Greenhouse Gas Emissions in New Jersey

Background

A greenhouse gas (GHG) is an atmospheric gas that slows the rate at which heat radiates into space, thus having a warming effect on the atmosphere. Carbon dioxide (CO_2) has long been recognized as a GHG, however there are other GHGs that have varying radiative (global warming) potential and residence times such as methane (CH_4), nitrous oxide (N_2O), chlorofluorocarbons (CFCs), hydrofluorocarbons (HFCs), and some other halogenated gases.[1] In addition, the direct radiative forcing of distinct aerosol species black carbon (BC), while not a GHG, make it a climate pollutant of concern.[2] These climate pollutants of concern make the earth considerably warmer than it otherwise would be, and that global warming results in a myriad of other climate changes, including increased frequency and intensity of storms and sea-level rise.[3]

Newark, NJ (Shutterstock, 2020)

Figure 1 illustrates the energy consumed in New Jersey by various fuel types in 2017, and the conversion to estimates of GHG emissions (as million metric tons of carbon dioxide equivalent, or $MMTCO_2e$).[4] This figure shows that approximately 98% of the State's GHG emissions from energy production are produced by the burning of fossil fuels. This figure also illustrates the fact that renewable (e.g., geothermal, wind, and solar) and nuclear power do not contribute to the State's GHG emissions (see "Energy Use and Renewable Energy Sources" in the NJDEP Environmental Trends series https://www.nj.gov/dep/dsr/trends/energy.pdf).

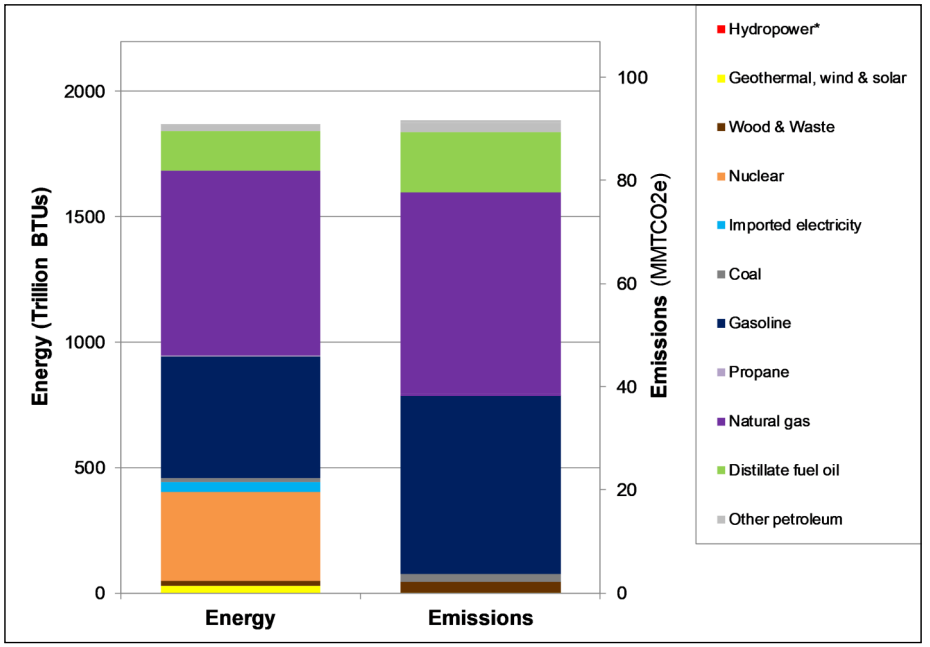

Figure 1: New Jersey's 2017 energy consumption and conversion to CO_2 equivalent emissions.[2] *Hydropower accounted for <1% of all energy consumed in New Jersey in 2017.

