

MiSustainable Holland

About this series

The MiSustainable Holland column is a collection of community voices sharing updates about local sustainability initiatives.

This Week's Sustainability Framework Theme:

Smart Energy: We need to use both conservation and efficiency measures to manage our resources to provide access to reliable and cost-effective energy.

The math on electrification all adds up

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As a savvy local utility customer, you may have wondered about the environmental benefits of switching away from natural gas appliances to electric appliances if most of our local electricity comes from a natural gas power plant.

Taking a residential heat pump as an example, let's walk through why "electrifying" reduces your carbon footprint as a Holland BPW customer.

The average Michigan home needs around 72 million BTUs of heat to get through the winter, regardless of the heating system you have. If you have a high efficiency gas furnace with a 95 percent efficiency rating, you need to buy and burn around 76 million BTUs of natural gas to get 72 million BTUs of heat output from your furnace.

If you have an electric heat pump, your heating load is still the same 72 million BTUs. But because heat pumps can capture existing heat from the surrounding air – even in cold winters thanks to chemical refrigerants – they can be more than 100 percent efficient in turning fuel (in this case electricity) into heat.

In fact, heat pumps can be more than 300 percent efficient, meaning they can use one unit of electric energy and produce three units of heat energy. So, for a heat pump to generate 72 million BTUs of heating, it only needs to use 24 million BTUs of electric energy, compared to the 76 million BTUs of gas that the traditional furnace needed.

Now consider the source of that electricity.

Most of your electricity here in Holland comes from HBPW's Holland Energy Park, a "combined cycle" natural gas power plant. It's called combined cycle because it burns natural gas to spin turbines and make electricity, and then waste heat from that process is used to make steam to spin a second generator, making even more electricity.

This process is normally around 50 percent efficient, but it can be up to 60 percent efficient in the winter when the system is dispelling additional waste heat into the downtown snowmelt system. This efficiency rating is less than your home's furnace, because a furnace's thermal efficiency measures how much useful heat you can get out per unit of fuel put in, while a power plant's efficiency rating measures its ability to make electricity – that is, converting thermal energy into mechanical energy to spin a turbine.

The 60 percent efficiency of the Holland Energy Park means that to make the 24 million BTUs of energy needed for your heat pump, the plant would need to burn about 40 million BTUs of natural gas. But since a portion of your local electricity comes from renewable sources, you actually need less than 40 million BTUs.

At Holland BPW's current level of providing around 16 percent renewable energy, that means your heat pump only used around 34 million BTUs from the Holland Energy Park with the other 6 million BTUs coming from clean renewable sources. As the Holland BPW works to meet the State of Michigan's

new renewable energy standards over the coming five to 10 years, the amount of natural gas needed to make each unit of electricity will continue to drop.

So, compare 34 million BTUs to power a heat pump with the 76 million BTUs needed to power an efficient gas furnace and you see that the gas furnace is responsible for more than twice the carbon emissions than when using a heat pump.

Learn about other ways to reduce your carbon footprint at cityofholland.com/1199/Sustainability.

■ *Andrew Reynolds is the community energy services manager for Holland Board of Public Works.*