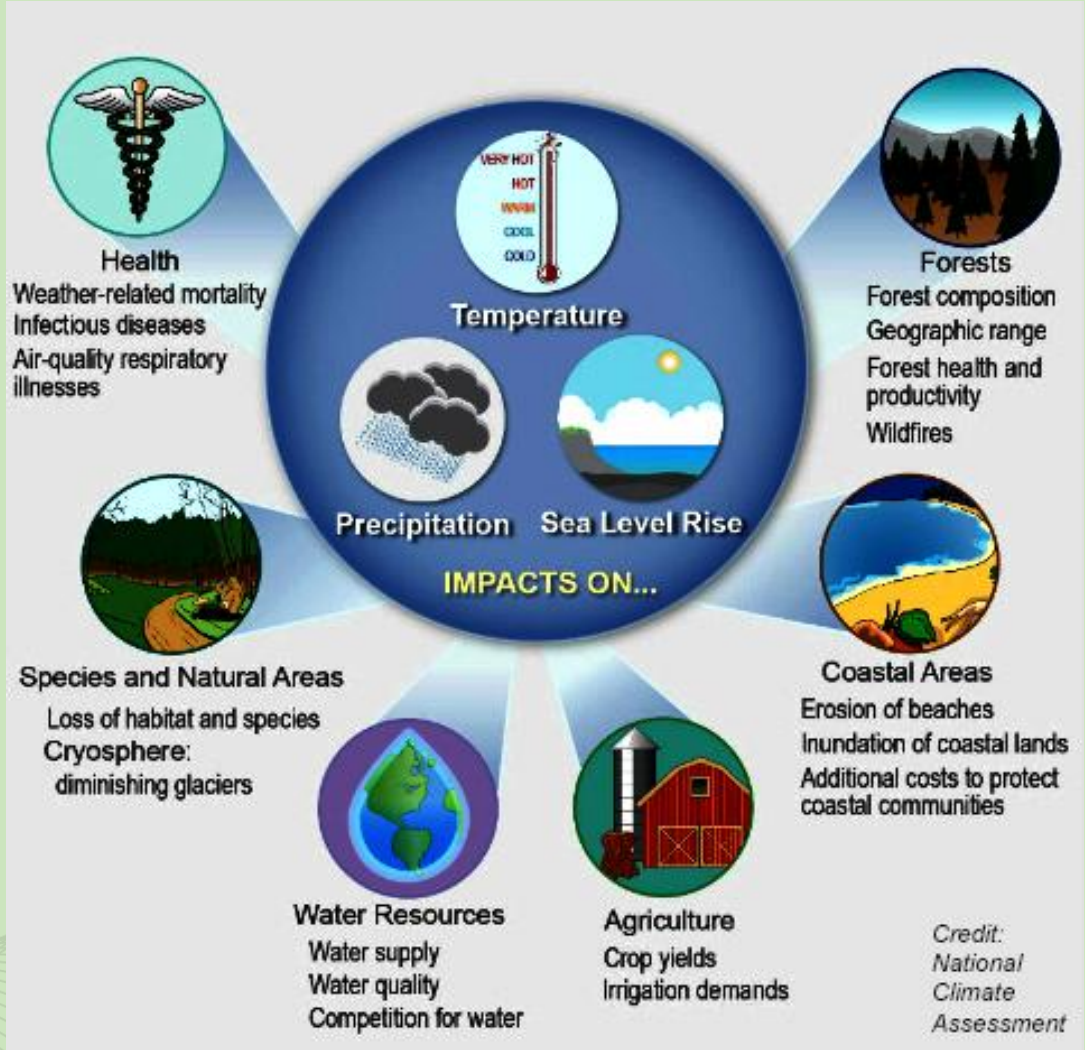
Doing Our Part for the Future

Electrifying Homes and Buildings To Save The Planet, Your Money & Your Health



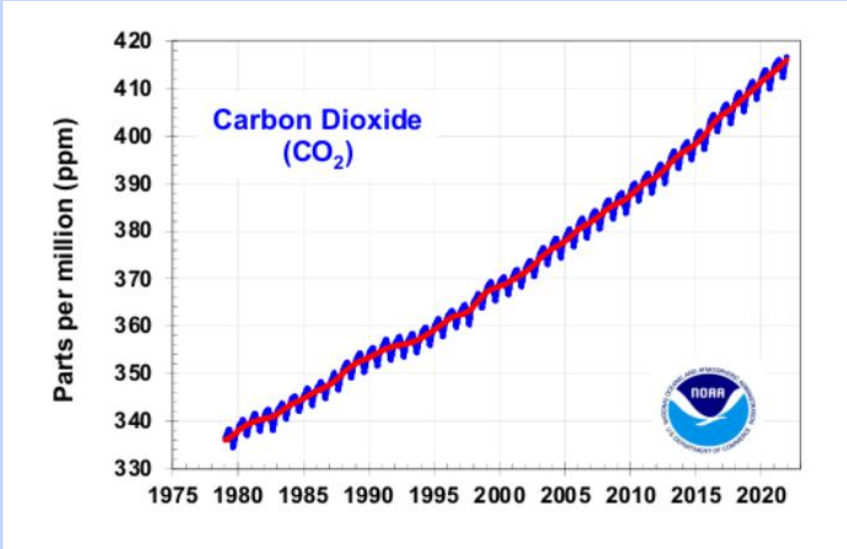
Slowing down and eventually reversing climate change is the existential issue of our time.

The climate is getting crazier

The last 7 years have been the hottest in the earth's history.

We are seeing historically unprecedented droughts, storm intensities, and other indicators

Atmospheric **concentrations** of greenhouse gases are still rising, as is the **total amount** that the planet emits every year.



Greenhouse gas emissions must shrink a lot

“Science tells us that the absolute priority must be rapid, deep and sustained emissions reductions in this decade. Specifically — a 45% cut by 2030 compared to 2010 levels.”

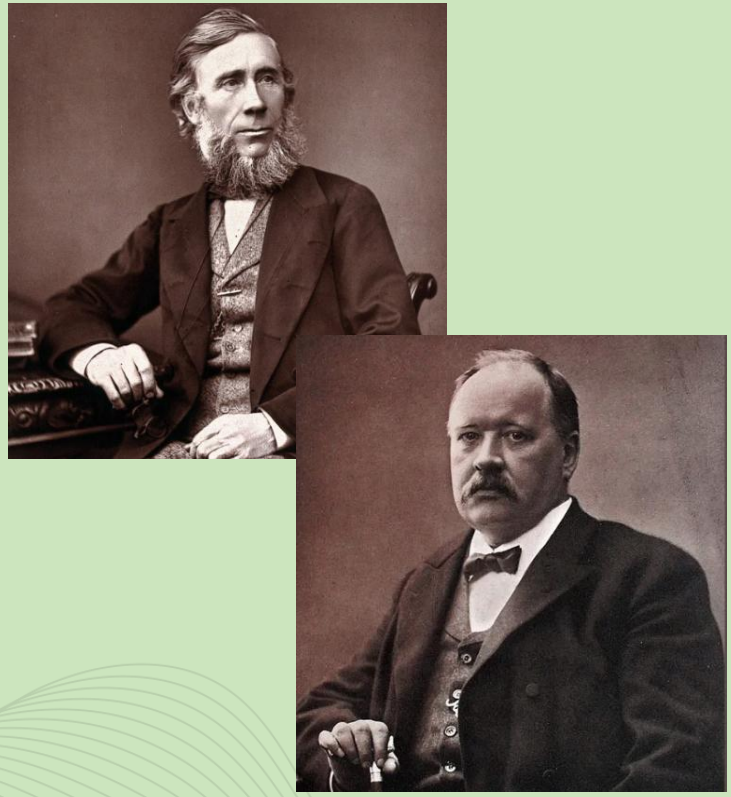
UN Secretary General António Guterres Glasgow Scotland, 11/13/21