Goals

New Jersey's Global Warming Response Act (GWRA),[5] which was signed into law in July 2007, establishes GHG emissions limits that are consistent with the degree of reduction estimated to be necessary at a global level. The New Jersey limit for 2020 is a quantity equal to the State's 1990 emissions, and the limit for 2050 is a quantity equal to 80% below the State's 2006 emissions.[6] In 2019, New Jersey enacted amendments to the GWRA establishing new deadlines for several tasks, including establishment of a greenhouse gas emissions monitoring and reporting program and completion of a 2050 Recommendations Report which will outline pathways to achieve the 2050 reduction limit.[7]

While New Jersey has achieved and maintained the 2020 GHG reduction goal of returning to 1990 levels by 2020, meeting the 2050 goal of 80% reduction from 2006 levels by 2050 will require transformative change in how New Jersey's residents work, travel, generate and consume energy. To better understand the limits established in the GWRA, it's important to first consider the total emissions at a global level. The amount of CO_2 in the atmosphere is well-measured and was over 400 ppm in 2016; levels continued to rise reaching 417 ppm in May 2020 at the National Oceanic and Atmospheric Administration's (NOAA) Mauna Loa Observatory.[8] In addition, the quantity of emissions of CO_2 and other GHGs and climate pollutants of concern can be estimated by fuel and land-use data. Approximately half of the CO_2 emitted to the atmosphere by anthropogenic activity each year remains in the atmosphere and the other half of what is emitted dissolves in the oceans or is taken up by plants or soils.[9,10] The ability of these pools to absorb CO_2 involves dynamic and complex processes, which means that, not only do different sinks absorb CO_2 at different rates, but that their ability to do so over time may be altered.[11]

Many climatologists suggest that the global atmospheric concentration of CO_2 is increasing at roughly 2.3 ppm per year on average over the period 2010 - 2020,[12] and must be held below a critical threshold level to avoid the potential for dangerous climate disruption. The Intergovernmental Panel on Climate Change (IPCC) indicates that an emission scenario that would lead to a CO_2 equivalent concentration equal to or lower than 450 ppm would *likely* maintain warming to below a 2ºC increase relative to pre-industrial levels.[13] Under widely varying scenarios about future growth in current forecasted concentrations, 450 ppm will almost certainly be reached by 2040 without serious mitigation efforts.[14]

Excessive CO_2 emissions due to anthropogenic activity cause an imbalance in the planet's natural ability to absorb or use CO_2, resulting in steadily increasing CO_2 concentrations. Concentrations of other GHGs are rising as well. Atmospheric concentrations of CO_2 (approximately 417 ppm as of May 2020)[8] and CH_4 (approximately 1,843 ppb as of September 2016)[15] exceed the range from the last 800,000 years.[16] Global increases in CO_2 concentrations are due primarily to fossil fuel use, with land-use change providing another significant, but smaller, contribution.[17] The United States releases more than 6.6 billion metric tons of greenhouse gases each year.[18]

Status and Trends

The DEP has estimated New Jersey's GHG emissions based on fuel consumption data obtained from the U.S. Department of Energy's Energy Information Administration (EIA)[19] and on other information, including EPA's MOVES model for transportation emissions, estimated emissions of methane from indirect pipeline losses, highly warming gases (e.g. HFCs used as solvents and refrigerants), and carbon released from land clearing and sequestered through forest growth.

Estimated GHG emissions for major sector activities over time are shown in Figure 2.[18] NJ's estimated GHG emissions have decreased slightly in recent years, with 2018 levels remaining below the 2020 GWRA limit (which is equivalent to the 1990 level; Figure 2). To achieve the 2050 GWRA limit of 80% below the 2006 value, NJ would need to reduce estimated GHG emissions by 75%, or about 2.3% per year on average until 2050.[3] As illustrated in Figure 2, emissions from commercial, industrial and residential, on-road transportation, and electricity generation have all been decreasing since 2007. While vehicle miles traveled in New Jersey increased from 2009 to 2018,[20] emissions from on-road transportation decreased over the same period.[21] This decrease in emissions is most likely due to an increase in the fuel efficiency of the overall U.S. motor vehicle fleet.[22]

