

***UUCWC's Earth & Climate Ministry
Presents:***



**CLIMATE CHANGE AND
WHAT YOU CAN DO:
Reduce Energy Costs &
Climate Pollution**



**Climate Disruption
Basics: Science,
Impacts & How to
Avoid the Worst**

Mike Aucott, Ph.D.

**Why We CAN
Win the
Climate Mitigation
& Energy Battle**

Mike Winka

**Power Your Savings
and Cut Climate
Pollution with
Electrification**

Pat and Steve Miller

Introduction for “Climate Change And What You Can Do: Reduce Energy Costs and Climate Pollution”

Hosted by Earth & Climate Ministry
Unitarian Universalist Church at Washington Crossing (UUCWC)
Leslie McGeorge & Barbara Drew, Moderators
Tuesday, April 16, 2024 7:00 pm

Good evening, I’m Leslie McGeorge and I would like to welcome all of you here in person and on-line, to the Unitarian Universalist Church at Washington Crossing (UUCWC) in NJ. If you are joining us online and you care to add your name, location and any affiliation into the chat that would be great. In the sanctuary, I’d like to ask for a raise of hands if you are a member of this church or another UU congregation, other faith-based community, environmental/climate advocacy group, or government agency?

The mission of our church is to *Create Community, Celebrate Life and Change the World*. While Unitarian Universalists have several key principles related to tonight’s presentations, the most relevant is *Respect for the interdependent web of all existence, of which we are a part*. We are a recognized Green Sanctuary by our Unitarian Universalist Association, and we are exploring the new climate justice-focused Green Sanctuary 2030 program. We are a Delaware Valley congregation from both NJ & PA, and, as such, our speakers will address climate actions related to both states, in addition to national & local strategies.

Our church's Earth and Climate Ministry is sponsoring this talk, and I'd like to ask our other co-chairs, Barbara Drew & Al Johnson, and all members of our team to please raise their hands, in-person or on-line. And we offer a special thank you to all of the Earth and Climate Ministry members who assisted with this Climate Session. Also, we offer our gratitude to our tech supports, Ariel Schwartz, MJ Hansen and John Harvi. These presentations would not be possible without all of you.

Our centering quote for the evening is attributed to the polar explorer Robert Swan –
“The greatest threat to our planet is believing that someone else will save it...”.

I am involved with climate advocacy as I want my grandchildren to have a livable world to grow up in, and am concerned about the climate disruption impacts they and all of us are already experiencing. Last summer, my grandson could not breathe the unhealthy air outdoors due to massive wildfires, he could not play on metal playground equipment due to searing heat, and severe storms and unprecedented flash flooding prevented his Gram and his friends from making it to his birthday party. And far more tragically, flash flooding from an intense storm with unprecedented rainfall took the lives of seven motorists in my local area. What comes next for my grandson, and all of our children and their children, if we do not act now?

We are very fortunate to have key leaders in the climate and energy fields with us tonight to tell us how WE can be the change that is needed. I had the pleasure of working with two of the speakers, Mike Aucott and Mike Winka, in the Science and Research program of the NJ Department of Environmental Protection, when they were instrumental in many NJ climate and energy innovations. And our last speaker combo, the Millers, amazingly just spent the weekend with Al Gore training climate activists through the Climate Reality Project in New York city.

To minimize the need for notetaking, the speakers have contributed to a great *Information Sheet* handout with a QR code, that has their contact information, slides, and their references and links. You can take one of the handouts as you leave, or use your smartphone here to just take a picture of the QR code to get all the live links.

I and most of our speakers are members of the excellent national advocacy group, with local chapters, Citizens Climate Lobby (CCL), which you will hear more about from our speakers. If you so choose, you can make donations to CCL in person in the lobby, or online. The CCL donation link will be in the chat.

1. Our first speaker is Mike Aucott, Mike retired from his position as a research scientist for the NJ Dept. of Environmental Protection (NJDEP) in 2012, and is now back with NJDEP as an advisor to the Bureau of Climate Change and Clean Energy. He has a Ph.D. in environmental science from Rutgers University. Mike taught chemistry at Bucks County Community College and at the College of New Jersey. In his first stint with NJDEP, Mike helped develop New Jersey's greenhouse gas emissions inventory, and pioneered the NJDEP's on-line Environmental Trends Report. He is a member of NJDEP's Science Advisory Board, the Hopewell Township Environmental Commission and the PA/NJ Chapter of the American Chestnut Foundation, and has done consulting work on energy issues.

**Climate Disruption Basics:
Science, Impacts,
& How to Avoid the Worst**

April 16, 2024

*Unitarian Universalist Church at Washington Crossing
Titusville, NJ*

Mike Aucott, Ph.D.

mlaucott@gmail.com

CLIMATE CHANGE



Healthcare!

Immigration!

Guns!

Free school!

Justice!

Legal weed!

- 1) We've known about this for a long time, the impacts are becoming obvious, and it's getting worse
- 2) We're not on track to solve the problem soon enough to avoid major impacts; more actions are needed
- 3) Local actions won't be sufficient; only steps that lead to national and international measures will save us from major impacts

- 1) We've known about this for a long time, the impacts are becoming obvious, and it's getting worse



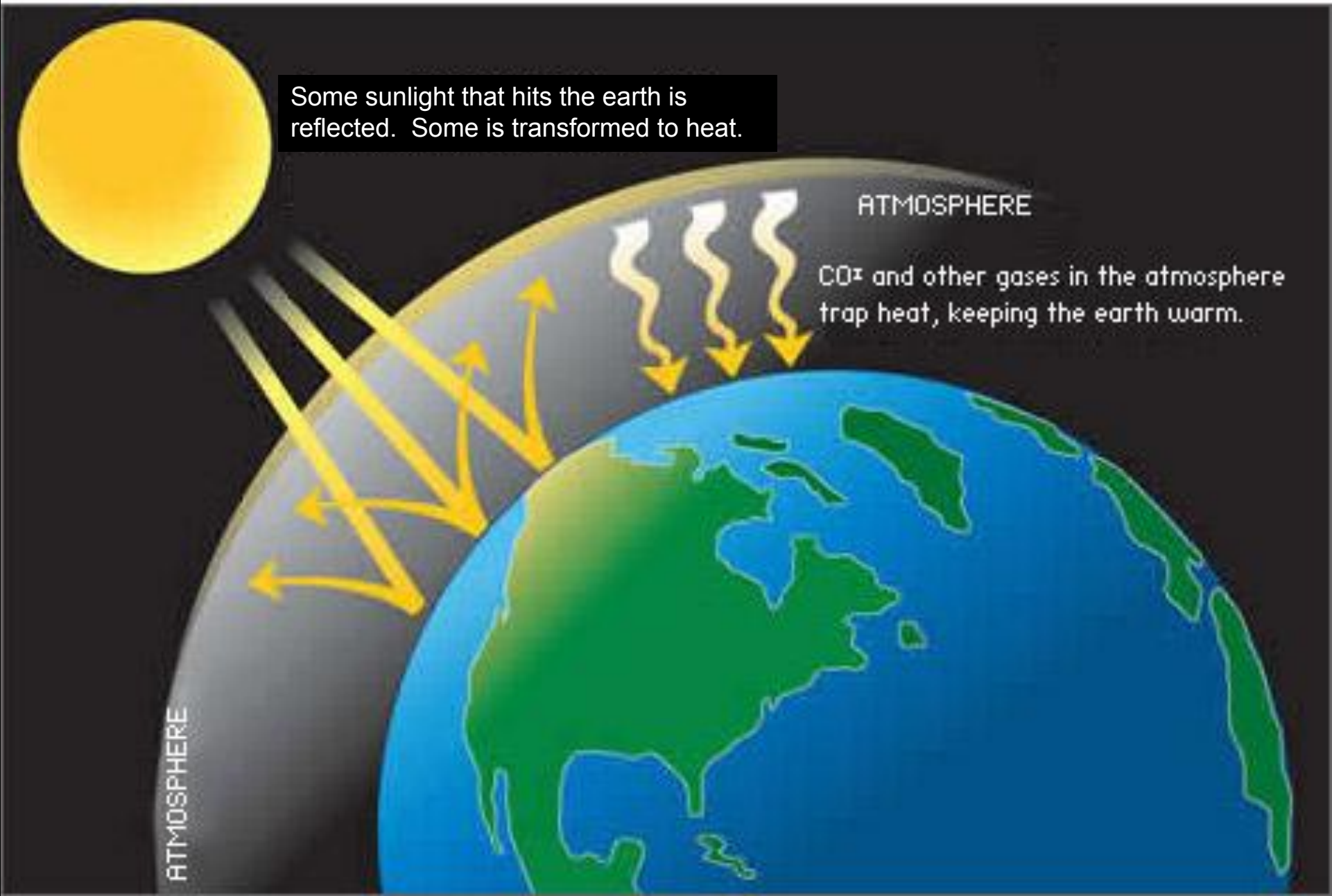
Eunice Foote identified the greenhouse effect in 1856



In 1896, Svante Arrhenius calculated that a doubling of atmospheric CO_2 , when effects of water vapor were included, would warm the Earth about 4 degrees C.

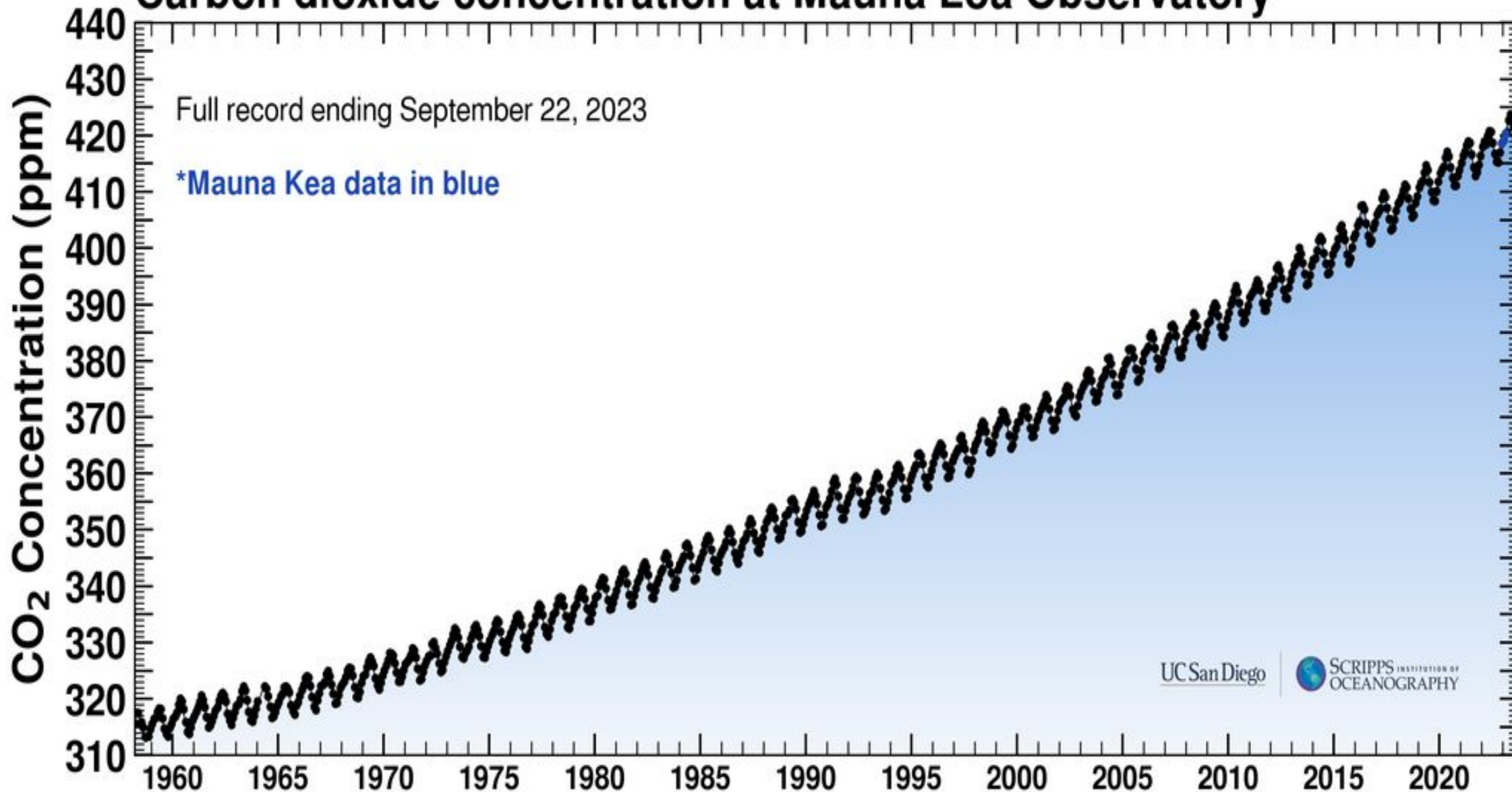
This is close to what today's sophisticated climate models predict.


The Greenhouse Effect



CO₂, the major greenhouse gas,
is building up in the atmosphere,
and the build-up is human
caused

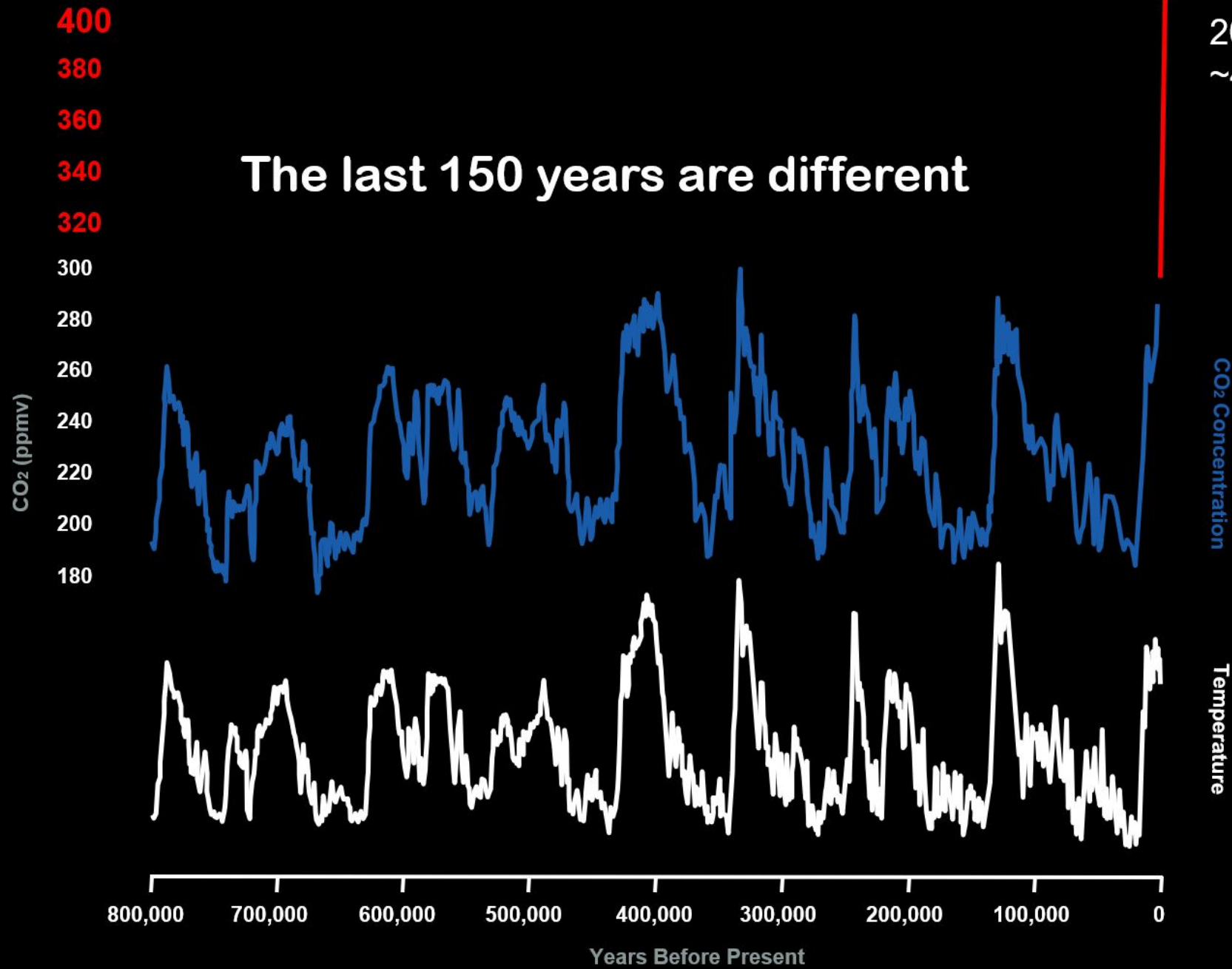
Carbon dioxide concentration at Mauna Loa Observatory*





CO₂ mostly
comes from
combustion

The rapid pace of the buildup is
unprecedented in the geological
record



2023 concentration,
~423 ppm

The two other major greenhouse gases, methane and nitrous oxide, are also building up

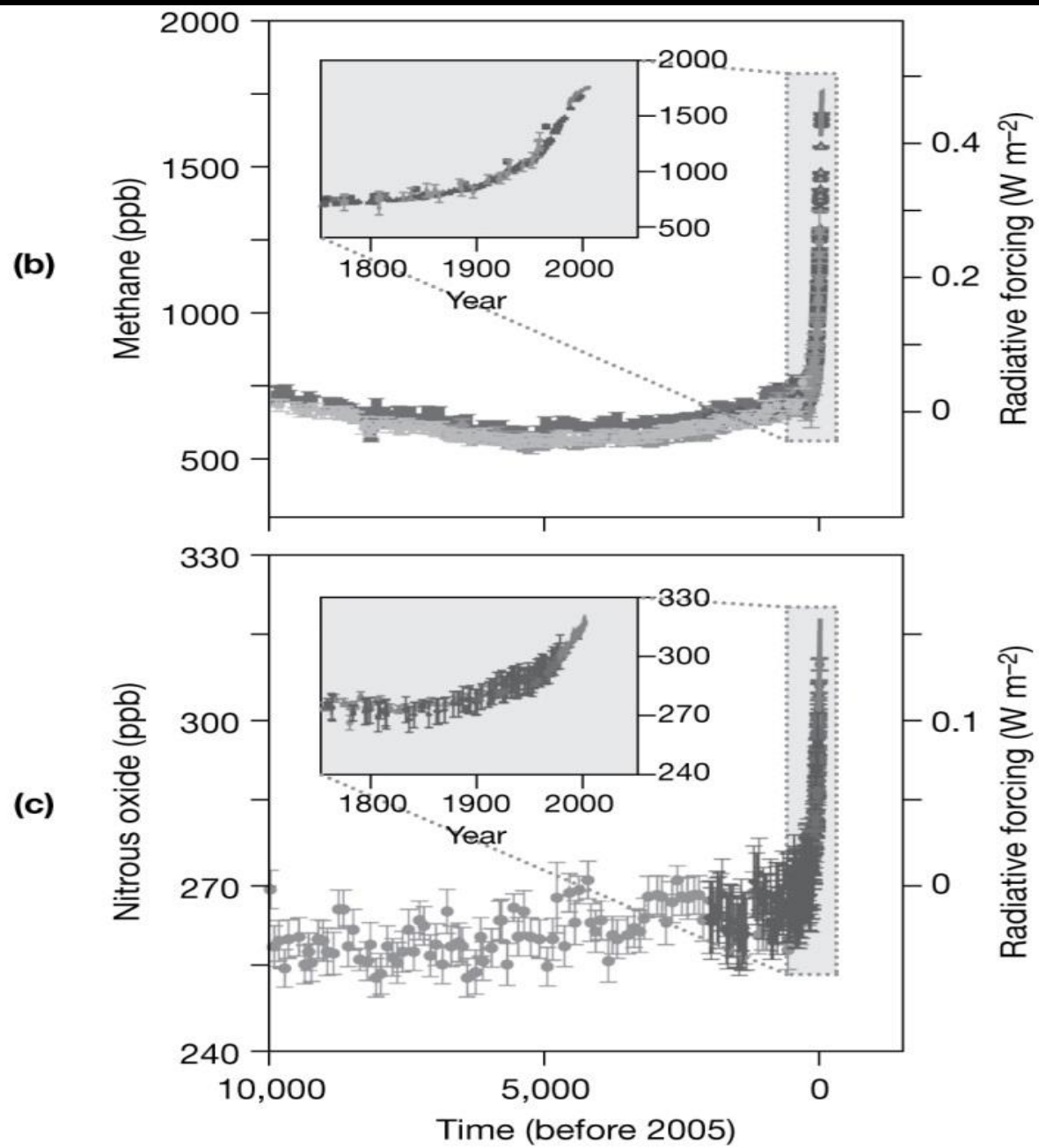
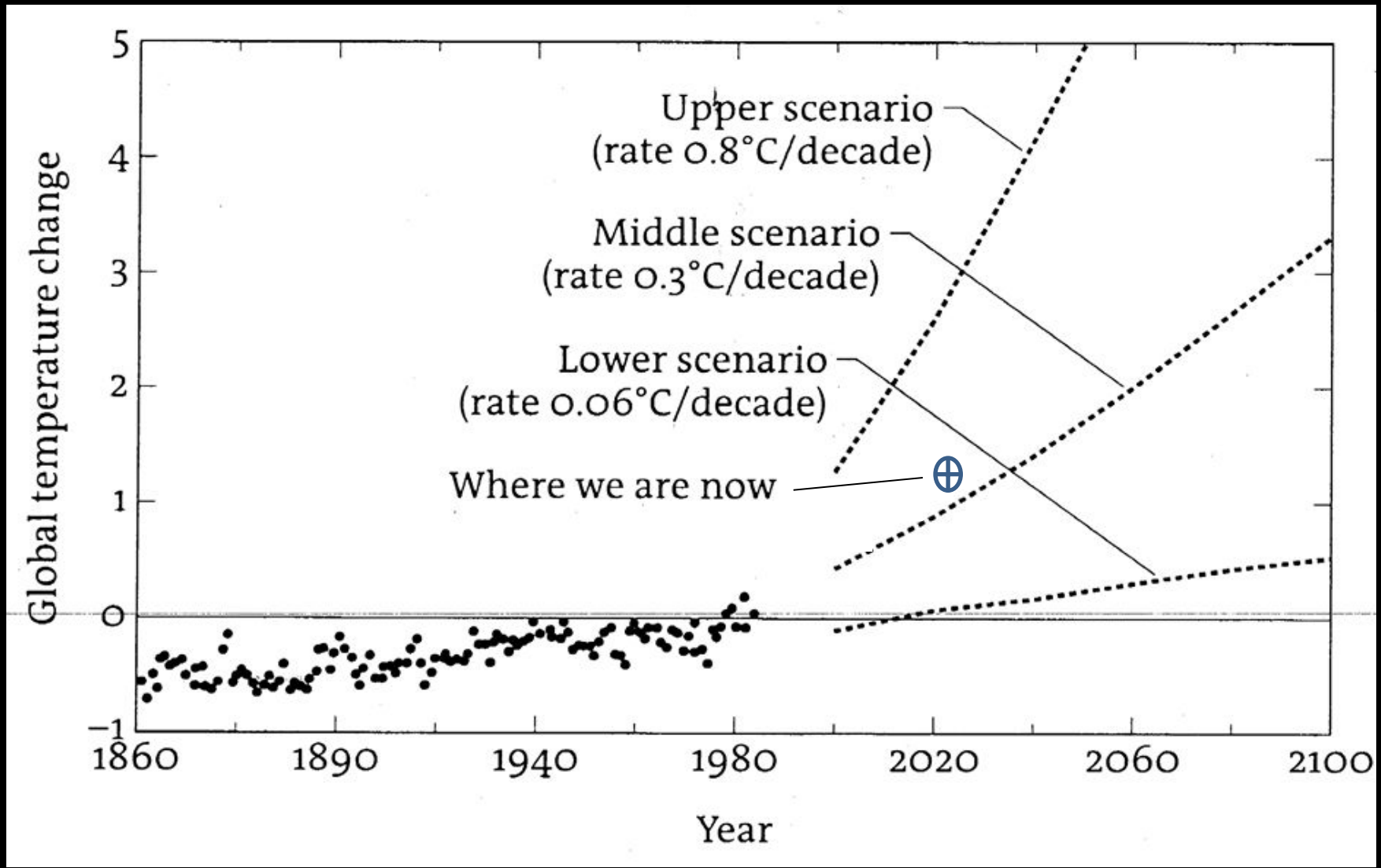


Figure 6.12 copyright 2011 University Science Books

The Earth is heating up..as
predicted

2023 was the hottest year since
record keeping began, and the 9
years since 2015 are the warmest
on record

Forecasts made in 1988

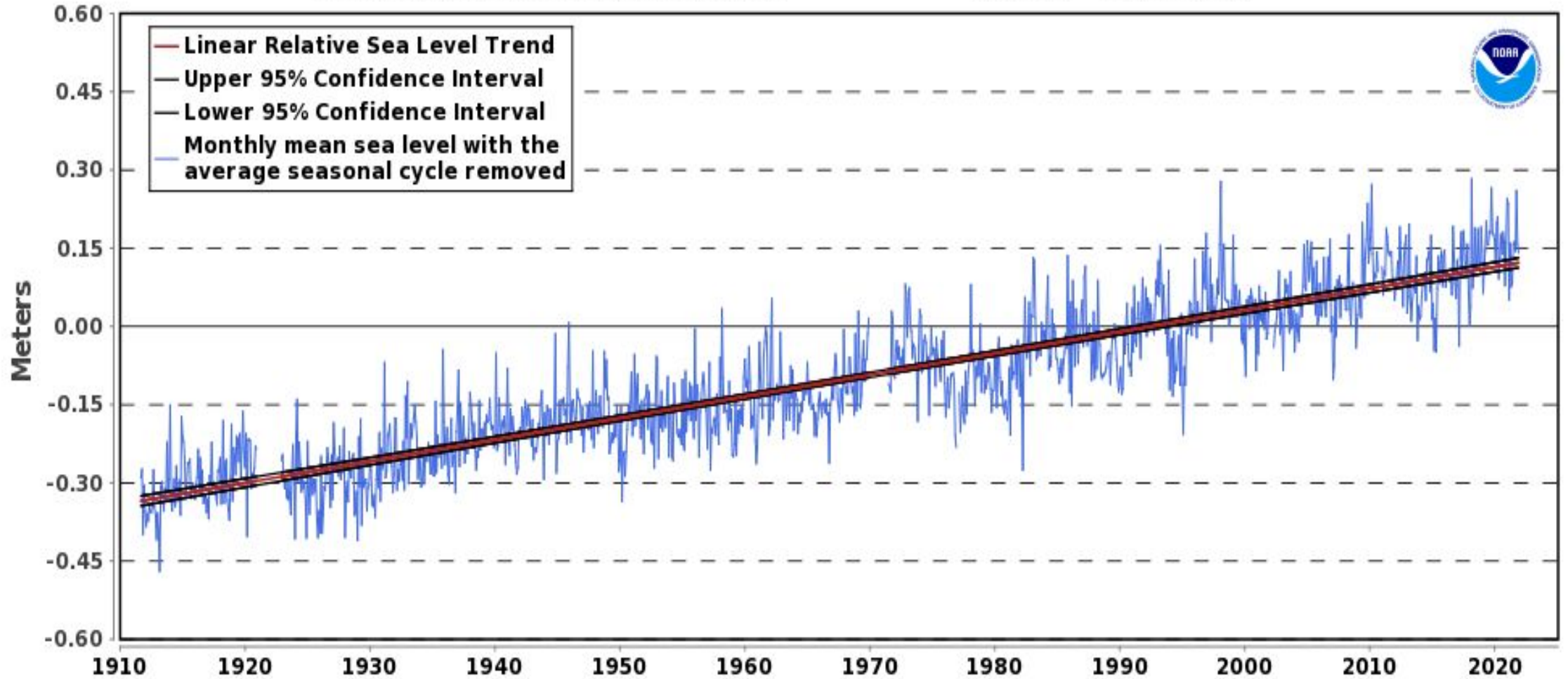


From: Schneider, Steven, 1989, Global Warming

Many impacts are becoming obvious..