PART 1: A LITTLE BACKGROUND

Al Gore did not invent climate science

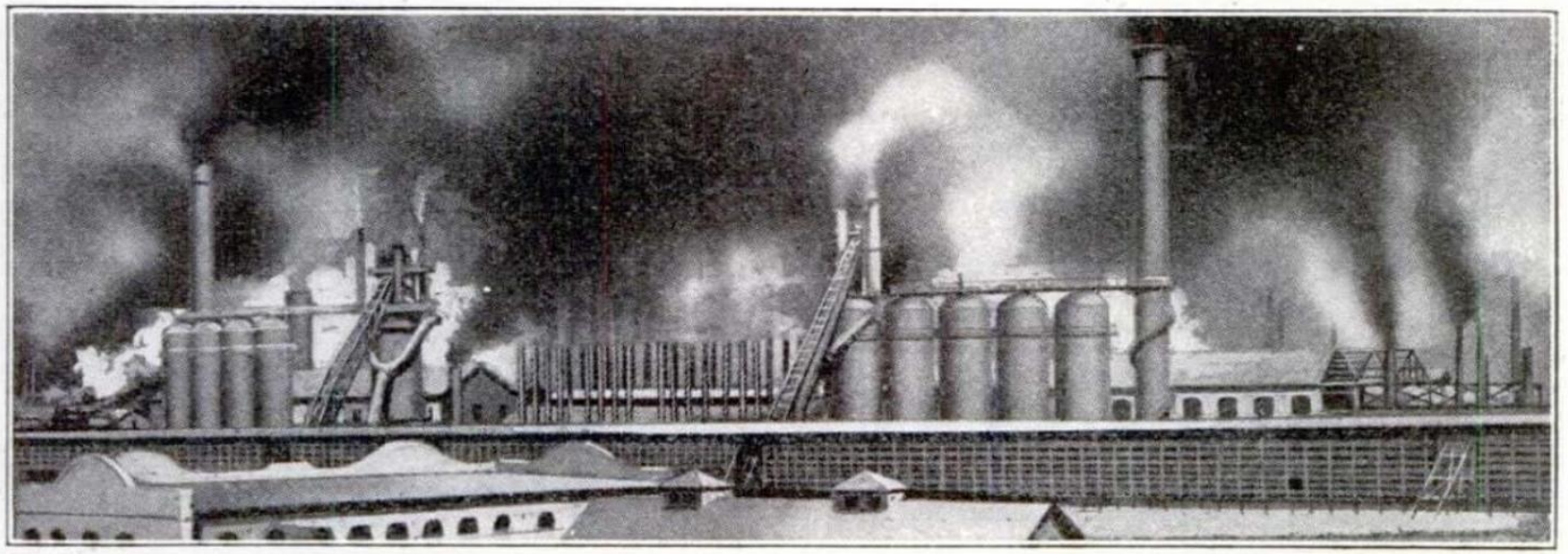
The basic science of greenhouse gases has been known for more than 120 years. American Eunice Foote was the first to hypothesize that higher amounts of CO2 in the atmosphere would cause earth's temperature to rise. Her paper "On the Heat in the Sun's Rays", was presented to the American Association for the Advancement of Science in 1856. Two French physicists had previously noted that the atmosphere trapped the earth's heat but didn't know why.

Climate history: Tyndall and Arrhenius



Three years later Irish physicist John Tyndall determined the exact absorption and radiative capacity of CO2 and many other gases, and in 1903 Swedish chemist Svante Arrhenius won a Nobel for his paper “On the Influence of Carbonic Acid [CO2] in the Air upon the Temperature of the Ground”.

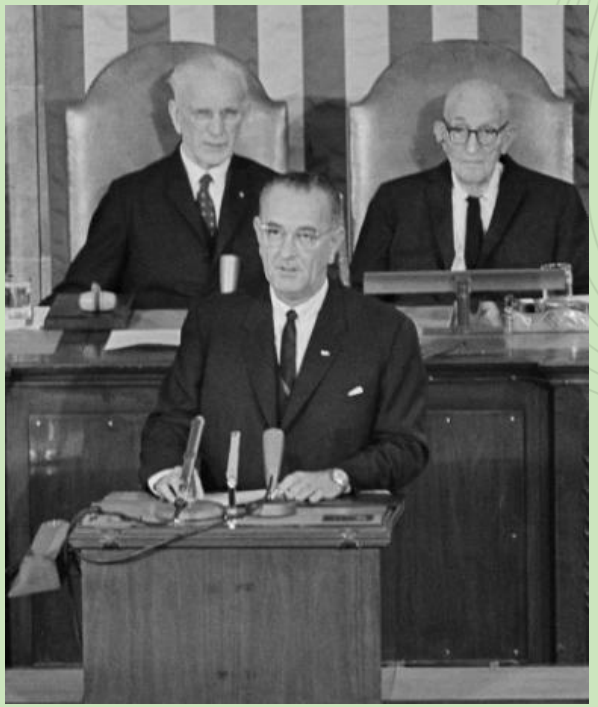
Climate history: 110 years ago



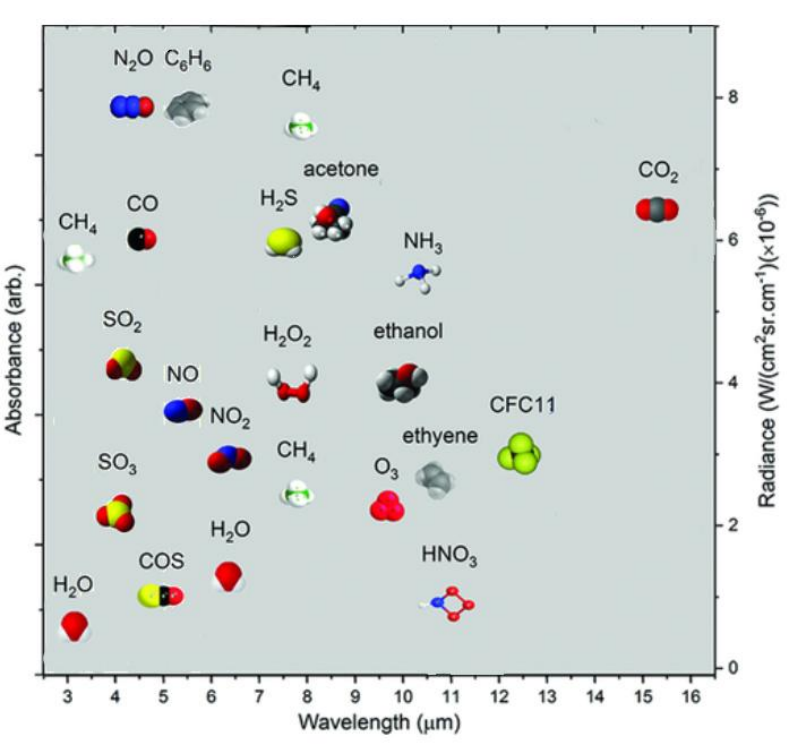
The furnaces of the world are now burning about 2,000,000,000 tons of coal a year. When this is burned, uniting with oxygen, it adds about 7,000,000,000 tons of carbon dioxide to the atmosphere yearly. This tends to make the air a more effective blanket for the earth and to raise its temperature. The effect may be considerable in a few centuries.

Climate history: 1965

President Lyndon Johnson warned Congress in 1965 that burning fossil fuels was changing the atmosphere. Later that year, his advisory board of prominent scientists estimated that there would be 25% more CO2 in the atmosphere by 2000 (they weren't far off.)

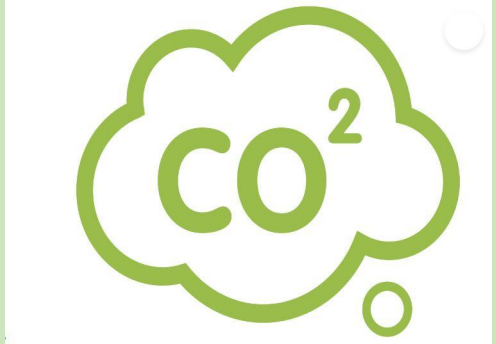


Basic science: what's a greenhouse gas?