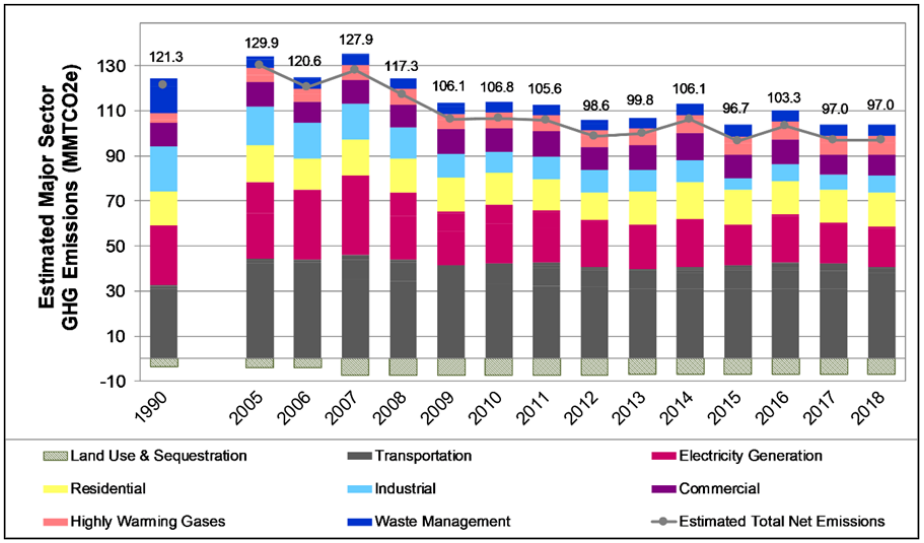

Figure 2: New Jersey's estimated GHG emissions by activity over time.[20] "Estimated Total Net Emissions" considers sequestration.

Emissions from the State's electricity generation sector have varied over the years (Figure 3). As described in the "Energy Use and Renewable Energy Sources" report in the DEP Environmental Trends series, reduced GHG emissions are attributed to the use of nuclear power and natural gas (a lower carbon GHG source) and a reduction in the amount of coal and distillate fuel oil (relatively higher sources of GHGs) to produce electricity. Energy efficiency initiatives, as well as growth in renewables, have also played a role in reducing emissions from the electrical generating sector.

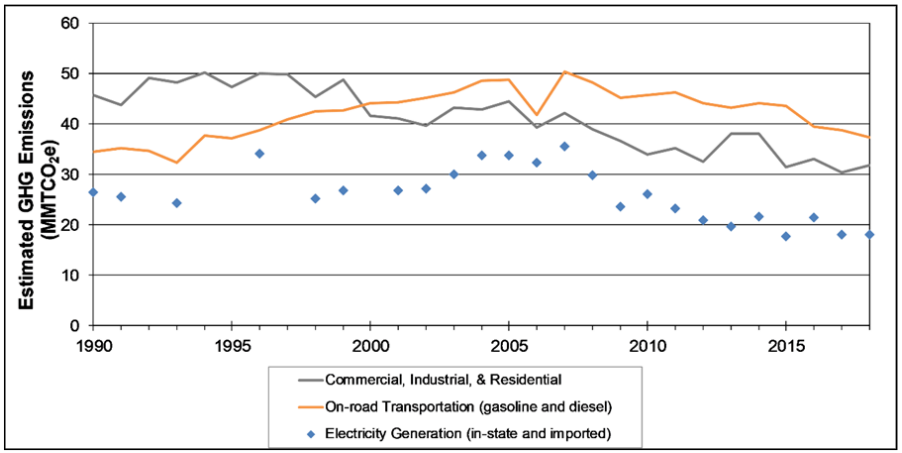

Figure 3: Estimated GHG emissions for New Jersey from 1990-2085 for three major categories.[2,20,23] (Transportation sector methodologies changed in 2006. From 1990 to 2005, transportation sector GHG emissions were based on fuel sales. From 2006 on, GHG emissions were based on the EPA MOVES model.)

Figure 4 shows the GWRA limits compared with recent annual emissions estimates. Achievement of the 2050 emissions limit will require a degree of emissions reduction that is far more pronounced than was necessary to achieve the 2020 limit (Figure 4).

