

An Assessment of Connecticut's Need to Adopt California's Medium and Heavy-Duty Vehicle Emission Standards

Connecticut Department of Energy and Environmental Protection

Mobile Sources Group

SIPRAC April 14, 2022

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Why Perform an Assessment

Executive Order 21-3 directed DEEP to assess the impacts of adopting CA's MHD rules.

15. Medium and Heavy-Duty (MHD) Vehicle Emissions Standards

- Directs the Department of Energy and Environmental Protection to assess whether Connecticut needs to adopt California's standards to meeting our air quality standards and emissions reduction targets.



Actions That Reduce Carbon Emissions and Adapt to the Climate Crisis

Potential Paths Forward

- Under the federal Clean Air Act, Connecticut cannot independently set its own new vehicle emission standards. Accordingly, Connecticut has two options to reduce emissions from MHD vehicles:
 - Adopt California's MHD vehicle emission standards, which were formally adopted in 2021 in California, and will go into effect as early as 2024.
 - Wait for EPA to adopt new federal standards, for which EPA announced a Notice of Proposed Rulemaking on March 7, 2022.
- As of January 2022, in addition to California five States including New York, New Jersey, Massachusetts, Oregon, and Washington, have adopted the California standards.
- 17 States have signed on to the MHD MOU indicating intent to adopt California standards.

CARB vs. EPA – Quick NOx and EV Comparison

CARB (ACT and Low NOx)

- 0.05 g/bp-hr NOx standard 2024-2025
- 0.02 g/bp-hr NOx standard 2026 and beyond (90% reduction)
- ACT – EV Vehicle deployment requirements starting in 2024

EPA NPRM Option 1

- 0.035 g/bp-hr NOx standard in 2027
- 0.02 g/bp-hr Nox standard from 2031
- Phase 3 GHG standards formulated to incentivized EV deployments

EPA NPRM Option 2

- 0.05 g/bp-hr in 2027 with no phase in and no stronger standard in later years
- Phase 3 GHG standards formulated to incentivized EV deployments



Emissions Overview

Connecticut fails to meet both the 2008 and 2015 ozone NAAQS. Connecticut is likely to be reclassified as being in “severe” non-attainment for the 2008 ozone standard in southwest Connecticut.

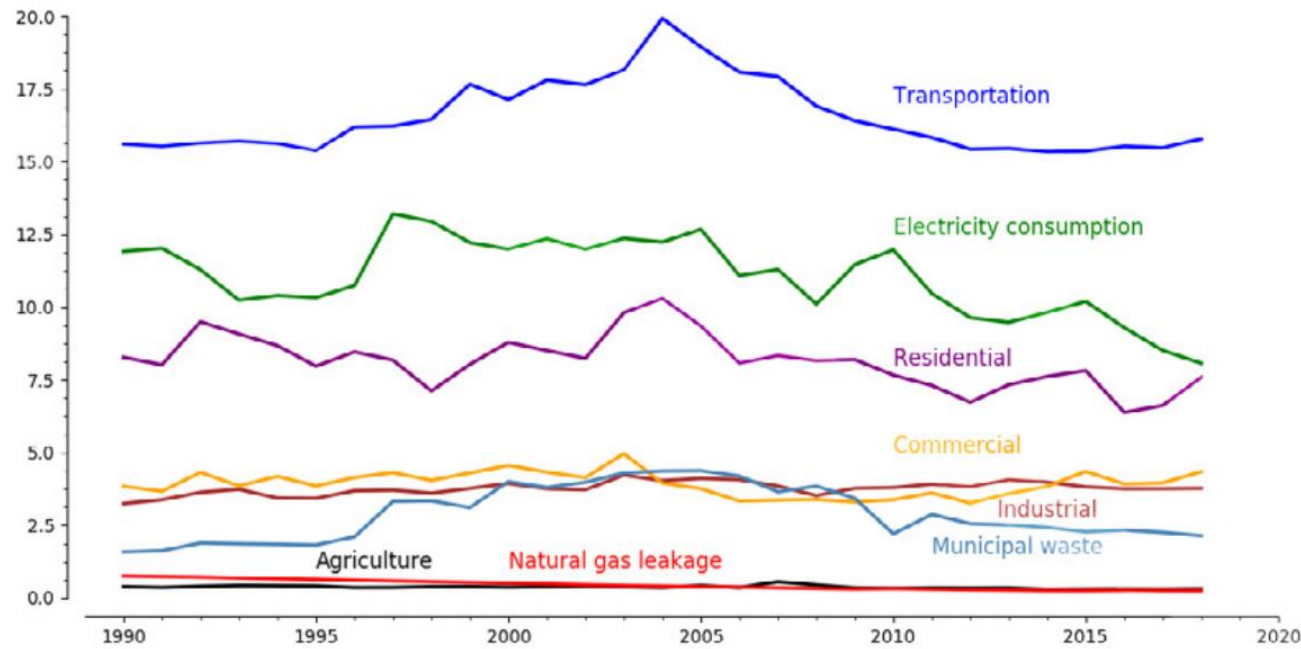
The 2018 Connecticut GHG Emissions Inventory, issued by DEEP in 2021, determined that Connecticut is not on track to meet its 2030 and 2050 Global Warming Solution Act targets and must decline transportation emissions by roughly one-third in this decade.