8534720 Atlantic City, New Jersey

4.14 +/- 0.15 mm/yr



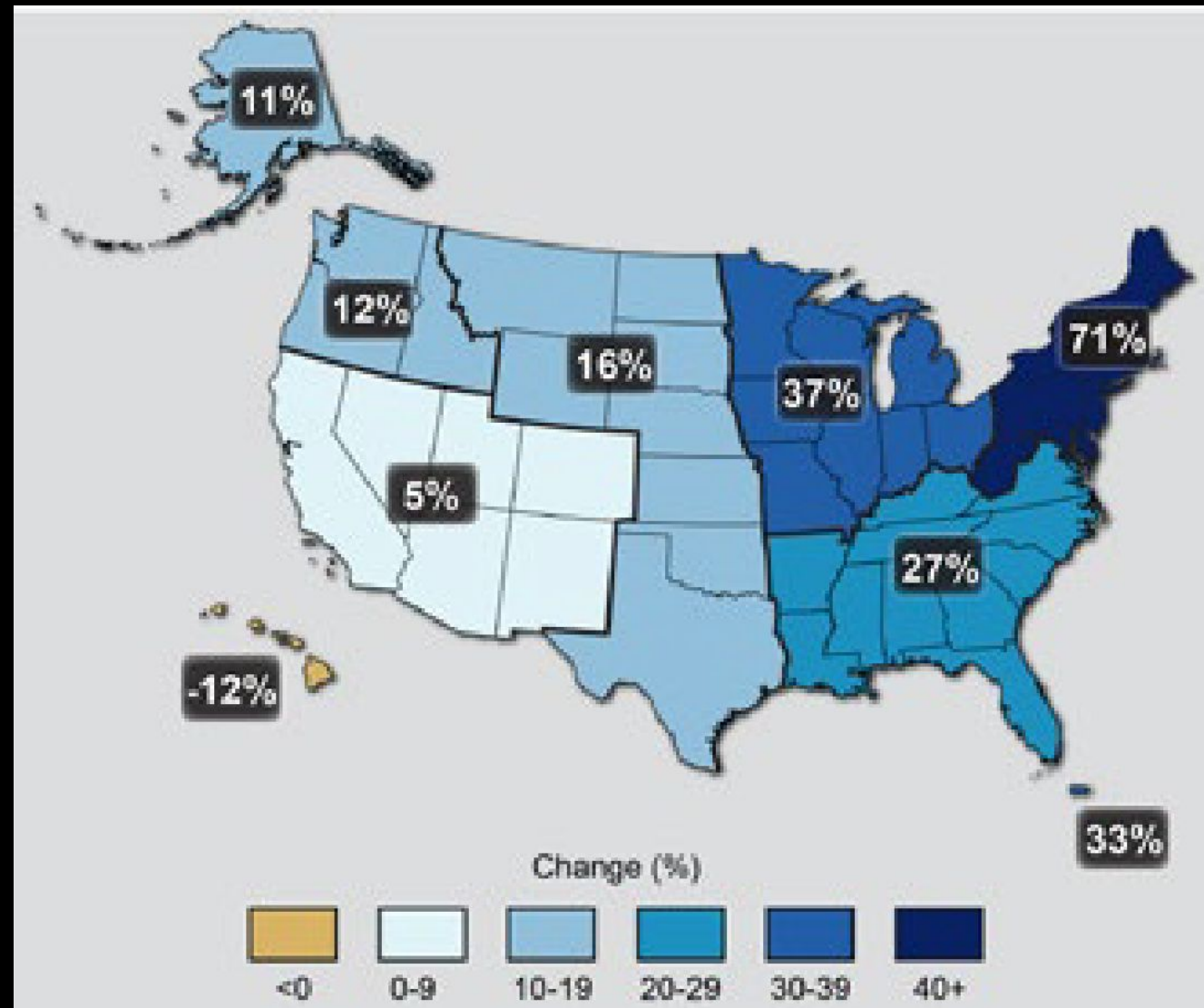
From: https://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?id=8534720





Atlantic City high tide street flooding

Observed change in heavy precipitation events, since 1958



From: <http://nca2014.globalchange.gov/report/our-changing-climate>



<https://pcntv.com/weather-world/>

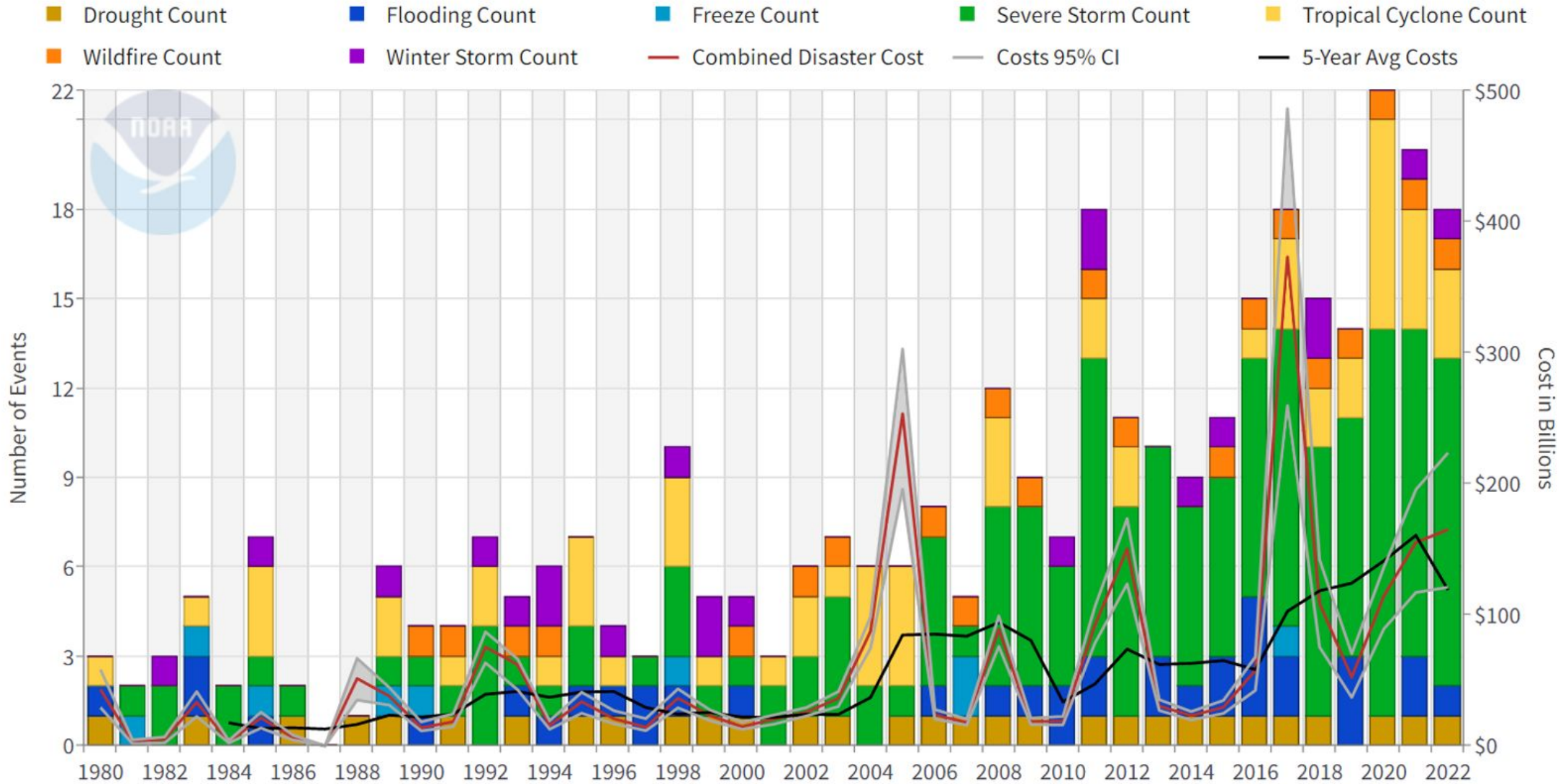
Reuters

PCN



June 7, 2023

United States Billion-Dollar Disaster Events 1980-2022 (CPI-Adjusted)



Updated: January 10, 2023

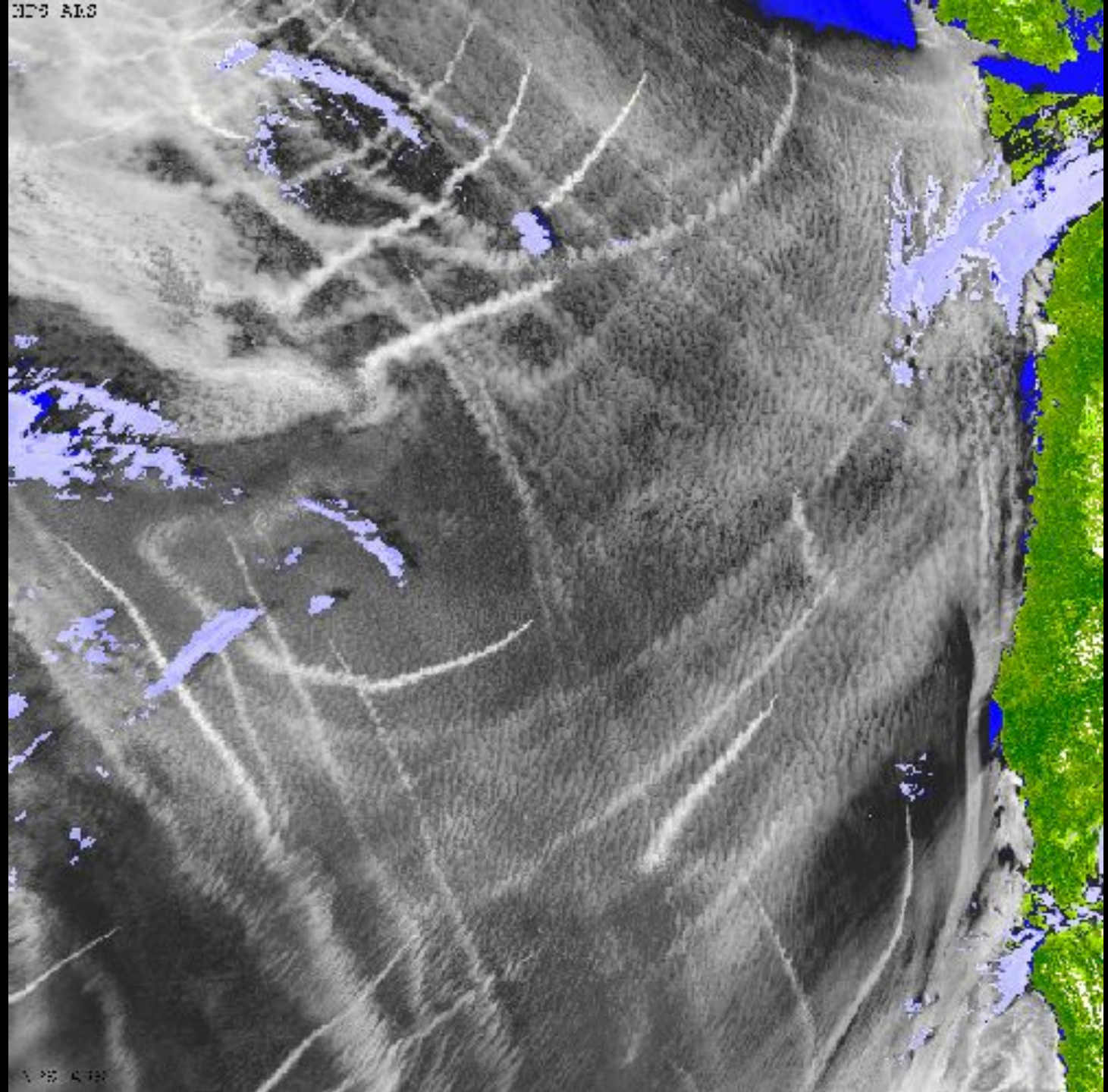
Powered by ZingChart

from <https://www.climate.gov/media/14990>

The heating appears to be accelerating



029 ALS



029 ALS



A church in Sancourt, France, is pictured at sunset during a July 2023 heat wave.

CLIMATE CHANGE

The hottest year was even hotter than expected

Greenhouse gases, El Niño, and cleaner air fueled record heat in 2023

By Paul Voosen

It comes as no surprise to anyone who sweated through it: 2023 was the hottest year in human history. Average surface temperatures rose nearly 0.2°C above the previous record, set in 2016, to 1.48°C over preindustrial levels, the European Union's Copernicus Climate Change Service reported this week. Only Australia was spared record-setting heat. The extreme conditions are a "dramatic testimony of how far we now are from the climate in which our civilization developed," said Carlo Buontempo, Copernicus's climate director, in a statement.

Yet 2023's record temperatures—confirmed days later by analyses from NASA, the U.S. National Oceanic and Atmospheric Administration, the United Kingdom's Met Office, and Berkeley Earth—come with a mystery. Humanity's unabated burning of fossil fuels is the dominant driver of the long-term trend, but it is insufficient to explain 2023's sudden spike, says Michael Diamond, an atmospheric scientist at Florida State University.

One exacerbating factor was the end of a La Niña climate pattern, which from 2020 to 2022 stirred up an increased amount of deep cold water in the eastern Pacific Ocean that absorbed heat and suppressed global temperatures. In 2023, the pattern flipped into an El Niño event, which blanketed the

equatorial Pacific with warm waters and began to boost global temperatures.

But the flip is not enough to explain 2023's record, Gavin Schmidt, director of NASA's Goddard Institute for Space Studies, wrote in a blog post last week. Typically, El Niño plays a larger role in global temperatures the year after it starts—in this case, this year. And in 2023 heat surged far from El Niño's influence, above the northern Atlantic and Pacific oceans, Schmidt noted.

The 2022 eruption of Hunga Tonga-Hunga Ha'apai, a volcano in the south Pacific, had been a suspect in the global temperature jump because of the vast amounts of climate-warming water vapor it injected into the stratosphere. But early studies neglected the sulfate particles it also sent into the upper atmosphere, which reflected light and canceled out the water vapor's warming effect, says Mark Schoeberl, an atmospheric scientist at the Science and Technology Corporation. "For 2022, it was a nonevent. I have continued my computations into 2023—still a nonevent."

Perhaps the best explanation for the extra warming is the continued drop in light-blocking pollution as society shifts to cleaner sources of energy, says Tianle Yuan, an atmospheric physicist at NASA's Goddard Space Flight Center. In 2022, satellites began to detect this decrease from space (*Science*, 22 July 2022, p. 353). In 2020, new regulations from the International Mari-

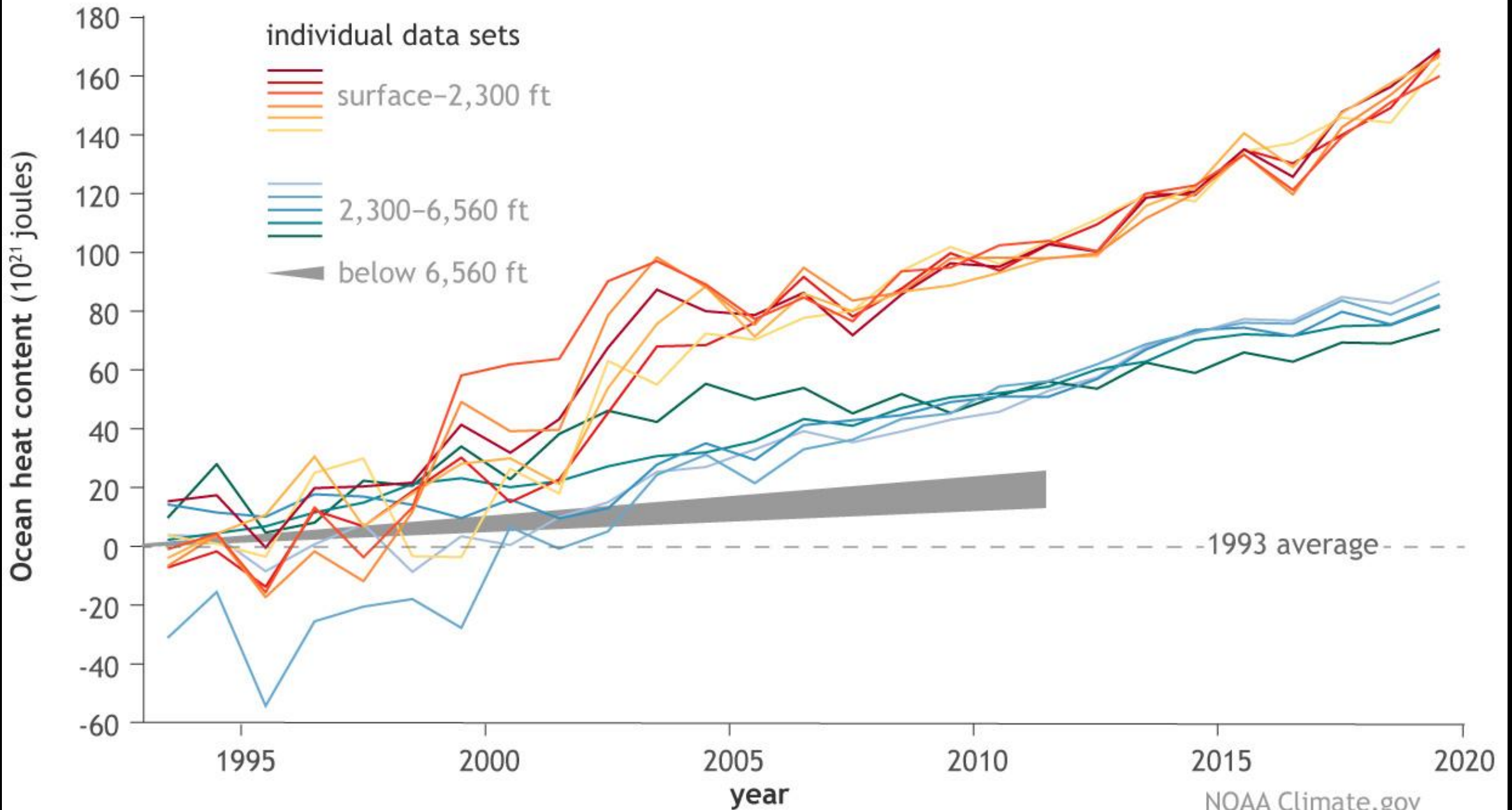
time Organization added to the effect when ships began to cut sulfur pollution—and inadvertently curbed the light-reflecting clouds that the sulfur particles help create (*Science*, 4 August 2023, p. 467). A preprint on Research Square suggests the loss of these clouds alone can explain half of the increase in the warming rate seen so far this decade, says Yuan, who led the work. "[It] would not account for all the warming we see this year, but it would represent a significant additional warming."

In a November 2023 paper, famed climate scientist James Hansen suggested curbing pollution has accelerated warming to 0.27°C per decade, up from the 0.18°C per decade rate experienced from 1970 to 2010. But the acceleration has yet to show up in records of heat in the ocean depths, which resist the short-term fluctuations of the atmosphere and offer a truer sense of long-term trends.

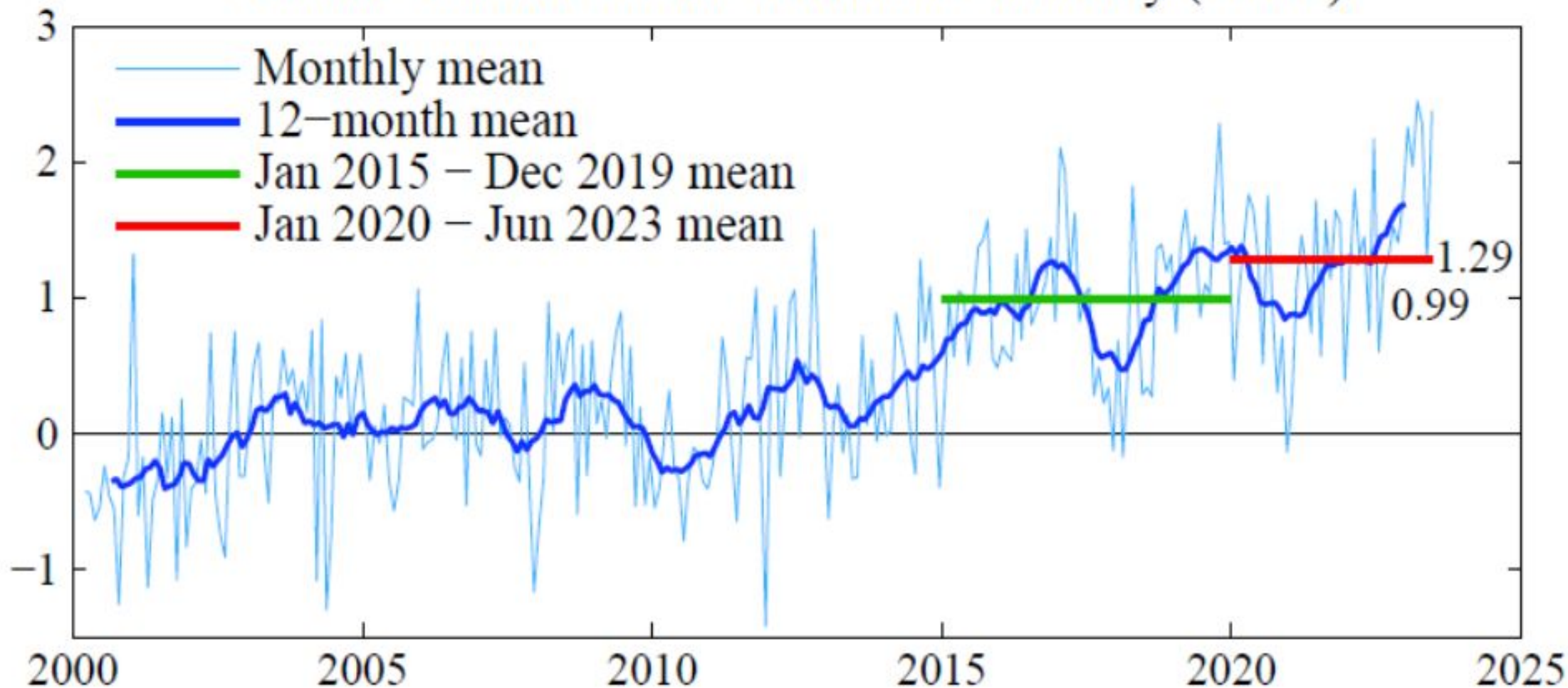
The mystery of the past year leaves projections for this year less certain than usual. El Niño may inflate temperatures further, pushing the world briefly past the arbitrary 1.5°C "limit" settled on by policymakers in 2015's Paris agreement to protect small island nations from extreme sea-level rise. But extreme heat will again have to develop over the northern oceans for the world to breach the threshold—hardly a sure bet.

