

Science You Can Use

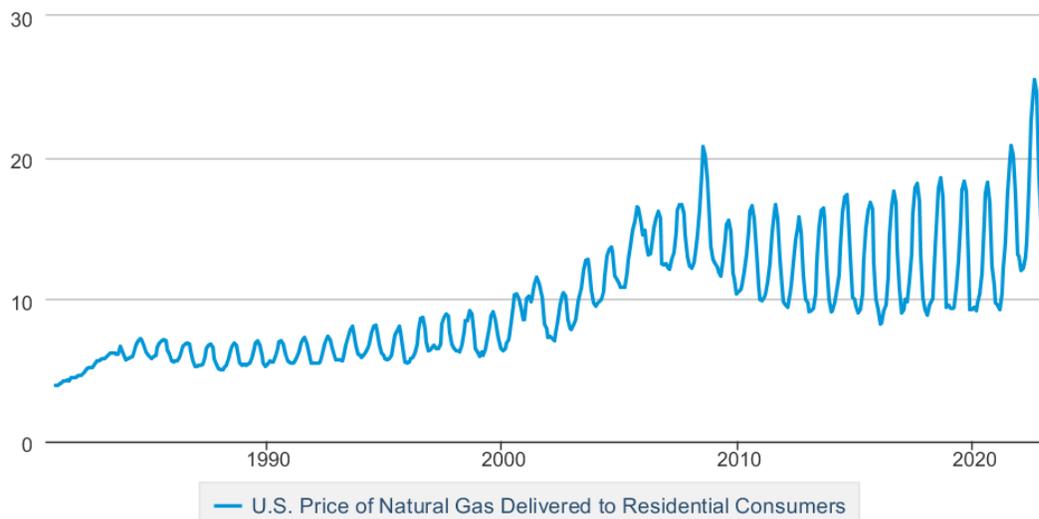
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Dear Science: I heat my house with a forced-air natural-gas furnace and cool the house with a conventional air conditioner. Even though I used about as much natural gas in February 2022 as I did in February 2023, my February 2023 gas bill was 50% higher than my February 2022 bill. What happened, and what can I do to reduce my heating bill? -- Buck R.

Dear Buck: In order to compare natural gas prices over time, you need to compare *unit prices* of gas. The unit price of gas is the price your gas supplier charges for a unit of gas. A unit of gas can be whatever the regulatory environment allows. Typically, a unit of gas is one hundred cubic feet (ccf), one thousand cubic feet, one British Thermal Unit (BTU), or (in the metric system), one (or one hundred, or one thousand) Joule(s). Your gas bill will state which of these units your gas supplier uses. Your supplier may include a statement of the unit price on your bill. If not, you can simply divide the total charge for gas on your bill by the number of units gas billed; that result is the unit price.

U.S. Price of Natural Gas Delivered to Residential Consumers

Dollars per Thousand Cubic Feet



Data source: U.S. Energy Information Administration

Figure 1. US Price of Natural Gas Delivered to Residential Consumers.

In addition to gas prices, gas bills typically include administrative and pipeline maintenance costs, and taxes.

Residential natural gas prices in the US approximately doubled from 2022 to 2023. Figure 1 puts this change in the context of residential natural gas prices, 1980-2023. Several features of Figure 1 are worth noting. First, beginning about 2000, the annual variation (summer low to winter high) in gas prices has been about 100% (i.e., the price has doubled from summer to winter). Second, there was sharp spike in price in 2008, following an upward trend in prices from about 2000. Third, the average price of natural gas has been trending upward since about 2020.

Why has the price of natural gas trended upward recently? The primary reason is that the energy market is worldwide, and the worldwide demand for natural gas has continued to increase faster than supply. Various factors have contributed to this demand. For example, more manufacturers and electricity-generating utilities than ever are converting to natural gas. In addition, the war in Ukraine has greatly reduced Russian gas supplies to Europe.

What can you do to reduce your natural gas bill? First, get a professional energy audit of your house. Some HVAC vendors and energy suppliers can provide such an audit, or may know who provides energy auditing in your area. The audit will help you to decide where you can get the best return on energy-efficiency improvements. One way to measure that return is how long it would take you to recover, through energy price savings, what you invest. This time is called the “payback period”. Actual payback time will depend on the construction of your house, the price of each option, the price of energy in your area, and weather conditions in your region.

Let’s look at some typical energy-efficiency-upgrade options, assuming an average 2000-square-foot house in the Midwest.

Change your thermostat settings. Set your thermostat to no higher than 70 degrees (Fahrenheit) in the heating months, and to no lower than 74 degrees (Fahrenheit) in the summer months. This change costs nothing, so the payback period is zero.

Add fans. 18”-diameter pedestal fans help to circulate warm air in the winter and cool air in the summer. They typically sell for less than \$50 each and last about five years in heavy use. They can have a payback period of as little as five years.

Weatherstrip. Windows and doors leak air. In houses more than 30 years old, this leakage can account for up to 20% of your heating and cooling costs. A few hundred dollars invested in installed weatherstripping can greatly reduce this leakage and have a payback period of less than 10 years.

Add window coverings. Glass is one of the primary sources of heat loss and gain in a house. Installing heavy curtains or cellular shades over windows will cost \$1,000 - \$5,000 and have a payback period of roughly 10 years.

Add thermal insulation. If your house has an attic and has six or fewer inches of thermal insulation in the attic floor, adding 6-12 inches of thermal insulation to the attic floor can pay back in 10 years.

Replace your HVAC with a heat pump. A heat pump is a combined heating and cooling appliance that replaces a conventional forced-air gas furnace and air conditioner. Installing a heat pump can cost \$20,000, but can save as much as 50% on your heating and air conditioning bill. Depending on your usage, it can take 15 years for a heat pump to pay for itself in reduced heating and cooling bills.

For further information, see <https://www.energy.gov/energysaver/fact-sheets> .

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