

Heat Pumps for Environmental Protection

NESCAUM

9-8-22



Outdoor units



Indoor Units



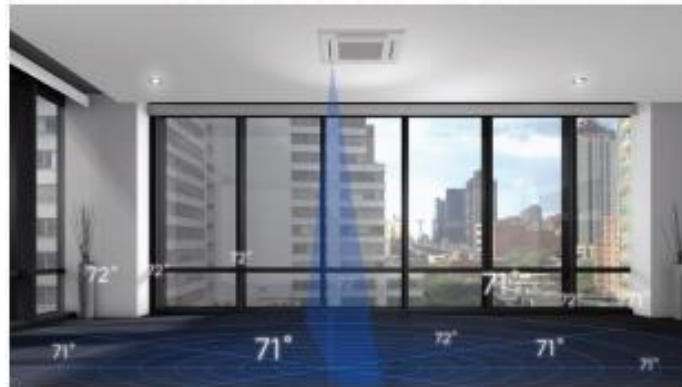
Heat pumps come in all shapes and sizes to meet your needs and aesthetics.



Light Commercial



- ▶ Available in 36,000 and 48,000 Btu/h capacities
- ▶ 100% heating capacity at 1° F
- ▶ 78% heating capacity down to -13°F, utilizing flash injection technology
- ▶ Models are Energy Star® qualified
- ▶ Base Pan Heater standard



i-see Sensor



Commercial, Industrial, Large Multi-family



PLFY-EP-NEMU (33"x33")
PLFY-P-NFMU (22"x22")
Ceiling Cassette (4-way)



PMFY
Ceiling Cassette (1-way)



PCFY
Ceiling-Suspended



PVFY
Multi-position Air Handler



PKFY
Wall-Mounted



PWFY-NMU-E2-AU (HEX)
PWFY-NMU-E-BU (Booster)
Hydronic Heat Exchanger



PEFY-P-NMSU Low Profile
PEFY-P-NMAU Medium Static
PEFY-P-NMHU / NMHSU High Static
Ceiling-Concealed Ducted



PFFY-NEMU Exposed
PFFY-NRMU Concealed
Floor-Standing



R2-Series / H2i® R2-Series
(Air-Source)



WR2-Series
(Water-Source)



Y-Series / H2i® Y-Series
(Air-Source)



S-Series / H2i® S-Series
(PUMY)
(Air-Source)

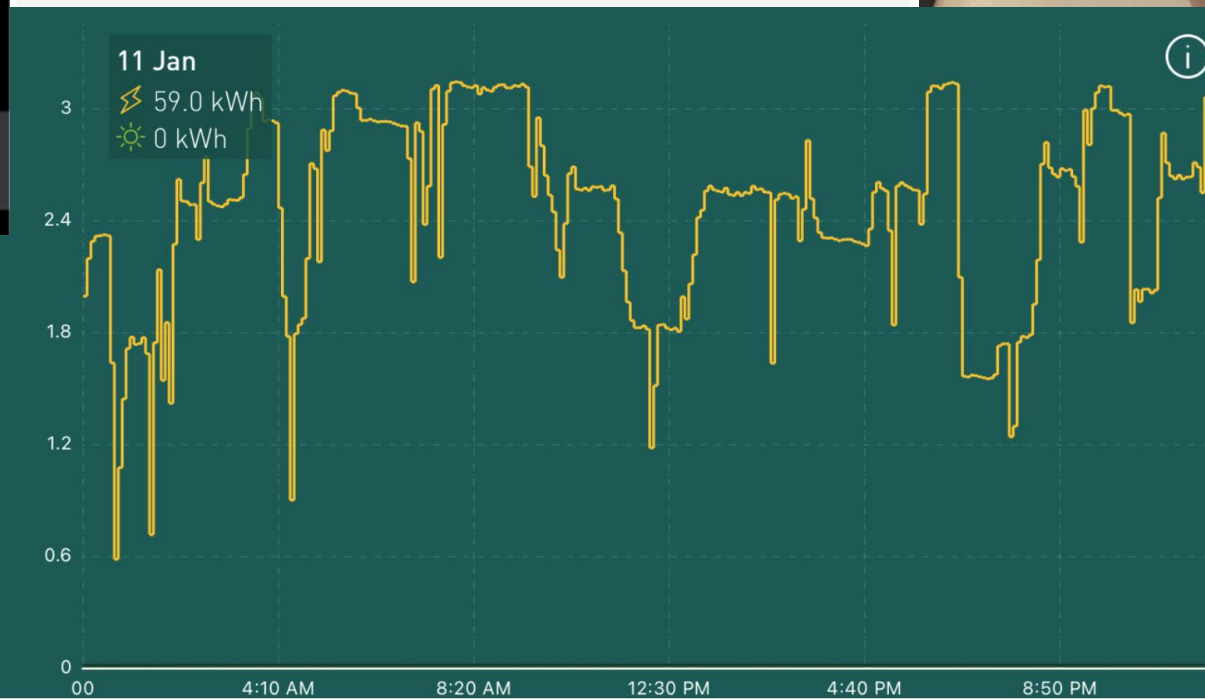


WY-Series
(Water-Source)