Failing to meet these health-based standards has subjected generations of Connecticut residents to adverse health and economic impacts. Connecticut cities frequently rate as some of the toughest to live in for people with asthma.

The transportation sector is responsible for over 67% of NO_x emissions, an ozone-related precursor, in Connecticut and is the single largest contributor to GHG emissions.

Air Quality and GHG Emission Goals

GHG Emissions (MMTCO₂e)



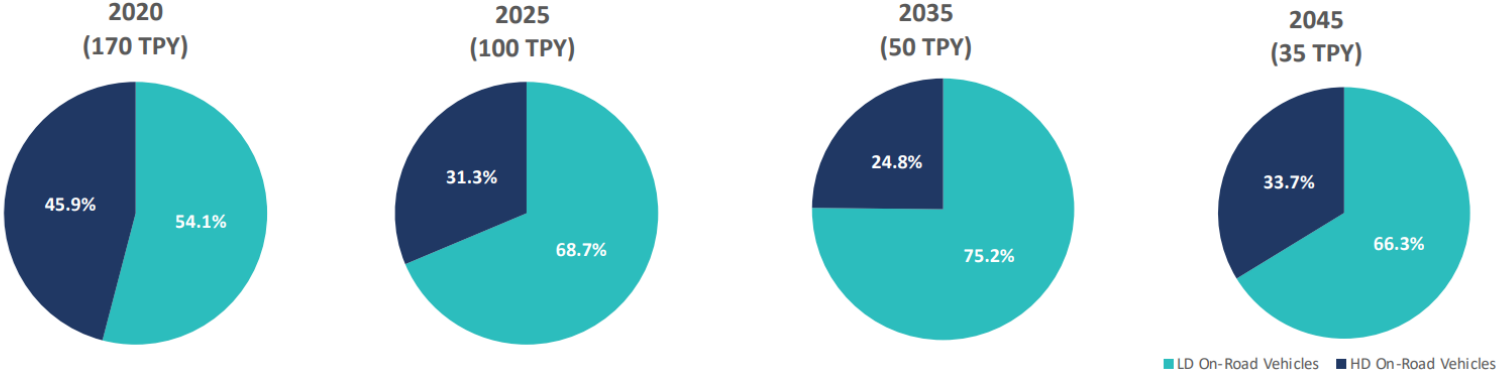
Connecticut Greenhouse Gas Emissions by Sector. 2018 Connecticut Greenhouse Gas Emissions Inventory

- To attain the ozone standards, Connecticut needs emission reductions from the transportation sector, which is responsible for over 67% of ozone-forming precursor emissions generated in Connecticut.
- The State must reduce GHG emissions from the transportation sector to achieve Connecticut's economy-wide GHG reduction targets of at least 45 percent below 2001 levels by 2030, and 80 percent below 2001 levels by 2050, as required by the 2018 Act Concerning Climate Change Planning and Resiliency.