Regardless, the long-term warming pattern is certain to continue, as it has for decades—until fossil fuel burning ends. ■

Annual ocean heat content compared to average (1993-2019)

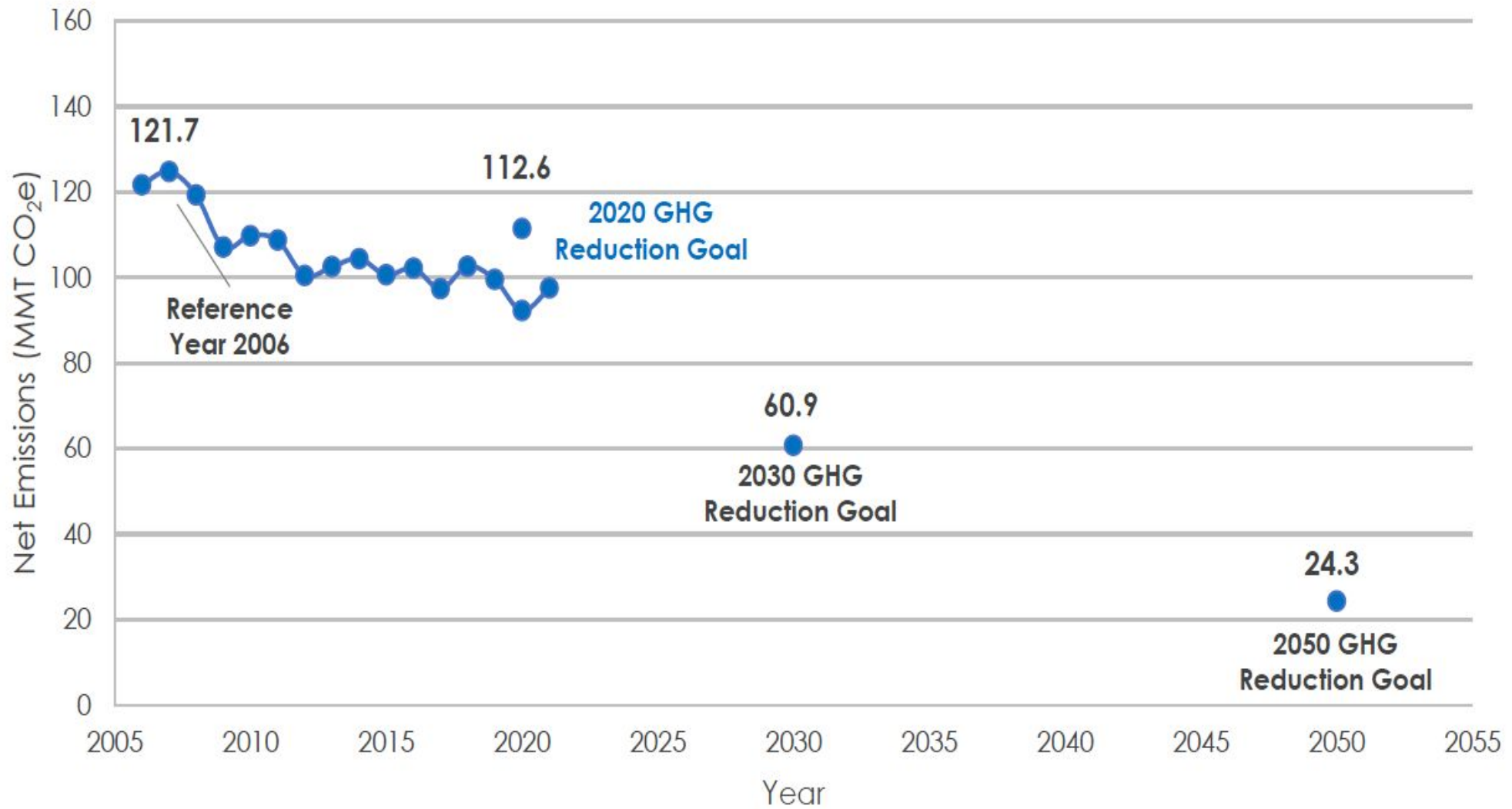


Global Absorbed Solar Radiation Anomaly (W/m²)

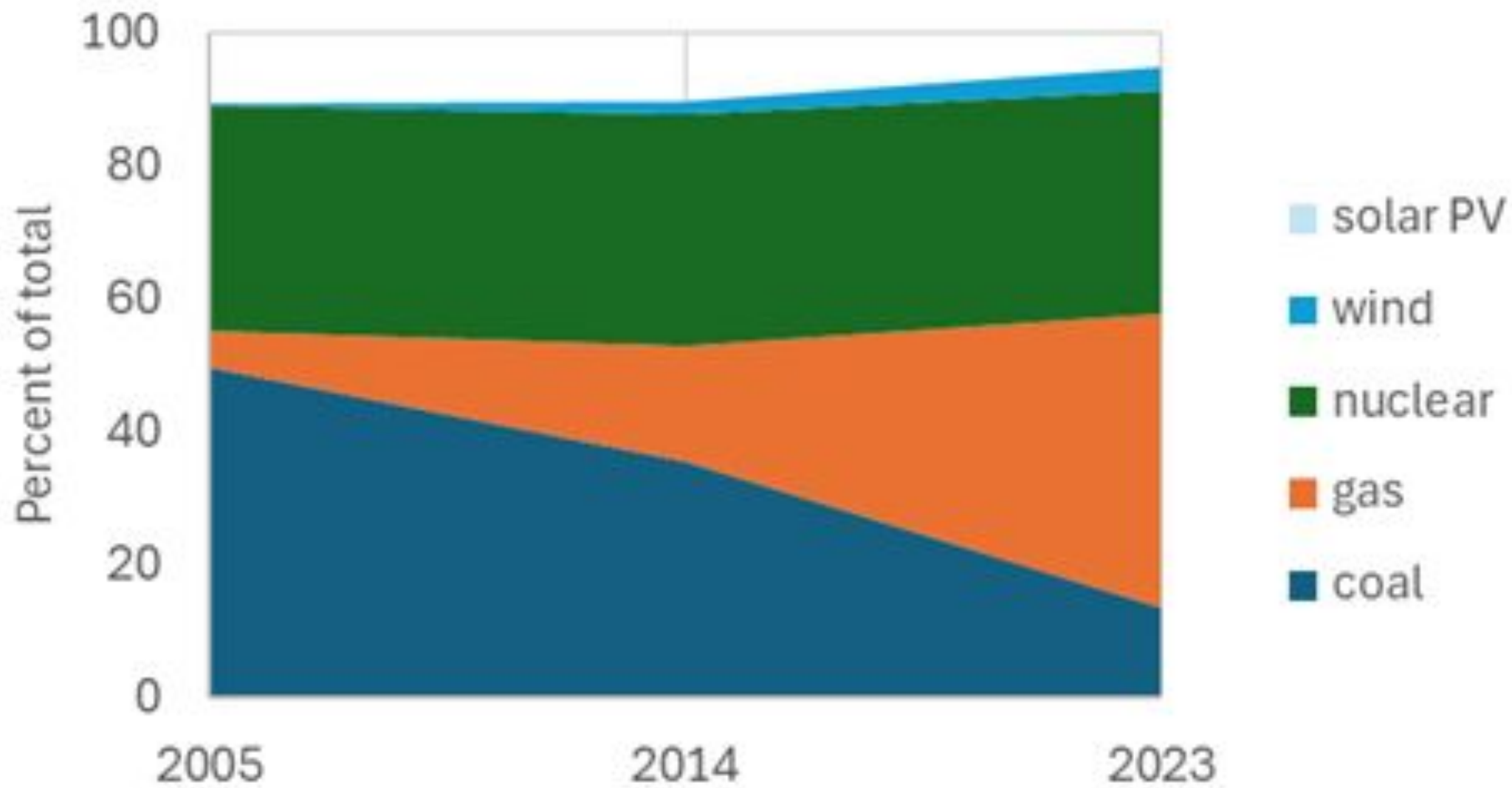


2) We're not on track to solve the problem soon enough to avoid major impacts; more actions are needed

New Jersey Greenhouse Gas Emissions and Goals

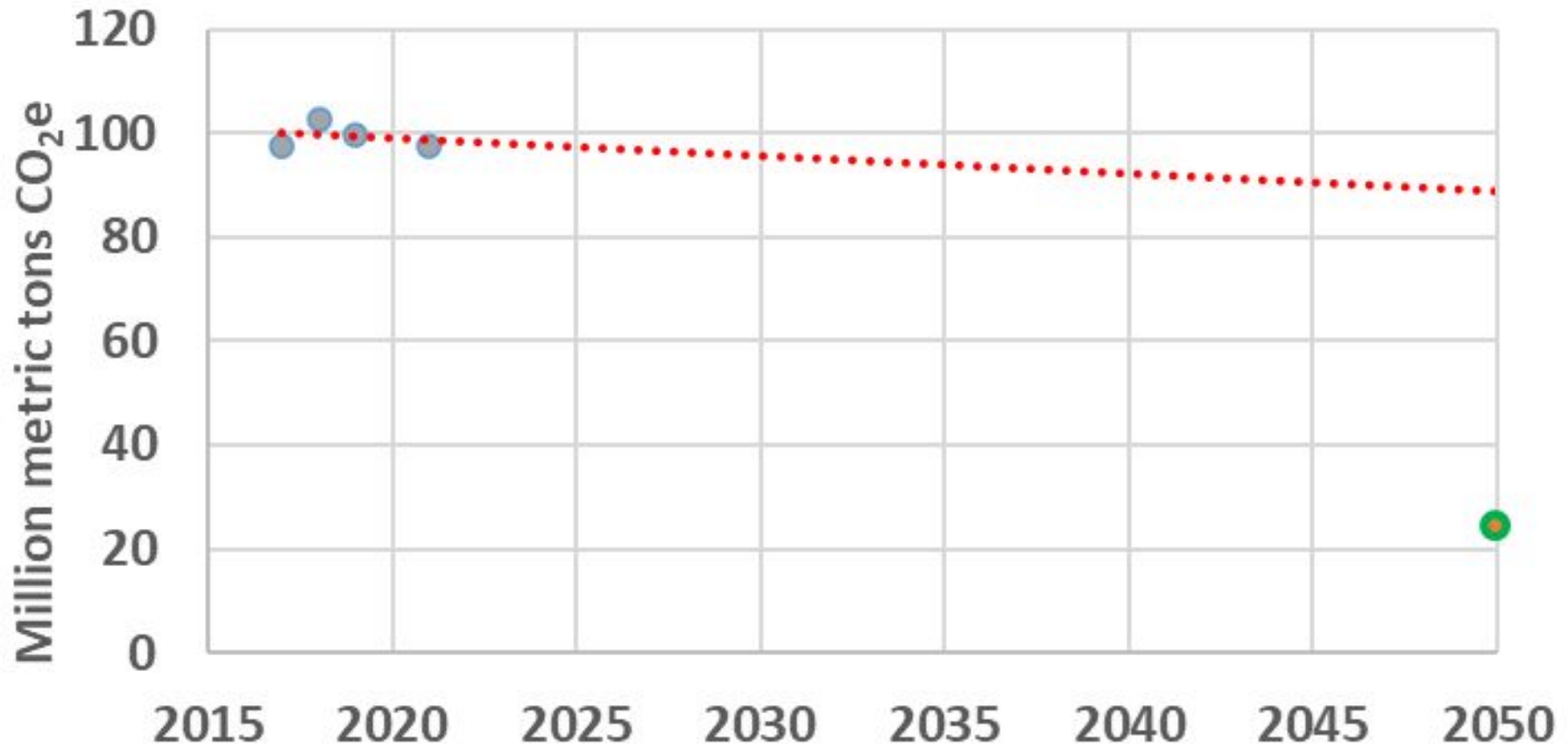


PJM fuel mix



New Jersey GHG Emissions, 2017-2021

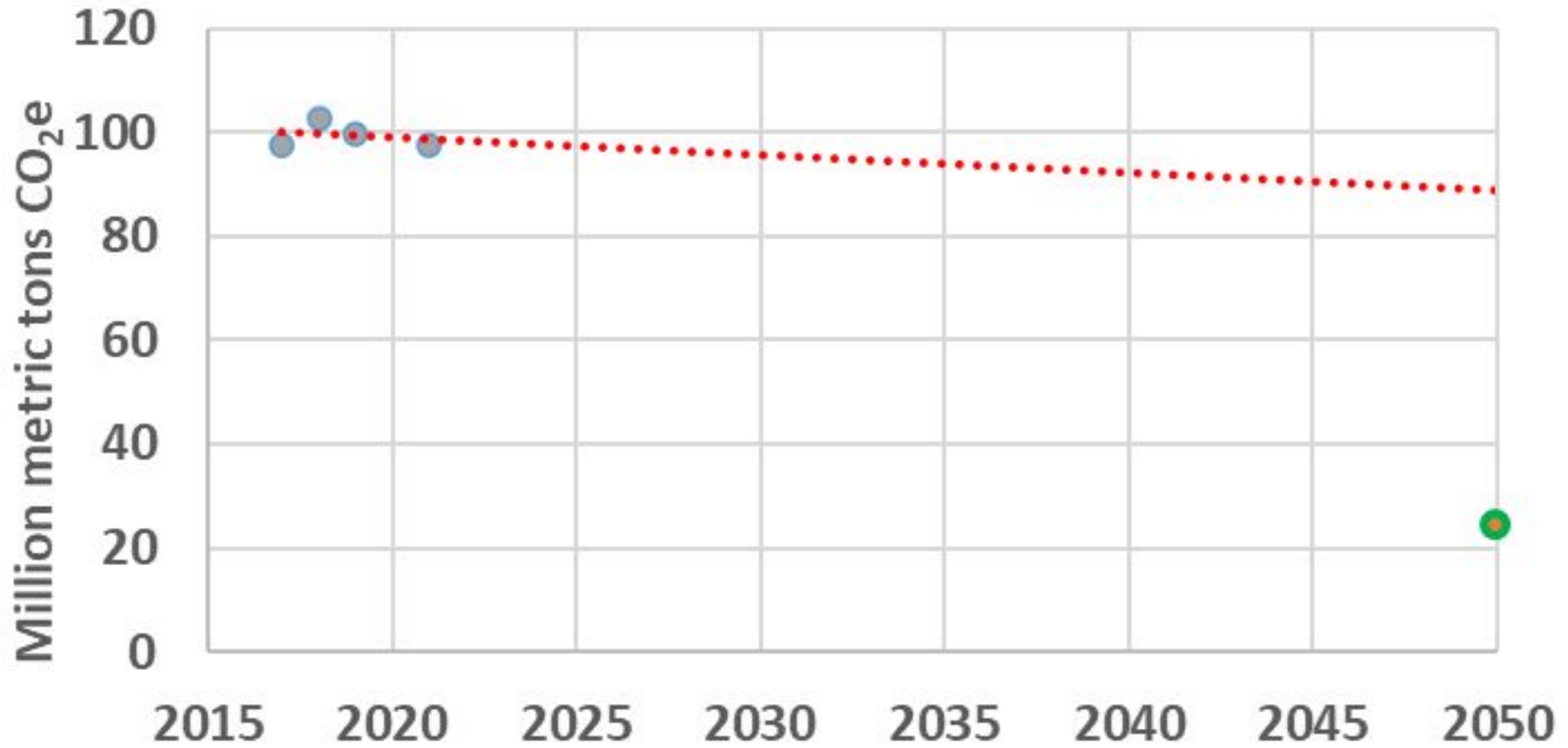
and best-fitting linear trendline; 2020 excluded as outlier



Data from: https://dep.nj.gov/wp-content/uploads/climatechange/nj_pcap_final-1.pdf

New Jersey GHG Emissions, 2017-2021

and best-fitting linear trendline; 2020 excluded as outlier



Data from: https://dep.nj.gov/wp-content/uploads/climatechange/nj_pcap_final-1.pdf

There are some promising initiatives, many driven by the Inflation Reduction Act...



2019 NEW JERSEY

ENERGY MASTER PLAN PATHWAY TO 2050

From:

https://nj.gov/emp/docs/pdf/2020_NJBPU_EMP.pdf



NJEDA
ECONOMIC DEVELOPMENT AUTHORITY





NEW JERSEY'S

PRIORITY CLIMATE ACTION PLAN

MARCH 2024



From:
<https://www.epa.gov/system/files/documents/2024-03/nj-pcap.pdf>

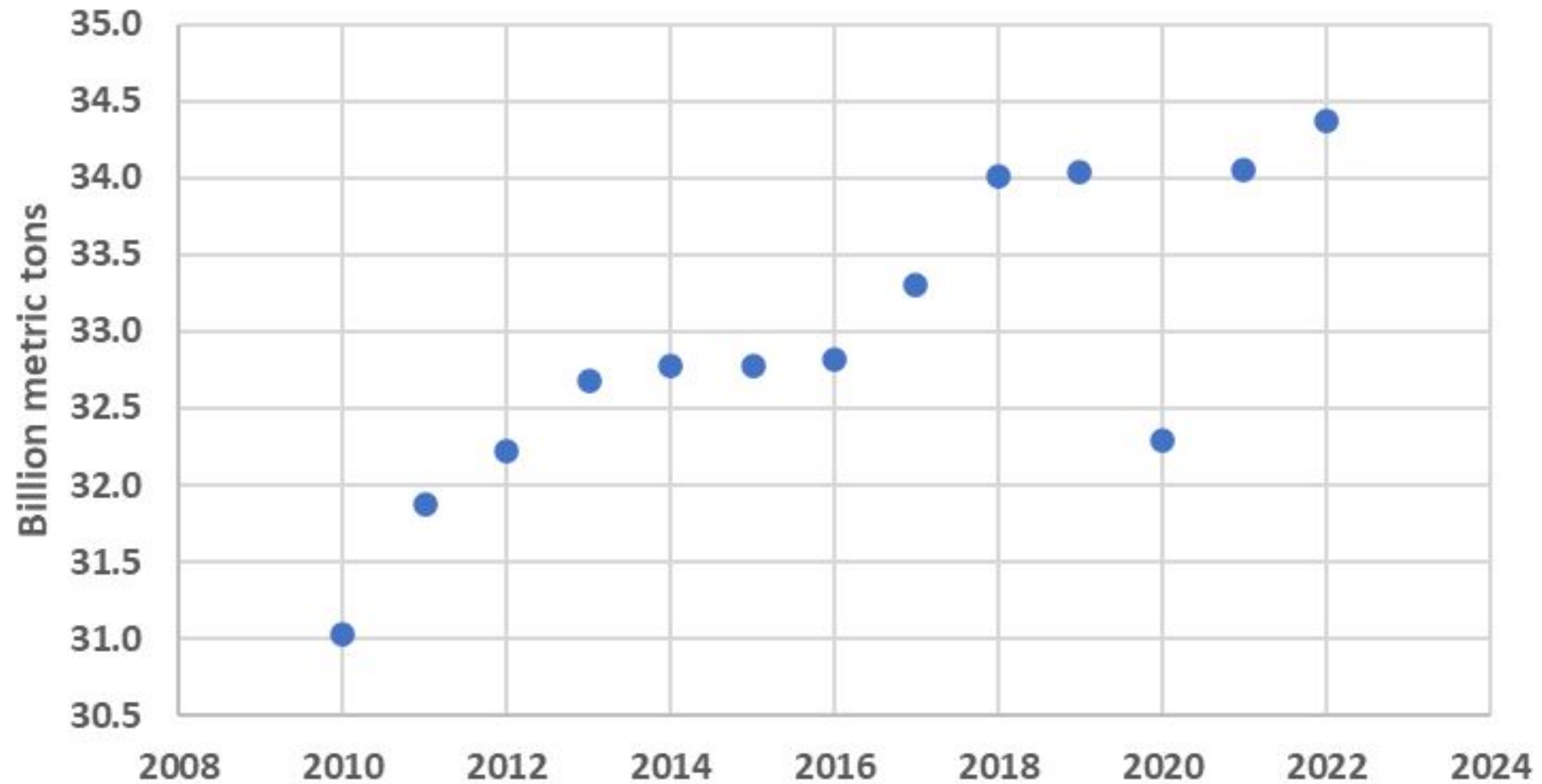
Are we ignoring something?



We're ignoring

- a) Globally, CO₂ emissions are still increasing, fossil fuel use is still increasing
- b) Climate disruption is a global problem

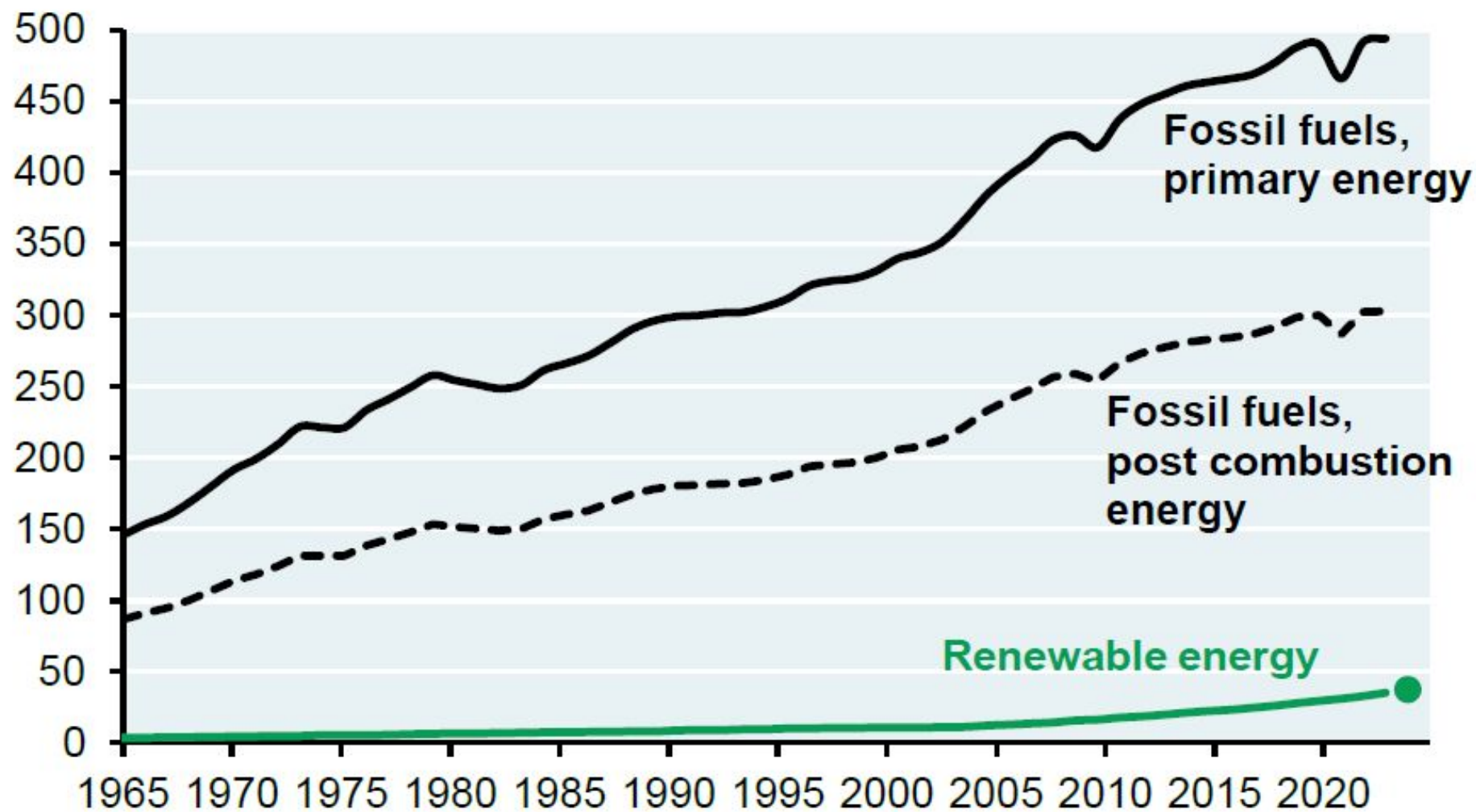
CO₂ emissions from energy, world



From: 2023 statistical review of world energy, <https://www.energyinst.org/statistical-review>

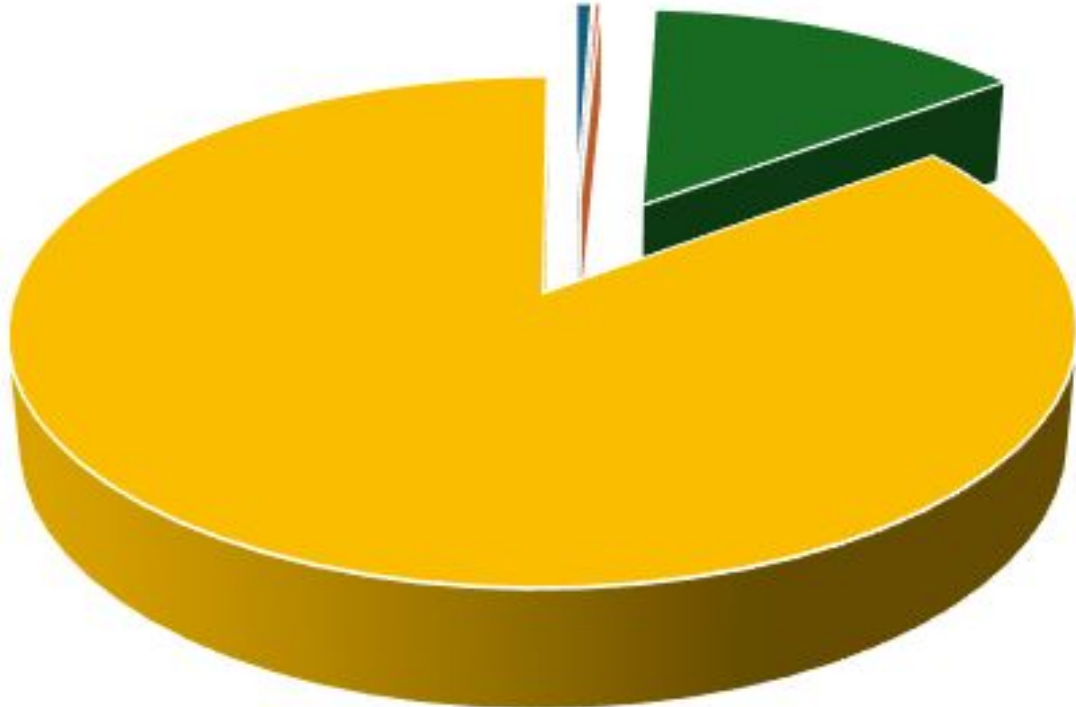
Global fossil fuel and renewable energy use

