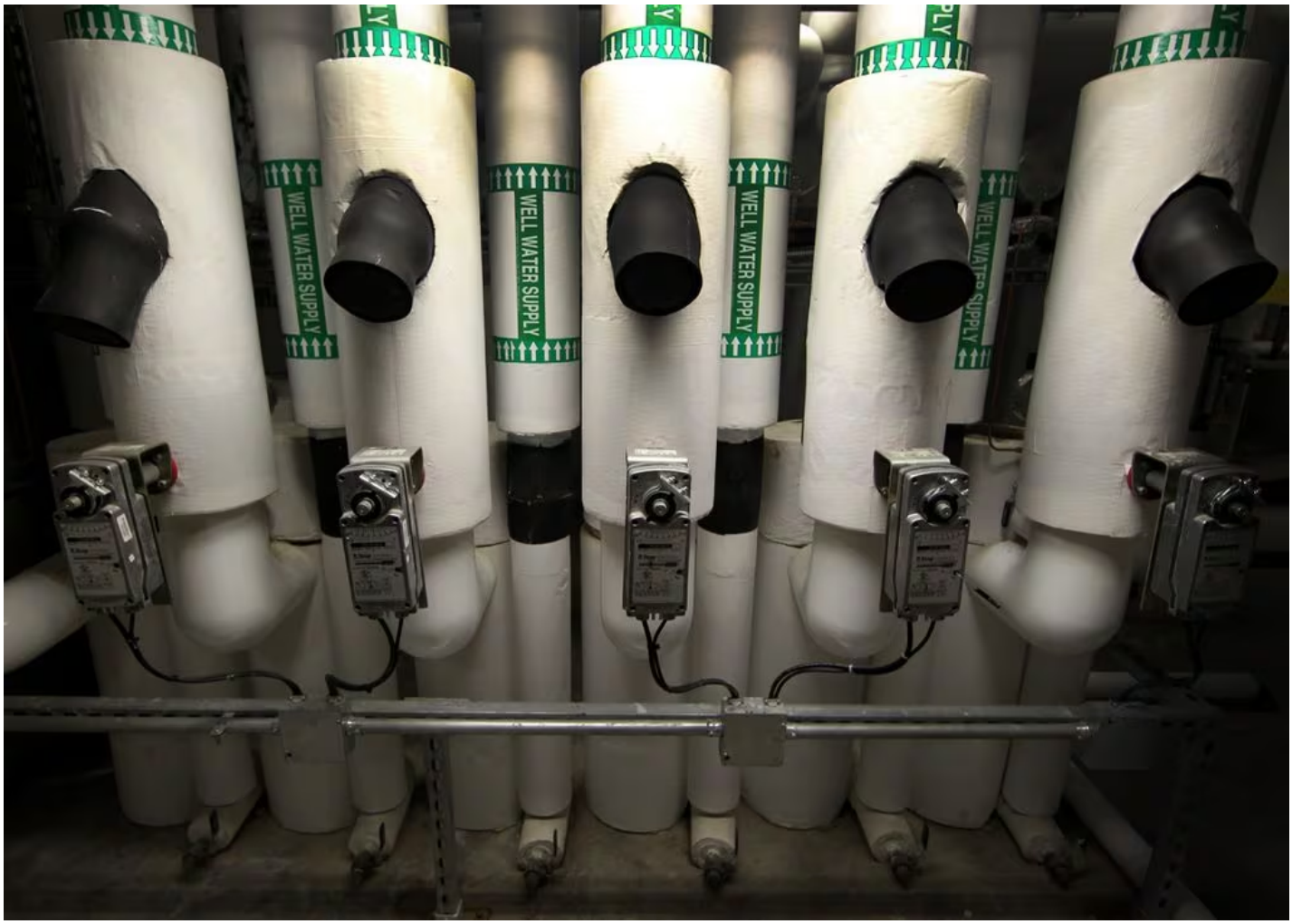
Two Massachusetts schools are ditching oil for geothermal heat pumps

Thanks to incentives from Washington, D.C., two Massachusetts public schools are turning away from fossil fuels and toward clean energy for heating and cooling.

By **Maggie Scales** Globe Correspondent, Updated November 22, 2023, 6:14 a.m.



The pump room at the Isabella Stewart Gardner Museum, where geothermal well water is pumped, filtered, and reclaimed. DAVID L. RYAN/GLOBE STAFF

It's time for Hopkins Academy to replace its heating system. The combined public middle and high school in Hadley, some 20 miles north of Springfield, has used an oil-burning boiler to heat classrooms in the cold winter months since it began occupying its current residence on Russell Street in 1954.

Going with the why-fix-what's-not-broken theory, the Hadley school committee decided to replace the broken-down boiler with an updated version of the same oil-burning system. Then they heard about a cheaper and more environmentally friendly option: geothermal ground source heat pumps.