It is a way of describing gases whose molecules absorb and radiate the long infrared waves–heat. Water vapor (H2O), carbon dioxide (CO2), methane (CH4), and ozone (O3) are four of the most common found in the atmosphere, with H20 being the most abundant. The term “green-house” to describe this phenomenon was first published by Nils Ekholm in England in 1901.

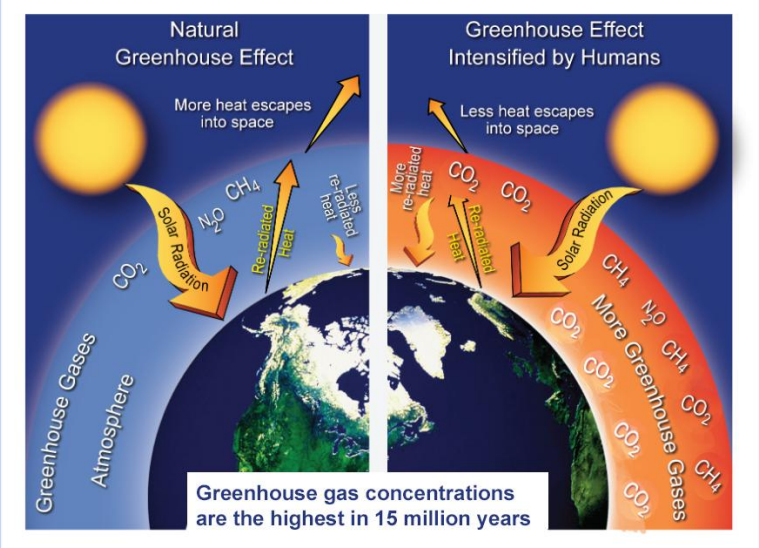
Basic science: CO2



Natural sources of carbon dioxide gas include respiration and the burning or decay of carbon-containing materials. Natural CO2 sources are balanced by vegetation and ocean “carbon sinks”, giving us a reasonably stable climate. Human sources from burning hydrocarbons like methane & gasoline and superheating limestone for making cement now results in about twice what natural sinks can handle.

Basic science: the atmosphere

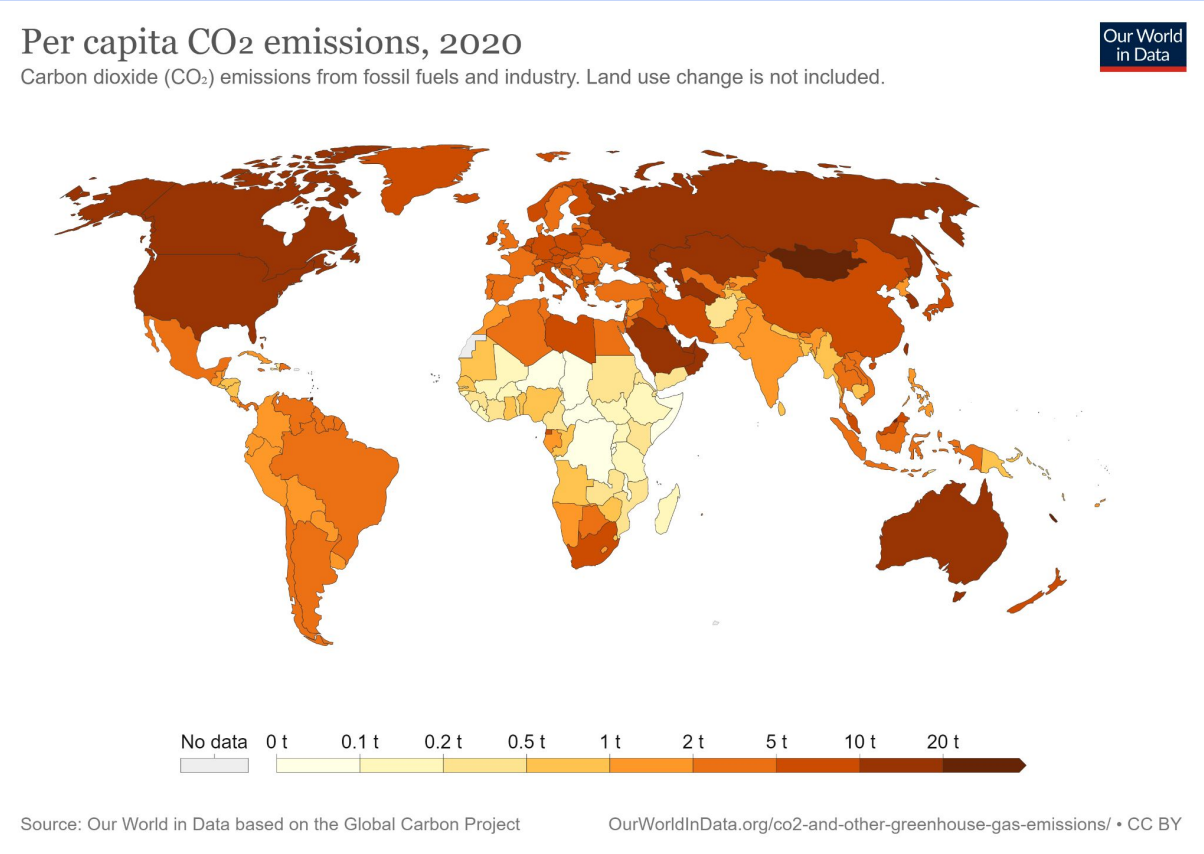
Our atmosphere is mainly nitrogen (N2) and oxygen (O2). These simple molecules let long-wave infrared radiation (heat) rising from the earth pass into space. More complex molecules like H2O, CO2, CH4, and O3 absorb and radiate heat, some of which returns to earth. The more of these complex molecules are in the atmosphere, the more heat is returned to earth.



Basic science: Unnatural gas

Most people understand that burning coal produces harmful CO2. Fewer people know that burning “natural gas” (or propane or fuel oil) is almost as bad. The gas industry has done a good job convincing people with false advertising that gas is clean and safe. In fact, it is a highly refined product that is almost entirely fossil methane – a very potent greenhouse gas in its own right that chemically converts to CO2 when it burns.