Projected Heavy-Duty Emissions (2020 – 2045)

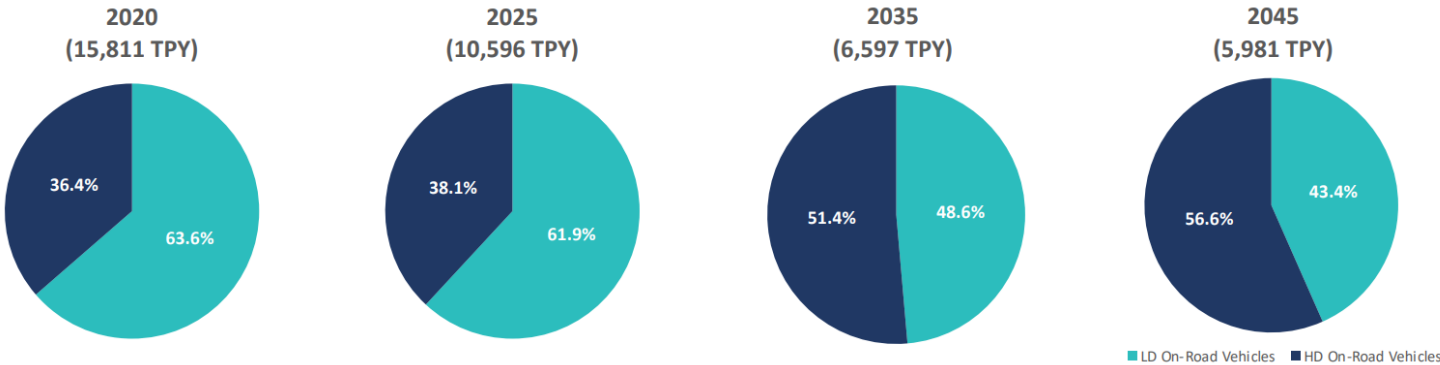
- DEEP reviewed MOVES modeling runs from the 2021-2024 State Transportation Plan (STIP) to project the total statewide annual emissions of NOx and PM2.5 between 2020-2045 for Connecticut's light duty and heavy-duty vehicle population.
- As light duty vehicle emissions continue to decrease at a steady rate, the relative impact of MHD emissions becomes more apparent. By 2045, the rate of emission reduction for MHD vehicles drops off considerably due to a lack of existing standards resulting in MHD emissions accounting for a larger percentage of total emissions.
- By 2045, if new emission standards are not adopted, HD vehicles will contribute 57% of NOx related emissions and 34% of PM2.5 related emissions.
 - Note: This DEEP analysis doesn't consider the larger subset of medium-duty vehicles.

Estimated Total Annual On-Road PM2.5 Primary Emissions



On-Road PM 2.5 Emissions 2020-2045

Estimated Total Annual On-Road NOx Emissions



On-Road NOx Emissions 2020-2045

Medium- and Heavy-Duty (MHD) Emissions

- After light-duty vehicles, MHD trucks are the next largest source of transportation sector emissions.
- Reducing MHD emissions is an essential component of any successful strategy to meet our air quality and GHG emission goals.
- Of all mobile source emissions, MHD vehicles—including trucks, buses, and smaller delivery vehicles account for as much as 53% of emissions of NO_x, despite being only 6% of the vehicle fleet.
- MHD vehicles are also responsible for 25% of GHG emissions and 45% of PM emissions from the transportation sector.

| M/HDV Share of Total On-Road Fleet | |
|---|------------|
| Greenhouse Gas Emissions | 25% |
| NO_x Emissions | 53% |
| PM Emissions | 45% |
| Share of On Road Vehicles | 6% |

Current Connecticut MHD Fleet's Share of Total Transportation Emissions. M.J. Bradley and Associates Report "Southern New England Clean Trucks Program" <https://www.ucsusa.org/sites/default/files/2021-11/southern-ne-clean-trucks-report.pdf>

Benefits of New Vehicle Emission Standards

Climate

Air Quality

Health Benefits

EV Market

Charging

Regional Coordination

Environmental Justice

Potential Benefits: Projections and Evaluations

- Three levels of analysis considered:
 - DEEP's Scale Modeling Evaluation
 - NESCAUM's COBRA Modeling
 - MJ Bradley & Associates' Clean Trucks Report for Southern New England
- Calculations of reductions in emissions: NO_x, PM_{2.5}, CO₂
- Health benefits and fiscal value
 - Avoided Premature Deaths
 - Avoided Cardiovascular Illness
 - Avoided Respiratory Illness
 - Avoided ER visits

DEEP: Scale Modeling Evaluation

- Takes New Jersey’s regulatory impact analysis methodology and adapts to Connecticut.
- Calculates values analogous to those for California based on data published in informational CARB documents about respective clean truck rules.
- Interpolation: Comparison of key values from Federal Highway Administrations 2019 Highway Statistics for Connecticut & California
 - State population
 - Percentage of population that lives in close proximity to major roads
 - Total VMT of all trucks in the state