Exajoules



Source: EI Statistical Review of World Energy, IEA, JPMAM, 2024

Humanity's GHG Emissions



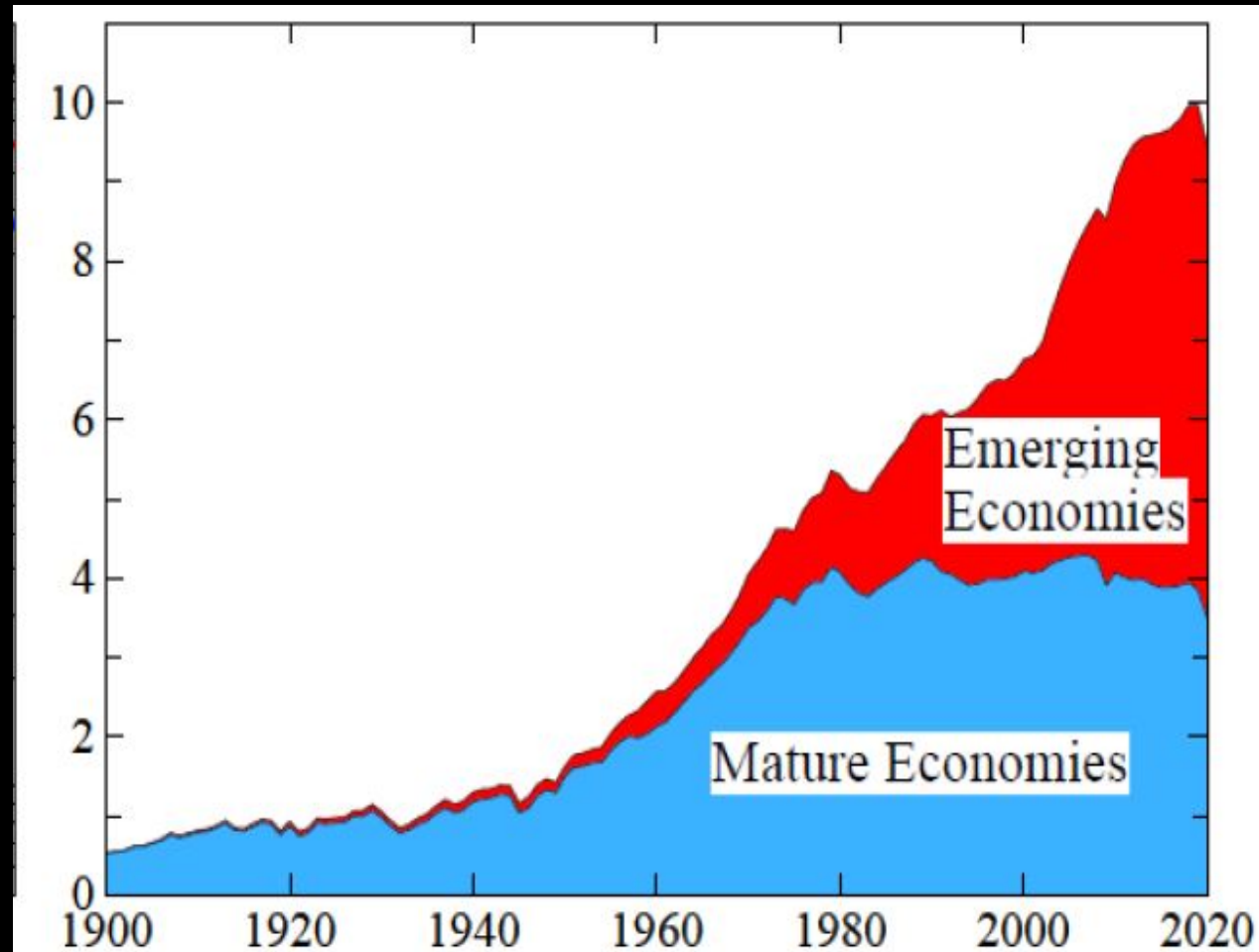
■ PA

■ NJ

■ Rest of the U.S.

■ Rest of the world

Global emissions of carbon, gigatons per year



From: <http://www.columbia.edu/~jeh1/Documents/PipelinePaper.2023.07.05.pdf>

Emerging economies need electricity available 24/7, and they need heat for industrial processes.

Global electricity demand is likely to double or triple by 2050.



Coal powerplant in India

If emerging economies can't get the energy they need to raise their standard of living from clean sources, they'll get it by burning gas, and coal

3) Local actions won't be sufficient;
only steps that lead to national and
international measures will save us
from major impacts

Fossil fuels enjoy a huge hidden subsidy - the waste product of their combustion, CO₂, is dumped into the air for free

This hidden subsidy could be addressed by a fee on carbon dioxide emissions.

This would raise the price of gasoline and heating oil, but if the \$ collected was refunded to families, it wouldn't hurt low and moderate income people

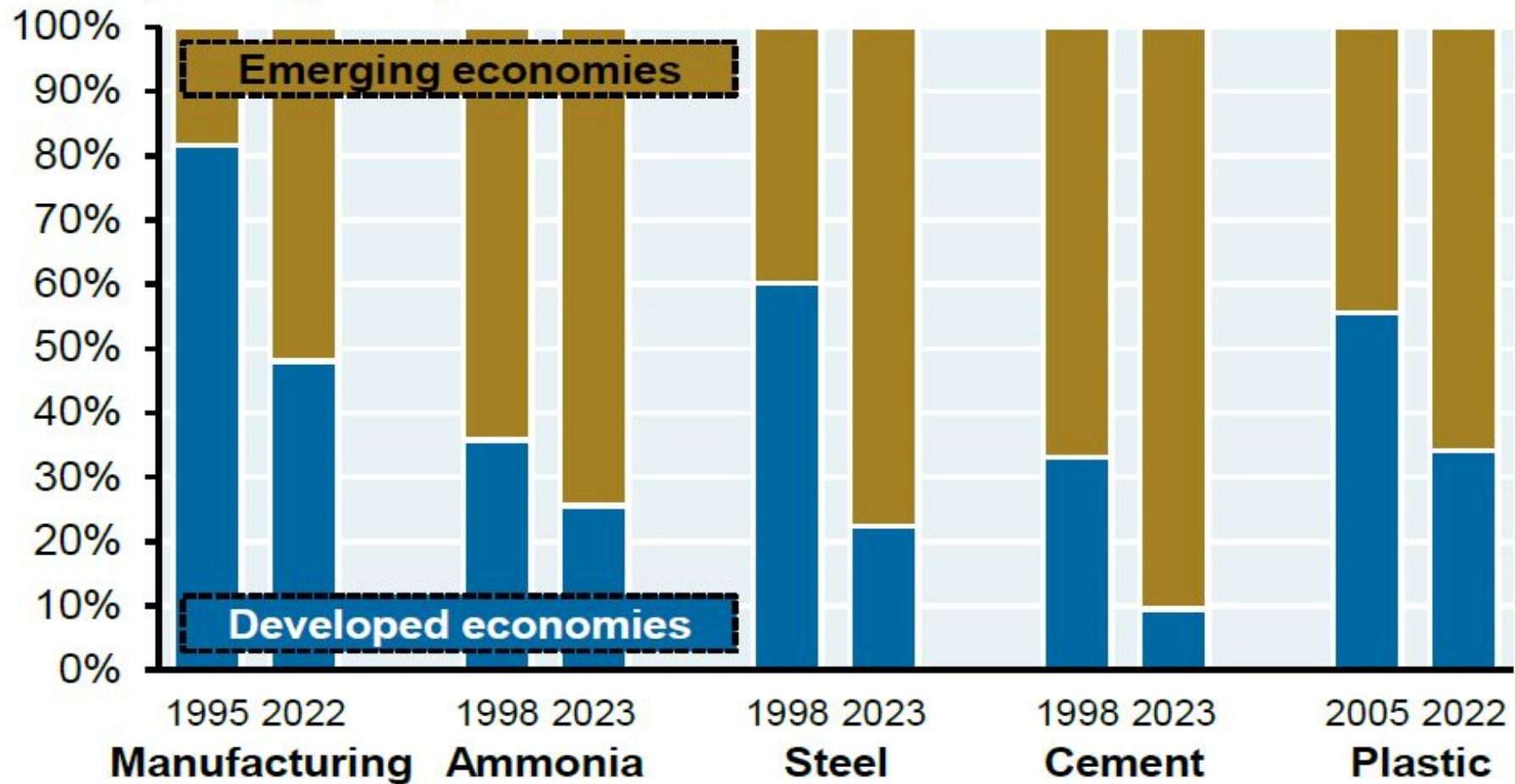
There are carbon pricing bills before Congress;
two of these are..

- H.R. 5744, the Energy Innovation and Carbon Dividend Act; co-sponsored by Bonnie Watson Coleman on April 5, 2024
- H.R. 6665, the MARKET CHOICE Act (sponsored by Brian Fitzpatrick)

How could U.S. policy drive global action?

A promising legislative proposal is the PROVE IT Act

A shift in energy intensive manufacturing to the emerging world, % of global production



Source: UN DESA, Worldsteel, PlasticsEurope, USGS, JPMAM, 2024

From:

<https://www.jpmorgan.com/insights/outlook/market-outlook/eye-on-the-market-electravisio>

Senators Coons, Cramer introduce legislation to study global emissions intensity and hold countries with dirty production accountable

An essential step to countering global emissions from polluting countries, the PROVE IT Act would gather the necessary data to quantify the advantage of the United States' cleaner manufacturing practices against countries with little to no environmental standards

AUGUST 09, 2023

The PROVE IT Act could set the stage for a carbon border adjustment mechanism, (CBAM) which would curb industrial carbon emissions at the global level

The European Union is implementing a CBAM

U.S. efforts to re-establish leadership in nuclear energy could lead to carbon-free technology that would be adopted globally

Six features contribute to advanced nuclear power's differentiated value proposition for a decarbonized grid



1. Additional applications include clean hydrogen generation, industrial process heat, desalination of water, district heating, off-grid power, and craft propulsion and power
 2. Renewables + storage includes renewables coupled with long duration energy storage or renewables coupled with hydrogen storage

Senate Passes Bipartisan Nuclear Energy Bill from Capito, Carper, Whitehouse

July 27, 2023

ADVANCE Act would boost development and deployment of new nuclear technologies, incentivize expansion in America, retool and support the NRC, and help position the U.S. as the world's leader in nuclear energy.

U.S. Seeks to Boost Nuclear Power After Decades of Inertia

Measures moving through Congress to encourage new reactors are receiving broad bipartisan support, as lawmakers embrace a once-contentious technology.



By **Brad Plumer**

Reporting from Washington

March 1, 2024

The House this week overwhelmingly passed legislation meant to speed up the development of a new generation of nuclear power plants, the latest sign that a once-contentious source of energy is now attracting broad political support in Washington.

The 365-to-36 vote on Wednesday reflected the bipartisan nature of the bill, known as the [Atomic Energy Advancement Act](#). It received backing from Democrats who support nuclear power because it does not emit greenhouse gases and can generate electricity 24 hours a day to supplement solar and wind power. It also received support from Republicans who have downplayed the risks of climate change but who say that nuclear power could bolster the nation's economy and energy security.

In summary..

- 1) The need for action has been clear for a long time
- 2) Current efforts aren't enough – more is needed
- 3) We can protect ourselves from the worst impacts of climate disruption only by fostering actions that will scale to the nation and the world

What to Do?

Become more informed, make climate-friendly choices

Encourage people to vote for climate friendly candidates (e.g., Environmental Voter Project)

Join a group working for national and international solutions (e.g., Citizens' Climate Lobby)

Citizens' Climate Lobby



Happy to try to answer any questions!

Mike Aucott

mlaucott@gmail.com

RESOURCES

Groups:

- Citizens' Climate Lobby, <https://citizensclimatelobby.org/>
- Environmental Voter Project, <https://www.environmentalvoter.org/>
- Climate Leadership Council, <https://clcouncil.org/>

Books:

- Hansen, James, 2009, *Storms of My Grandchildren*, Bloomsbury, NY
- Gates, Bill, 2021, *How to Avoid a Climate Disaster*, Knopf, NY

Reports:

- New Jersey's Priority Climate Action Plan: <https://www.epa.gov/system/files/documents/2024-03/nj-pcap.pdf>
- New Jersey's Strategic Climate Action Plan: <https://dep.nj.gov/strategic-climate-action-plan/>
- New Jersey's Global Warming Response Act 80x50 Report:
<https://dep.nj.gov/wp-content/uploads/climatechange/nj-gwra-80x50-report-2020.pdf>
- New Jersey Energy Master Plan - Pathway to 2050: https://nj.gov/emp/docs/pdf/2020_NJBPU_EMP.pdf
- The Pathway to Advanced Nuclear Commercial Liftoff: <https://liftoff.energy.gov/advanced-nuclear/>

Online resources:

- Carbon Tax Center, <https://www.carbontax.org/>
- En-ROADS, <https://en-roads.climateinteractive.org>

2. Our second speaker is Mike Winka - Mike worked for the State of New Jersey for almost 40 years, including over 20 years at the NJ Dept. of Environmental Protection in the Division of Solid Waste Management, and in the Division of Science and Research as Chief of the Office of Innovative Technology and Market Development. At Science and Research, his main activity was assisting in the development of the NJ Statewide Greenhouse Gas (GHG) Action Plan.

Mike then worked for the NJ Board of Public Utilities (NJBPU) for 17 years. He was the first Director of the Office of Clean Energy and managed NJ's Clean Energy Program (NJCEP) for 9 years. He helped establish the state's solar and offshore wind programs and expand the statewide energy efficiency programs. Mike worked on State Energy Master Plans, and helped to develop the Town Center Microgrid, Community Solar, Battery and Thermal Storage, Heat Pump, Smart Grid and EV programs.

Mike currently teaches a graduate course on sustainable energy and policy at Rutgers, and is a member of Sustainable Lawrence, Sustainable Jersey Energy Task Force and the Mercer County Sustainability Coalition.

Why We Can Win the Climate Mitigation and Clean Energy Transition

UUCWC

April 16, 2024

Why Im Optimistic

We'll Get to 100% Clean Energy before 2050

Local Action – Tracking Progress

Mike Winka

Sustainable Lawrence

mwinka@comcast.net – 609-778-8717

Why We Can Win the Climate Mitigation and Clean Energy Transition

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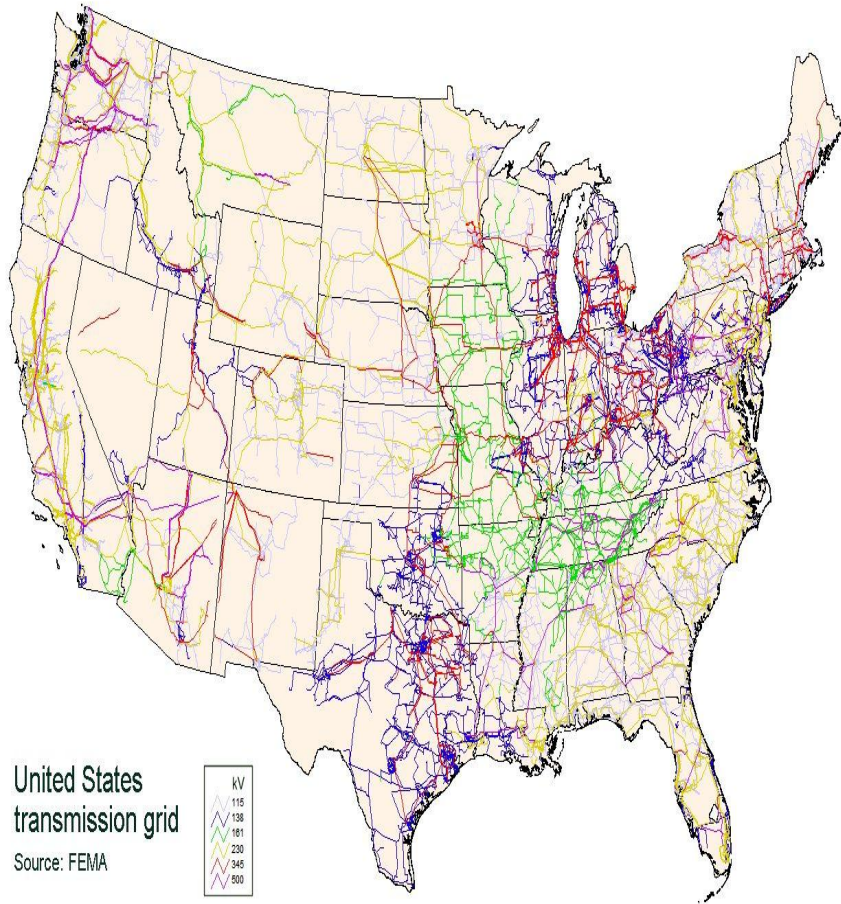
Local Action – Tracking Progress

- **The Size of the Issue – Climate and Energy Systems**
- **Mitigation Strategies/Measures– at the State, Local, and Household Levels**
- **The Costs and Benefits of those Mitigation Strategies/Measures**

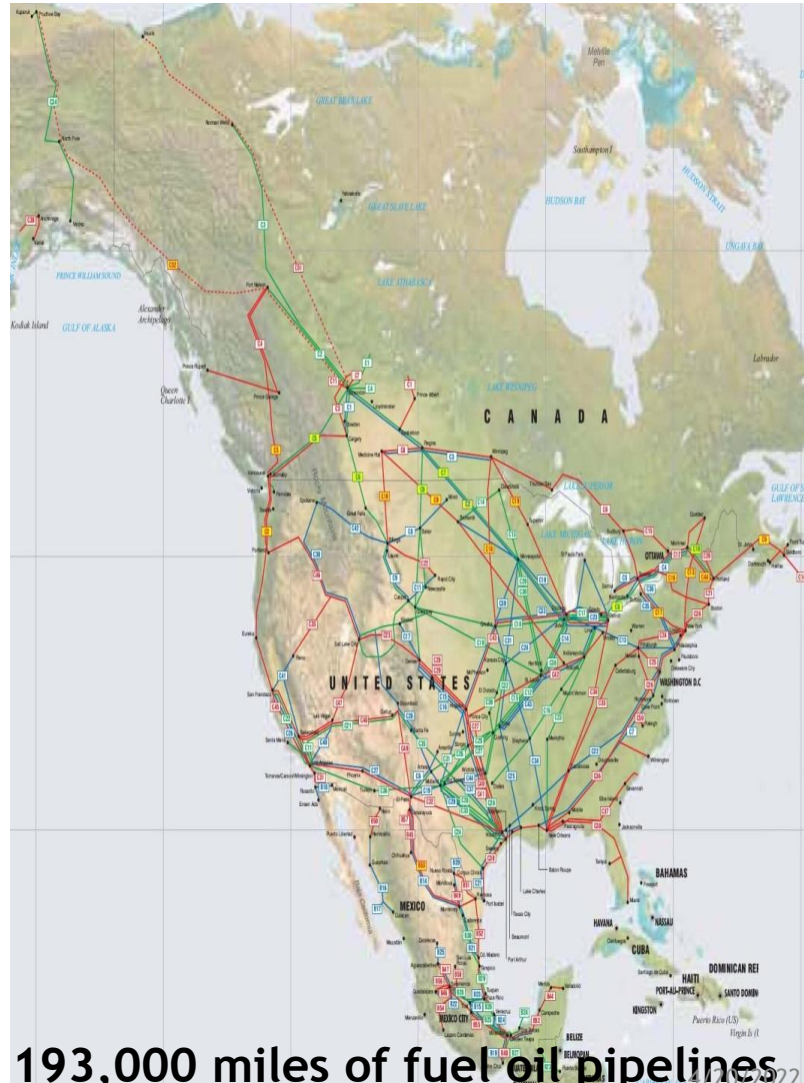
- **Energy Policies to reduce GHG emission Pollution – It starts with a Plan**
- **3 Charts on why I'm Optimistic**

The US Energy System of pipes and wires are large enough to X-cross the US over 200 times
 Energy is over \$1.96 trillion – almost 6% of US GDP - In NJ - \$43.6B PA \$70.8B - 2021

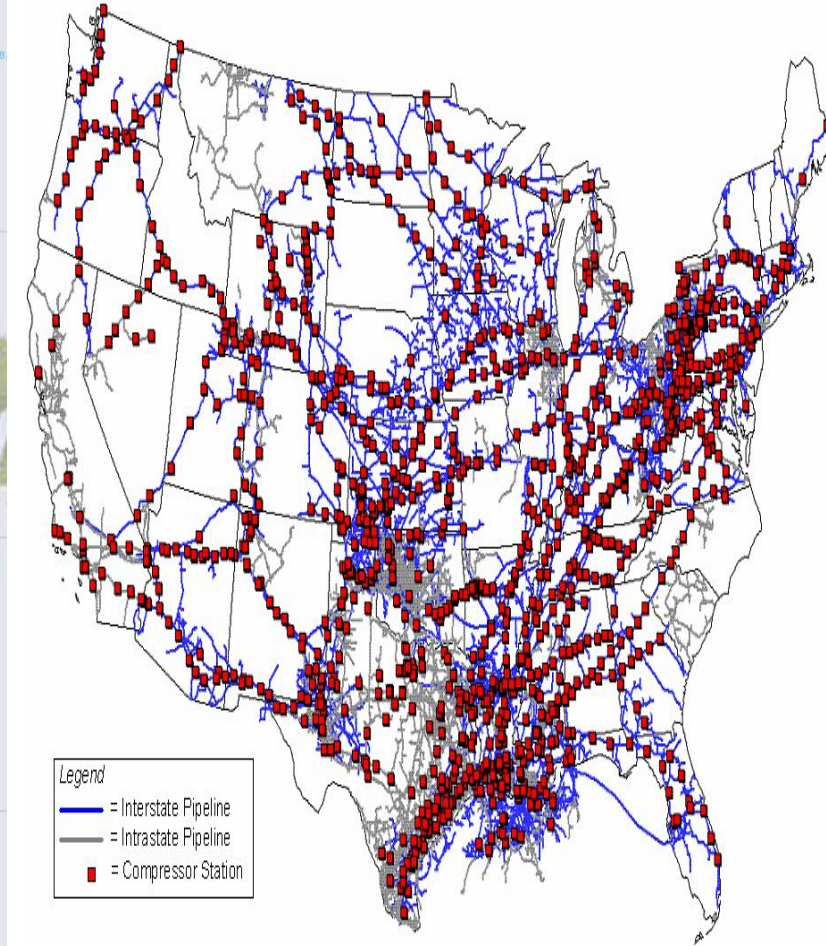
U.S. Energy Information Administration - EIA - Independent Statistics and Analysis



200,000 miles of electric transmission wires and 5.5 million miles of distribution wires



193,000 miles of fuel oil pipelines in US



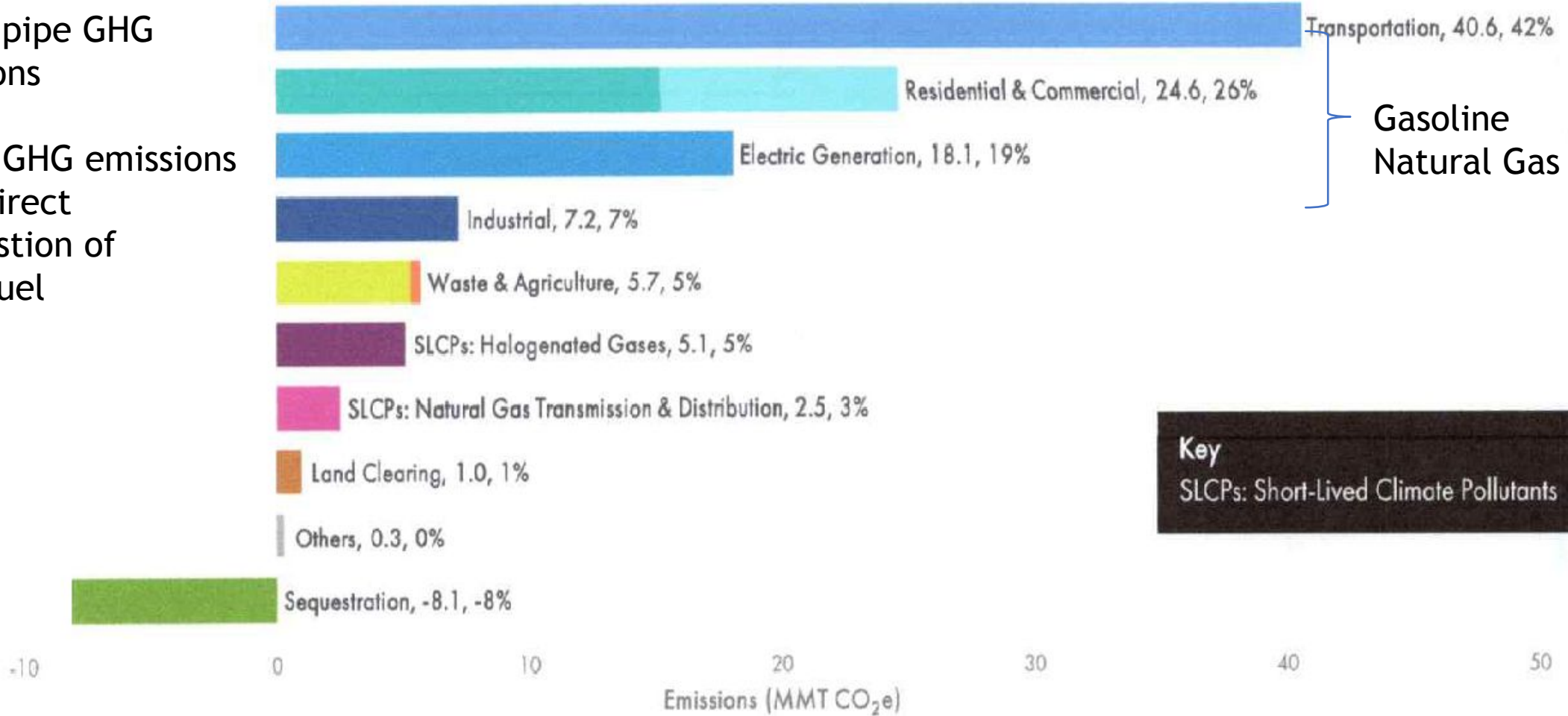
300,000 miles of inter and intrastate natural gas pipelines and 2.1 M miles of distribution pipes

Figure ES.2. New Jersey GHG Emissions Inventory for 2018 (MMT CO₂e and Percentage).
 Opportunities for emissions reductions are present in each of the categories.

