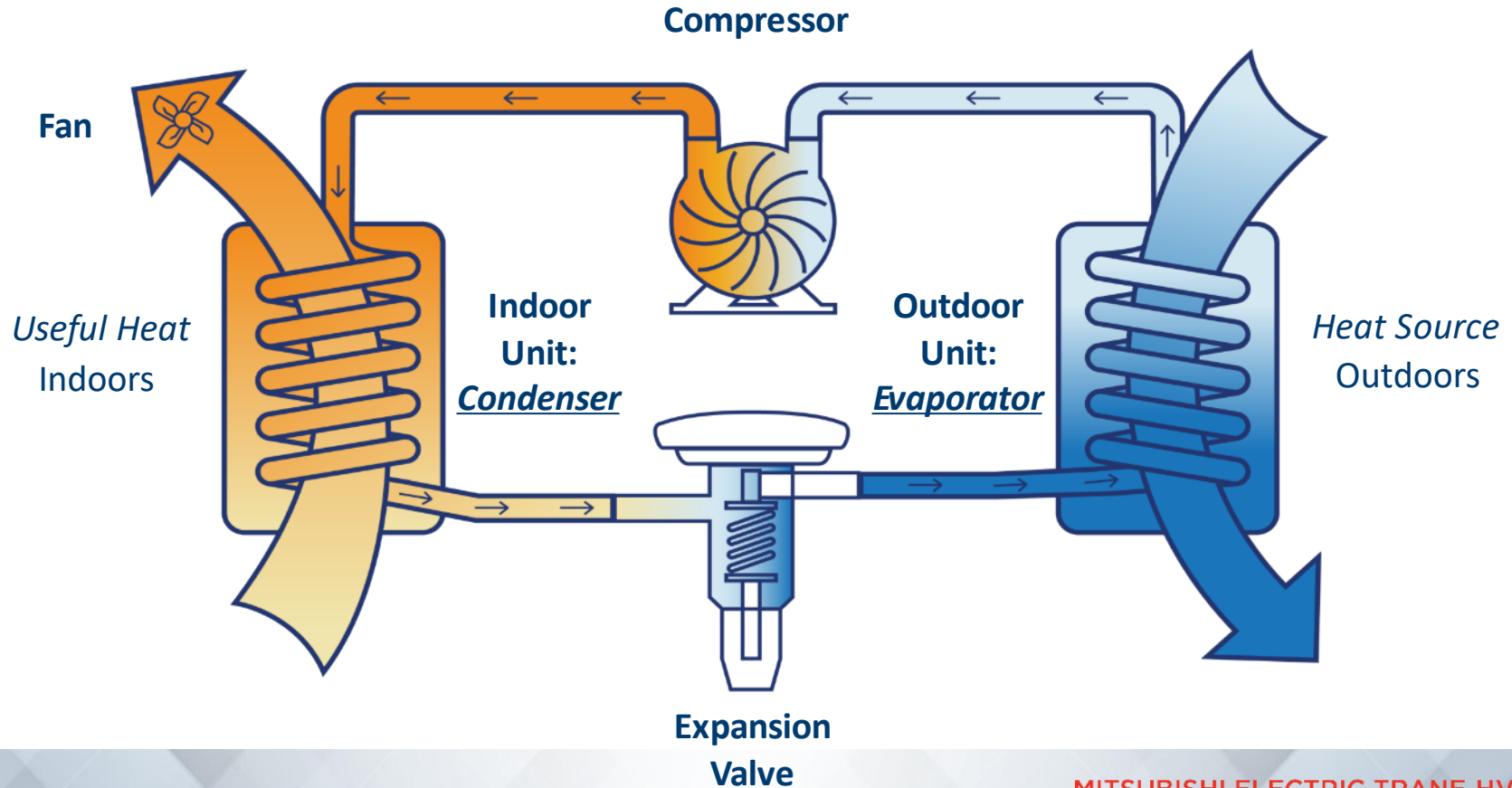
Shawn LeMons

Performance Construction Mgr

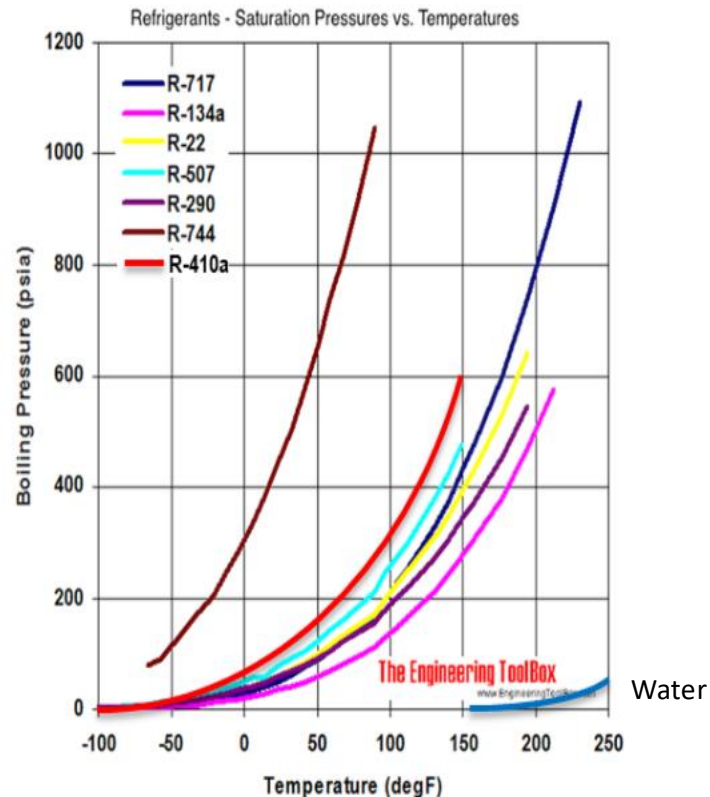
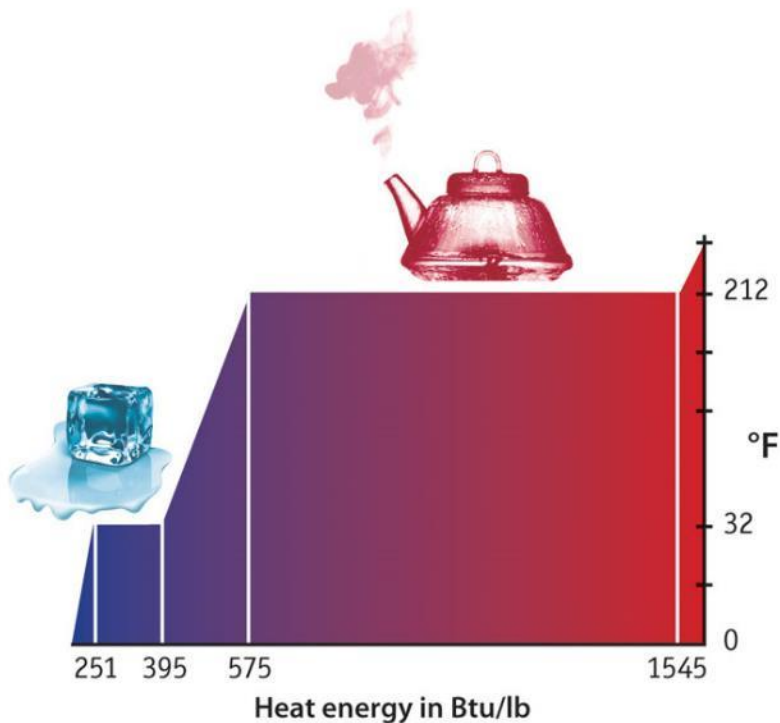
(Former BPI, IECC, RESNET, LEED, PHIUS, Thermography)



Heat Pumps Refrigerant Cycle



Hidden Heat of Phase Change



Heat pumps manage temperature and pressure around the boiling point of refrigerants.