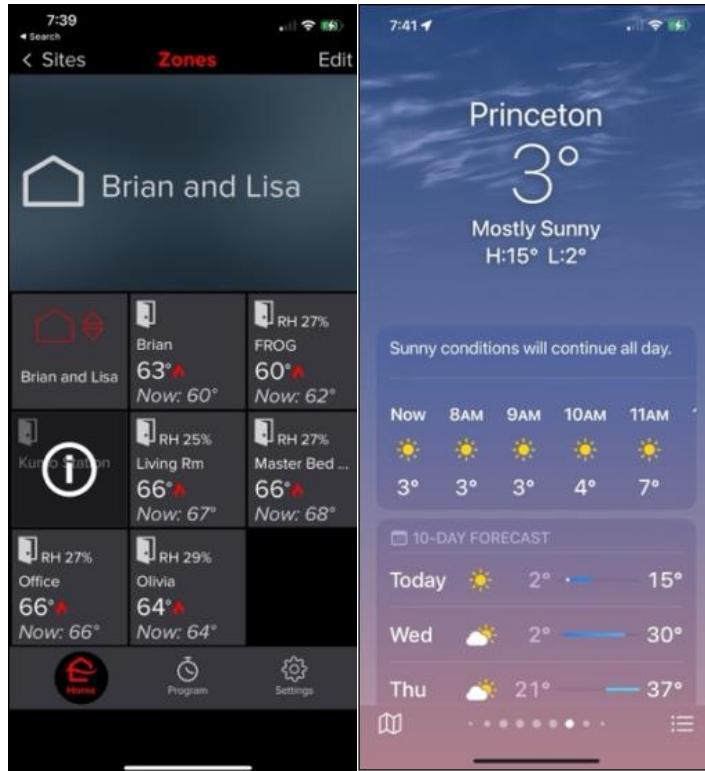




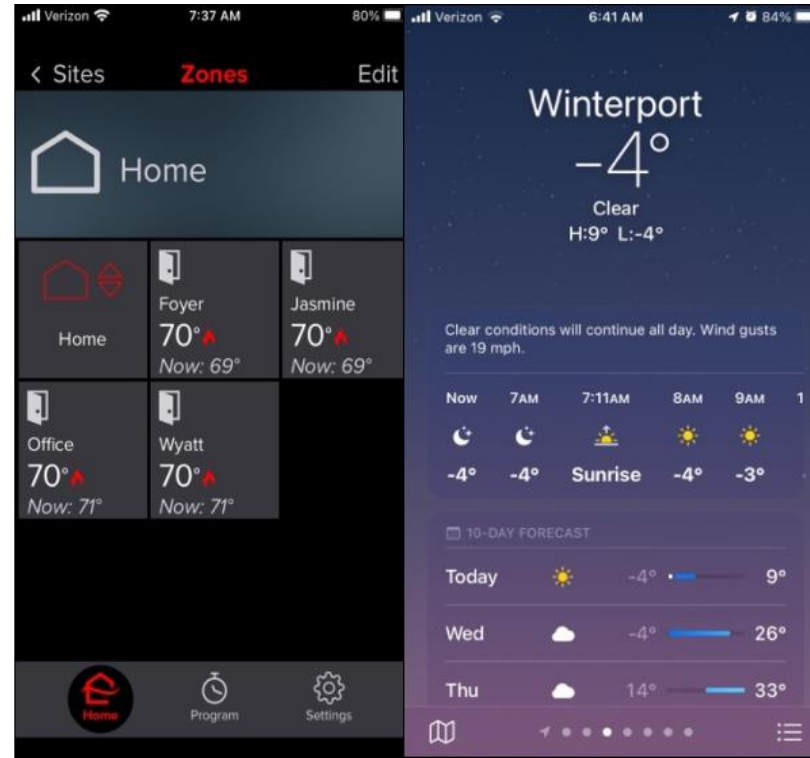
Portland ME, Jan 11th, 2022
(2) FS12 systems
1,500 sq ft heated space.
Total operational usage:
422 kWh November
829 kWh December
1,421 kWh January (v. cold)
All heat pump heat



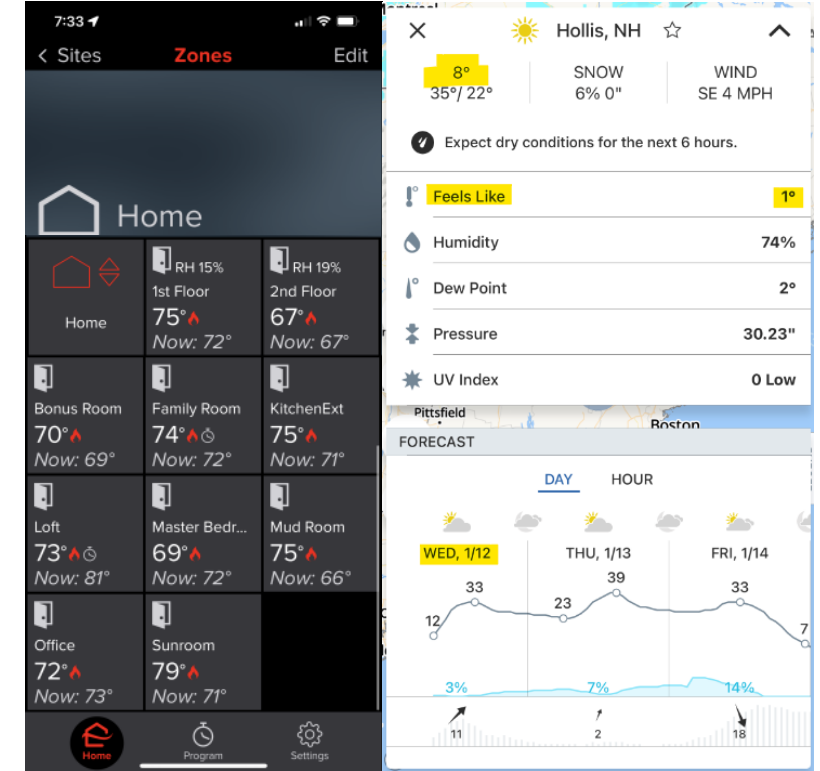
Elsewhere on 01/11/2022 with heat pump only heat



Large home in Princeton MA with large multi-zone system. Heat pump delivering exactly what is being asked. Wind chill temperature at -14F.



2 story colonial outside Bangor ME. Multiple condensers. Wind chill temperature at -21F.



Very large home in Hollis NH. 3 outdoor units, 2 PEADs, and 8 wall units January 12 snapshot. No problem maintaining temps on the 11th either.