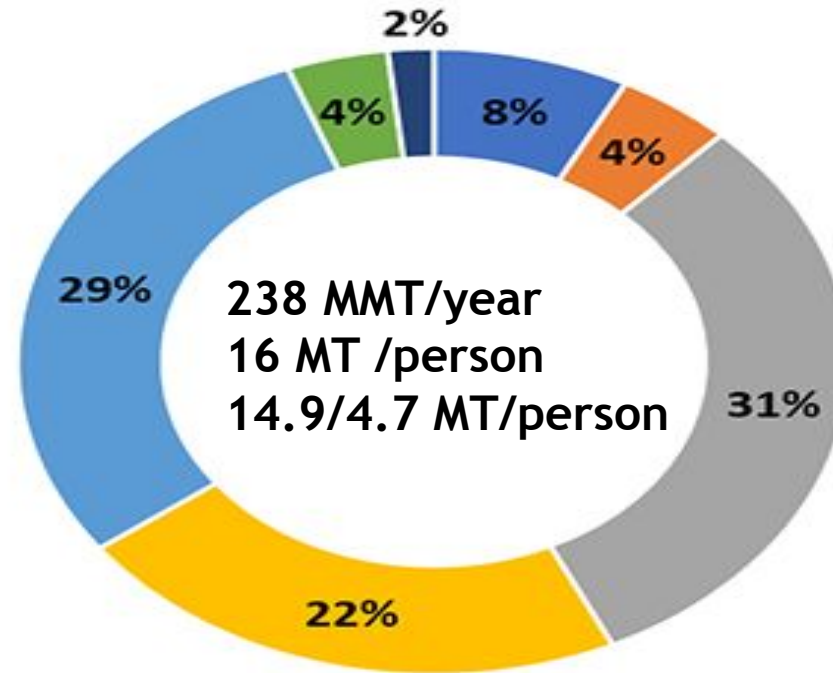
100 MMT per year
 11 MT per person (14.9/4.75 MT/person)
 Our World in Data

End of pipe GHG Emissions

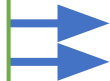
84% of GHG emissions from direct combustion of fossil fuel



Pennsylvania 2020 GHG Emissions % of Total by Sector



Coal and
natural
gas
mining



- Residential
- Industrial
- Electricity Production
- Waste Management

- Commercial
- Transportation
- Agriculture

gasoline



https://files.dep.state.pa.us/Energy/Office%20of%20Energy%20and%20Technology/OETDPortalFiles/ClimateChange/FINAL_2023_GHG_Inventory_Report_12.13.23.pdf

[CO₂ emissions - Our World in Data](#)

2019 NJ Energy Master Plan – Strategies to get to 100% Clean Energy by 2050

The EMP puts mitigation in 5 basic buckets – a more integrated approach <https://nj.gov/emp/>

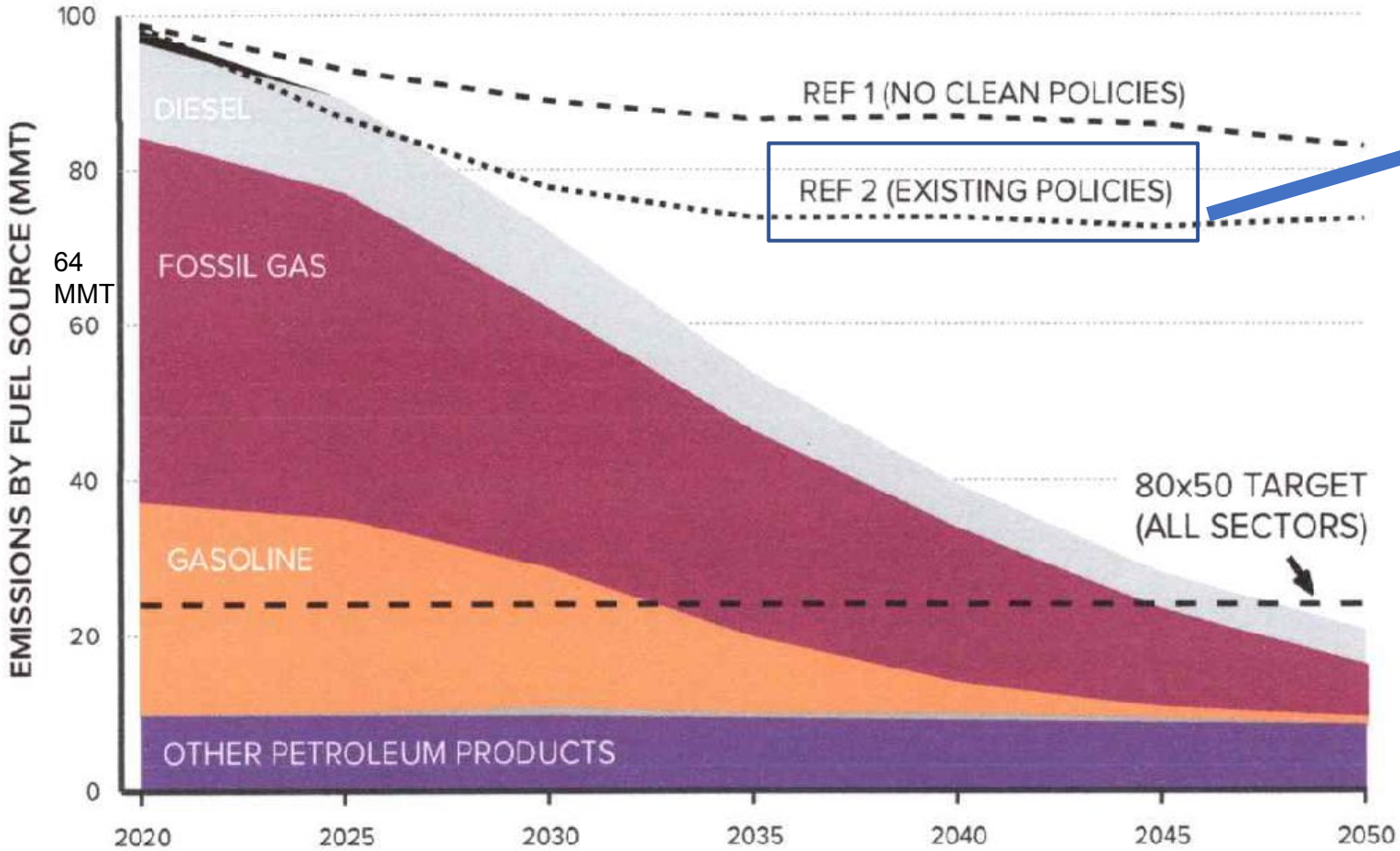
2019 NJBPU EMP STRATEGIES	INTEGRATED ENERGY PLAN
Reduce energy use and emissions from the transportation sector	Accelerate the transition to electric vehicles powered by clean renewable electricity
Accelerate the deployment of renewable energy and Distributed Energy Resources (DER)	Expand in-state renewables and within PJM to supply clean electricity for the transportation and building sectors Retain near term but no expansion of existing natural gas and nuclear capacity for reliability
Maintain energy efficiency and peak demand reduction	Continue and expand existing EE and DR programs with a focus on heat pumps and EVs - powering New Jersey economy w clean energy
Reduce energy use and emissions from the building sector	Existing building electrification powered by clean renewable electricity Develop electrification programs for new construction
Decarbonize and modernize the New Jersey energy systems	Electricity to double by 2050 Plan grid modernization - integrated distribution plans Natural gas and gasoline usage declines

2019 EMP Goals

Achieving 100% clean energy and 80% reduction in 2006 greenhouse gas emissions 125 million metric tons to 24 million metric tons statewide by 2050. 100% clean energy is defined as 100% carbon-neutral electricity generation and maximum electrification of the transportation and building sectors - specifically heating.

FIGURE 7.

Energy Emissions by Fuel Source, Least Cost Scenario



4/20/2022

Clean Energy Act of 2018 –Ref 2

The Clean Energy Act of 2018 was enacted by Governor Murphy in May 2018 and included the following:

Energy storage goal of 600 MW by 2021 and 2,000 MW by 2030

Class I RPS of 21% by 2021, 35% by 2025 and 50% by 2030 with a cap of 7% on the total cost .

Modify or replace the SREC program

A community solar program

Utility EE goals of 2% annually for electricity and 0.75% for natural gas

OSW goal of 3,500 MW

How does the 2019 NJBPU Energy Master Plan Translate to what you can do and what local governments can do

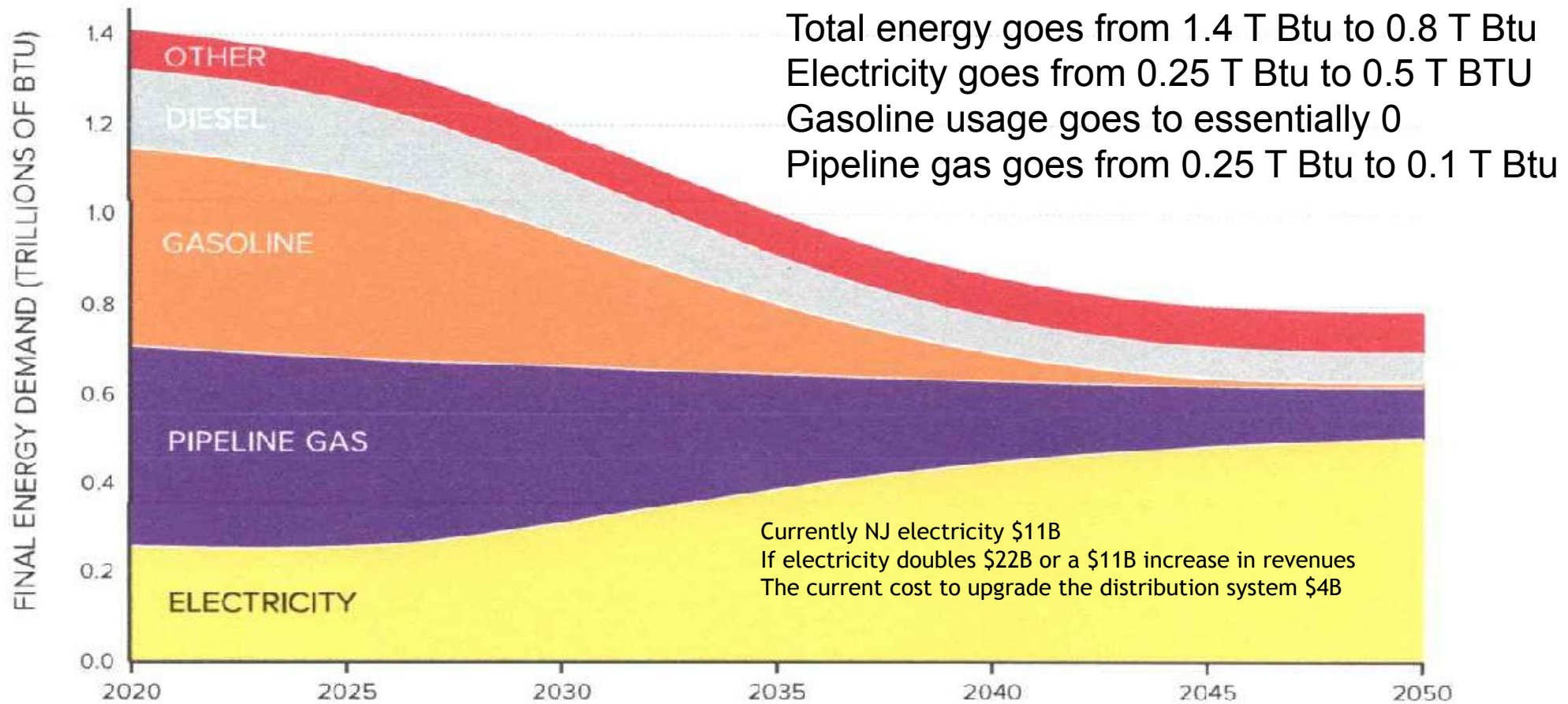
- Energy Storage - 2,000 MW by 2030
- Renewable Energy Portfolio Standard (RPS)- 50% by 2030 (100% clean electricity by 2035)
- Solar - additional 3,750 MW from 2021 by 2026 (existing 5,200 MW 7.6% total generation)
- Offshore Wins (OSW) - 7,000 MW by 2035 (11,000 MW by 2040)
- Electric Vehicles (EV) - 330,000 by 2025, 2 million by 2035
- EV Charging Stations (EVCS) - 1,000 level 2 and 400 DC by 2025
- **Cold Climate Heat Pumps - (400,000 residential, 20,000 Commercial)**
- Energy Efficiency electricity - 2% annual reduction in use
- Energy Efficiency natural gas - 0.75% annual reduction in use
- Clean Energy - (100% clean energy by 2050)
- Greenhouse Gas (GHG) reduction - 80% reduction in 2006 level by 2050
- **GHG reduction - 50% reduction in 2006 level by 2030)**
- GHG reduction - 28% reduction in 2005 level by 2025 - Paris Agreement

New Jersey does not reach its goals unless every municipality reaches these goals
Every municipality does not reach these goals unless every household and business reaches these goals

Energy Savings to Electrify the Building and Transportation Sectors Powered by Renewable Energy

FIGURE H.

Final energy demand in the Least Cost scenario

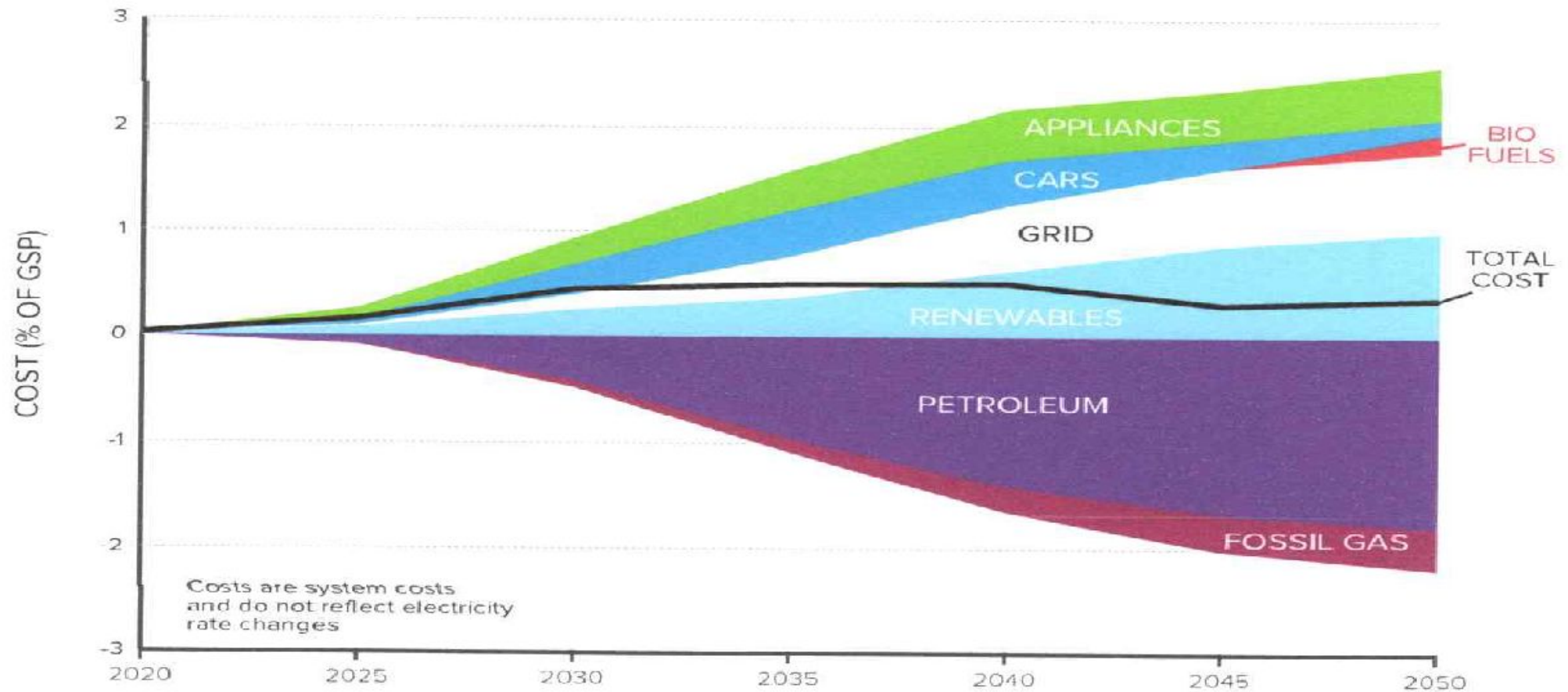


Cost to Electrify the Building and Transportation Sectors Powered by Renewable Energy

FIGURE G.

Incremental and avoided costs in the Least Cost scenario

See call-out box for description of this and similar charts.



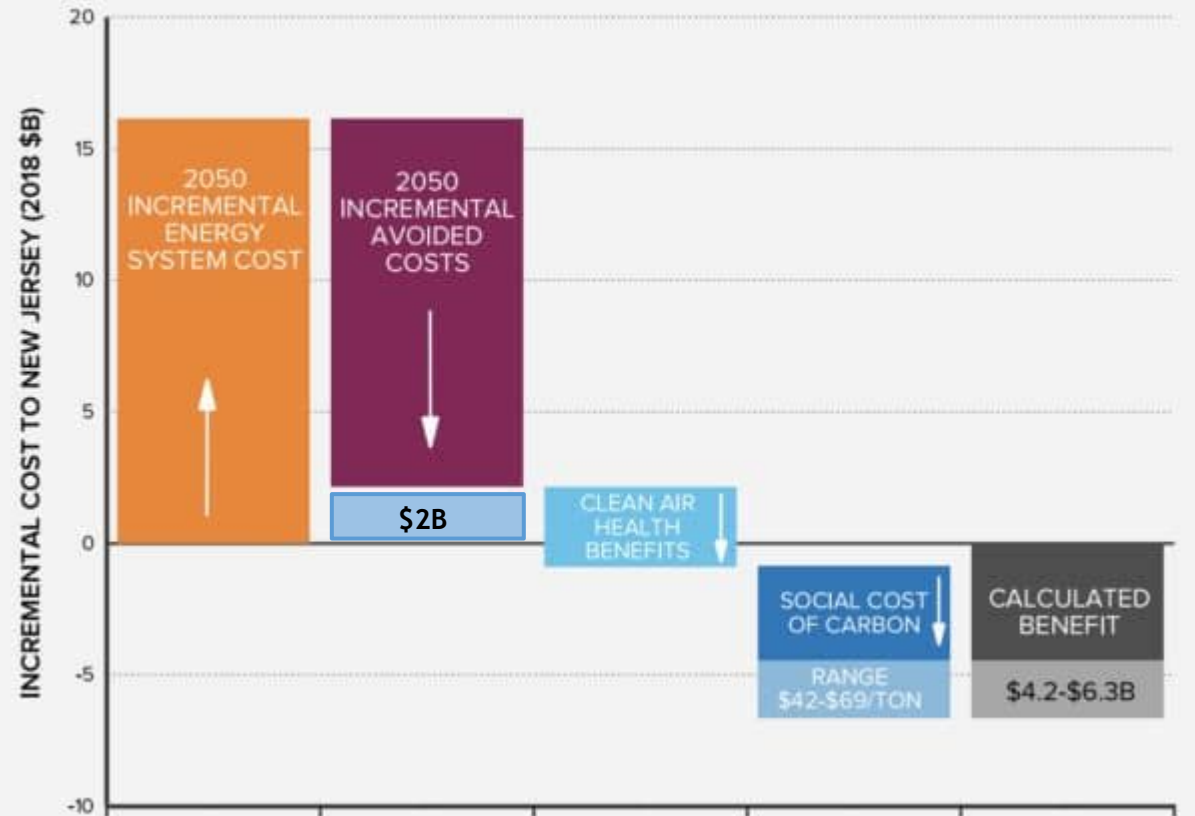
The Incremental Cost and Benefits to Electrify the Building and Transportation Sectors Powered by Renewable Energy - Its Cost Effective

\$2B incremental cost in a \$1 T NJ economy or 0.2% increase

Average Annual Energy Cost, 2020-2050



Benefits and Incremental Costs to New Jersey in the Least Cost Scenario



From the 2019 NJ Integrated Energy Plan presentation – Nov 2018

Summary of Key Finding presented by Rocky Mountain Institute

- **New Jersey Can meet the goals of the 2019 EMP for 100% clean energy and 80% reduction in GHG emissions by 2050 with existing technologies**
- **Cost to meet the 2019 EMP goals are relatively small compared to total energy spending and offset by the benefits by 2 to 1**
- **Existing policies reduce GHG emissions but are not enough to achieve the 2019 EMP goals**
- **The least cost energy systems are substantially different from today's energy system**

Six Simple Currently Cost Effective (without subsidies) Clean Energy Technologies (EE/RE) that can be Implemented

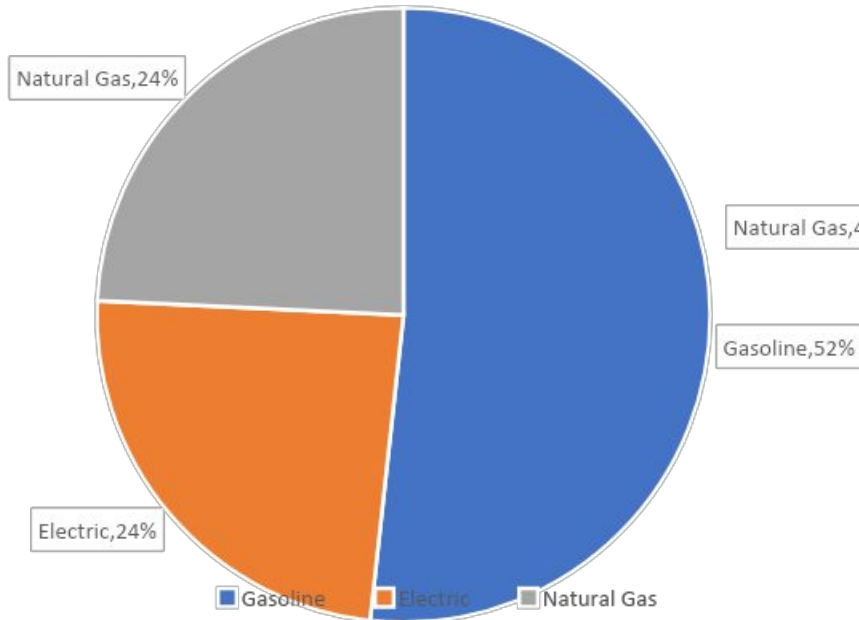
Incrementally and Integrated -not siloed
to Mitigate Climate Change by Reducing GHG at the HH and Local Level.