We need to do our part

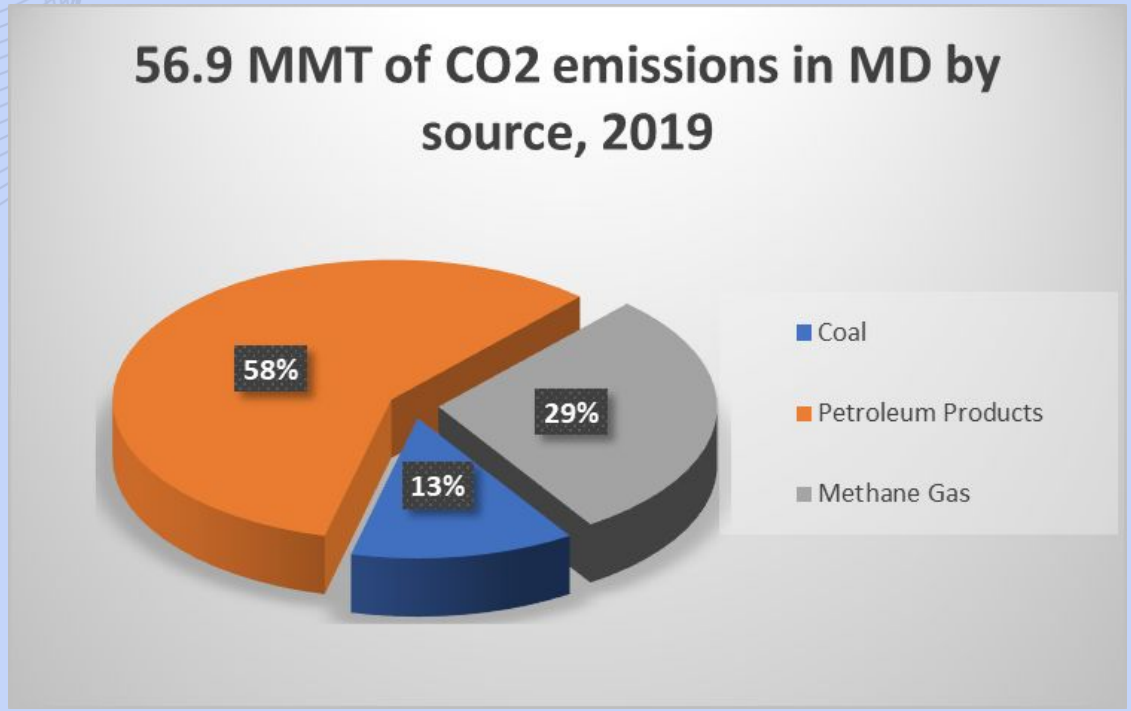


Maryland has set high goals

"The state shall achieve net-zero statewide greenhouse gas emissions by 2045."

— Maryland Annotated Code

Sources of CO2 emissions in Maryland



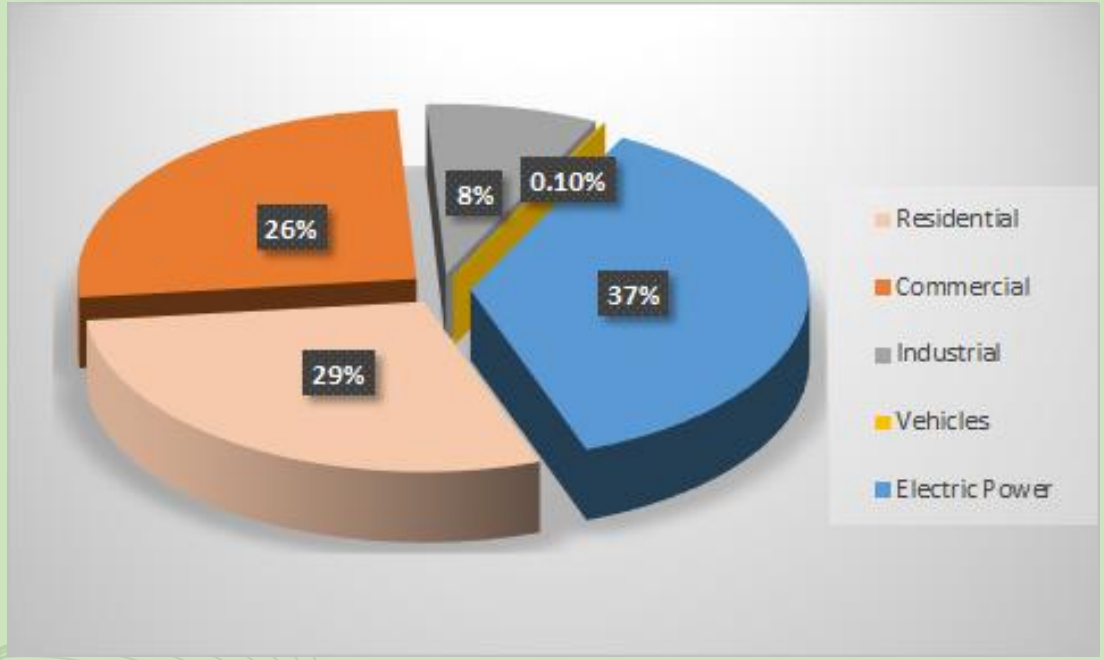
Petroleum
58% = 33 MMT

Methane Gas
29% = 16.5 MMT

Coal 13% = 7.4 MMT

DATA FROM FEDERAL ENERGY INFORMATION ADMINISTRATION

MD homes and buildings: 9 MMT

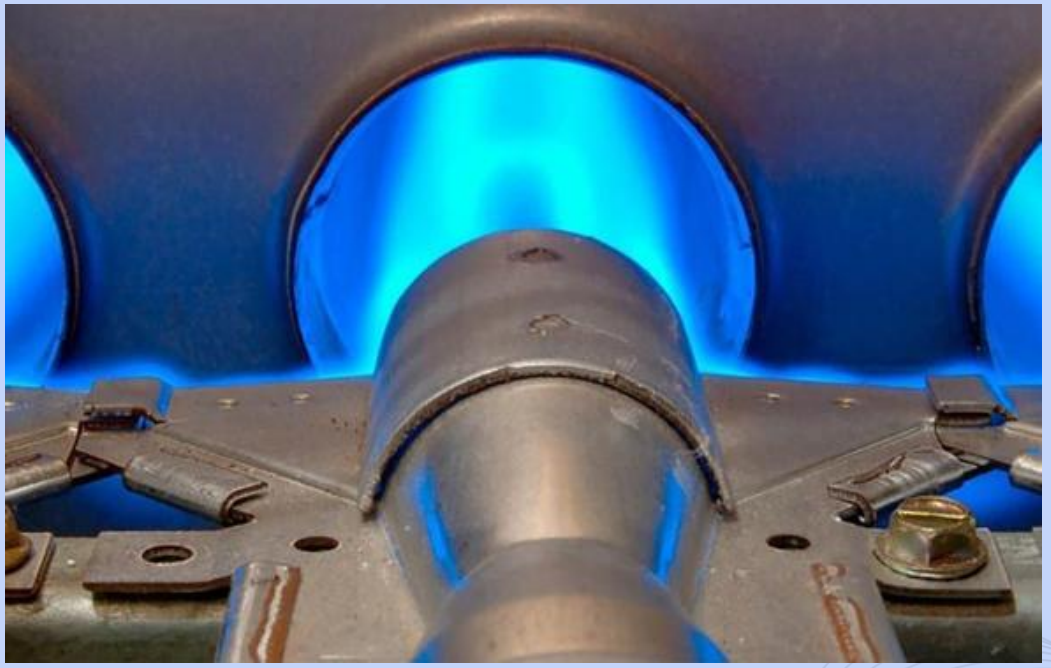


The residential and commercial building sector produces about 9 million metric tons of greenhouse gases each year that must be removed by 2045.

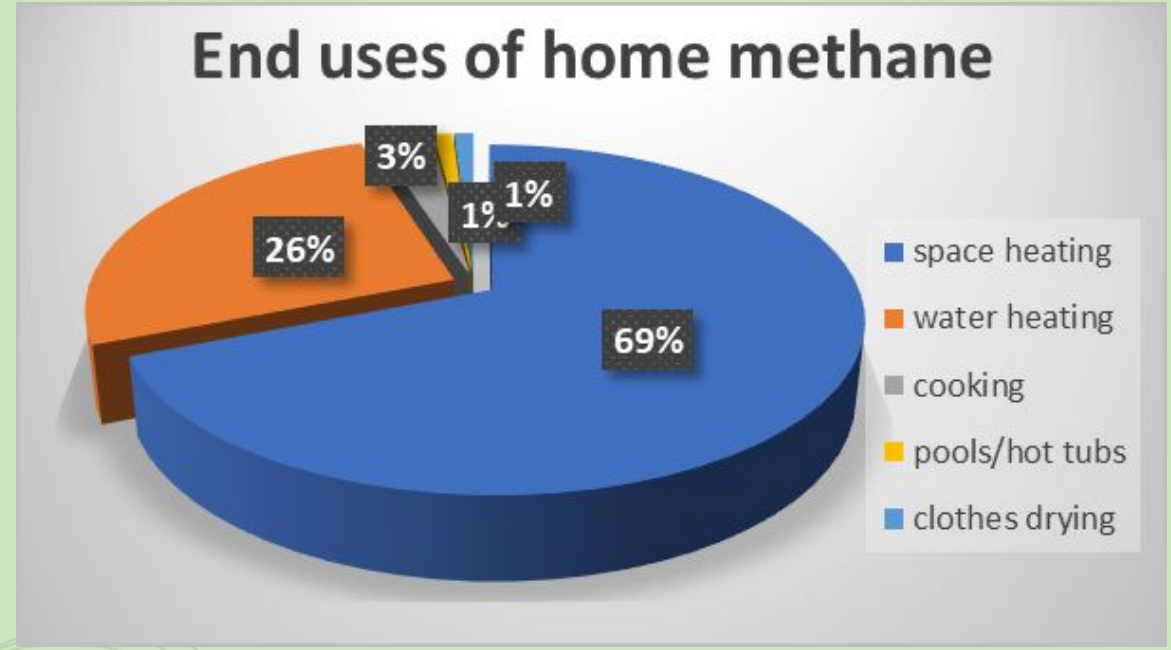
DATA FROM FEDERAL ENERGY INFORMATION ADMINISTRATION

How does this happen?