What happens when it is ridiculously cold?



Salida, Colorado
Elevation 7,083



Shawn LeMons • 2nd
Performance Construction Manager
22h • Edited •

Shout out to Greg Follet at Fish Builders of Colorado, finishing up a beautiful new home for his clients outside of Salida, Colorado. And yes, the Mitsubishi Electric's Hyper-Heating INVERTER® heat pumps are the heat source for the house.

"February 3, 2022. Showed up to my job located on the river at about 8:15am. The temperature according to my truck was -22 degrees F. I was very curious how the Mitsubishi mini split system would be holding up. I was amazed to walk in and find it to be very comfortable inside." (holding 69°F inside)

https://lnkd.in/eP_pYGxV

#coldclimateheatpumps #mitsubishiheatpumps


Kevin DeMaster and 19 others

1 comment

Like Comment Share Send

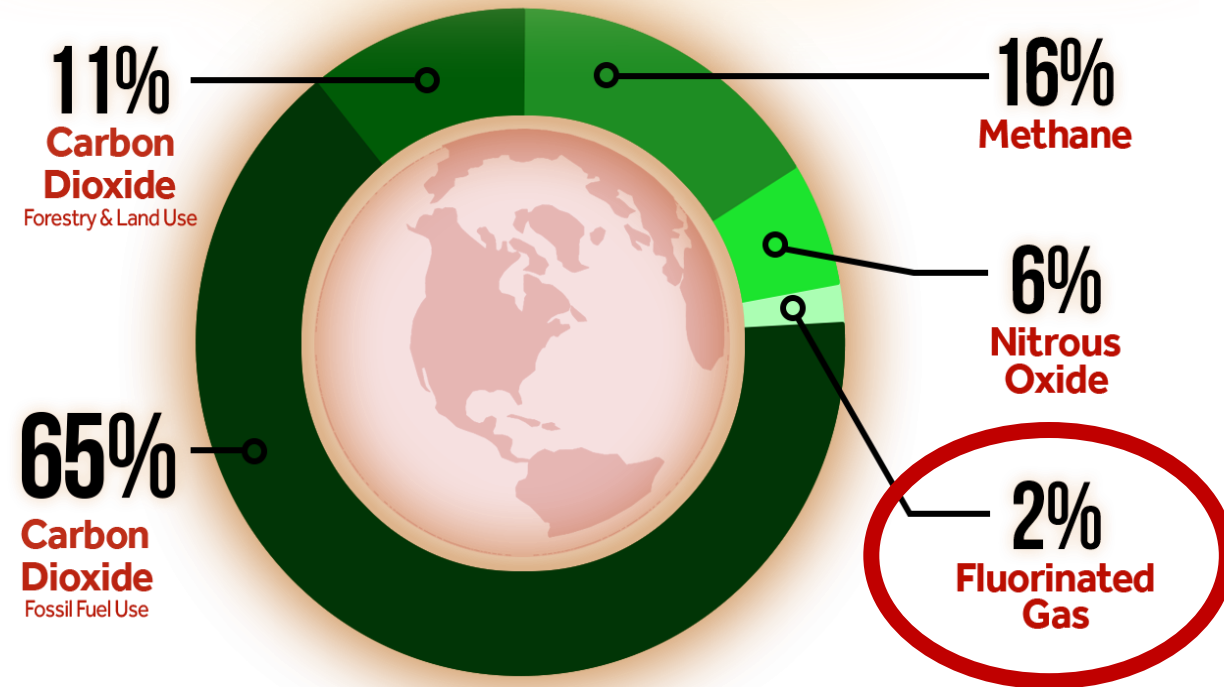
"February 3, 2022. Showed up to my job located on the river at about 8:15am. The temperature according to my truck was -22 degrees F. I was very curious how the Mitsubishi mini split system would be holding up. I was amazed to walk in and find it to be very comfortable inside." (holding 69°F inside)

Why *Another* Refrigerant Transition?

- Environmental concerns 
 - Ozone Depleting Potential (ODP)
 - Global Warming Potential (GWP)
- A transition should
 - Result in a reduction in emissions
 - Refrigerant GWP
 - Direct: Leaks
 - Indirect: Source Energy
 - Maintain or improve capacity and energy efficiency
 - Maintain or improve safety and reliability