Thrive Home Builders

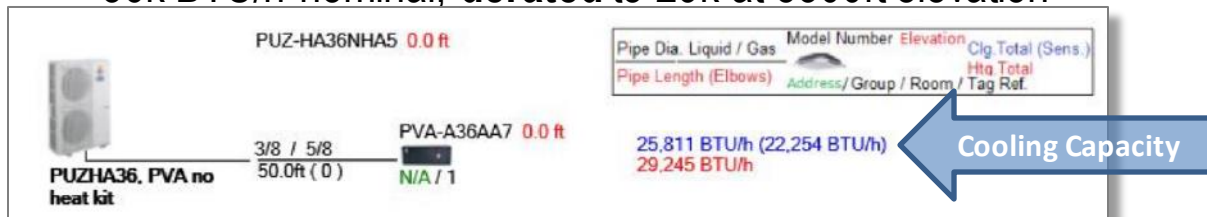


- 3700 sf, 2 story + basement
- U-0.02 ceiling
- U-0.03 walls
- U-0.25, SHGC-0.30 windows
- U-0.20 doors
- U-0.20 framed floors
- U-0.20 basement floors
- “Tight” infiltration
- 120 cfm ventilation

- 21.2k BTU/h **cooling** load
- 43.8k BTU/h **heating** load

Thrive Home Builders

- 36k BTU/h nominal, **derated** to 29k at 5300ft elevation



- Plus 34k BTU/h with 10kW, 2 stage heat kit



21.2k BTU/h **cooling** load

43.8k BTU/h **heating** load

25.8k BTU/h **cooling** capacity

63.3k BTU/h **heating** capacity

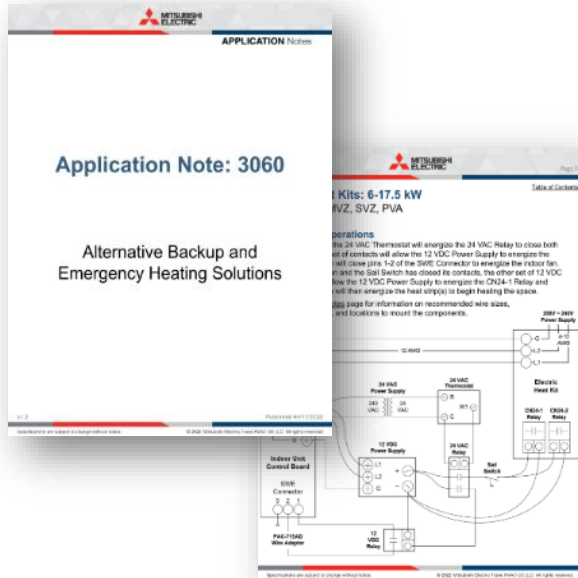
17.8 SEER, 11.0 HSPF

Correction Factors			
Temperature:	0.98	0.95	
Piping Length:	0.96	0.99	
Defrosting:	-	1.00	
User Derate:	1.00	1.00	
Total Derate:	0.77	0.77	
Additional Refrigerant:	0.00	lb	
Total Refrigerant Amount:	12.00	lb	

Conditions (°F)			
Cooling			
Indoor DB	75.0	Humidity 55.4%	Indoor WB 64.0
Outdoor DB	91.0		
Heating			
Indoor DB	70.0		
Outdoor DB	1.0	Humidity 72.8%	Outdoor WB 0.2

Thrive Home Builders

What to do for temp heat when the outdoor unit of a high-performance heat pump isn't set until trim?