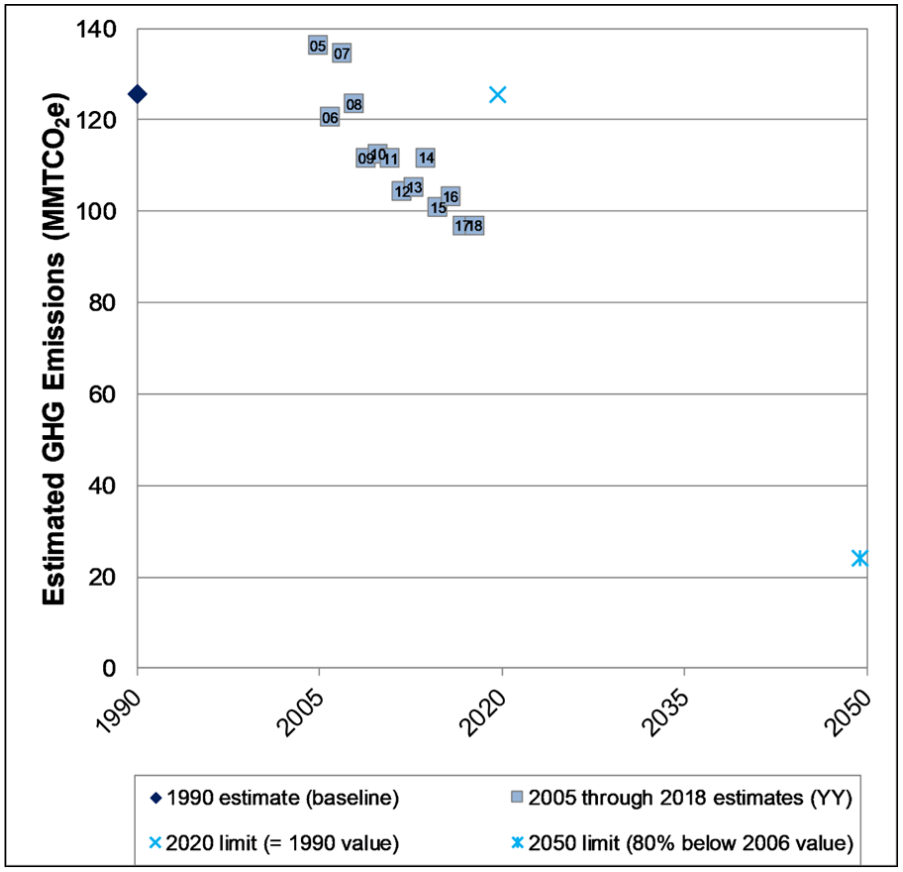

Figure 4: Estimated GHG emissions for New Jersey from 1990-2018 with targets shown for 2020 and 2050.[3,20] (*For the 2005-2018 estimates, "XX" in gray corresponds to two-digit year*).

Outlook and Implications

As noted above, New Jersey enacted the GWRA, which establishes a limit for 2020 emissions to be equal to the State's 1990 levels and a limit for 2050 emissions to be 80% below the State's 2006 level. Much of the reduction necessary to meet the 2050 GWRA limit is expected to come from the implementation of New

Jersey's Energy Master Plan (EMP) and the recommendations in the State's soon to be released 2050 GWRA Recommendations Report. The 2019 EMP includes a list of recommended policies to increase in-state renewable electric generation, improve grid reliability, encourage energy resiliency, and recognize the significant economic and environmental benefits of energy efficiency, conservation, renewable, and nuclear energy sources. It also accelerates the Renewable Portfolio Standard (RPS) requirement consistent with the GWRA and prioritizes electrification of the transportation and building sectors. Finally, the 2019 EMP is the first of its kind to comprehensively address emissions from the State's transportation sector, including recommendations to encourage electric vehicle adoption, electrify transportation systems, and leverage technology to reduce emissions and miles traveled.[24]

Other actions are expected to contribute to achievement of the necessary reductions. In addition to those energy specific actions described further in the report, "Energy Use and Renewable Energy Sources" in the NJDEP Environmental Trends series, New Jersey has taken the following GHG reduction actions.