In 2020, Maryland had 1,185,385 residential users and 79,347 commercial users of methane gas for heat, water heat and cooking. Some of the gas leaks out, even when appliances are off. The rest burns and produces CO2



What produces the most CO2 in homes?



Almost 70% of methane gas use in homes is for heat

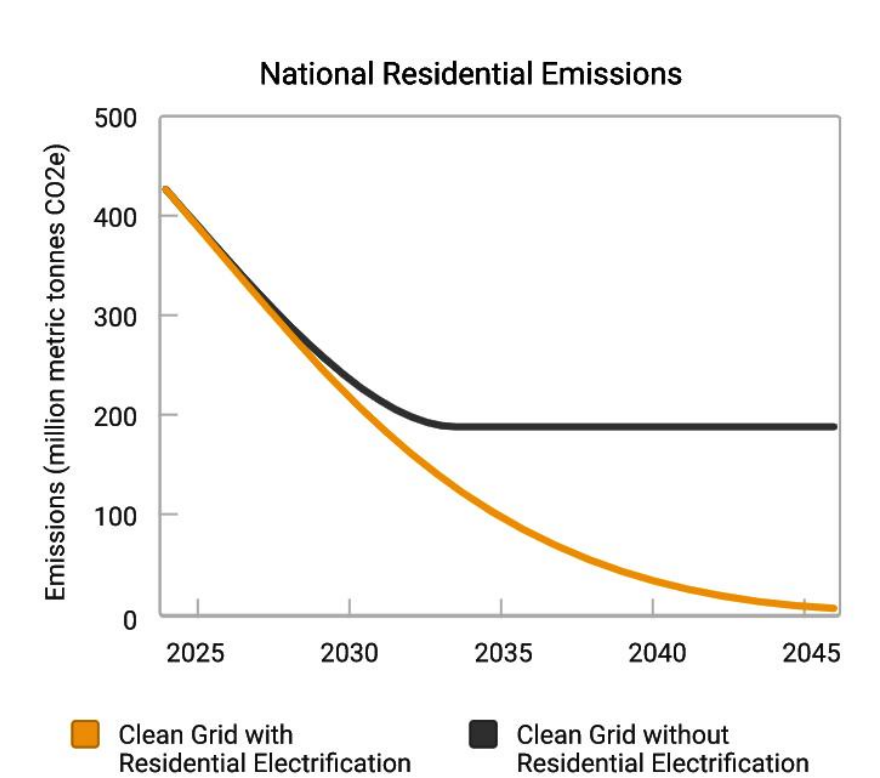
Another 26% for hot water

Sidebar: my own house's emissions of greenhouse gas

My family lives in a modest remodeled 1930s farmhouse in western Howard County. We use delivered propane for heat, hot water, and cooking. We have had an energy audit, bought several new windows, and insulated the attic. In the winter we install film on some older windows and close off two rooms.

Since March 2021, we have burned 1039 gallons of propane, producing just short of 6 metric tons of CO2. That's the equivalent of driving 14,792 miles in a typical passenger car.

We can't get to zero emissions without switching our heat and water heat



Maryland can’t reach zero emissions unless we stop directly burning fossil fuels for heat, hot water, cooking, and other household uses..

Chart courtesy of Rewiring America


WHAT CAN I DO?!!

PART 2: STOPPING EMISSIONS FROM YOUR HOME

Think about heat, your water heat, and your stovetop or cooktop. Are they powered by burning methane gas, fuel oil or propane? What are you likely to do when they need to be replaced?

Methane gas appliances have long lives

The math here is simple.

Furnaces, boilers, water heaters, dryers, and stoves are replaced just once every 15–25 years.

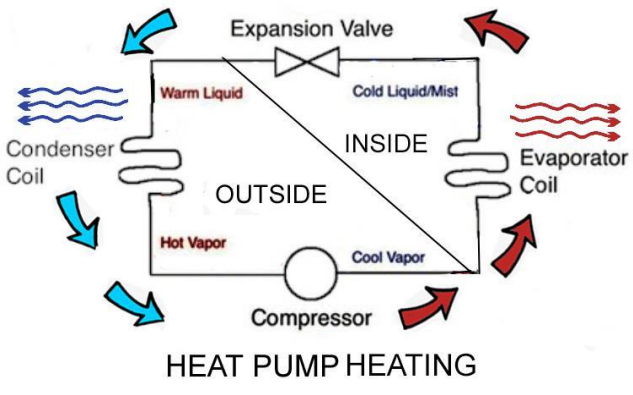
Unless we stop putting gas appliances in buildings NOW, we cannot get to MD's zero emissions goal by 2045.

Every methane gas appliance has a more efficient electric replacement option

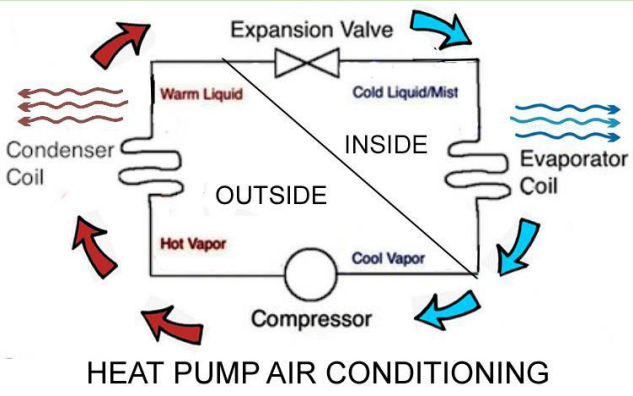
Modern heat pumps

A modern heat pump can replace both a furnace/boiler and an air conditioner. The technology has been around since the 1940s but is hugely improved. They are appropriate both for residential and commercial/institutional use. They can be installed centrally with a duct system, or in individual rooms, or even in windows.

How Heat Pumps work



HEAT PUMP HEATING



HEAT PUMP AIR CONDITIONING

Heat pumps don’t burn anything to make heat, but rather extract heat from the air and move it – outside in the summer and inside in the winter. They use basically the same technology as air conditioners and refrigerators. The most efficient can operate to -20o. Sweden and Germany have more than a million installed.

Four good reasons to switch

1 Good for the planet

Certainly, the most important reason to make the switch is to do our part to reduce greenhouse gas emissions.

But it’s also.....

2 Good for your wallet

99% of households in Maryland—2.2 million—would save money on energy bills if they transitioned to efficient electric heat pumps and heat pump water heaters instead of gas, propane or fuel oil appliances.

Of those, 39% are low- and moderate-income and would save an average of $413 each year.

Analysis from Rewiring America

Fuel costs and the magic of efficiency

Electric resistance heat can be considered 1 to 1. Space heaters, baseboard heaters, toasters, ovens.

Methane gas, propane, & fuel oil is always less: 74% to 98%..

Air and ground source heat pumps are always more efficient – sometimes 3 or even 4 times more. .