GREENHOUSE GAS EMISSIONS

Global Greenhouse Gas Emissions



Source: US EPA

CLIMATE CO₂ CENTRAL

Small %, but up to several thousand times the GWP of CO₂ per compound

High Pressure Refrigerants – Challenging to Replace

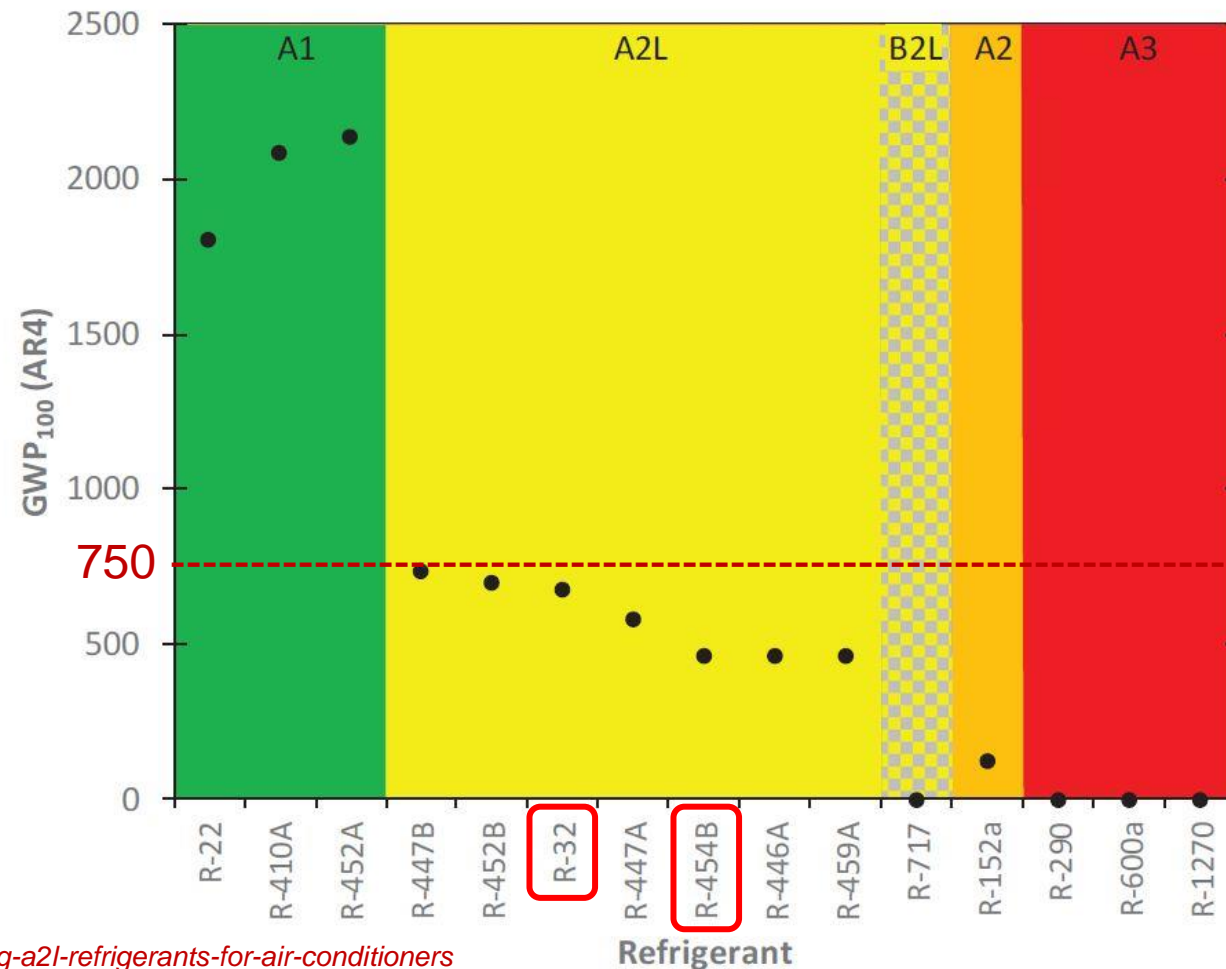
Pressure	Type	Refrigerant	Toxicity	Flammability	ODP	GWP
High	HCFC	R-22	A	1	1	1,810
	HFC	R-410A	A	1	0	1,924
	HFC	R-466A	A	1	0	733
	HFC	R-32	A	2L – BV 6.7	0	677
	HFC	R-454B	A	2L – BV 5.2	0	467
	HFC	R-152a	A	2 – BV 23	0	138
		R-290 (Propane)	A	3 – BV 40	0	5



Source: NEEP

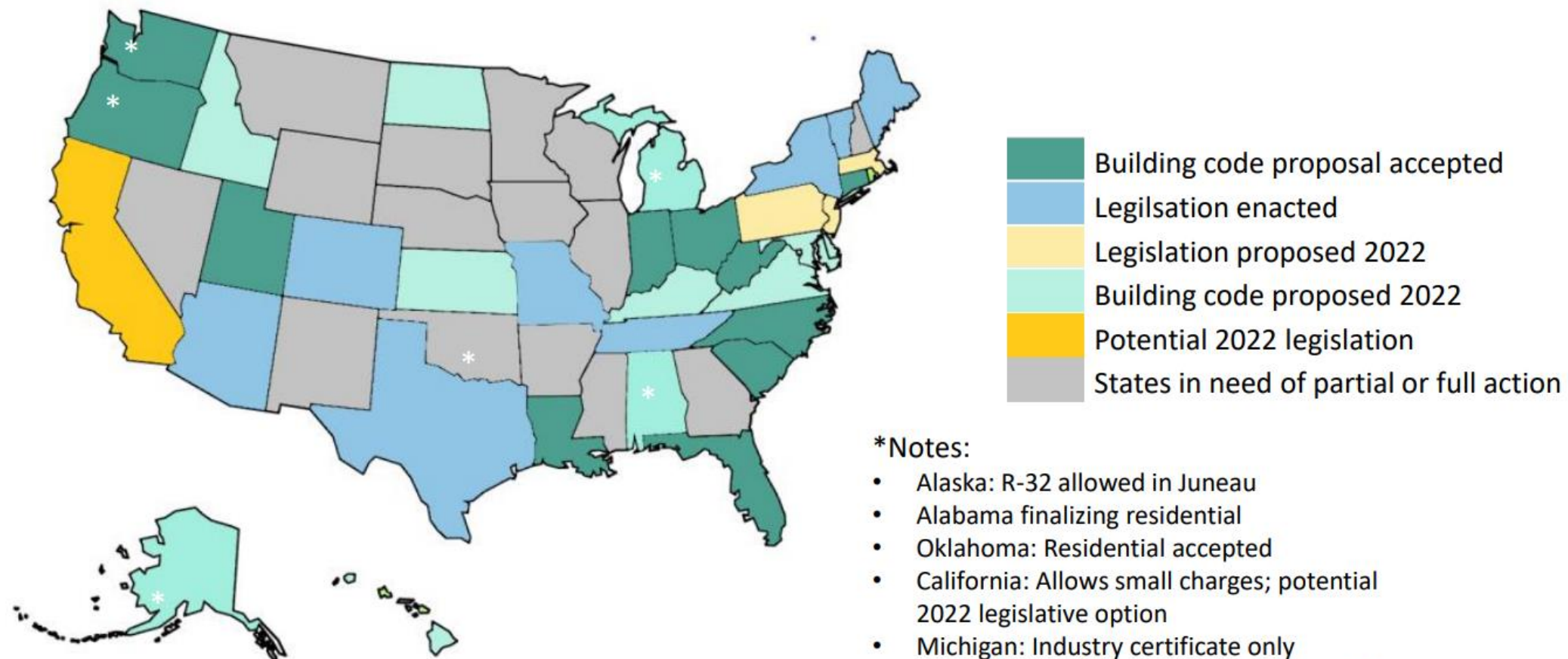
R-410A Replacement: The Challenge is Flammability