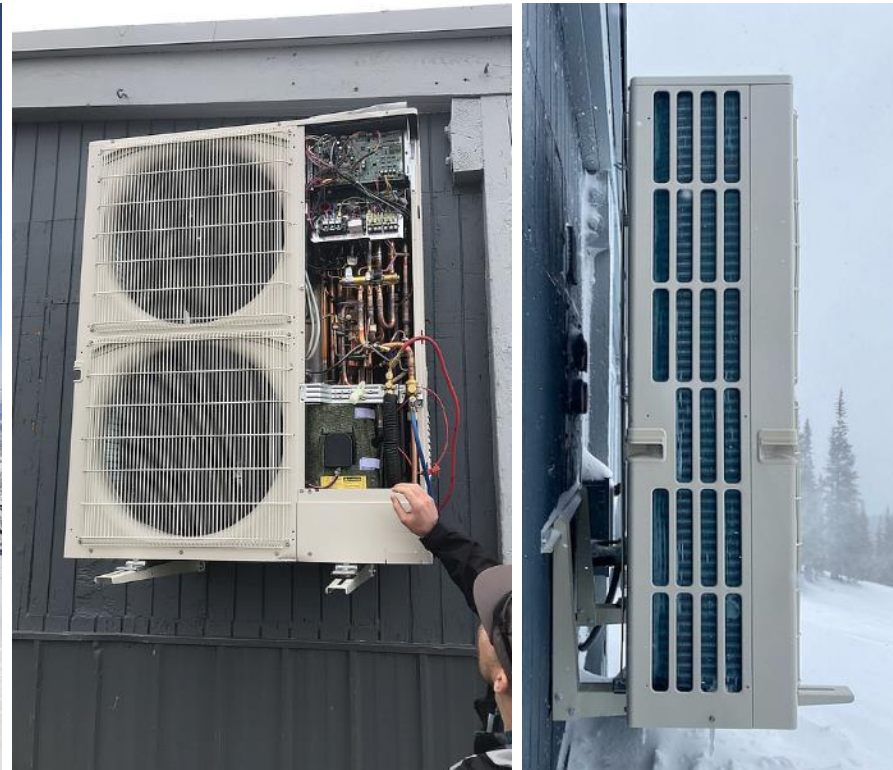


Heat Kit & Pleated Filter

http://www.mylinkdrive.com/usa/App_Notes

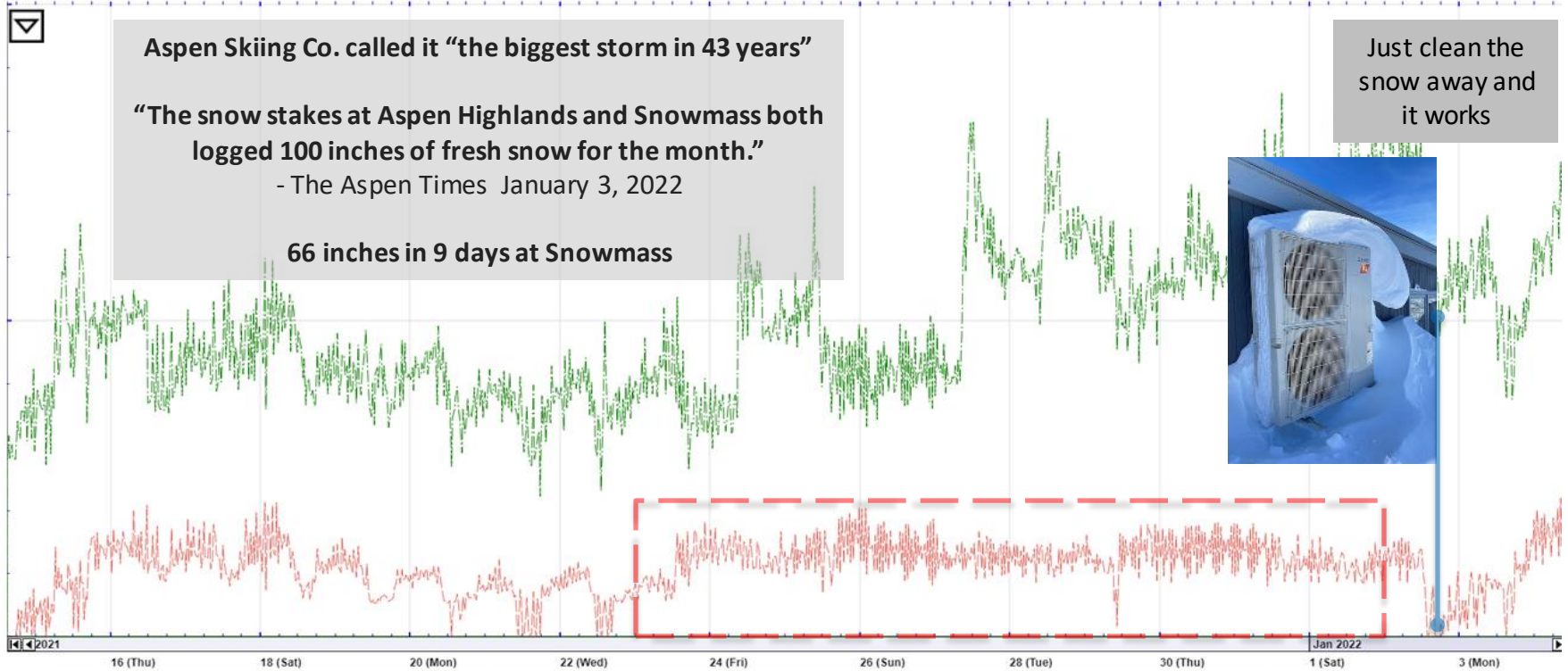
Fall 2021 Install @ 11,300 ft Elevation

Snowmass Ski Patrol and Warming Hut - Field Test



Winter 2021 @ 11,300 ft Elevation

Snowmass Ski Patrol and Warming Hut - Field Test



A High Country Best Practice

Don't let snow build up



Don't clean coil with an ice axe



Refrigerant leaks are bad...