Comparing real MD heating fuel costs

Average residential gas price in MD = 20.36 cents/1000cf

1,000,000 BTUs of gas heat at 85% efficiency = $23.96

Average residential electric price in MD = 14.21 cents/kWh

1,000,000 BTUs of electric resistance heat at efficiency 1 = $41.63

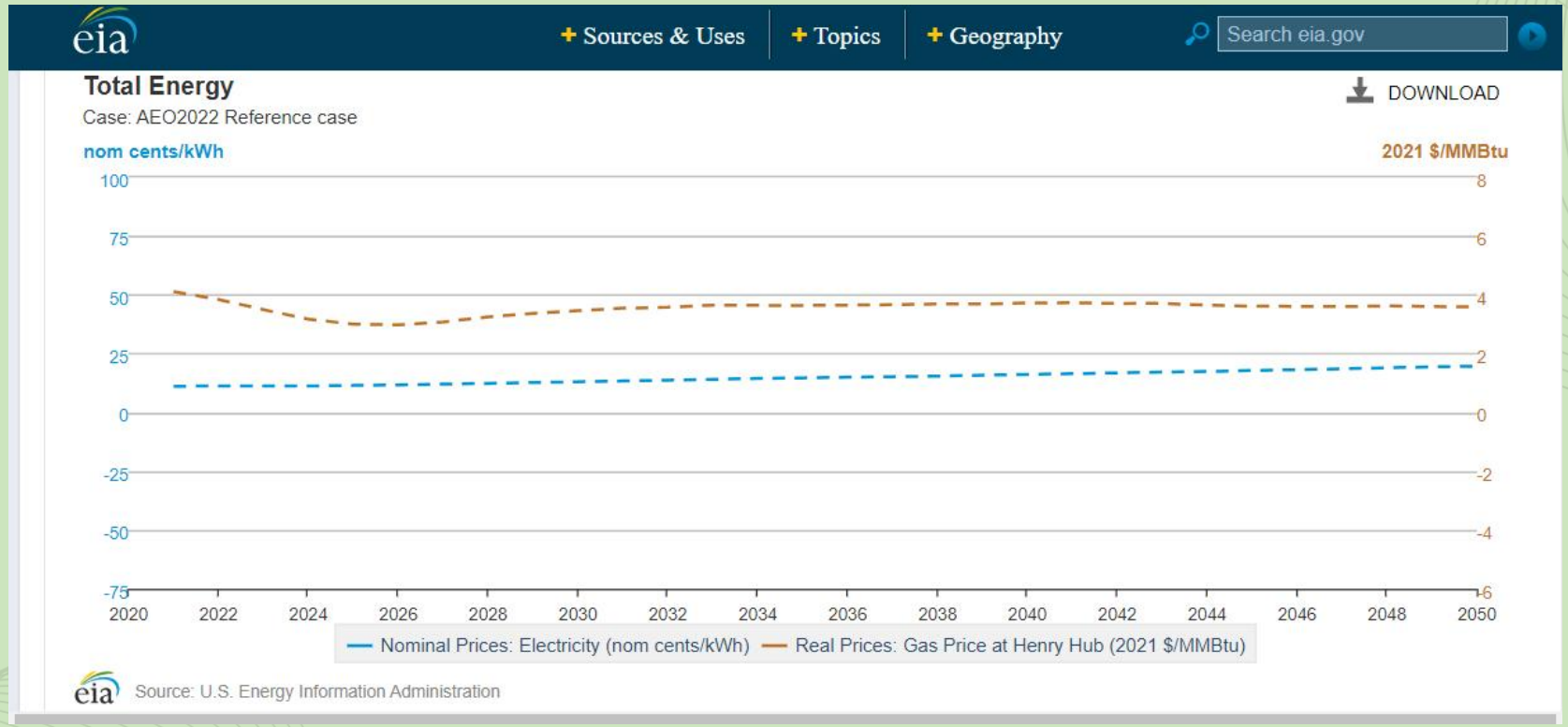
1,000,000 BTUs of heat pump heat at efficiency 3 = $13.88

Heating a MD home might use 100 million BTUs a season.
Difference between methane gas and heat pump: **$1,004.00.**

Propane and fuel oil are much more expensive than methane gas.

Cost data from Federal Energy Information Administration, July 29, 2022

Fuel price projections through 2050
(before passage of IRA PTCs)

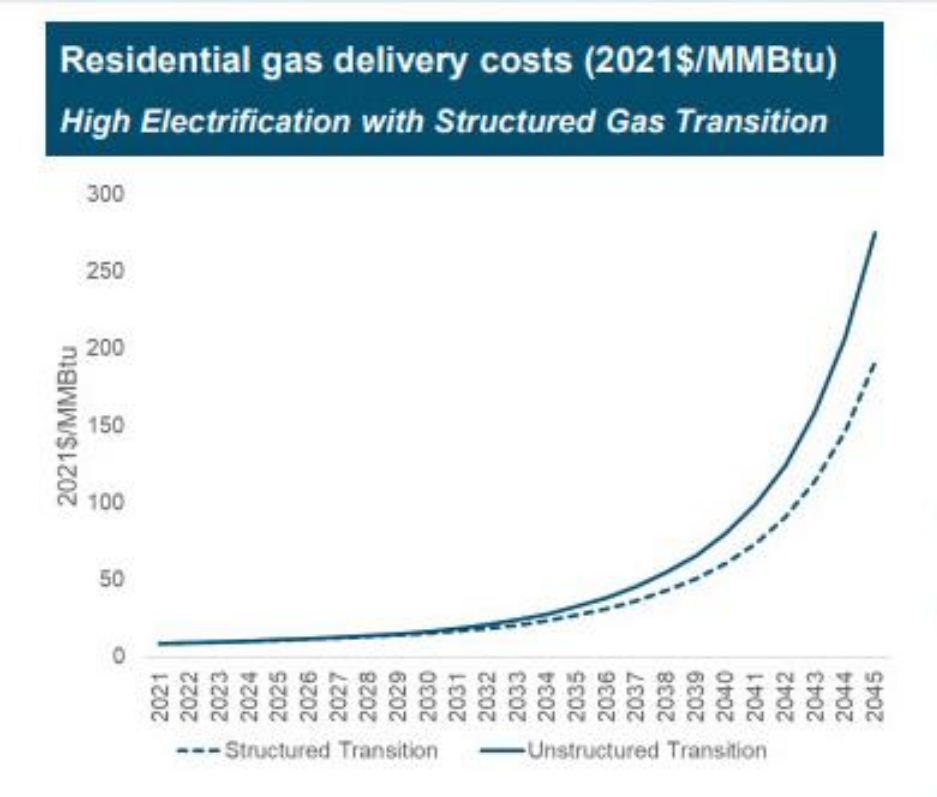


Data from Federal Energy Information Administration

Changes since the prior chart was done

The price of gas has risen 38%, largely because of demand from Europe, where gas is now about $37 per MMBTUs - nearly three times the price in Maryland. At the same time, recently legislation has extended generous production tax credits for renewable energy production, which should lower the cost of electricity.

MD Commission on Climate Change residential gas delivery cost modelling



Most of the total of your gas bill is not the methane gas itself, but other charges, including the maintenance and repair of the pipe system. The fewer gas customers there are, the more everyone has to pay for these other fixed costs.

3 Good for your health

Cooking with gas produces nitrogen oxides and other pollutants that trigger respiratory difficulties and asthma, particularly in children. These compounds in your kitchen are the same as smog outdoors on bad air days. Effects can be much worse in homes with small kitchens and poor ventilation.

"...families who don't use their range hoods or who have poor ventilation can surpass the 1-h national standard of NO2 within a few minutes of stove usage, particularly in smaller kitchens." Stanford University study

Asthma

A 2013 “meta-analysis” of 41 separate studies of indoor air concludes: “Our analyses suggest that children living in a home with gas cooking have a 42% increased risk of having current asthma, a 24% increased risk of lifetime asthma and an overall 32% increased risk of having current and lifetime asthma.”