- Flammability and GWP are essentially inversely proportional for higher pressure refrigerants
- Removal of the fluorine-based chemicals lowers GWP, but results in an increase in volatility



<https://www.achrnews.com/articles/141733-understanding-a2l-refrigerants-for-air-conditioners>

Low-GWP Refrigerant Building Code Update (Air Conditioning)



The Grid is just fine.

ISO Releases Annual 10-Year Forecast Report

- Issued on April 29, the annual Capacity, Energy, Loads, and Transmission (CELT) [Report](#) is the **primary source** for assumptions used in ISO system planning studies
- **Overall** electricity use is expected **to increase 1.4%** annually over the ten year period (22'–31')
- **Summer peak demand** is expected to **increase 0.3% annually**
- **Winter peak demand** is expected to increase **1.5% annually**



https://www.iso-ne.com/static-assets/documents/2022/06/clg_meeting_george_iso_new_england_update_presentation_june_9_2022.pdf

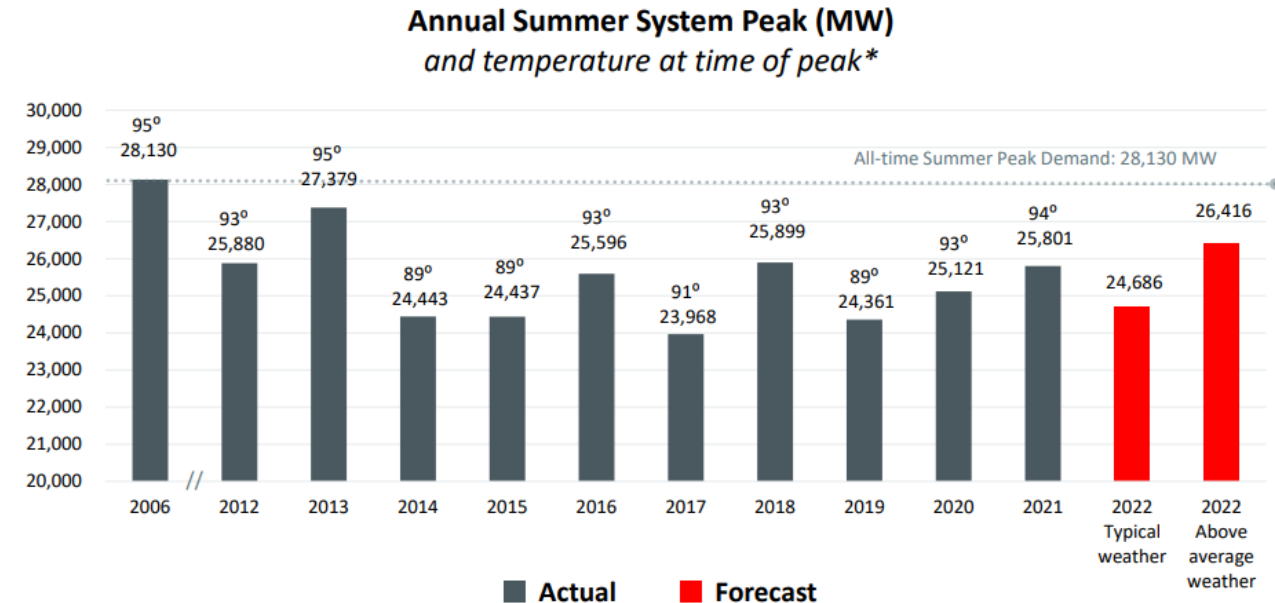
The Grid is just fine.

2022 CELT Includes 10-Year Forecasts for Heating Electrification and Light-Duty Electric Vehicles

- The CELT forecasts that by 2031:
 - More than **1.5 million light duty electric vehicles** will be deployed in New England
 - More than **1.1 million air-source heat pumps** will be deployed in the region
- Transportation electrification from EVs is forecasted to contribute **1,535 MW to the winter peak** and **1,096 MW to summer peak** in 2031–2032
- Heating electrification is forecasted to contribute **1,899 MW to the winter peak in 2031–2032**, under average weather conditions
- The ISO began including **forecasted impacts** of heating and transportation electrification on state and regional electric energy and demand in the 2020 CELT report

Weather Drives Summer Peak Demand

Historical and Projected Peak Demand in New England



*Temperature is dry-bulb temperature in degrees Fahrenheit based on weighted average of eight New England weather stations. Summer 2022 50/50 and 90/10 forecasted peaks include the demand-reducing effects of energy-efficiency measures acquired through the Forward Capacity Market and behind-the-meter solar.

Sources: ISO-NE Seasonal Peaks Since 1980, 2022 CELT Forecast

- New England has more than **31,000 MW** of total capacity available this summer

Decarbonization!



State	#/Mwh	CO2 generated per therm equivalent heat provided by ASHP	Seasonal % CO2 change from NG to ASHP	Seasonal % CO2 change from Oil to ASHP	Seasonal % CO2 change from Propane to ASHP
DE	857	4.77	-59%	-70%	-66%
RI	839	4.51	-61%	-72%	-68%
MA	752	4.49	-62%	-72%	-68%
MD	580	2.98	-75%	-81%	-79%
CT	522	2.81	-76%	-83%	-80%
NJ	475	2.60	-78%	-84%	-81%
NY	396	2.33	-80%	-86%	-83%
NH	223	1.35	-88%	-92%	-90%
ME	210	1.34	-89%	-92%	-90%
VT	1	0.01	-100%	-100%	-100%

Building heating with fossil fuels accounts for ~39% of all carbon emissions in the US.