- Energy Efficiency - Whole House Weatherization (EE) (high efficiency shell measures)
- Building electrification - Heat pumps - induction stove - LED
- Electric Vehicles (EE) and EV Charging
- On-site Solar (RE) - Community Solar -(Grid scale Renewables -OSW)
- On-site Storage electric and thermal (CE) - (Grid scale storage) -
- Smart Grid - Grid Interactive Efficient Buildings (GEB)

Average New Jersey Single-Family Home -
2,400 sq ft 2 cars at 25 mpg

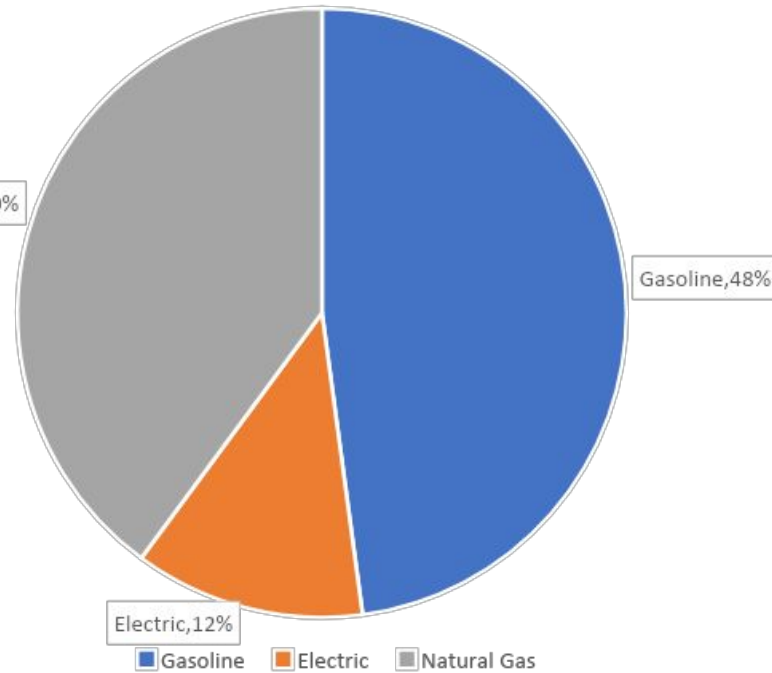
uses 1,000 gallons of gasoline per year, 1,000 therms of natural gas per year, 9,000 kwh of electricity per year

Annual HH Energy Cost



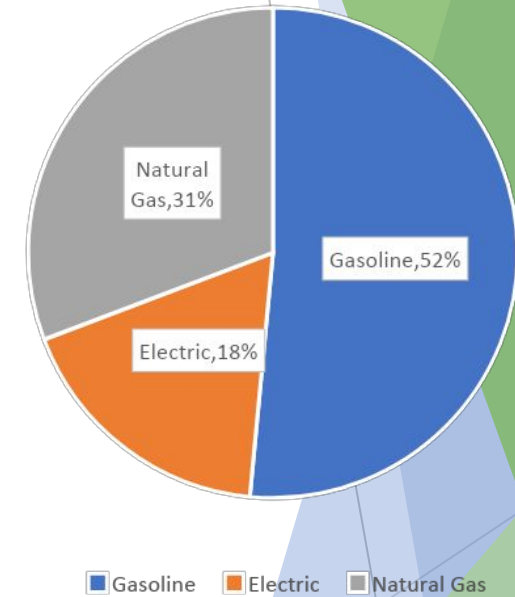
\$6,200

Annual HH Energy usage
in MM Btus



250 MM Btus

Annual HH CO2 emissions
In MT



**38,000 lbs.
17 MT**

The key to reducing energy, cost, and GHG emissions is a plan

Transportation Sector - Going Electric

How to Change the Demand Curve for Oil and Gasoline
to Prevent Future Oil pipelines
Just think Integrated



An EV is about \$10,000 more than an ICEV

An EV is about 4 times more energy-efficient than a similar ICEV (25 mpg vs 03.kWh/mi)

EV is about 3 times lower cost to fuel than a similar ICEV (\$3.5/gal vs \$0.18/kWh)

Per car mag 40% less cost to maintain The EV over 10 years than a similar ICEV including the cost to replace the batteries

**3.5 kilowatts (kW) of solar
SPB 10 years w/o incentive 4.5 years -
"free" fuel for 20+ years
Avoiding 4.62 MT of CO2 - (54%<)
Reducing both gasoline and natural gas
demand and emissions and storage solar electricity**

MM Btu is a million
Btus

Building Sector - Going Electric

How to Change the Demand Curve for Natural Gas to Prevent Future Natural gas pipelines

Start slow and small and build into a movement



Heat Pump water heater is 2 times the cost of an efficient gas water heater

Heat pump water heater uses 3 times less energy than an efficient gas water heater

But costs the same to operate

**1.5 kilowatts (kW) of solar
HPWH + solar = 9 years
Free hot water after that
Avoiding 2.3 MT (13% >) - 67%**

Reducing natural gas demand in electric and heating sectors

A major advantage is you can store your solar electricity in the HPWH

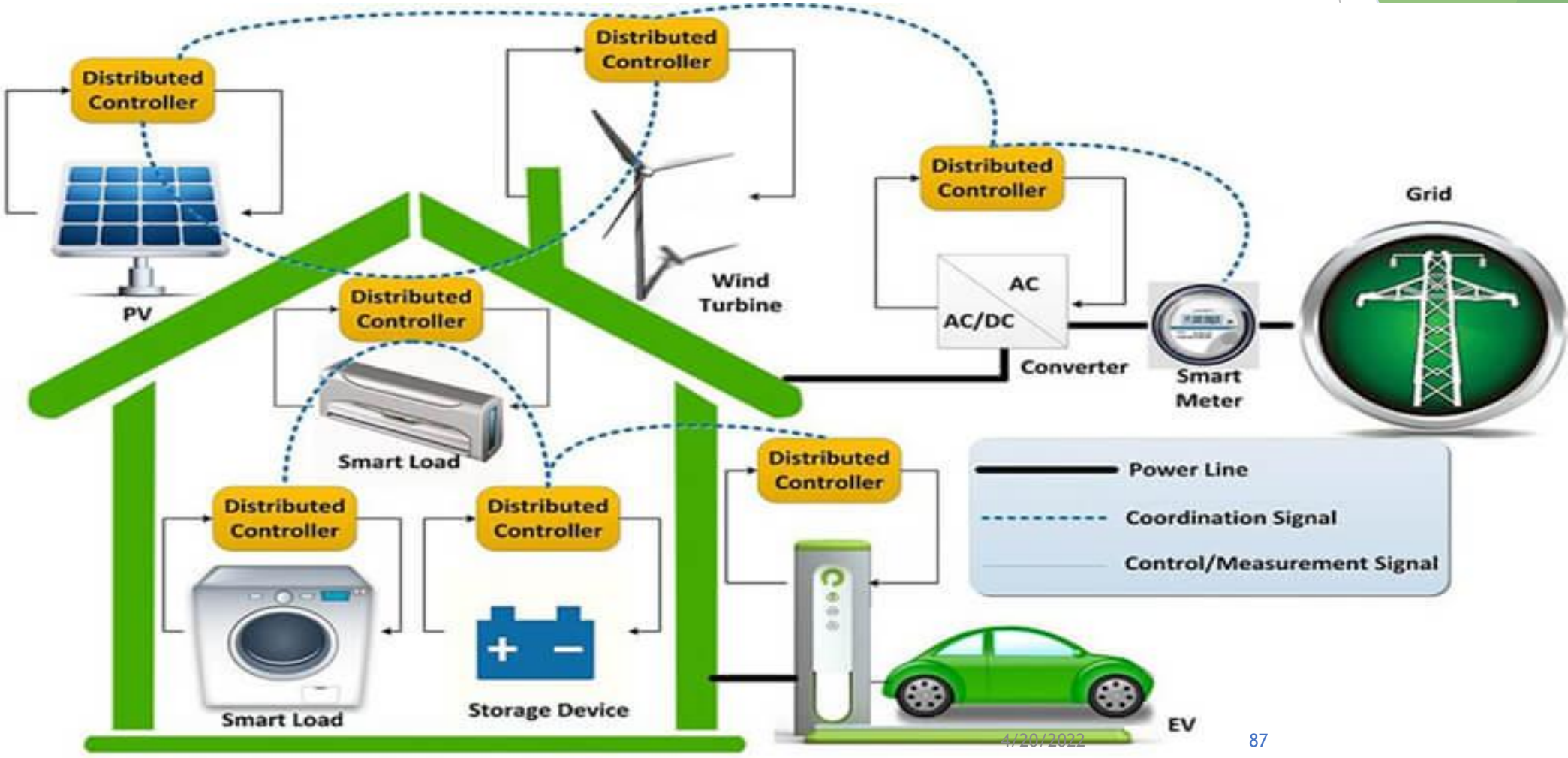
Heat Pump Water Heater

- 1 A fan pulls air through the top air filter.
- 2 Heat in the air is absorbed by eco-friendly refrigerant inside the evaporator coil and cool (dehumidified air) is exhausted.
- 3 Refrigerant is pumped through a compressor, which increases the temperature.
- 4 Simultaneously the cooler water from the bottom of the tank is pumped to the top of the appliance, where it circulates.
- 5 Hot refrigerant transfers its heat to the water inside the condenser coil.
- 6 Heated water is returned back to the top of the tank.
- 7 Condensate drain connection.
- 8 Backup electric heating elements.

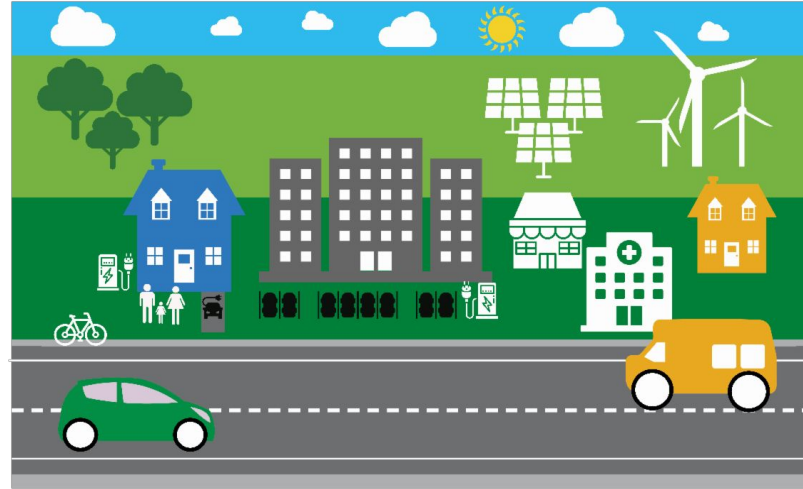


To extend the usability of solar energy

Smart Grid – Grid modernization – Smart Home or Office



How to Implement Energy and Climate Mitigation at a Local Level Community Energy **Plan** - New Jersey Board of Public Utilities



Sustainable Jersey Guide
for **Sustainable Energy
Communities**



[Community Energy Plans | NJ OCE
Web Site \(njcleanenergy.com\)](https://www.njcleanenergy.com)

\$10K per town \$25K OBC
Up to \$250K for implementation

https://www.sustainablejersey.com/fileadmin/media/Actions_and_Certification/Actions/Energy/SJ_Sustainable_Energy_Communities_Guide10_2021.pdf

A SUSTAINABLE JERSEY GUIDE

**Community Energy Plan
Workplan Template**



https://www.sustainablejersey.com/fileadmin/media/Actions_and_Certification/Actions/Energy/Community_Energy_Plan_Workplan_Template10_2021.pdf

Aggregated Community-Scale Utility Energy Data for Lawrence Township Mercer County

Municipality	County	Year	Utility	Residential Electricity	Commercial Electricity	Industrial Electricity	Street Lighting Electricity	Total Electricity (kWh)	Utility	Residential Natural Gas	Commercial Natural Gas	Industrial Natural Gas	Street Lighting Natural Gas
Lawrence township	Mercer	2015	PSEG	106,134,154	187,842,638	38,105,296	1,649,698	333,731,786	ETG/PSEG	9,648,317	12,973,782	2,288,252	NDA
Lawrence township	Mercer	2016	PSEG	105,603,678	199,808,852	38,262,441	1,646,646	345,321,617	ETG/PSEG	8,838,046	12,309,951	2,121,839	NDA
Lawrence township	Mercer	2017	PSEG	100,970,931	194,926,118	32,032,660	1,646,096	329,575,805	ETG/PSEG	9,191,212	12,872,924	1,880,139	NDA
Lawrence township	Mercer	2018	PSEG	104,482,043	202,739,946	35,160,031	1,652,724	344,034,744	ETG/PSEG	9,939,680	12,974,053	2,503,676	NDA
Lawrence township	Mercer	2019	PSEG	99,352,338	187,065,495	31,462,578	1,649,129	319,529,540	ETG/PSEG	9,448,441	13,179,329	2,152,911	NDA
Lawrence township	Mercer	2020	PSEG	102,989,913	161,806,084	50,289,084	1,669,701	316,754,782	ETG/PSEG	8,900,888	9,168,669	3,730,152	NDA
Lawrence township	Mercer	2021	PSEG	103,062,151	171,368,117	37,733,814	1,664,212	313,828,294	ETG/PSEG	9,306,149	11,290,947	3,637,900	NDA

Community-Scale Greenhouse Gas (GHG) Emissions - Metric Ton Carbon Dioxide Equivalent (MTCO2e)

Municipality	County	Year	Residential Electricity	Commercial Electricity	Industrial Electricity	Street Lighting Electricity	Residential Natural Gas	Commercial Natural Gas	Industrial Natural Gas	Street Lighting Natural Gas	Other Heating Fuels	On-Road Vehicles
Lawrence township	Mercer	2015	26,881	47,576	9,651	418	51,388	69,100	12,188	NDA	4,451	168,040
Lawrence township	Mercer	2020	22,998	36,131	11,230	373	47,407	48,834	19,867	NDA	3,046	214,346

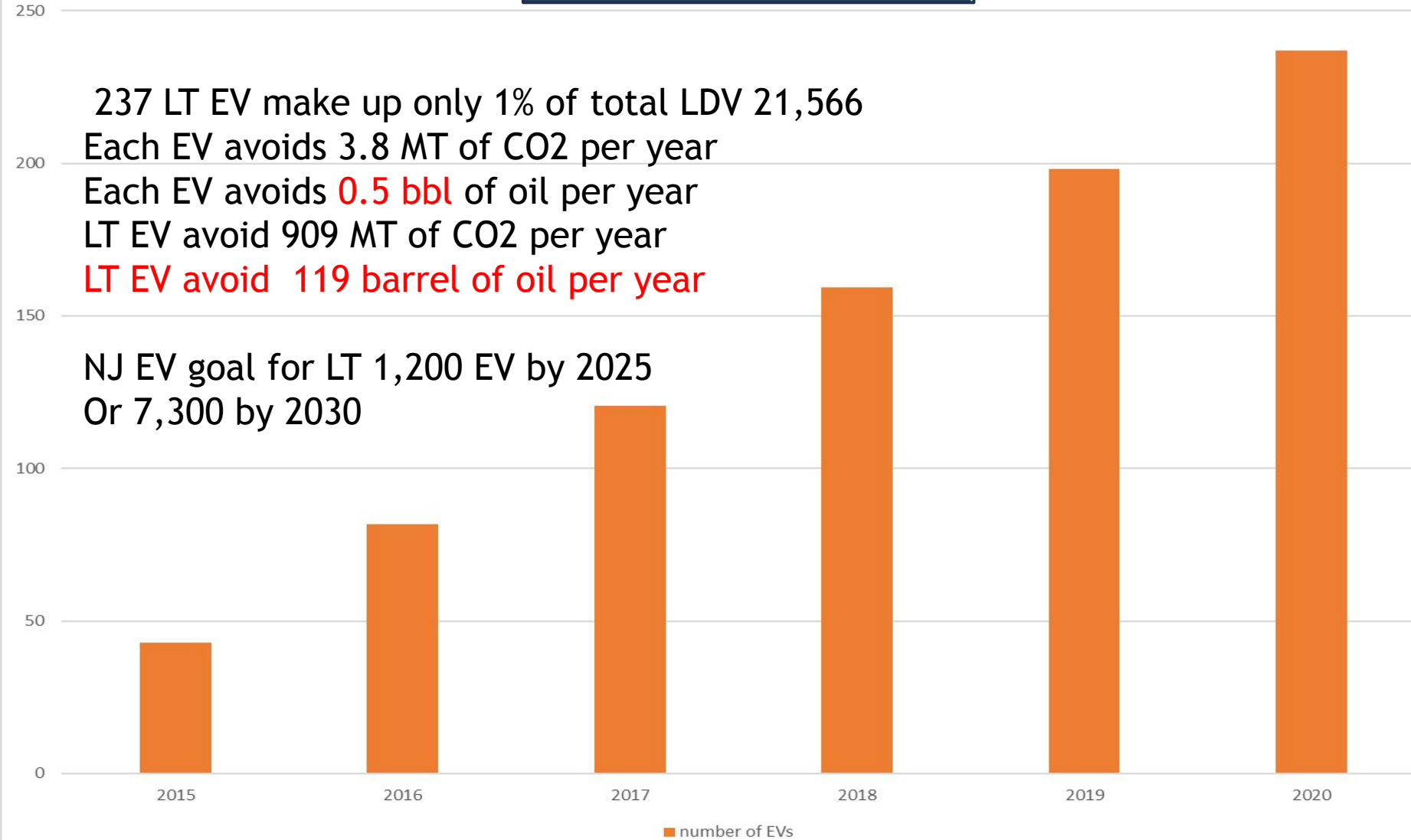
Electric Vehicle (EV) Ownership Data

June 2022

* Further information on Notes sheet

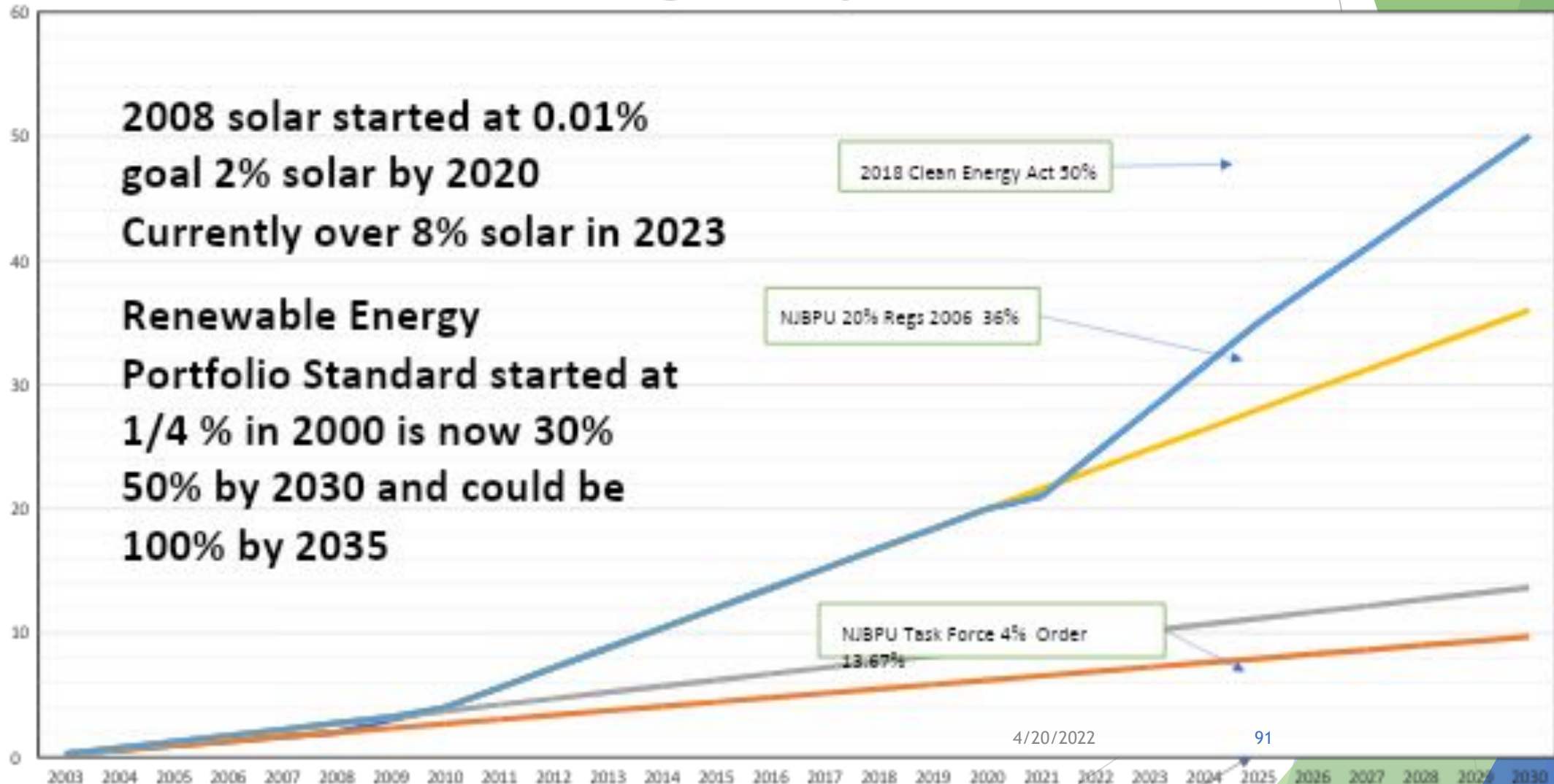
Municipality	County	Year	Total Personal Vehicles	# of EVs	% of EVs
Lawrence township	Mercer	2015	21,570	43	0.20%
Lawrence township	Mercer	2020	21,566	237	1.10%

EV in Lawrence Township



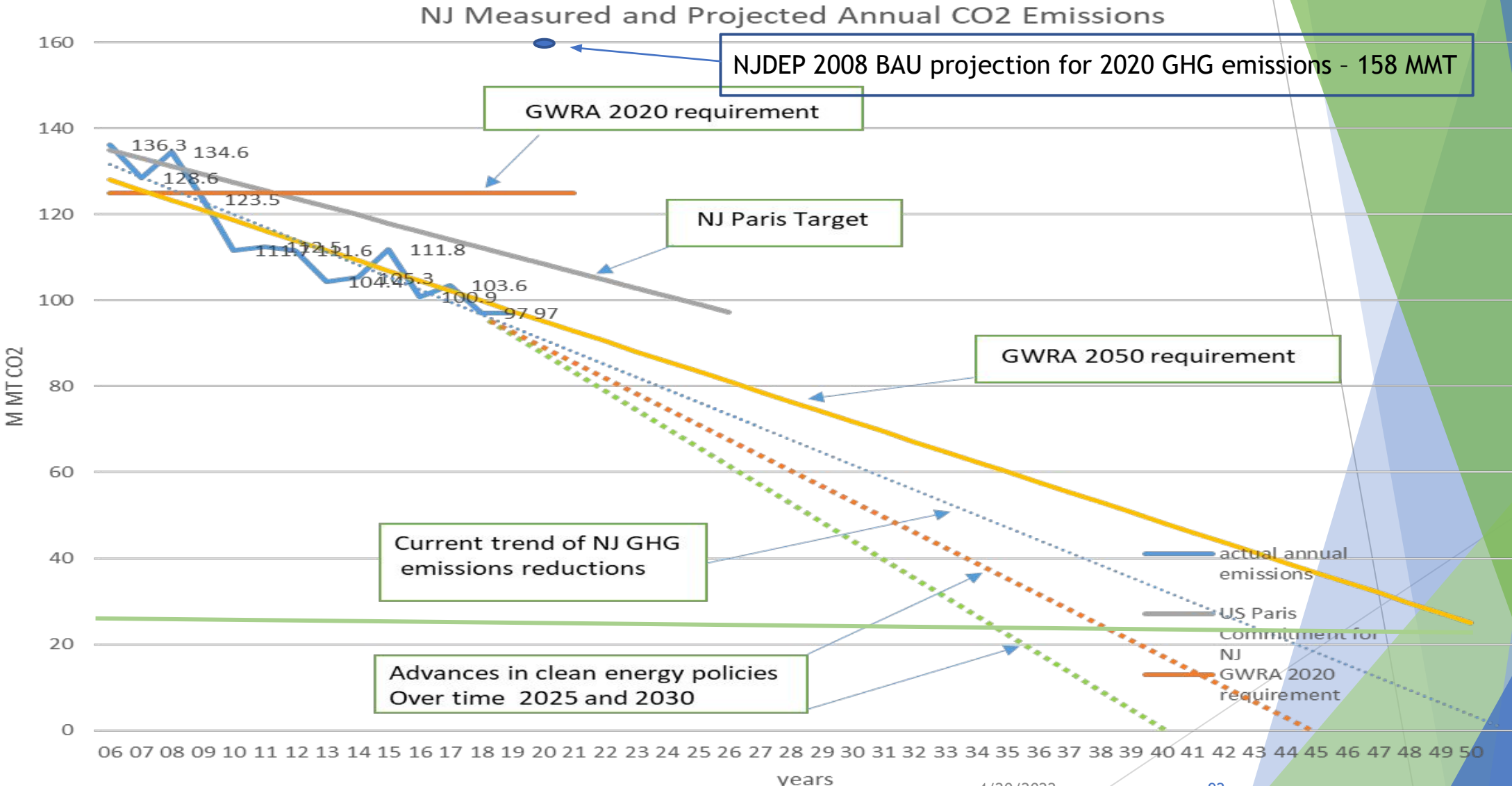
How Clean Energy Policy Changes over time – to achieve larger goals Optimism Curve

NJ Class I RPS Change in Policy over time 2003 to 2030



New Jersey's Progress to achieving its GHG emissions reduction goals and more

Why I'm Optimistic Getting to 50% by 2030 and beyond depends on us



Source for actual data NJDEP GHG emissions Inventory Report https://www.nj.gov/dep/aqes/NJ_GHGinventory2015Update.pdf