These systems use the temperature below the earth, which remains relatively constant between 45 and 75 degrees Fahrenheit year-round, for heating and cooling. When below-ground temperatures are warmer than the air above, a geothermal heat pump captures heat from below through a ground heat exchanger. And when the ground is cooler than the air, the system can use the temperature difference to cool buildings.

Water and anti-freeze solution are pumped through pipes — normally five to 10 feet underground in a horizontal system or hundreds of feet down when it's a vertical well — where heat exchange happens. Electricity powers an above-ground compressor, fan, and circulating pump.

These bigger geothermal systems are different than heat pumps typically found in smaller homes, also called mini-splits, where an above-ground outdoor air compressor interacts with the outside air to deliver cooler or warmer air to an indoor wall unit.

Initial installation costs for a heat pump can be several times more expensive than traditional oil or gas heating systems, but the savings are generally recouped in 5 to 10 years through energy-use reductions.

But the geothermal system Hadley is turning to actually became more affordable to install largely thanks to President Biden's signature Inflation Reduction Act, signed into law in August of 2022, which offers steep rebates for installing environmentally-friendly heating and cooling systems.

Oil and gas used to heat buildings in the Northeast are among the biggest sources of greenhouse gas emissions that drive climate change. In Boston, buildings account for roughly 70 percent of emissions.

"When we looked at the facts, it seemed to pan out that we would be in a really positive financial situation by choosing this climate-friendly solution," said Humera Fasihuddin, school committee chair for Hadley Public Schools. "It just became a no-brainer for us to investigate ground source heat pumps further."

Fasihuddin said that because of the federal tax credit and state incentives, the cost of the school's new geothermal heat pumps will be significantly cheaper than a new boiler. The town will also no longer have to pay its regular oil bills.

Hadley will have to front about $3.65 million for the heat pumps but will receive close to $1 million through the Mass Save program — the state's ratepayer-funded energy efficiency program, which is run by the utility service providers — then get an additional federal tax rebate of $1.8 million. Add it all up, the town is responsible for $863,000 to be paid over the next several years, a little less than half of what it would've cost to replace its oil-burning system.

When the weather turns hot, Hopkins's new ground source heat pumps will also provide the school with air conditioning, something the building has never had.

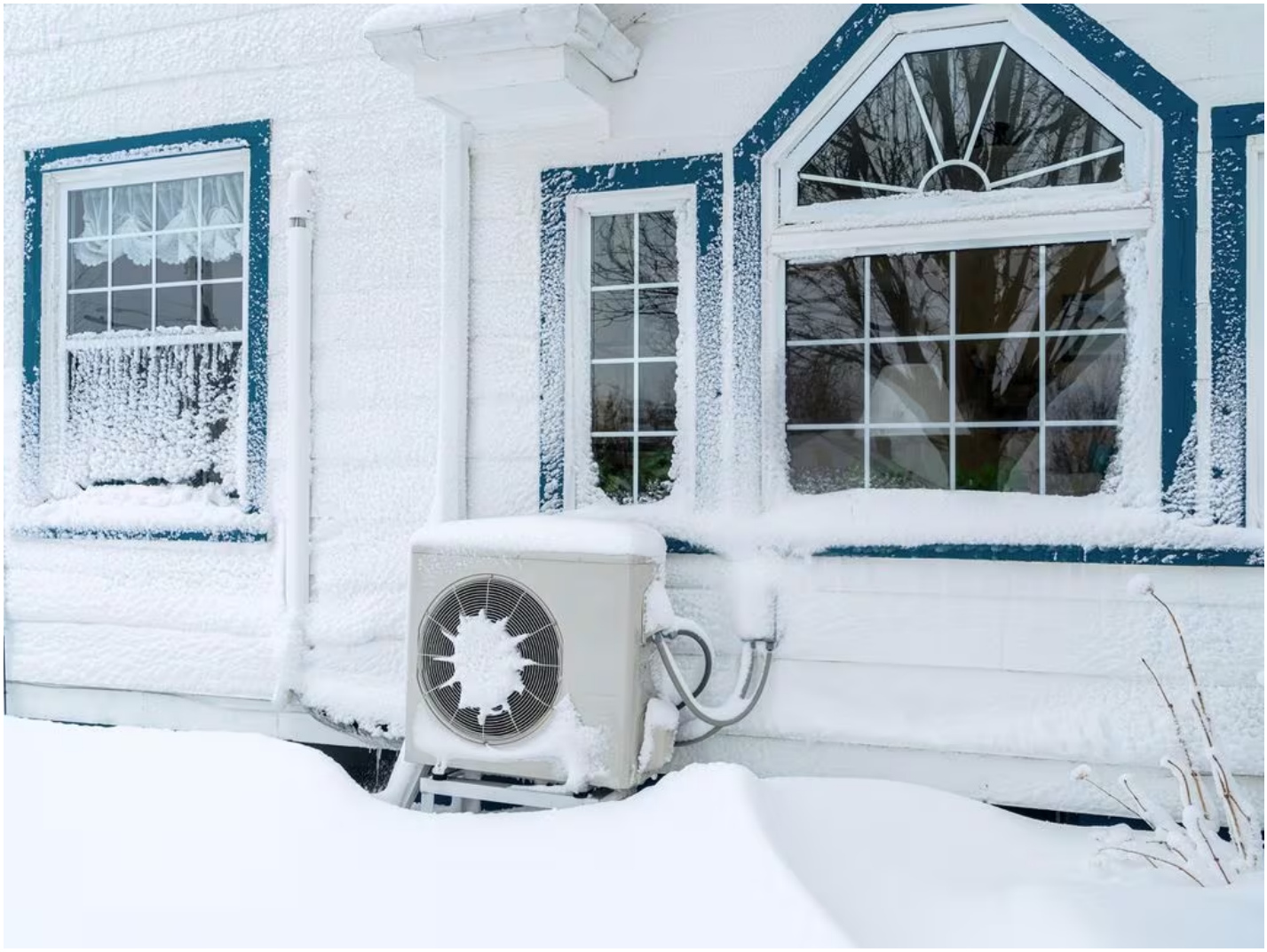
"This is the only option that will provide the schools with air conditioning, which has become increasingly necessary each year as our summers get hotter at the beginning of the school year," added Fasihuddin. "This will greatly contribute to the quality of life for the teachers and students."