11.7 pounds of CO2 is emitted per therm of Natural Gas burned in a conventional furnace or boiler.

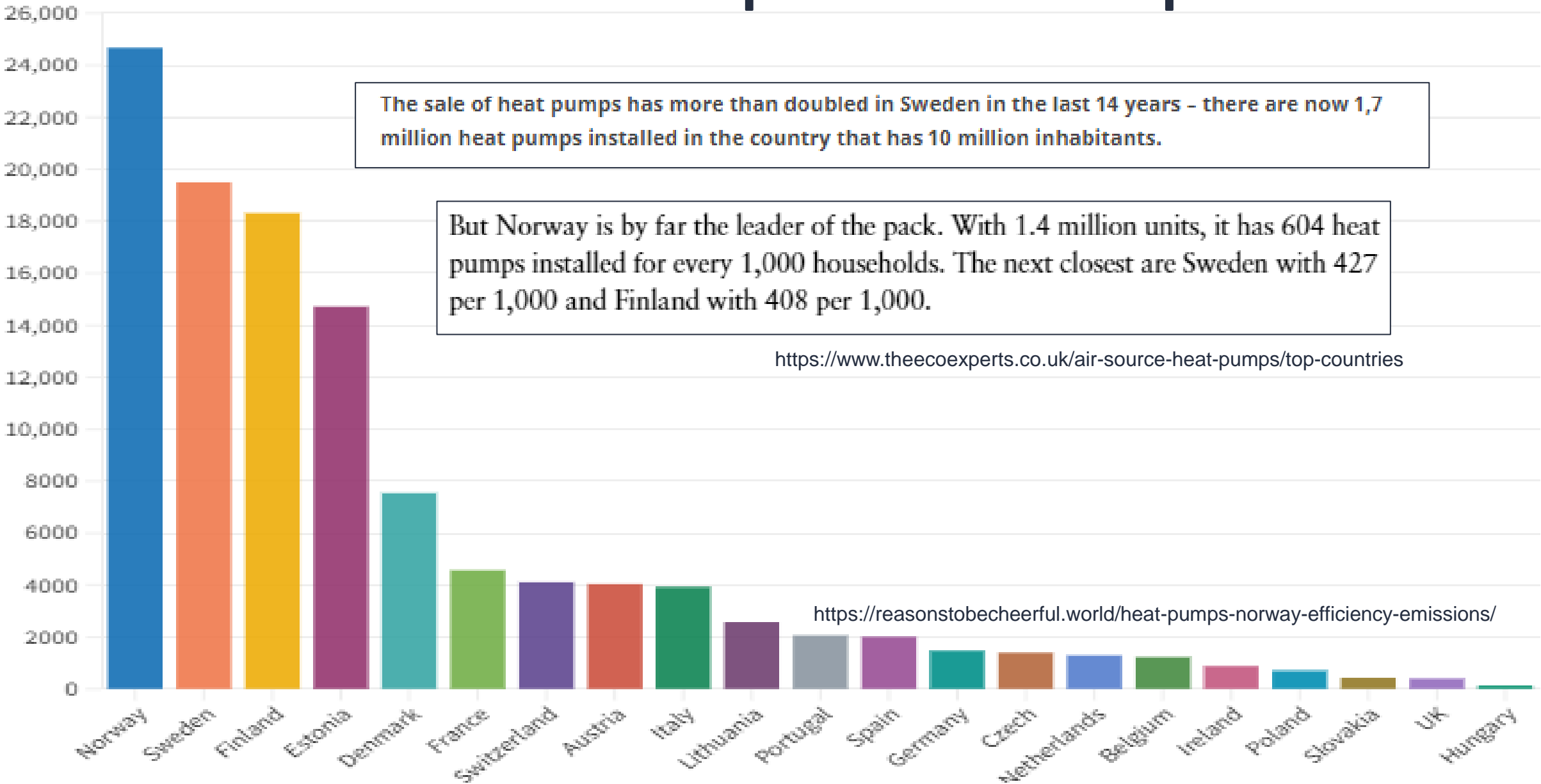
16.1 pounds of CO2 is emitted per therm of Oil burned in a conventional furnace or boiler.

13.9 pounds of CO2 is emitted per therm of Propane burned in a conventional furnace or boiler.

Based on calculation of COP of FS12 hyper heat unit in state weather bin conditions against 2020 Carbon output per MWH in US States.

<https://www.statista.com/statistics/1133295/electric-sector-carbon-dioxide-emission-rate-by-state-united-states/>

Heat Pumps across Europe...



Q: Was it just incentives?
A: No, it required regulation too.