R-410a =

2100 GWP (global warming potential)

10 lbs leaked =

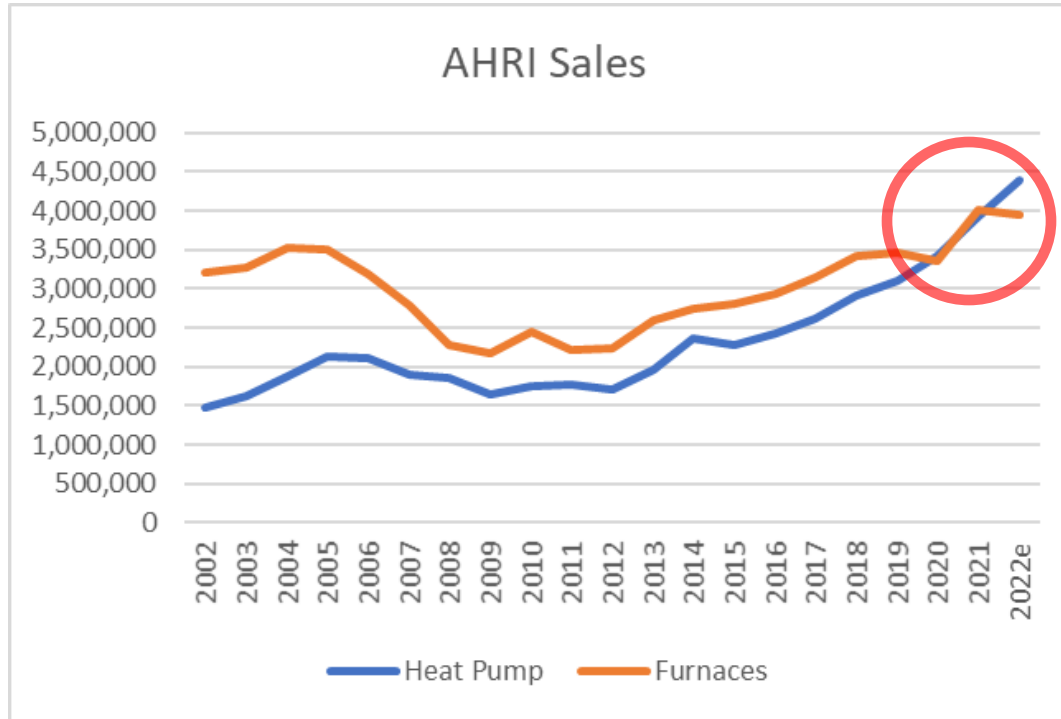
21,000 lbs of CO₂ equivalent

This is 125% of the CO₂ footprint of the average person in the US.

<https://www.nature.org/en-us/get-involved/how-to-help/carbon-footprint-calculator/>



Heat Pumps Overtake Furnaces



Heat Pump Inflection Point
and 2022 (est) Forecast

<https://www.ahrinet.org/analytics/statistics/monthly-shipments>

Colorado Decarbonization

Colorado's 2020 GHG Pollution Reduction Roadmap

Heat pumps will be 24% of sales of all new heating systems by 2025 and 60% of sales by 2030.

	Annual Installs (000's)	22%	188.3	
Year	CO	AGR%	HVAC Market	HP % of Market
2021	22.0	35% YOY 2020	191.1	11.5%
2022	26.8	22%	194.0	13.8%
2023	32.7	22%	196.9	16.6%
2024	39.9	22%	199.8	20.0%
2025	48.7	22%	202.8	24.0%
2026	59.5	22%	205.9	28.9%
2027	72.5	22%	209.0	34.7%
2028	88.5	22%	212.1	41.7%
2029	108.0	22%	215.3	50.2%
2030	131.7	22%	218.5	60.3%
Total	630.5	499%	2045.4	424%

<https://energyoffice.colorado.gov/climate-energy/ghg-pollution-reduction-roadmap>

