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Getting steamed: Mega-plume blossoms in cold weather at St. Paul energy plant



The steam plume from St. Paul's central heating plant rises into the air on Thursday, Jan. 2, 2020. (Scott Takushi / Pioneer Press)

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Almost everyone in the metro area has seen St. Paul's largest thermometer.

The enormous plume from the St. Paul District Energy plant rises and falls with every change in temperature. On a cold day, it's like a colossus towering over the dozens of lesser plumes scattered at its feet.

That's when Nina Axelson sometimes has to explain that, no, the giant cloud is not smoke. It's water vapor, and it's getting bigger because the plant is getting greener — burning more water-bearing wood.

"It's an exciting time. The bar is being set high for all of us," said Axelson, vice president of sustainability and outreach for District Energy and its subsidiary, Ever-Green Energy.

It's the water in the wood that makes the steam-cloud so huge, even though the plant itself is not the biggest in the state. There is now more local wood to burn, said Axelson, because of the epidemic of emerald ash borers that is killing ash trees.

The plant heats 80 percent of the buildings in downtown St. Paul, about 33 million square feet — more than a square mile of office space.

Last year, it fluctuated from the equivalent of 170 megawatts of heat in winter, to 10 megawatts in the summer. The size of the plume tracked the output — a white tornado in the winter, and a few wimpy wisps in the summer.

Mike Burns, Ever-Green's senior vice president of operations, explained that the plume isn't actually steam.

Steam is hot air containing invisible water — which condenses into water vapor as it cools. It's water vapor — not steam — that forms clouds, creates fog and rises from coffee cups.

It also creates Burns' gigantic plume, which gets moisture from two ways:

- **New water.** Any combustion creates water molecules by combining hydrogen with oxygen. A coal-fired or natural gas plant, then, produces some steam from the water it creates.
 - **Old water.** Existing water in fuel turns to steam when heated, and scrap wood is usually 35 percent water. It generates far more steam than any other fuel.
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The oversized plume is a sign — visible for 20 miles — that the plant is burning wood.

The plant's shift to greener fuels began in 2003, when it started to burn wood.

When the emerald ash borer hit St. Paul in 2009, trees began to be removed. Suddenly, a constant supply of local wood was available — much cheaper than wood transported from around the state.

The plant stopped burning coal in 2019.

Today, it burns wood and natural gas. Burns is trying to push the wood-consumption higher, and on Jan. 2, he said, 60 percent of the plant's energy came from burning wood.

The plant generates electricity to sell to Xcel Energy. The heat that would ordinarily be wasted is transferred to the plant's 197 downtown customers via pipes.

Burns said it's about twice as efficient to burn the wood for electricity and heat than just the electricity by itself.

The plume is also an indicator of humidity and wind speed.

If the air is already humid, it can't take as much new water — and more of it condenses into big clouds. On a low-humidity day, the air soaks up the water and the visible plume shrinks.

Axelson appreciates the plume because it's a visible sign that the plant is functioning well.

"Folks notice it," she said. "Everything else we have is underground."

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Bob Shaw

Bob is a 40-year veteran (yes, he is grizzled) who edited one Pulitzer Prize winner and wrote two that were nominated. He has also worked in Des Moines, Colorado Springs and Palo Alto. He writes about the suburbs, the environment, housing, religion -- anything but politics. Secret pleasures: Kayaking on the Mississippi on the way to work, doughnuts brought in by someone else. Best office prank: Piling more papers onto Fred Melo's already trash-covered desk.

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