News > World > Europe

Norway to ban the use of oil for heating buildings by 2020

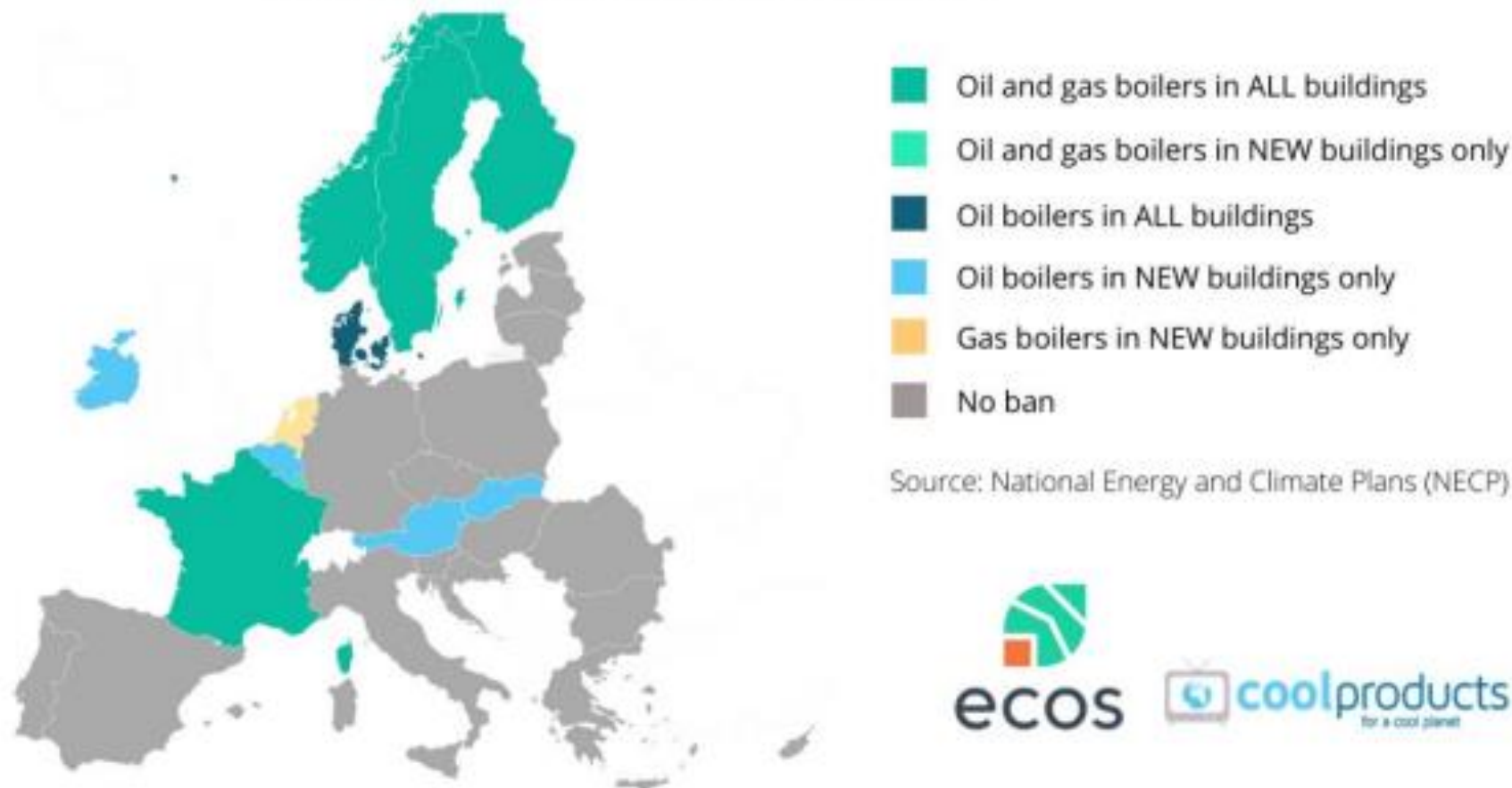
'Those using fossil oil for heating must find other options by 2020,' says country's Environment Minister