Colorado Greenhouse Gas Pollution Reduction Roadmap

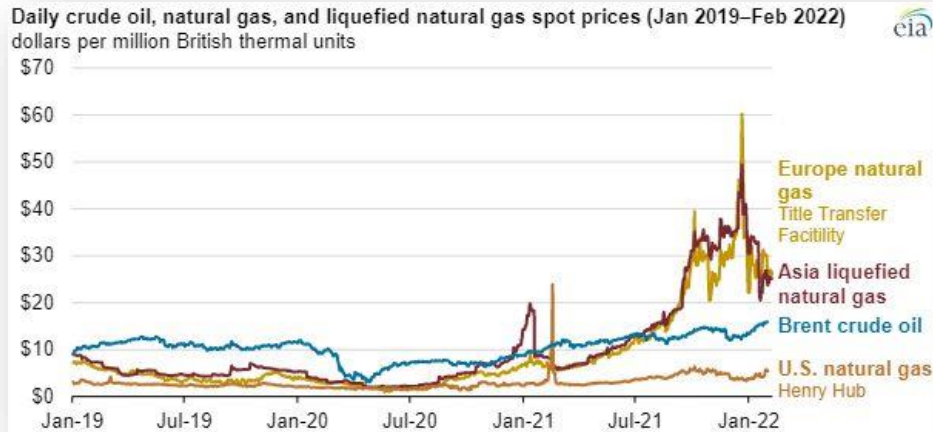
January 14, 2021



NG Costs Changing Over Time

Recent events have impacted world energy prices. Europe and Asia are paying more for NG than the US.

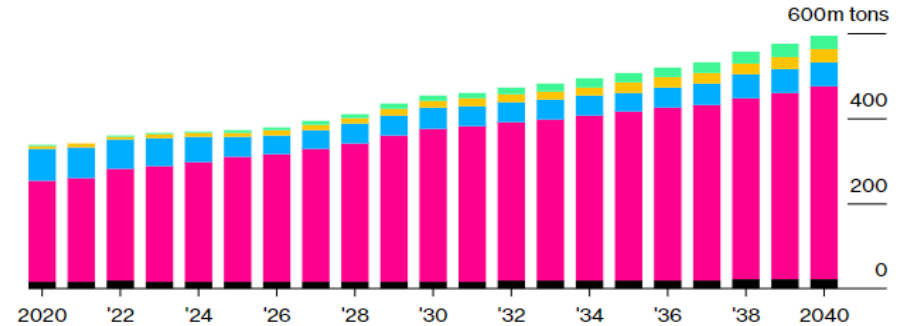
Natural Gas demand is forecasted to increase internationally. Used to fuel power plants, buses, and other demands.



Strong Consumption

Asia seen underpinning global LNG demand growth through 2040

■ Americas ■ Asia ■ Europe ■ Rest of World ■ Unspecified



Source: BloombergNEF

Shawn's Home Gas Rates (no Service & Facility fees)

3/2/2021 \$57.18 / 103 Therms = \$0.56 / Therm

3/3/2022 \$25.21 / 27 Therms = \$0.93 / Therm

Electrification = Energy Independence

Exporting oil and gas does not create energy independence, electrification does.