The New Bedford public school system, tucked in the southeast corner of the state, is also turning away from its oil-burning boiler system in an old elementary school building in favor of ground source heat pumps for the construction of the new DeValles Elementary School.

"It's going to use less energy than the existing DeValles school and it [the new building] is going to be four times the size," said Timothy Brennan, associate architect at T2 Architecture, the firm designing the school, while speaking at a recent New Bedford school committee meeting.

Andrew O'Leary, interim superintendent of New Bedford Public Schools, said that including ground source heat pumps in the new school's infrastructure "has led to considerable savings for the city of New Bedford."

The upfront costs for geothermal heat pumps in New Bedford would normally be nearly $14 million. But with federal and state rebates, installation costs will drop to about $6.1 million, significantly cheaper than four other more traditional heating options the school investigated. Annual energy costs with a geothermal system will also be lower than with a more traditional boiler.



Because of their efficiency, heat pumps already produce less emissions than oil, gas, or propane heating systems. VERENA MATTHEW/FILE

“We probably wouldn’t consider ground source heat pumps if it wasn’t for the current administration’s Inflation Reduction Act,” said Dan Pallotta, a project manager of the DeValles school building project, at Monday’s meeting. “The payback is short.”

Sara Ross, cofounder of UndauntedK12, a nonprofit that advocates for climate-friendly schools, said the changes at the two Massachusetts schools illustrate a win-win: cost

savings for the districts and less carbon pollution for the planet. She gives a lot of credit to Washington.

“This is about how the Inflation Reduction Act is making its way into communities and changing community-level decision-making,” said Ross. “Often things in DC seem detached, but this piece of federal legislation is changing decision-making on the ground in our communities.”

Maggie Scales can be reached at maggie.scales@globe.com. Follow her @scales_maggie.

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46 Comments

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Rush Inbot 11/22/23 - 6:29AM

I hope their kids like it cold inside!

improvr 11/22/23 - 6:35AM

Yes, they have AC for the broiling fall and spring days we have regularly now. A heat pump is basically a refrigerator, the most reliable appliance in your house.

tsynchronous 11/22/23 - 6:50AM

Geo thermal does require a moderate sophisticated facility manager, I would not install one on a residential property.

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John Steak 11/22/23 - 6:51AM

Sounds very promising! Hopefully it's a technology that works great and more people/businesses will feel comfortable installing.

RickS357 11/22/23 - 6:58AM

I would never rely on heat pumps to heat my school building. Actually let a few test locations try it and see the results. You can not turn the temperature down on off hours and expert the room(s) become comfortable in the time it takes a fossil fuel system to bring up to temp. Also at low temperatures you're pretty much heating with electric because of the efficiency.
BTW, I've heated my home with heat pumps for over 10 years and still have fossil fuel as emergency back up.

Cayde Six 11/22/23 - 7:31AM

And how often have you had to rely on the fossil fuel backup?

improvr 11/22/23 - 7:38AM

Do you still teach that the sun revolves around the earth in your school buildings too?