Maya Oppenheim • Sunday 02 July 2017 16:29 •  Comments

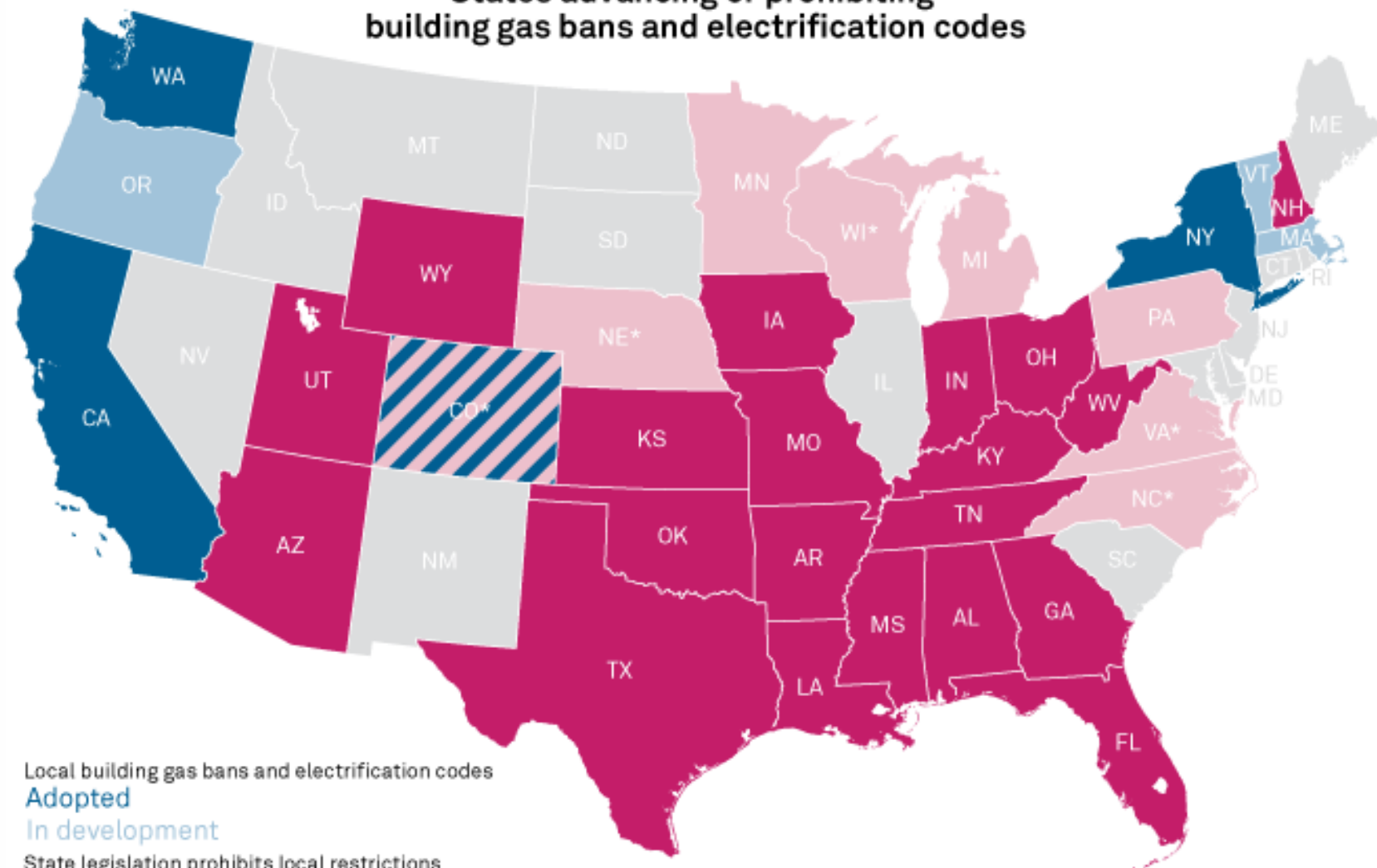


Heating with oil used to be quite common in Norwegian homes and commercial buildings. But this practice was banned at the beginning of 2020, with few exceptions.

End of fossil-fuel heating in the European Union. What types of boilers will be banned by 2024?



States advancing or prohibiting building gas bans and electrification codes



Local building gas bans and electrification codes

Adopted

In development

State legislation prohibits local restrictions
on gas use in buildings

Passed

Introduced in latest session

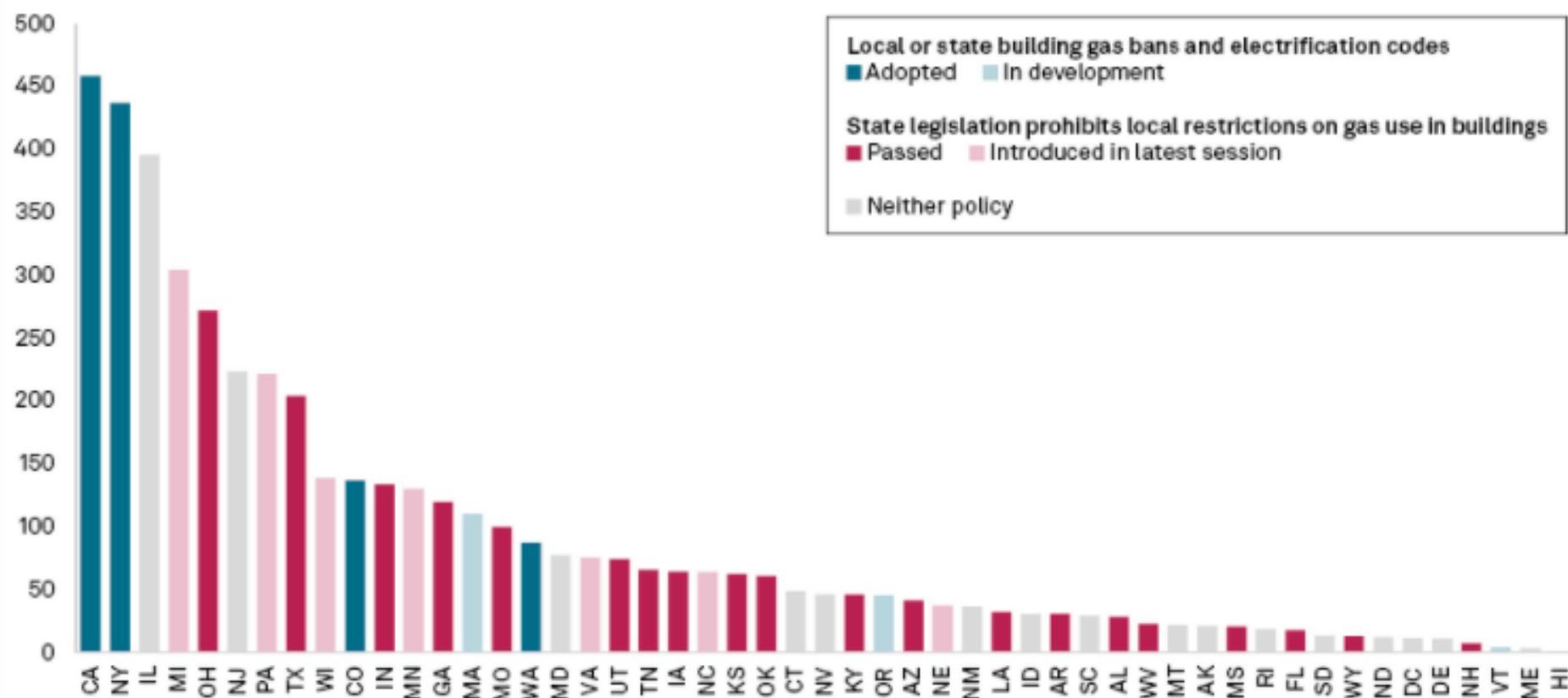
**Failed to advance*

As of April 21, 2022.

Map credit: Ciaralou Agpalo Palicpic

Source: S&P Global Market Intelligence

Residential natural gas volume by state and gas use policy (Bcf)



As of June 8, 2022.

The North Carolina governor vetoed a gas ban preemption bill. Virginia lawmakers dropped preemption language from a bill. The legislative session ended before the Nebraska and Wisconsin bills received votes. Michigan, Minnesota and Pennsylvania bills are still active.

Sources: U.S. Energy Information Administration; S&P Global Market Intelligence

The residential and commercial sectors accounted for 15% and 11% of total U.S. gas consumption in 2021, according to the EIA.

Electrification = Opportunity

More heat pump use = less burning stuff

Dana Fischer
Director of Regulatory Strategy
dfischer@hvac.mea.com