American Medical Association

"RESOLVED, That our AMA inform its members and, to the extent possible, health care providers, the public, and relevant organizations that **use of a gas stove increases household air pollution and the risk of childhood asthma** and asthma severity;...and be it further

RESOLVED, That our AMA advocate for innovative programs to assist with mitigation of cost to **encourage the transition from gas stoves to electric stoves i**n an equitable manner."

Passed by AMA House of Delegates, June 14, 2022

4 Good for your life

'It Was Like A Bomb Went Off' | Residents Say Baltimore Gas Explosion Jolted Their Homes

Residents in the northwest Baltimore neighborhood where a gas explosion crumbled at least three homes say the explosion rocked their homes -- blocks away.

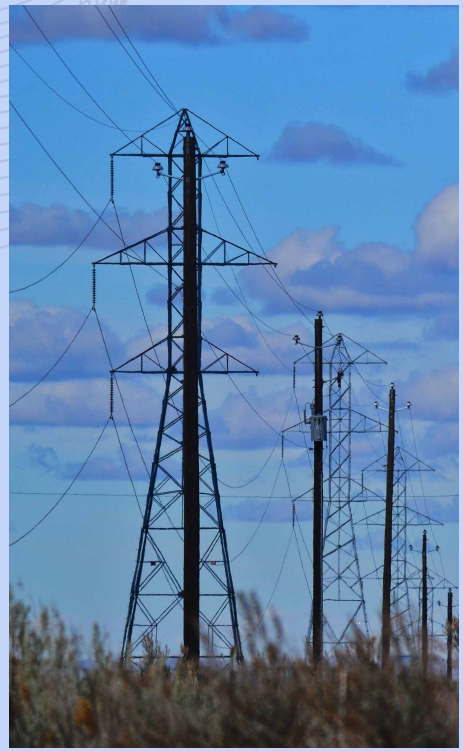
CBS Local Baltimore WJZ August 2020

Gas explosion levels part of a building in Maryland shopping center

By Leah Asmelash

Published 3:37 PM EDT, Sun August 25, 2019

Is electricity better? No argument.

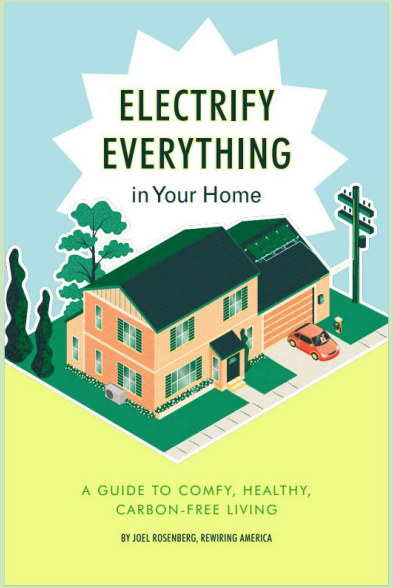


In 2022, all MD retail electricity providers must get at least 32.6% from renewable sources. Percentage rises each year until 52.5% in 2030.

Plus, about 42% of MD base generation does not produce GHGs. % will rise as more renewables come online, especially with new federal renewable production incentives.

Electrification results in constant GHG reductions.

How to begin electrifying your home



Get started NOW.

Read the Rewiring America handbook: www.rewiringamerica.org/electrify-home-guide

Get a home energy audit from your utility & weatherize if needed.

Make your home electric-ready. Have an electrician assess whether you need to “heavy-up” your electric service panel. Think ahead about an induction stove and a future electric car; they may need new electric circuits.

How to begin electrifying your home 2

Know your appliances, including their age and operating costs, and make a replacement plan.

Be very picky about choosing a HVAC contractor. When shopping around, tell them you are a climate activist interested in ELECTRIFICATION. Tell them want you want: ie. a heat pump without a gas backup, or a heat pump hot water heater.

Take full advantage of Maryland and federal rebates and tax credit programs.

New federal tax credits can help

New credits start in 2023. Annual credit limit $1,200 except for heat pumps/water heaters.

- Up to $150 for home energy audits;
- $250 for an exterior door ($500 total for all exterior doors);
- $600 for exterior windows and skylights; central air conditioners; electric panel upgrades and certain related equipment;
- $2,000 for electric heat pumps & HP water heaters;
- In a different provision, 30% of the cost to install solar, wind, geothermal, biomass or fuel cell power to produce electricity or heat, as well as battery storage over 3KWh, kicks in now.

PART 3: ELECTRIFICATION AS POLICY FOR NEW HOMES AND BUILDINGS

For now, stop making it worse

Soon we are going to have to develop strong carrot and stick policies to get people to switch to electric when their appliances need replacing. In the immediate term, we have to stop digging the hole deeper by focusing on new building construction.

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All over the country, jurisdictions are focusing on new building electrification laws

"....if cities are serious about their climate goals, electric buildings are inevitable."

Martha Schantz
Urban Land Institute

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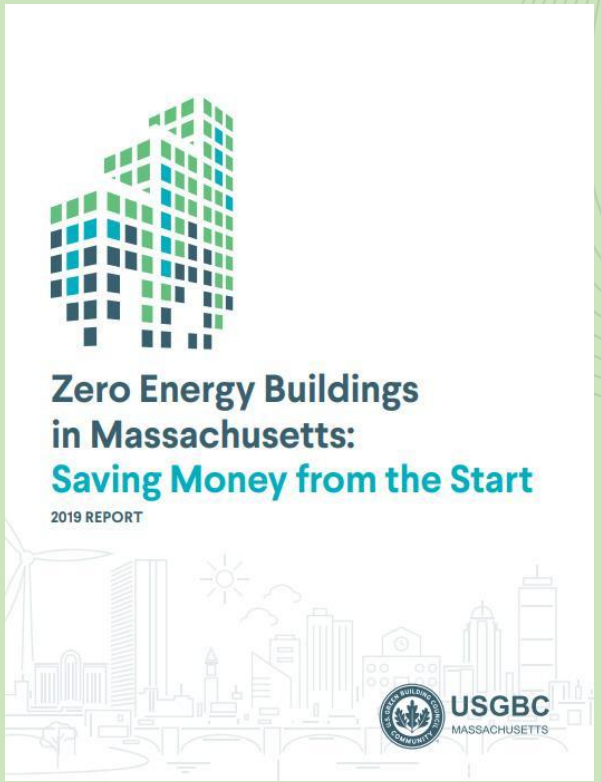
New all-electric construction codes

Washington State
Crested Butte CO
New York City
Washington DC
10 towns in Massachusetts
40 other localities in California

Ithaca
Burlington
Denver
San Francisco
Boulder
Seattle
Los Angeles
San Diego



Good for building costs

Maryland Commission on Climate Change, chaired by Governor Hogan's Environment Secretary, concluded that construction costs are similar and ongoing utility costs would decrease significantly with all-electric buildings.

Findings confirmed by many others, including the highly respected National Buildings Institute and research groups such as the Rocky Mountain Institute, the American Council for an Energy Efficient Economy, and Rewiring America.

Urban Land Institute: "Owners, developers, and investors who ignore the growing [electrification] trend risk premature obsolescence of their assets and face growing operating and capital expenses as the rest of the market moves away from fossil fuels."

Good for Environmental Justice

Families living in smaller homes or apartments with poor ventilation—more likely to be low income families— face serious harm from gas appliances.

Lower income families that pay a relatively higher percentage of income on utilities will save significant dollars every month.

As customers get off gas, those remaining will have to pay more and more to cover the sunk costs of the massive gas infrastructure.

Good for jobs

Electrification is projected to create 4,200 installation jobs in MD.

Nationwide, it would generate 227,000 additional installation jobs, 80,000 manufacturing jobs that Maryland can compete for, and 800,000 indirect and induced jobs, including in Maryland.