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Zippitidoodah 11/22/23 - 7:31AM

Rick, the geothermal system described in the article, unlike your mini split, will function efficiently even at low temperatures since it draws heat from the ground and not the air. They have no need for an oil fired backup system.

improvr 11/22/23 - 7:36AM

It's amazing the outdated ignorance that persists on the subject of heat pumps. In the case of some commenters on this site, it is willful and deliberate ignorance.

bamboozled 11/22/23 - 7:48AM

The video embedded in the article states a supplemental heat source is needed.

HoraceM 11/22/23 - 7:54AM

There is a "willingness to understand" that has to go along with the "ability to understand" that is lacking for some people I see.

Ben Lieberman 11/22/23 - 7:59AM

Great choice. Going conventional locks in emission for decades.

EphWilliams 11/22/23 - 8:56AM

What a mess. Just build more pipelines for natural gas, build nuke plants, call it a day.

Guest3 11/22/23 - 9:31AM

What is a "mess" about this in any way?

ceb86 11/22/23 - 10:37AM

How is an efficient heating/cooling system a "mess"? I guess at Eph's house, there is no insulation and they keep all the widows open throughout the winter and just crank up the heat. Right?

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This comment has been blocked.

HCEarwicker 11/22/23 - 9:30AM

Why is Metro Kiddie obsessed with someone else's balls?

Guest3 11/22/23 - 9:32AM

"Kids" like Metro Kid don't belong at the adult table, sorry.

Show all 7 replies

MarieOnCape 11/22/23 - 9:37AM

As I read about it Maynard plans to build their new elementary school with geothermal because the town's citizens didn't want fossil fuel for it in town meeting.

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twik-d 11/22/23 - 10:37AM

Maynard is, but your reasoning is not accurate as to the why.

Justthedata2 11/22/23 - 9:49AM

The article does not quantify the emissions from the heat pump vs natural gas. Why not? It’s a pretty important fact,

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ceb86 11/22/23 - 10:43AM

Heat pumps have no emissions. The only emissions would be related to the generation of electricity to run the system, if any. If you add a solar installation, it would obviously minimize the dependence on externally generated electricity. Both systems would pay for themselves in less than a decade.

Guest3 11/22/23 - 10:11AM

It's hard to definitively quantify and depends entirely on the source of power for that particular building and the grid that building is attached to. But inherently it should be less, as the grid in MA is around 60-70% fossil fuel electricity while natural gas is 100% fossil fuel energy. And the percentage of non-fossil fuel electricity is increasing every year, meaning a building with

electric heat pumps emits LESS CO2/pollution every year than the year before.

Buckospal 11/22/23 - 10:31AM

How's that Vineyard Wind project progressing?

Targus 11/22/23 - 10:37AM

Hopefully well. It's needed. There are no detrimental consequences to offshore wind. Other countries have been doing it for years safely and reliably. So there's no reason we shouldn't except for those whiners and naysayers stuck in the past.

Targus 11/22/23 - 10:51AM

And, Bucky, how about the wind farm off Block Island? Don't see anything negative about that installation do you except for normal wear and tear? It has been in operation for about six years and produced enough electricity to power about 20,000 homes over that time span. Is it worth the investment? Is it worth the energy production? OF COURSE it is. Nothing of real value operates 100% of the time without some problems. So what's the big deal?

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Targus 11/22/23 - 10:34AM

Whoopee for them! Installed a heat pump system and more efficient central heating system/exchanger at the urging of National Grid two years ago. So what does National Grid now report monthly? While we use much less gas we now are using more electricity. That's OK though because the heat pump/system we have uses less electricity then the previous make and model.

The bottom line is that we are saving money, have a great quiet system, are comfortable throughout the year, and with the kickbacks from Mass Save the system was worth the cost.

Vote-With-Your-Feet 11/22/23 - 11:22AM

Hadley will have to front about $3.65 million for the heat pumps but will receive close to $1 million through the Mass Save program — the state's ratepayer-funded energy efficiency program, which is run by the utility service providers — then get an additional federal tax rebate of $1.8 million. Add it all up, the town is responsible for $863,000 to be paid over the next several years, a little less than half of what it would've cost to replace its oil-burning system.

I give up. How does a town, which is not a federal-tax-paying entity, score an enormous federal tax rebate?

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user_3820275 11/22/23 - 11:53AM

"How does a town, which is not a federal-tax-paying entity, score an enormous federal tax rebate?"

The Federal government doe this sort of thing - and more! - all the time for initiatives that are deemed worthwhile. Getting our buildings off of the direct use of fossil fuels (fun fact - you can generate electricity to run a heat pump without burning fossil fuels) certainly seems worthwhile.

Also, too, you might look into the grant programs the feds offer for local school building. You'll be outraged, no doubt.

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