4/20/2022

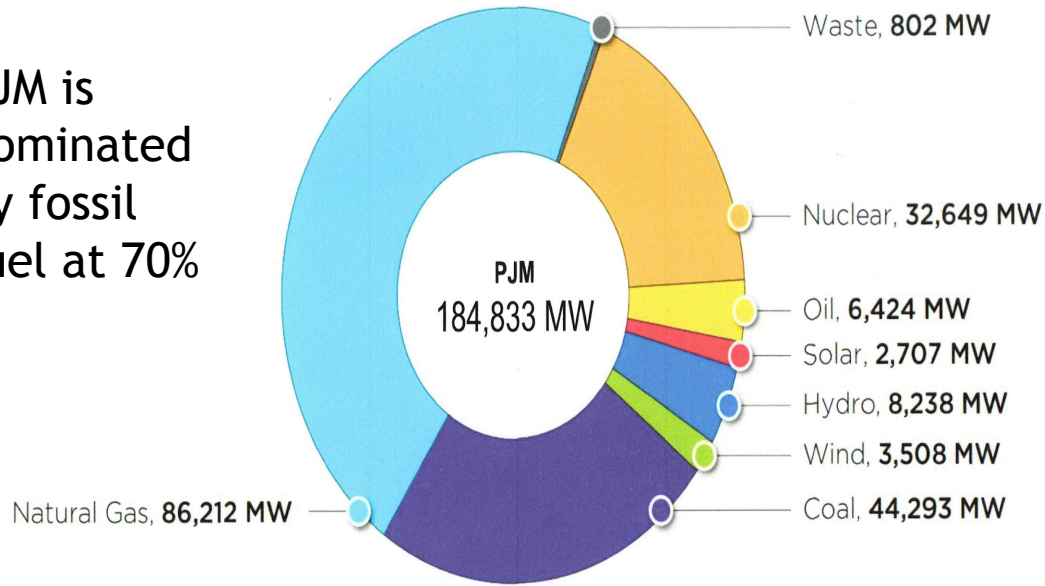
97

This is why I am 100% convinced we will get to 100% Clean Energy well before 2050

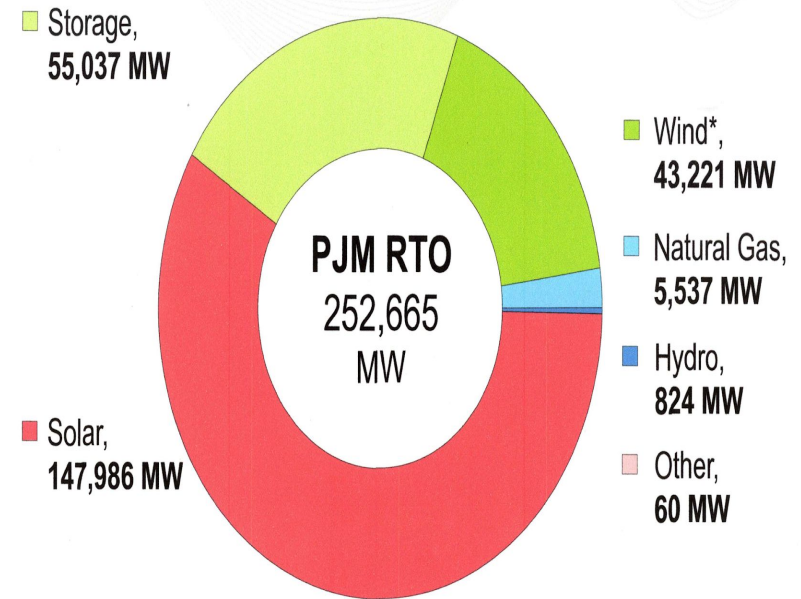


PJM – Existing Installed Capacity
(CIRs – as of Dec. 31, 2022)

PJM is dominated by fossil fuel at 70%



PJM Queued Capacity (Nameplate) by Fuel Type
(*Active* in the PJM Queue as of April 1, 2023)



*Wind includes both onshore and offshore wind

Why we are winning in the Clean Energy Transition And Climate Mitigation

Why Im Optimistic

We'll Get to 100% Clean Energy before 2050

Local Action – Tracking Progress

Thank You - Questions????

Michael Winka

energy translator

mwinka@comcast.net

Additional Slides for reference

Is New Jersey a High Energy Cost State?

The answer is No - we are average at worst

Electricity NJ is ranked 12th highest at \$0.1648 per kWh compared to the US average of \$0.1319 per kWh

Natural Gas NJ is ranked 36st highest at \$1.48 per therms
Compared to the US average of \$1.260 per therms

Gasoline NJ is ranked 28th highest at \$3.41 per gallon
Compared to the US average of \$3.20 per gallon.

<https://www.eia.gov/beta/states/states/nj/overview>

<https://www.eia.gov/beta/states/states/nj/data/dashboard/energy-indicators>

IRA Tax Credits - State Incentives

IRA Clean Vehicles <https://www.irs.gov/clean-vehicle-tax-credits> <https://www.energy.gov/save>

New - Tax credit up to \$7,500 new, qualified plug-in EV or fuel cell electric vehicle (FCV). Based on battery size and where manufactured Income limits \$300K Limit of vehicle price

Used electric vehicle (EV) or fuel cell vehicle (FCV) \$25,000 or less, tax credit equals 30% of the sale price up to a maximum credit of \$4,000. Income limit \$150K limits on battery size and vehicle wt.

EV Charging – Personal \$1,000 - Businesses \$100,000

New Jersey

NJDEP <https://dep.nj.gov/drivegreen/>

Sale and used tax exemption on zero emission vehicles

Grants to offset Businesses installation EV charging equipment costs \$750 for Level 1 and \$4,000 for a Level 2

NJBPU <https://chargeup.njcleanenergy.com/home-ev-charger-incentive>

\$250 grant for residential EV charging equipment

Multi unit charger rebates

EV rebates between \$1,500 to \$4,000 depending on the vehicle

EV Charging incentive information is available from [Atlantic City Electric](#), [PSE&G](#), [RECO](#) and [JCP&L](#).

PA – PADEP

<https://www.dep.pa.gov/Citizens/GrantsLoansRebates/Alternative-Fuels-Incentive-Grant/Pages/Alternative-Fuel-Vehicles.aspx>

400% of the federal Poverty level – Up to \$3,000 depending on income level and vehicle type

IRA Tax Credits

Home Energy

Primary residents, Renter and second homes used as residents

Energy Efficient Home Improvement Credit -These expenses may qualify -[requirements detailed on energy.gov](#):

- Exterior doors, windows, skylights and insulation materials
- Central air conditioners, water heaters, furnaces, boilers and heat pumps
- Biomass stoves and boilers
- Home energy audits

Tax credit is a percentage of the total improvement expenses in the year of installation:

- 2022: 30%, up to a lifetime maximum of \$500
- 2023 through 2032: 30%, up to a maximum of \$1,200 (heat pumps, biomass stoves and boilers have a separate annual credit limit of \$2,000), no lifetime limit

Residential Clean Energy Credit These expenses may qualify [requirements detailed on energy.gov](#):

- Solar, wind and geothermal power generation
- Solar water heaters
- Fuel cells
- Battery storage (beginning in 2023)

The amount of the credit you can take is a percentage of the total improvement expenses in the year of installation:

- 2022 to 2032: 30%, no annual maximum or lifetime limit
- 2033: 26%, no annual maximum or lifetime limit
- 2034: 22%, no annual maximum or lifetime limit

[Get details on the Residential Clean Energy Credit.](https://www.irs.gov/credits-deductions/understanding-the-residential-clean-energy-credit)

Act 129 Electric Company Energy Efficiency Programs and Rebates

The Act directs only the state's seven largest electric distribution companies (EDCs) with more than 100,000 customers to provide EE&C plans

FirstEnergy Companies:
Duquesne Light:
PPL Electric:
PECO:
UGI Electric:

Measure	Met-Ed (FirstEnergy Company)	Penn Power (FirstEnergy Company)	West Penn Power (FirstEnergy Company)	Penelec (FirstEnergy Company)	Duquesne	PPL	PECO	UGI
LED Lamps – Regular and Specialty 	✓	✓	✓	✓	✓	✓	✓	✓
LED Fixtures 	✓	✓	✓	✓	✓	✓	✓	
CFL Lamps 	✓	✓	✓	✓	✓		✓	
Energy Efficient Appliances 	✓	✓	✓	✓	✓	✓	✓	✓
HVAC Programs 	✓	✓	✓	✓	✓	✓	✓	✓
Behavioral Measures 	✓	✓	✓	✓	✓	✓	✓	
School Education 	✓	✓	✓	✓	✓	✓	✓	✓
Home and Online Energy Efficiency Audits 	✓	✓	✓	✓	✓	✓	✓	✓
New Home Construction 	✓	✓	✓	✓	✓	✓		
Room Air Conditioner Recycling 	✓	✓	✓	✓		✓	✓	✓
Dehumidifier Recycling 	✓	✓	✓	✓		✓		
Refrigerator/Freezer Recycling 	✓	✓	✓	✓	✓	✓	✓	✓

New Jersey Clean Energy Program. More information on the Clean Energy Program can be found on this [website](#).

NJBPU and NJCEP Administered Programs



- New Construction (residential, commercial, industrial, government)
 - Large Energy Users
 - Energy Savings Improvement Program (financing)
 - State Facilities Initiative*
 - Local Government Energy Audits
 - Combined Heat & Power & Fuel Cells
- *State facilities are also eligible for utility programs

Utility Administered Programs



- Existing buildings (residential, commercial, industrial, government)
Energy Audit
- Efficient Products
 - Lighting & Marketplace
 - HVAC
 - Appliance Rebates
 - Appliance Recycling

What is your **household** Carbon Footprint

The average Single family House (SFH)

Just need to know your **household** annual energy usage

Annual **household** electric use – electric bill

Annual **household** natural gas use – natural gas bill

Annual **household** gasoline use – gasoline bills/mileage

Your **household** CO₂ =

energy usage * emission factor (lbs/unit of energy)

Household Energy use assumptions

2,400 sq ft single family home

Two average fuel economy cars driven the average per year

Gasoline – per EPA/DOE and USDOT-FHWA

13,000 miles/year/vehicle * 2 / 25 miles/gal = 1,000 gals/yr

Natural Gas per EIA average eff - furnace and hot water heater

1,000 therms per year

Electricity per EIA average central AC and lighting

9,000 kWh per years

Gasoline

1,000 gal/yr * 19.6 lbs of CO₂/gal = 19,600 lbs of CO₂/yr

\$3.50/gal * 1,000 gal/yr = \$3,500/yr (3.6% annual cost at medium income)

120,000 Btus per gallon = 120 MM Btus

Natural gas

1,000 therms/yr * 11.7 lbs of CO₂/therms = 11,700 lbs of CO₂/yr

\$1.30/therm * 1,000 therms/yr = \$1,300/yr (1.7%)

100,000 Btu per therm = 100 MM Btus

Electricity

9,000 kWh/year * 0.75 lbs of CO₂/kWh = 6,750 lbs of CO₂/yr

\$0.18/kWh * 9,000 kWh/yr = \$1,620 (1.7%)

3,412 Btu per kWh = 30.7 MM Btus

Total = 38,010 lb of CO₂ / HH or 20 T/HH - \$6,420/yr (6.9%)

Building Sector - Going Electric

How to Change the Demand Curve for Natural Gas to Prevent Future Natural gas pipelines

Start slow and small and build into a movement



GWH = \$1,200

230 therm - 23 million Btus \$340/yr emitting 2.3T

HPWH = \$2,500

2,000 kWh 6.8 million Btus \$330 /yr emitting 0.5T

3 times less energy - Avoiding 1.8 MT of CO2

2,000 kWh /year = 1.5 kilowatts (kW) of solar

@ \$3/W = \$3,330 - \$990 = \$2,310

HPWH + solar = 10.5 years (ROI 9.5%)

Avoiding 2.3 T of CO2

Reducing natural gas demand in electric and heating sectors

A major advantage is you can store your solar electricity in the HPWH

Heat Pump Water Heater

- 1 A fan pulls air through the top air filter.
- 2 Heat in the air is absorbed by eco-friendly refrigerant inside the evaporator coil and cool (dehumidified air) is exhausted.
- 3 Refrigerant is pumped through a compressor, which increases the temperature.
- 4 Simultaneously the cooler water from the bottom of the tank is pumped to the top of the appliance, where it circulates.
- 5 Hot refrigerant transfers its heat to the water inside the condenser coil.
- 6 Heated water is returned back to the top of the tank.
- 7 Condensate drain connection.
- 8 Backup electric heating elements.



Transportation Sector - Going Electric

How to Change the Demand Curve for Oil and Gasoline
to Prevent Future Oil pipelines

Start slow and small and build into a movement



MM Btu is a million
Btus

Used EV for under \$20,000 (+ \$2,000 - level 2 charger)

50 miles RT for 260 days (5 day work week)

An average ICE vehicle

520 gal/ yr - **60.3** MM Btus - **\$1768**/yr.

An average EV

3,900 kWh /yr - **13.3** MM Btu - **\$644**/yr.

4.5 times less energy - **2.7** times less cost

Savings **\$1,124**/yr. avoiding **3.74 MT** of CO₂

3,900 kWh / year - **3.5** kilowatts (kW) of solar

@\$2/watt SPB for EV and solar **15** yrs. (ROI

6.7%) - after **4.3** years driving on "free" fuel

Avoiding **4.62 MT** of CO₂

Reducing both gasoline and natural gas demand and emissions and storage solar electricity

4/20/2022

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Our final set of speakers is Pat and Steve Miller. They are co-Leaders of the NJ 50x30 Building Electrification Team. They are retired engineers and managers from the former Bell Labs in Holmdel and its successor companies. And wait until you hear about the energy savings at their family's homes! After being trained by Al Gore and the Climate Reality Project in 2017, they have worked as climate activists with a mission to "leave a livable world for our children and grandchildren." They are also active in Sierra Club, Citizens' Climate Lobby (CCL), and are members of the Unitarian Universalist Church in Monmouth County.



Pat and Steve Miller
April 2024

**Power Your Savings and Cut Climate Pollution
with Electrification and Inflation Reduction Act
(IRA)**

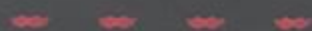
Source: NASA

Induction cooktops heat using a magnetic current. The result is evenly heated pots and pans with much less energy lost during cooking.



Soup Water Fry Hot Pot Stir-Fry

Temp.



Power



Timer/Pre.



Child Lock



Elec./Volt.



Function



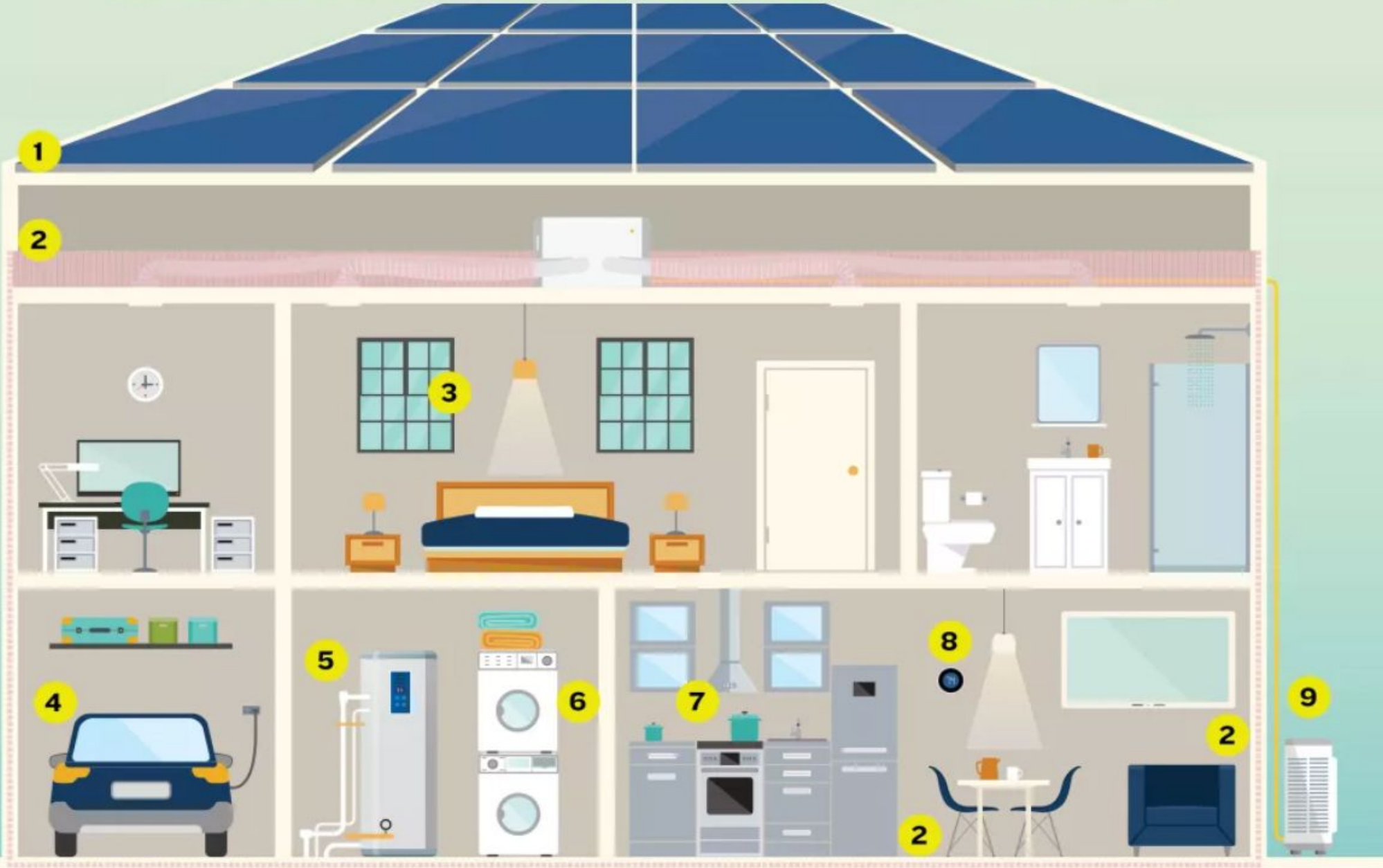
ON/OFF

Photo © Shutterstock



ZEROING OUT HOME CARBON EMISSIONS

1. Solar Panels
2. Insulated Walls, Floors and Attic
3. Energy Efficient Windows & Doors
4. Electric Car
5. Heat Pump Water Heater
6. Heat Pump Dryer
7. Induction Stove
8. Smart Thermostat
9. Heat Pump Heating and Cooling



CREDIT: NRDC

IRA incentives

NAVIGATING INDIVIDUAL INCENTIVES, BY DR. LEAH STOKES

[HTTPS://WWW.CLIMATEREALITYPROJECT.ORG/ELECTRIFICATION-JOURNEY](https://www.climateRealityProject.org/electrification-journey)

Name	Technical Name	Type of Program	Technologies	Target Population	Maximum \$ Amount per Household	Total Budget
Electrification Rebates	HEEHRA	Rebates	Heat pumps, heat pump water heaters, electric stoves, heat pump clothes dryers, panels, wiring, weatherization	Low- and moderate-income households	\$14,000	\$4.5B
Efficiency Rebates	HOMES	Rebates	Whole-home improvements (including heat pumps)		\$8,000 (LMI) \$4,000 (non-LMI)	\$4.3B
Electrification + efficiency tax credits	25C	Tax Credits	Heat pumps, heat pump water heaters, weatherization, panels, energy audits	Anyone with tax liability	30%, up to \$3,200 per year	Uncapped
Solar + storage tax credits	25D	Tax Credits	Solar, storage, geothermal	Anyone with tax liability	30%, uncapped	Uncapped
EV tax credits	30D/25E	Tax Credits	New EVs (30D) and used EVs (25E)	Non-high income households	\$7,500 (new) \$4,000 (used)	Uncapped

The law also allocates tax credits of up to:

- **\$7,500** for new electric vehicles (EVs)
- **\$4,000** for used EVs
- **\$1,000** for EV chargers
- **\$2,000** for heat pump HVAC systems
- **\$2,000** for heat pump water heaters
- **\$1,200** for weatherization
- **\$600** for electrical panels
- **30%** for battery storage
- **30%** geothermal heating
- **30%** for rooftop solar installation

**Starting in late 2023, the IRA will offer
electrification rebates of up to:**

- **\$8,000** for heat pump air conditioners/heaters
- **\$8,000** for certain home efficiency upgrades
- **\$4,000** for electrical panels
- **\$2,500** for electric wiring
- **\$1,750** for heat pump water heaters
- **\$1,600** for weatherization
- **\$840** for electric stoves
- **\$840** for heat pump clothes dryers

Rewiring America Savings Calculator

<https://www.rewiringamerica.org/app/ira-calculator>

Rebates available up to \$14,000 per household, plus tax credits

- 100% cost coverage for low-income households
 - Up to \$83,000 per year
- 50% cost coverage for mid-income households
- 50% cost coverage for low-income households

Zip Code [?]
95652

Homeowner Status [?]
Homeowner

Household Income [?]
\$100,000

Tax Filing [?]
Joint

Household Size [?]
4 people

Calculate! We do not store this data.

Your Personalized Incentives
Use these any time in the next 10 years.

UPFRONT DISCOUNTS	AVAILABLE TAX CREDITS
\$14,000	\$7,536
ESTIMATED TOTAL INCENTIVES	
\$21,536	

Household Electrification Incentives			
These are available to American homeowners and renters over the next 10 years.			
ITEM	DISCOUNT TYPE	DISCOUNT	TIMELINE
Rooftop Solar Installation	Tax Credit	30%	Now!
Geothermal Heating Installation	Tax Credit	30%	Now!
Battery Storage Installation	Tax Credit	30%	Now!
Community Solar Subscription	Tax Credit	30%	Now!
New Electric Vehicle	Tax Credit	\$7,500	2023
Used Electric Vehicle	Tax Credit	\$4,000	2023
Heat Pump Air Conditioner/Heater	Tax Credit	\$2,000	2023
Electric Panel	Tax Credit	\$600	2023
Basic Weatherization	Tax Credit	\$1,200	2023
Heat Pump Water Heater	Upfront Discount	\$1,750	2023
Heat Pump Air Conditioner/Heater	Upfront Discount	\$8,000	2023

TAX CREDITS & REBATE SUMMARY <https://docs.google.com/document/d/10vSXETbjYZ3fBYhZbBahOLVxXrn82QKHkJGHGTRNvyg/edit>
 Building Electrification rebates and tax credits (not shown are available tax credits for solar & batteries)

<p>NJ HOME CREDITS & REBATES</p>	<p>Rebates from NJ utilities (in addition to NJ rebates and U.S. tax credits). May be available until Jan 1, 2025. Rebates are for “Energy Star” devices. HVAC-related rebates for JCP&L, PSEG, Rockland Electric & Atlantic City Electric are indexed in https://energyefficiencyalliance.org/wp-content/uploads/2023/08/NJ-HP-Incentives.pdf Beginning 1/1/2025, the “up to” rebates shown below are identical for PSEG electric, JCP&L, ACE and Rockland Electric (see “Note 1”) In addition, each utility is considering higher rebates to meet BPU goals to more rapidly decarbonize</p>				<p>IRA TAX CREDIT CAPS: 30% and \$3200 max/calendar-year; IRA credits have a three-year carryback and a twenty-two year carry forward. Credits transferable (limited by passive activity rules).</p>	<p>IRA REBATE (\$14K total cap); STATES MAY VARY (eff- 2025 in NJ); stackable with tax credits & utility rebates; funding may quickly run out; All are “<u>HEEHRA</u>” unless labeled “HOMES”. Appliances must be rated “Energy Star”. Incomes are 80% & 150% of NY/NJ median income</p>	
	<p>JCP&L REBATES Appliance Rebates</p> <p>2024 2025</p>		<p>PSEG REBATES</p> <p>2024 2025</p>			<p><80% Median Income: \$93K</p>	<p><150% Median income: \$174K</p>
<p>AIR SOURCE HEAT PUMP</p>	<p>Cold Climate</p> <p>Other than cold climate</p>	<p>1K</p> <p>400 to 1K up to \$3500 (includes mini-split)</p>	<p>Cold Climate</p> <p>Other</p>	<p>\$600</p> <p>\$240 - \$600 up to \$3500 (includes mini-split)</p>	<p>30% (capped at \$2K/year for heat pump + heat pump water heater)</p>	<p>100%, up to \$8K</p>	<p>50%, up to \$8K;</p>
<p>GEO THERMAL HEAT PUMP</p>	<p>REPLACE AIR OR GND SOURCE HEAT PUMP</p>	<p>\$500</p>			<p>30% for geothermal; no caps and no limits</p>	<p>100% up to \$8K</p>	<p>50% up to \$8K</p>
<p>GEO THERMAL HEAT PUMP</p>	<p>REPLACE ELECTRIC FORCED AIR FURNACE/ AC</p>	<p>\$1500 up to \$10K</p>		<p>up to \$10K</p>	<p>30% for geothermal; no caps and no limits</p>	<p>100% up to \$8K</p>	<p>50% up to \$8K</p>
<p>HEAT PUMP WATER HEATER</p>		<p>\$750 up to \$2500</p>		<p>\$600 up to \$2500</p>	<p>30% for heat pump water heater capped at \$2K/year for heat pump + heat pump water heater)</p>	<p>100% up to \$1750;</p>	<p>50%, up to \$1750;</p>

ELEC OR INDUCTION STOVE		\$150	up to \$150		up to \$150		100% up to \$840	50% up to \$840	
EV CHARGERS	\$250 Must be level 2 Energy Star charger from NJ approved list https://chargeup.njcleanenergy.com/ev-charger-incentive						30% up to \$1K		
WEATHERIZATION	NJ utilities typically provide: free or low cost energy audits; list of authorized weatherization companies; low or no interest "on bill" up to 5 to 10 year loans; "Home Performance with Energy Star" (see below)						30% cap/year: max \$1200 /yr (incl \$600elec.panel); insulation; \$250/door; \$600 windows; \$150 energy audit;	100% up to \$1600	50% up to \$1600
ELECTRIC PANEL <u>200Amp</u> & SUBPANEL							\$30%; \$600 cap/year	100% up to \$4K	50% up to \$4K
ELECTRIC WIRING			up to ?				Branch Circuits & Feeders	100% up to \$2500	50% up to \$2500
HEAT PUMP CLOTHES DRYER	"Most Efficient" Other Models	\$300 \$100	up to \$500		up to \$500			100% up to \$840	50% up to \$840
Modeled and Measured Energy Efficiency of Whole House	<p>2025: "Whole House Project" is capped at \$7500 OR "up to 75% of "weatherization measures covered" plus fixed amount for each "EE Prescriptive Measure"</p> <p>2024:Home Performance with Energy Star (HPwES) \$5K max rebate for 25% improvement in energy efficiency. Less rebate for less improvement (HPwES will be discontinued before 2025)</p> <p>3 different programs; eligibility based upon family income Do not choose (superficial) "Quick...Check-up"</p> <p>PSEG: https://homeenergy.pseg.com/assessments</p> <p>JCP&L: https://residential.energysavenj.com/</p> <p>Obtain several bids from approved contractor list</p>							*HOMES Energy Efficiency (modeled): 80% up to \$8K	*HOMES Energy Efficiency modeled: 50% up to \$4K "measured" program is 50% (no cap)
GOOD SOURCE:	https://www.rewiringamerica.org/app/ira-calculator								
THIS IS BEST SITE: determine rebate and tax credits for YOUR location and family income									
JCP&L https://residential.energysavenj.com/jersey-central/hvac/ Appliances must be "Energy Star"						Highest efficiency "energy star" products required			

PA RESIDENT REBATES-DISCOUNTS

<https://www.peco.com/ways-to-save/for-your-home/rebates-discounts>



Appliance Rebates

Choose ENERGY STAR® home appliances and save.