> “The Inflation Reduction Act will be transformational for workers and our planet. It invests billions of dollars in renewable energy with strong labor standards that will create union careers in communities that need them most.”
>
> Pat Crowley, Climate Jobs RI and secretary-treasurer of the Rhode Island AFL-CIO

The new “Clean Energy DC Building Code Amendment Act" requires net zero energy

Net zero energy requires all commercial, institutional, and government buildings, and all residential buildings over three stories, to produce or purchase enough clean energy to meet all its annual energy needs & prohibits ANY fuel combustion in new buildings for thermal energy.

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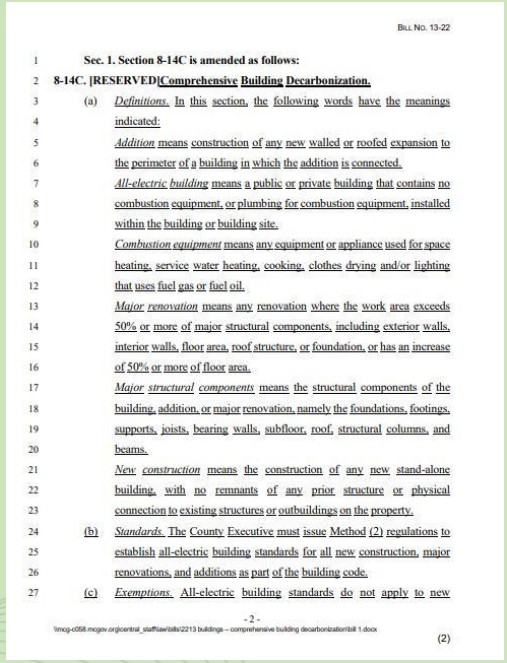
The DC Climate Commitment Act

Also, the new “Climate Commitment Act” law prohibits DC from buying new methane gas boilers or furnaces in government buildings, including schools, or buying new gas light duty vehicles. It requires all government operations to be net-zero by 2040.

Montgomery County Bill 13-22, "Comprehensive Building Decarbonization"



BILL NO. 13-22

Sec. 1. Section 8-14C is amended as follows:

8-14C. [RESERVED]Comprehensive Building Decarbonization.

(a) *Definitions.* In this section, the following words have the meanings indicated:

Addition means construction of any new walled or roofed expansion to the perimeter of a building in which the addition is connected.

All-electric building means a public or private building that contains no combustion equipment, or plumbing for combustion equipment, installed within the building or building site.

Combustion equipment means any equipment or appliance used for space heating, service water heating, cooking, clothes drying and/or lighting that uses fuel gas or fuel oil.

Major renovation means any renovation where the work area exceeds 50% or more of major structural components, including exterior walls, interior walls, floor area, roof structure, or foundation, or has an increase of 50% or more of floor area.

Major structural components means the structural components of the building, addition, or major renovation, namely the foundations, footings, supports, joists, bearing walls, subfloor, roof, structural columns, and beams.

New construction means the construction of any new stand-alone building, with no remnants of any prior structure or physical connection to existing structures or outbuildings on the property.

(b) *Standards.* The County Executive must issue Method (2) regulations to establish all-electric building standards for all new construction, major renovations, and additions as part of the building code.

(c) *Exemptions.* All-electric building standards do not apply to new

- 2 -

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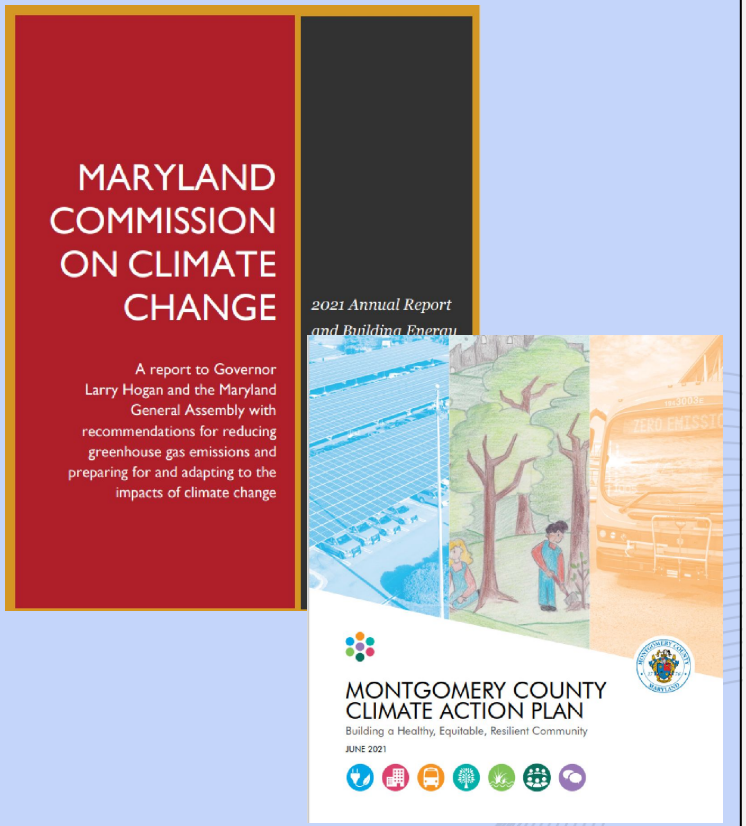
(2)

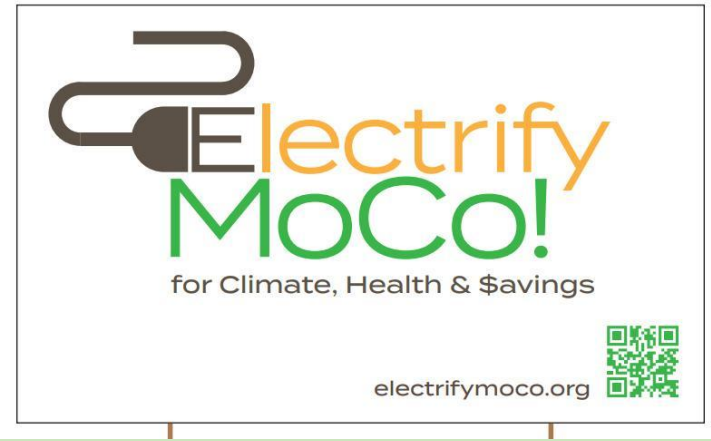
Requires the County Executive to issue all-electric building standards for new construction, major renovations, and additions by January 1, 2024, with exemptions and/or extended timelines for certain building types.

Recommended by the state and the county

The Comprehensive Building Decarbonization bill didn't come out of the blue. The top recommendation of the Maryland Commission on Climate Change in 2021 was all-electric building codes for Maryland no later than 2024. At the county level, it is a key element of Montgomery County's own Climate Action Plan.



Montgomery County Advocacy Coalition



Vote expected November 1 or November 15

A strong coalition of CCAN, IPL, the Climate Action Plan Coalition, the Montgomery County Faith Alliance for Climate Solutions, Elders Climate Action, Sierra Club, MoCo 350, the Green & Healthy Homes Initiative, Chesapeake PSR, Audubon Naturalist Society, Climate Reality, the Institute for Market Transformation and others is working hard for passage.

Hard opposition

The opposition from the utilities and other forces of the status quo is strong: American Gas Association, Washington Gas, BGE, Pepco, Realtors, Homebuilders, Chambers of Commerce, Building Associations, Pipefitters and Gasfitters Unions. Most of the same groups killed the bill in the Maryland legislature.

What's happening in Howard?

Organizing a coalition to advocate for a bill at least as strong as MoCo is underway.

Councilwoman Walsh's amendment failed to get a second last November, but 3 of the 4 councilmembers expressed interest in having a hearing and discussing a bill. The topic is on the agenda for the September Council Monthly Meeting.

Thank you.

For more information:

Doug Siglin doug@chesapeakeclimate.org

If we all do a little we can get a lot done
Bob Marietta, HCC Environmental Health & Safety Supervisor