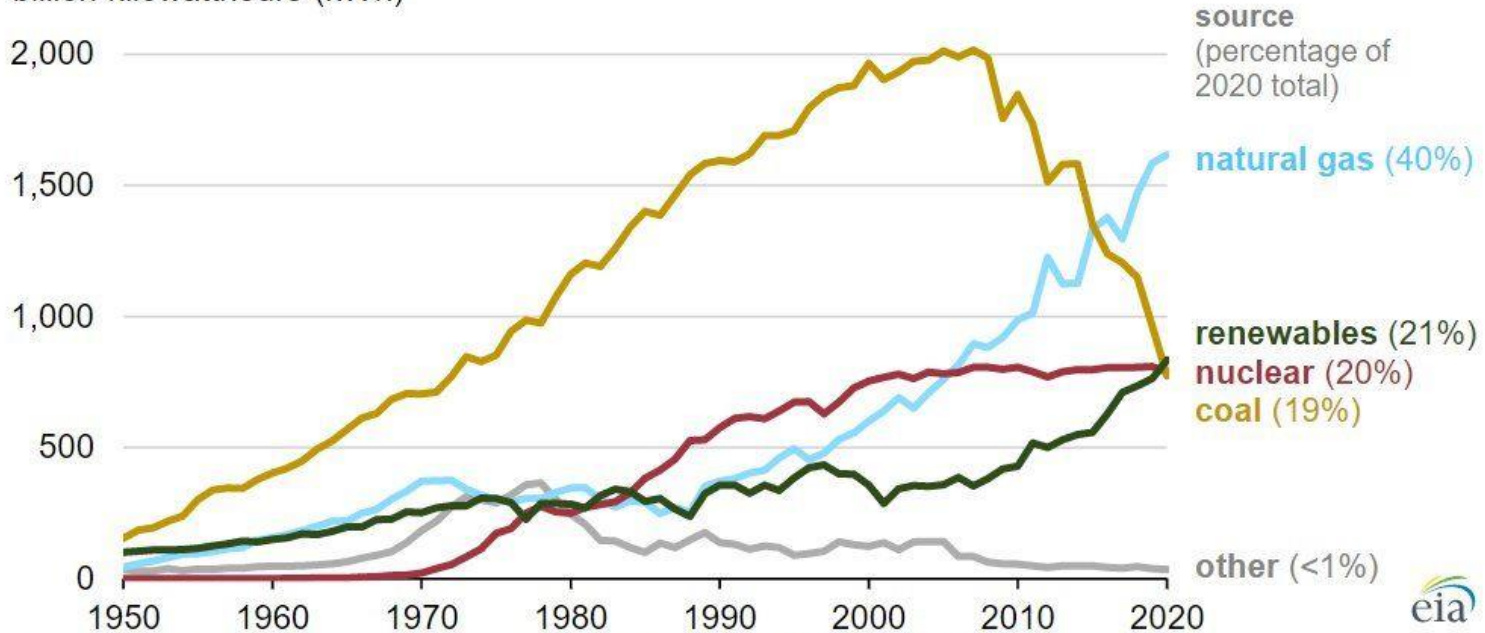


Sam Calisch
Rewiring America

- **Even though the U.S. now exports more oil and gas than it imports (often called “energy independence”), we remain very dependent on world energy markets, buying and selling fossil fuels at prices we don’t control.**
- **There are technical, economic, and political reasons for this, but the result is the same: global fossil fuel price volatility exposes everyday Americans to economic hardship, a fact laid bare by the 2022 invasion of Ukraine.**
- **There is, however, a path to true energy independence: full electrification powered by renewable energy. This not only results in low, stable energy prices, but also combats the existential threat of climate change.**

Power Mix Changing Over Time

Annual U.S. electricity generation from all sectors (1950–2020)
billion kilowatthours (kWh)



Source: U.S. Energy Information Administration (EIA), *Monthly Energy Review*

Note: This graph shows electricity net generation in all sectors (electric power, industrial, commercial, and residential) and includes both utility-scale and small-scale (customer-sited, less than 1 megawatt) solar.



Building Resilience

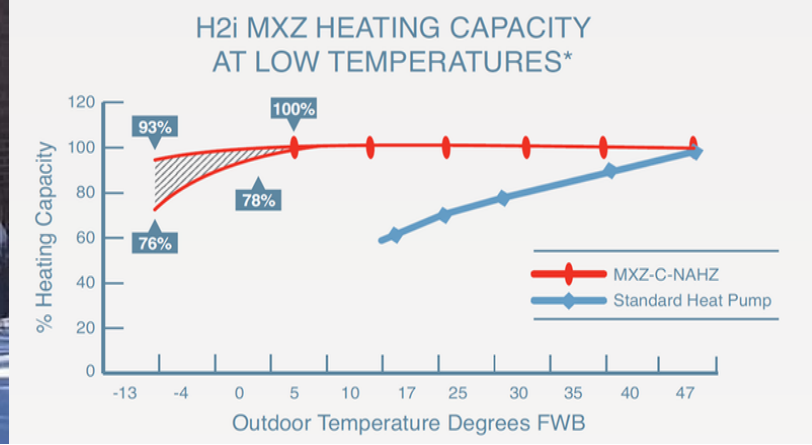
Wildfire Recovery - Marshall Fire – Louisville, CO



- 1100+ buildings lost.
- Electric restored several days before Gas.
- Air tighter homes with heat pumps recovered faster.

Thank You For All You Do!





Questions?

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