Heating & Cooling Rebates

Upgrade your heating/cooling and boost your home's energy efficiency.



Energy-Efficient Homes

Enjoy the increased comfort and savings of a high-efficiency home.



Water Heating Rebates

Save now by upgrading to a high-efficiency water heater.

MILLER HOME MIDDLETOWN, NJ

STAGED EFFICIENCY AND ELECTRIFICATION

by Steve Miller

**REFERENCES (INCLUDING THESE SLIDES)
[HTTPS://SMILLER.ORG/REF1.DOCX](https://smiller.org/ref1.docx)**

Top 3 Greenhouse Gas (GHG) Emissions

Sources in NJ: (87%) of All Emissions

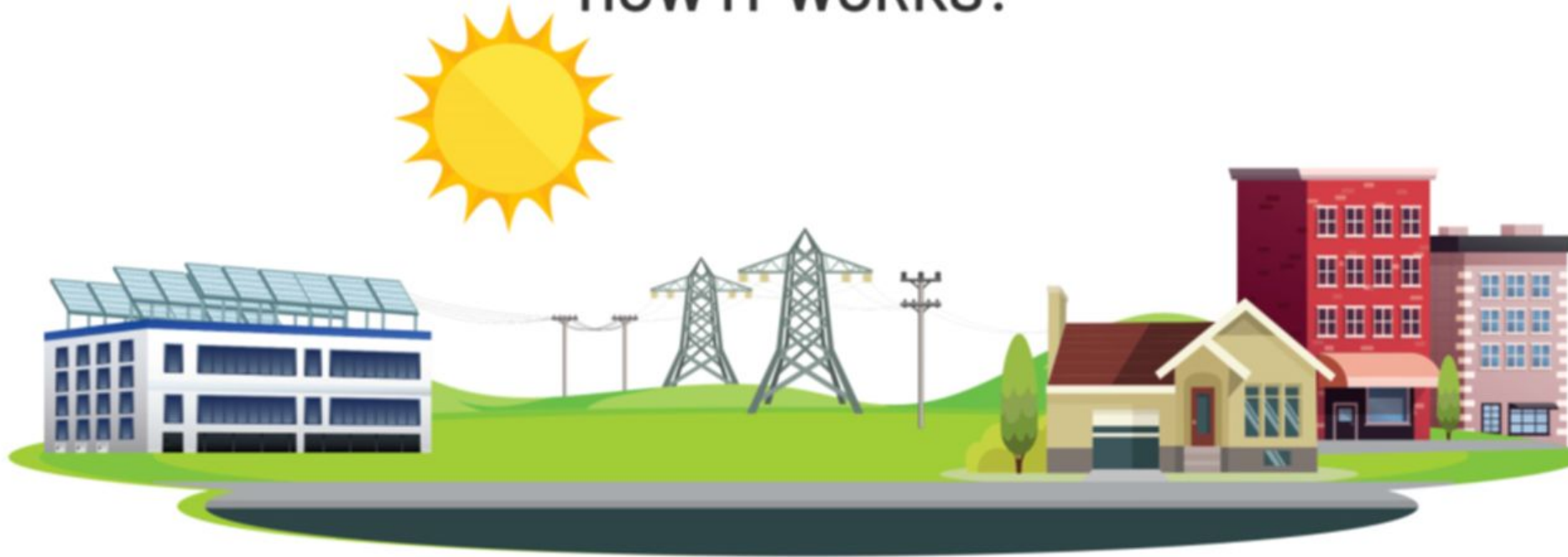
Sources in Pa: [63%] of All Emissions

- Electricity generation (19%) [29%]
- Transportation (42%) [22%]
- Residential/commercial bldgs (26%) [12%]

REDUCE ALL 3

COMMUNITY SOLAR

HOW IT WORKS?



Clean
Energy

Lower
Energy
Costs

No Panels
on Your
Property

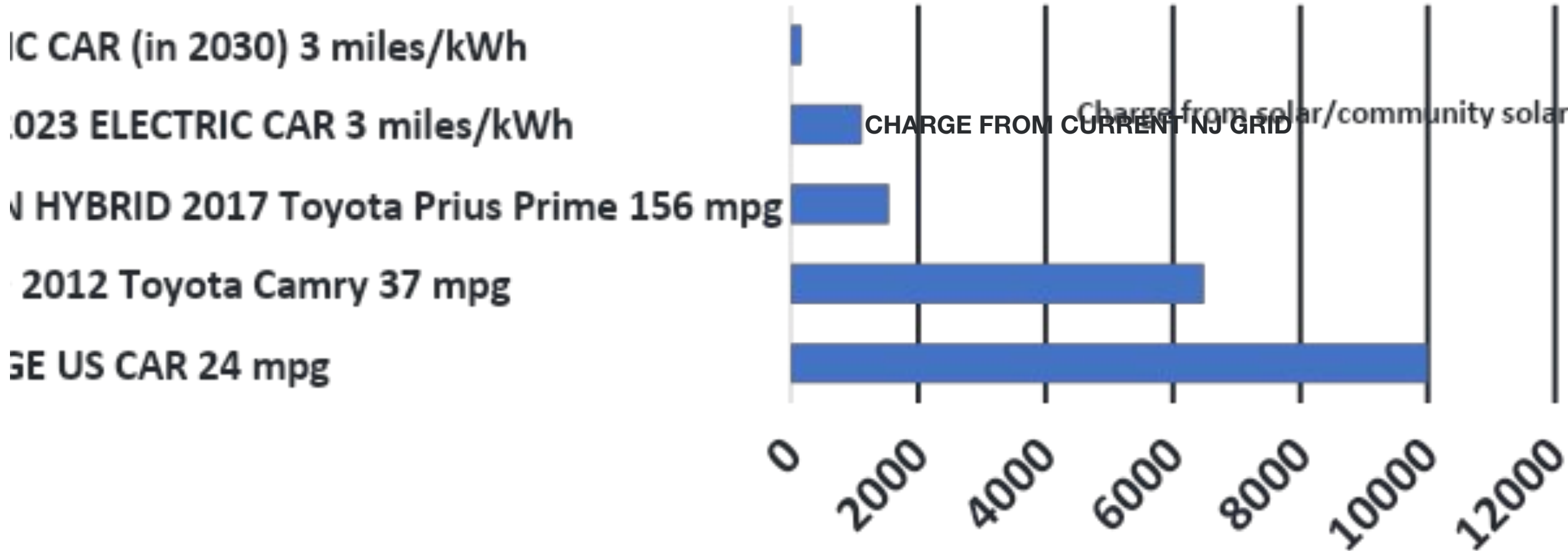
www.sustainablejersey.com/communitysolar



OUR EV – PRIUS PRIME PLUG-IN



MILLER FAMILY AUTOMOBILES CO2 EMISSIONS (pounds/year)



ANNUAL POUNDS CO2 EMISSIONS (12K MILES/YR)



Energy Efficiency – Use Less Energy



A SIMPLE DO-IT-YOURSELF PROJECT

DUCT SEALING

**CAULKING
CORD**

**PRESSURIZED
FOAM
FOR LARGE GAPS**

**ALUMINUM
FOIL TAPE
TO SEAL JOINTS
IN INSULATION**

**DUCT SEALANT
WATER BASE**



**REFLECTIVE
BUBBLE WRAP**

**WRAP
AIR DUCTS IN
UNHEATED AREAS**

SPACE HEATING & COOLING WITH ELECTRIC HEAT PUMP

Gas Furnace Backup on Right



ELECTRIC HEAT PUMP WATER HEATER



Spare Circuits for Future Electric Appliances



**New Box on Left
for New/Future**

- **2nd Heat
Pump Space
Heater/AC**
- **Stove**
- **Dryer**
- **2nd EV**

Pool Heater – Electric Heat Pump



Electric Heat Costs Less, Pollutes Less

2023 ENERGY COSTS

	ACTUAL 2023 with heat pumps for space & water heating	ACTUAL 2021 with gas for space & water heating	% CHANGE with heat pumps	With Heat Pumps
TOTAL Gas + Electric*	\$1703	\$1967	(13%)	Savings
GAS Cost	\$49	\$1113	(96%)	Reduction
ELECTRIC Cost	\$1654	\$854	48%	Increase
THERMS Gas Burned	29	954	(97%)	Savings
TONS CO ₂ Emitted	0.2	5.6	(96%)	Savings

*Electricity in 2024 is 100% clean AND 21% lower cost, supplied by nearby Community Solar Miller residence, single family house, Middletown, NJ



Daughter's Whole House Efficiency and Electrification for New Addition



HOME PERFORMANCE WITH ENERGY STAR NJ & NATION-WIDE Rebate Program

South Brunswick, NJ

May 11, 2023

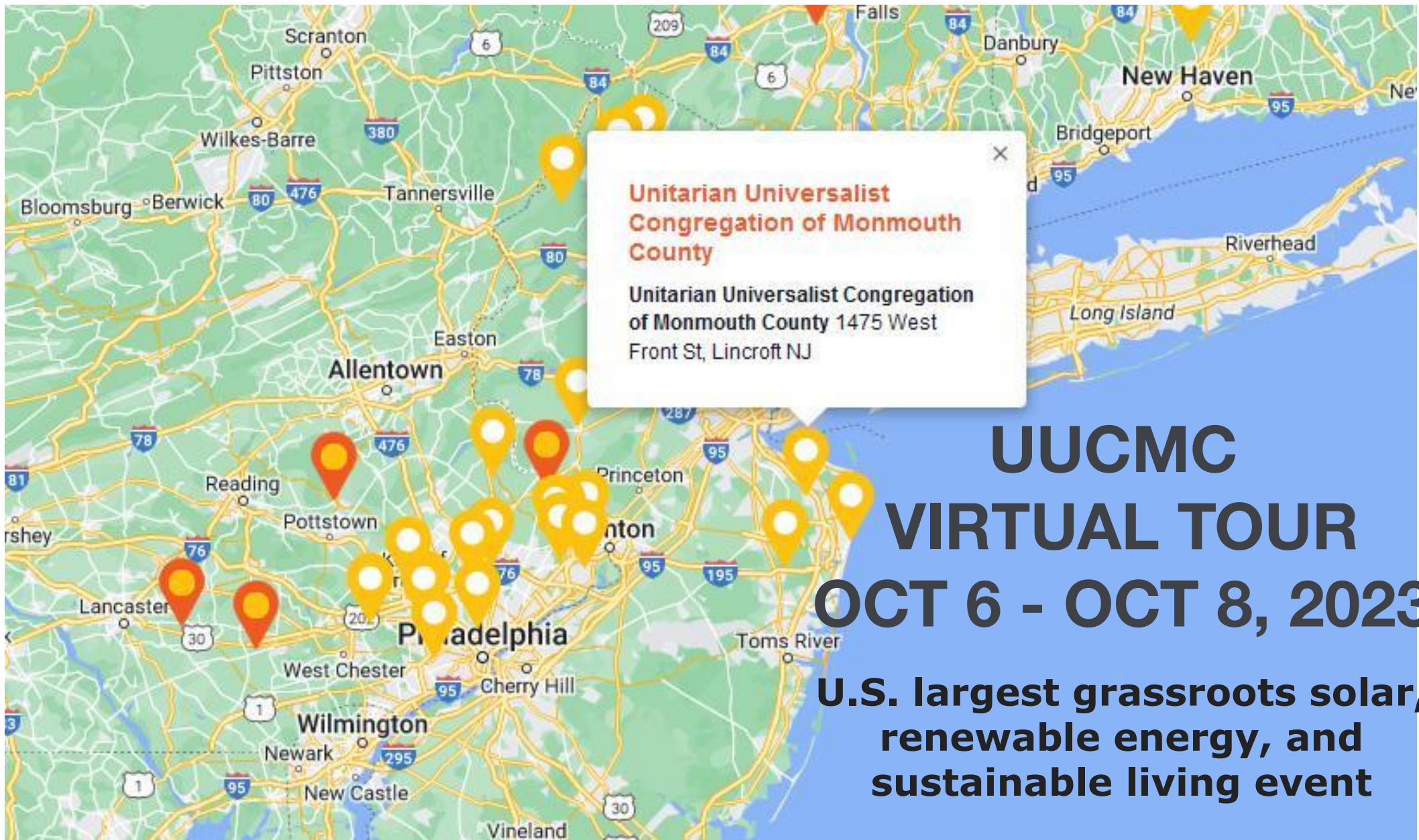
Install 50 Gallon Heat Pump Water Heater w. UEF of 3.88	\$5,460
Shell Test & Seal Incl. Applicable Air Seal Top-Plates & Penetrations	\$2,960
Attic Hatch Insulated to R-13	\$275
Attic Stair Cover Insulated to R-13	\$475
4" of Dense-Packed Cellulose in Exterior Walls R-13, 564 Sq Ft	\$3,412
4" of Dense-Packed Cellulose in Garage Buffered Walls R-13, 267 Sq Ft	\$1,775
Audit Refund (\$99)	(\$99)
Total Project Cost	\$14,258
Rebate to Ciel Power, LLC	\$5,000
Balance Due Upon Completion of Project	\$9,258

* Can be paid with PSE&G 0% On-Bill Repayment

Project qualifies for a \$5,000 rebate to contractor through NJ HPwES Program

**Unitarian Universalist Congregation
of Monmouth County (UUCMC)
Lincroft, NJ**

**20-Year Energy Saver Award
Interfaith Power & Light**



UUCMC VIRTUAL TOUR OCT 6 - OCT 8, 2023

**U.S. largest grassroots solar,
renewable energy, and
sustainable living event**

DESCRIPTION, VIDEO AND PHOTOS LOCATED AT:



[HTTPS://WWW.NATIONALSOLARTOUR.ORG/TOURMAP/UNITARIAN-UNIVERSALIST-CONGREGATION-OF-MONMOUTH-COUNTY/](https://www.nationalsolartour.org/tourmap/unitarian-universalist-congregation-of-monmouth-county/)

UUCMC 2022 Rooftop Solar

4 X Capacity of Old System



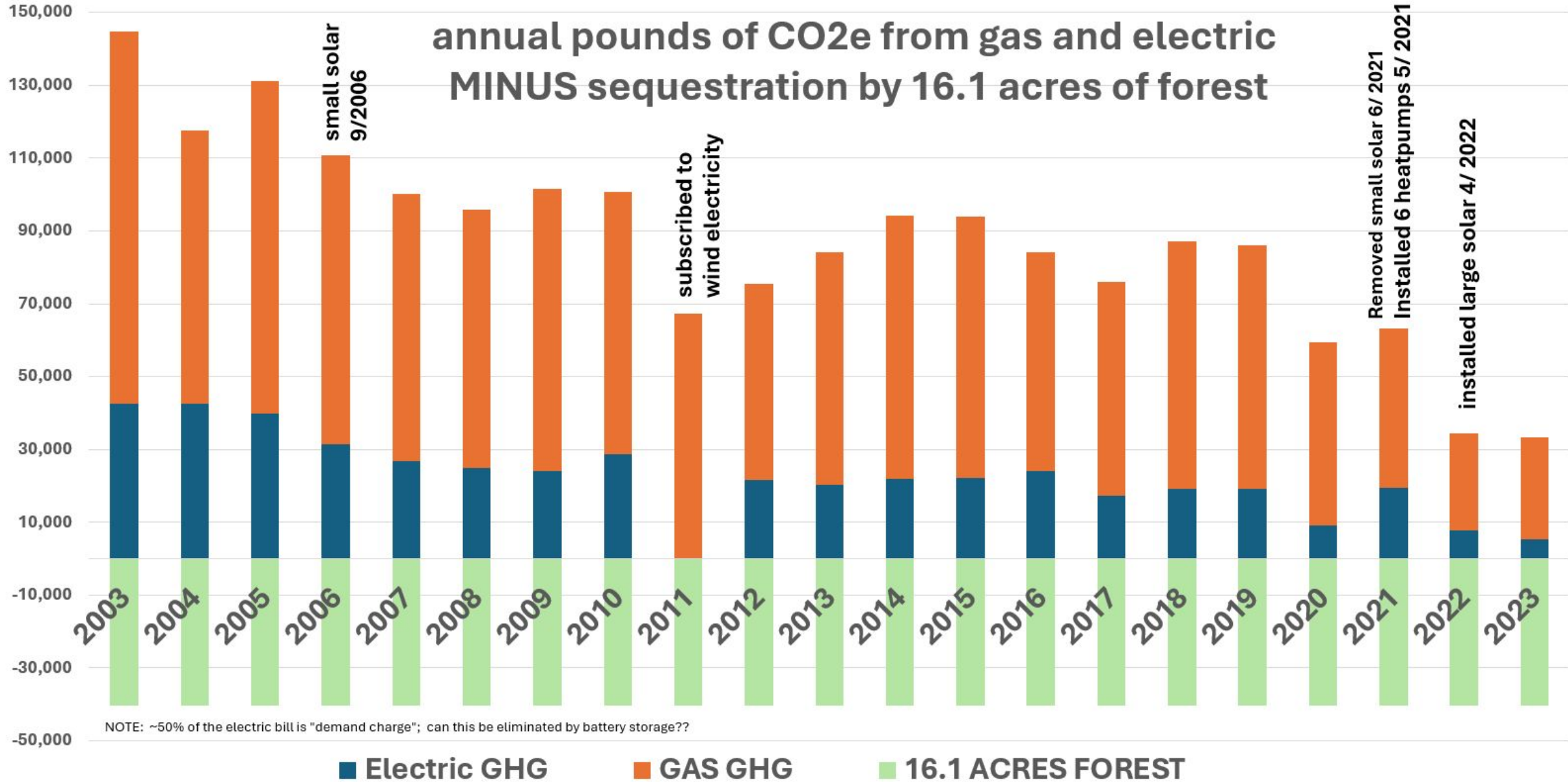
UUCMC 2021 Heat Pumps



CO2 EMISSIONS
(pounds)

UUCMC GREEN HOUSE GAS EMISSIONS

annual pounds of CO2e from gas and electric
MINUS sequestration by 16.1 acres of forest



UUCMC REDUCTIONS IN CO₂ AND UTILITY BILL

- 2003 - 2019 Insulated, sealed, LED bulbs, heat pump water heater...
- 2021 - 2022 6 furnaces replaced with heat pumps;
+ installed large rooftop solar array

YEAR	GAS CO ₂ Tons	ELECTRIC CO ₂ Tons	TOTAL CO ₂ Tons	% TOTAL CO ₂ REDUCTION	ELECTRIC MWh from GRID	TOTAL BILL GAS+ELECTRIC	% TOTAL BILL REDUCTION
2003	49	21	70		72.4	\$22.1K	
2019	26	10	36	49%	32.8	\$12.4K	44%
2023	14	3	17	76%	10.0	\$6.3K	71%



How to Plan the Electrification & GHG Reduction of Your Household



Matt Kavanagh
Founder Green Insight LLC



**JOIN OUR POPULAR MATT KAVANAGH
Let Matt Guide Your Whole House Plan
Hosted by Pat and Steve Miller**

REGISTER <https://bit.ly/3tmyd1g> for 7PM, Thurs, April 18

- Options for heating/cooling, and all electric appliances
- Use tax credits and IRA to lower/eliminate utility bills
 - Improve home comfort & reduce harmful pollution
- Reduce your carbon footprint; backup for electric outages

**Matt's "GREEN INSIGHT" provides the answers:
Analysis, Roadmap, Pricing, ROI, and Milestones**

Sponsors: UUCMC Climate Action Team; Sierra Club NJ Chapter, NJ Building Electrification Committee; Climate Reality Project, Greater NJ Gateway Chapter; Citizens Climate Lobby, NJ Chapter;



Speak up, act, and vote

Like your world depends on it



Your world depends on it.

REFERENCES: CLIMATE CHANGE & WHAT YOU CAN DO

APRIL 16, 2024 UUCWC EARTH & CLIMATE MINISTRY



[ALL REFERENCES](#)



BACKUP - PA REBATE DETAILS

- **NEXT SLIDES SHOW PA REBATES FOR
PECO UTILITY**



PA RESIDENT REBATES-DISCOUNTS

<https://www.peco.com/ways-to-save/for-your-home/rebates-discounts>



Appliance Rebates

Choose ENERGY STAR® home appliances and save.



Heating & Cooling Rebates

Upgrade your heating/cooling and boost your home's energy efficiency.



Energy-Efficient Homes

Enjoy the increased comfort and savings of a high-efficiency home.



Water Heating Rebates

Save now by upgrading to a high-efficiency water heater.

Appliance Rebates

² Rebates available to qualified PECO customers. Smart thermostat rebates are determined by your heating and/or cooling system that will be connected to your smart thermostat.

[View Rebate Process](#)



✓ PECO Marketplace

Get instant rebates on small appliances and smart thermostats when you shop online at **PECO Marketplace**. Free shipping on orders over \$35. You must be a PECO residential electric customer to place an order.

✓ Instant Discounts

For instant in-store discounts on the items marked above, look for the PECO Instant Discount sticker at select participating locations for the following retailers. Your discount is applied at checkout. Instant discounts are also available via online purchase in eligible zip codes for Lowe's and Home Depot stores. No need to fill out an application!



Appliance Rebates

PECO Appliance Rebates	Rebate Amount	Apply Online or by mail after purchase	Available on PECO Marketplace	Instant Discount available at some retail locations
ENERGY STAR® Air Purifier ¹	\$25	✓	✓	✓
ENERGY STAR Clothes Dryer (Electric)	\$15	✓		
ENERGY STAR Clothes Dryer (Natural Gas)	\$15	✓		
ENERGY STAR Clothes Washer	\$25	✓		
ENERGY STAR Dehumidifier	\$50	✓	✓	✓
Heat Pump Clothes Dryer	\$75	✓		
ENERGY STAR Heat Pump Water Heater	\$350	✓		
ENERGY STAR Refrigerator	\$20	✓		
ENERGY STAR Smart Thermostat ²	\$50		✓	
Advanced Power Strips	\$15		✓	✓
Spray Foam Insulation	\$1			✓

¹ Air Purifier Smoke CADR must meet or exceed 51.

² Rebates available to qualified PECO customers. Smart thermostat rebates are determined by your heating and/or cooling system that will be connected to your smart thermostat.

.HEATING AND COOLING PECO REBATES 1/1/2024 – 12/31/2024

.FIRST, SCHEDULE AN [ENERGY ASSESSMENT](#) (before an emergency furnace repair/replacement!)

[.ENERGY STAR Central A/C & Air Source Heat Pump](#)

**.ENERGY STAR AIR SOURCE HP 15.2-17.0 SEER2; 11.7+ EER2; 7.8 HSPF2
\$200**

.ENERGY STAR AIR SOURCE HP 17.1+ SEER2; 11.7 EER2; 7.8+ HSPF2 \$300

**[.ENERGY STAR DUCTLESS HP](#) 15.2-17.0 SEER2; 11.7+ EER2; 7.8 HSPF2
\$150**

.ENERGY STAR DUCTLESS HP 17.1+ SEER2; 11.7 EER2; 7.8+ HSPF2 \$300

[.AIR SOURCE HEAT PUMP MAINTENANCE](#) \$25 Requires Refrigerant charge level & correction; inspect/clean/replace filters; inspect blower & motor- + Lube; inspect/clean condenser & evaporator coil

. ECM Fan Motor \$50

