# Gas or Electric?

## an inquiry into greenhouse gas production

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Lately, I've been receiving lots of exhortations to "Go Electric." But, when it comes to reducing your carbon footprint is electricity really a better option than gas? The answer can be quite complex, but generally, it depends on how your electricity is generated.

If your electricity is produced mostly from coal, gas wins hands down. If your electricity is produced mostly from non-polluting renewable sources, electricity wins handily. So check into where your distributor gets its electricity. It makes a huge difference, although the "Go Electric" cheerleaders are unlikely to tell you this.

Suppose you are an "average" Estadounidense (inhabitant of the United States of America). Your electricity comes from:

coal 22%,
natural gas 38%,
other sources 40%.

However, the Carbon Dioxide ($CO_2$) you generate comes from:

coal 56%,
natural gas 42%,
other sources 2%.

The United States power industry produced 4,109.7 million megawatt-hours of electric energy in 2021 generating 1,651.9 million metric tons of $CO_2$ which is equivalent to 0.886 pounds of $CO_2$ per kilowatt-hour (kWh) of electric energy produced. On the other hand, if you burn natural gas in your home you generate 0.398 pounds of $CO_2$ for an equivalent kWh of thermal energy. In other words, you reduce your carbon footprint by 55% by using gas instead of electricity.

But, if you are an "average" Washingtonian, since Washington gets most of its energy from non-polluting renewable sources, you generate only 0.219 pounds of $CO_2$ per kWh, thereby reducing your carbon footprint by 45% by using electricity instead of gas.

However, in Missouri, which relies heavily on coal, you would generate 4.3 times as much $CO_2$ per kWh of energy by using electricity instead of gas. In Rolla, or any of the other 34 cities belonging to Missouri Public Energy Pool (MOPEP), you are 4% below the state average, generating 4.12 times as much $CO_2$ using electricity instead of gas.

These comparisons are laid out in Table 1 below. Links to data sources are below the table.

This analysis is incomplete. I have neglected the climatic and environmental costs of mining and drilling, building infrastructure, transportation and transmission and the efficiency of the appliances installed in your home. I've also neglected other greenhouse gasses such as methane and sulfur dioxide. However, I leave this more complete analysis to those more knowledgeable than I am.

An additional factor is the by-products of combustion within one's home, which can be detrimental to one's health. One such by-product, nitrogen dioxide, can cause respiratory problems. If your electricity generation relies heavily on fossil fuels, particularly coal, one merely passes these toxic by-products back to those who live near locations were fossil fuels are mined, drilled, refined or burned. Since folks who live in these locations are often poor and under-privileged, this is a matter of environmental justice.

However, in the case of non-polluting renewables, these detrimental health effects are mostly avoided.

So to sum up: Before jumping on the "Go Electric" bandwagon, find out where your electricity comes from. You may be better off getting involved with an organization like Great Rivers Environmental Law Center than spending your money on new electric appliances. Great Rivers is working to retire the most polluting coal-fired electric generation plants and forcing electric utilities to transition to non-polluting renewable sources.

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**Table 1: $CO_2$ Emissions Per Energy Generated**

| Location | Source | Miillion mWh produced | portion of Total mWh | CO2 Emissions million tonnes | CO2 Emissions tonnes/mWh | CO2 Emissions lbs/million btu | CO2 Emissions lbs/kWh | CO2 Emissions As % of Nat .Gas / 100 |
|---|---|---|---|---|---|---|---|---|
| U.S.Total | | | | | | | | |
| | Total | 4,109.7 | 1.00 | 1,651.9 | 0.402 | | 0.886 | 2.23 |
| | Coal | 898.0 | 0.22 | 919.3 | 1.024 | | 2.257 | |
| | Natural Gas | 1,579.2 | 0.38 | 695.9 | 0.441 | | 0.972 | |
| | Other Sources | 1,632.5 | 0.40 | 36.7 | 0.022 | | 0.050 | |
| Washington | | | | | | | | |
| | Total | 110.8 | 1.00 | 11.0 | 0.099 | | 0.219 | 0.55 |
| | Coal | 3.1 | 0.03 | 3.5 | 1.129 | | 2.489 | |
| | Natural Gas | 16.6 | 0.15 | 7.4 | 0.446 | | 0.983 | |
| | Other Sources | 91.1 | 0.82 | 0.1 | 0.001 | | 0.002 | |
| Missouri | | | | | | | | |
| | Total | 76.9 | 1.00 | 59.7 | 0.776 | | 1.712 | 4.30 |
| | Coal | 57.9 | 0.75 | 56.2 | 0.971 | | 2.140 | |
| | Natural Gas | 6.1 | 0.08 | 3.2 | 0.525 | | 1.157 | |
| | Other Sources | 12.9 | 0.17 | 0.3 | 0.023 | | 0.051 | |
| Rolla (MOPEP, Rolla Municipal Utilities, See notes 2-4 below) | | | | | | | | |
| | Total | | 1.00 | | 0.744 | | 1.640 | 4.12 |
| | Coal | | 0.66 | | 0.971 | | 2.140 | |
| | Natural Gas | | 0.19 | | 0.525 | | 1.157 | |
| | Other Sources | | 0.15 | | 0.023 | | 0.051 | |
| Natural Gas (energy content when burned) | | | | | | 116.65 | 0.398 | 1.00 |

Notes

1. All data from US Energy Information Administration for year 2021 except data for Rolla
2. Data for Rolla on mWh by fuel type from Missouri Public Energy Pool for year 2022
3 Data for Rolla on emissions per mWh based on 2021 Missouri State ratio of emissions to energy produced
4. Rolla Other Sources: 9% wind, 2% hydro, 2% solar and 2% landfill gas

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Links

Electric energy produced (USEIA [US Energy Information Administration])
CO2 emissions generated (USEIA)
CO2 emissions coefficients (USEIA)