- In 2018, the legislature and Governor Murphy enacted a law (P.L. 2018 Chapter 3, February 21, 2018) requiring the State of New Jersey to join the United States Climate Alliance. The United State Climate Alliance seeks to uphold the Paris Climate Accord by reducing greenhouse gas emissions by at least 26-28 percent below 2005 levels by 2025.
- The State has initiatives to encourage electric vehicle (EV) use. These include the Drive Green New Jersey initiative, a sales tax exemption on EV sales, and grants, and an employer recognition element to encourage employers to purchase and install electric vehicle charging stations.[25] In addition, "It Pays to Plug In" is a New Jersey initiative that provides grants to employers to offset the cost of purchasing and installing electric vehicle charging stations. This program is intended to encourage individuals to purchase and drive electric cars to work, which will reduce vehicle emissions.[26]
- In May 2018, Governor Phil Murphy signed the State Zero Emission Vehicle Program Memorandum of Understanding, formally committing New Jersey to join eight (now nine) other states to place a combined 3.3 million zero-emission vehicles on the road by 2025 (NESCAUM, 2018b). Collectively, the signatory states represent 27% of U.S. auto market. Pursuant to membership, New Jersey participates in the multi-state ZEV Task Force, contributes to development of the ZEV Action Plan (NESCAUM, 2018a) and supports related initiatives, such as electrification of medium and heavy-duty trucks and buses (NESCAUM, 2019). New Jersey has also joined the International ZEV Alliance, a partnership of states and nations, including Norway, Germany, Canada, and the UK, that seeks to reduce global greenhouse gas emissions by one billion metric tons per year by 2050 (International ZEV Alliance, 2020).
- In January 2020, the New Jersey Legislature intensified the state's electrification efforts by setting specific statutory goals for future adoption of plug-in battery-powered vehicles and plug-in electric hybrid vehicles under P.L. 2019 c.362. Among the goals, by December 31, 2025, the total number of registered light-duty plug in electric vehicles (including battery-only and plug-in hybrids) should reach 330,000 units, and by the end of 2035 the number should reach two million. By the end of 2040, 85% of new light-duty vehicles sold in the state should be plug-in electrics. The law also sets targets for installation of charging infrastructure at public locations, multifamily residential properties, overnight lodging facilities, and similar settings. The law further requires that 25% of state-owned, non-emergency light-duty vehicles be plug in electrics or hybrids by the end of 2025, and 100% by the end of 2035.
- The Partnership to Plug In, a collaboration between the NJDEP, NJEDA, and NJBPU, will lay the groundwork to register 330,000 electric vehicles by 2025. Examples of activities undertaken by the program to date include providing support for charging infrastructure development and creating mapping applications to assist motorists in finding charging stations. "It Pay$ to Plug In" is a complementary grant-making program designed to offset the costs of installing charging equipment, with fiscal year 2020 funding of $7.6 million from various sources, including the New Jersey portion of the Volkswagen Settlement.
- Governor Murphy signed Public Law 2019, c.507 in January 2020, prohibiting the use of hydrofluorocarbons or other similar substances, in all new equipment or products for sale, lease, rent, or to be installed or entered into commerce in the State according to the timeframe established in the legislation.
- In 2020, alongside the release of New Jersey's Energy Master Plan, the Murphy Administration embarked on a climate-focused regulatory reform of its

environmental laws, called Protecting Against Climate Threats (PACT). NJ PACT prioritizes new air pollution regulations to achieve critically needed reductions in carbon dioxide, and implementation of a new greenhouse gas monitoring and reporting rules. NJ PACT will also modernize environmental land use regulations, that will enable governments, businesses and residents to effectively respond to current climate threats and reduce future climate damages.

The emission of GHGs through the combustion of fossil fuels and other anthropogenic activities contribute to the increased global temperatures currently being measured. Through inventory of these gases and effective management scenarios that reduce their presence, the State of New Jersey will continue to advance towards our goals of reducing these greenhouse gases.

More Information

For more information, please visit the following websites:

- NJDEP's Office of Air Quality, Energy & Sustainability (AQES) https://www.nj.gov/dep/aqes/;
- NJDEP's Climate web site https://www.nj.gov/dep/climatechange/;
- New Jersey Board of Public Utilities https://www.nj.gov/bpu/;
- U.S. EPA's Greenhouse Gas Emissions web site https://www.epa.gov/ghgemissions; and
- U.S. Department of Energy, Energy Information Administration https://www.eia.gov/ .

For more information about New Jersey's Low Emission Vehicle and Electric Vehicle initiatives, visit: https://nj.gov/dep/cleanvehicles/

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