Table 5: DEEP Scale Analysis: Projected Emission Reductions

| Rule | Pollutant | Years(s) | Value | Units |
|---------|-------------------|---------------------------|-------|--------------------------------------|
| Low NOx | NOx | 2024 | 0.03 | tons/day |
| | | 2031 | 1.98 | tons/day |
| | | 2040 | 4.66 | tons/day |
| | | 2050 | 6.49 | tons/day |
| ACT | NOx | 2020–2040 (cumulative) | 2.38 | tons/day |
| | PM2.5 | | 0.073 | tons/day |
| | Well-to-Wheel GHG | | 0.25 | tons/day CO ₂ e |
| | GHG | | 1.48 | 10 ⁶ MT CO ₂ e |

Table 6: DEEP Scale Analysis: Projected Health Benefits^{26 27}

| Rule | Description | Years(s) | Value | Units |
|---------|--------------------------------------|-------------|-------|---------|
| Low NOx | Deaths Prevented | 2024 – 2050 | 119 | people |
| | Hospitalizations Prevented | | 40 | people |
| | ER visits prevented | | 55 | people |
| ACT | Avoided Premature Deaths | 2020 – 2040 | 29 | people |
| | Value of All Avoided Health Outcomes | | 271 M | dollars |

NESCAUM's COBRA Modeling

Table 7: Environmental Benefits of ACT Implementation Emission Reductions (tons), year 2050

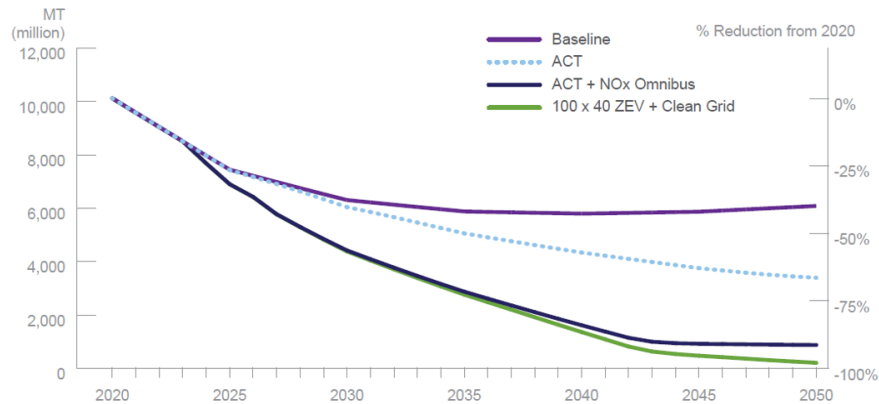
| | ACT: Isolated | ACT & Low NOx |
|-----------------|---------------|---------------|
| NOx | 412 | 912 |
| CO ₂ | 355,767 | 355,767 |
| PM2.5 | 5 | 5 |

Table 8: Health Benefits of ACT Implementation

| Description | | ACT: Isolated | ACT & Low NOx |
|---|-----------|----------------|-----------------|
| Avoided Premature Deaths | Incidents | 4 – 9 | 8 – 19 |
| | Valuation | \$47M – \$106M | \$103M – \$233M |
| Avoided Hospitalizations for Cardiovascular Illness | Incidents | 1 | 2 |
| | Valuation | \$40,000 | \$100,000 |
| Avoided Hospitalizations for Respiratory Illness | Incidents | 1 | 2 |
| | Valuation | \$30,000 | \$70,000 |
| Avoided ER visits | Incidents | 4 | 6 |
| | Valuation | \$2,000 | \$3,000 |
| Total health benefits | - | \$48M – \$107M | \$105M – \$236M |

- EPA's CO-Benefits Risk Assessment Health Impacts Screening and Mapping Tool (COBRA)
 - Quantifies dangerous health outcomes that will be avoided with improved air quality
 - Assigns economic value of said outcomes over time
- By 2050, Connecticut could save:
 - \$413 million in health costs
 - 912 tons of NOx
 - 335,767 tons of CO₂
 - 4.7 tons of PM_{2.5}

Figure C1 Projected M/HD Fleet NOx Emissions



MJ Bradley & Associates Analysis

- Report for all of Southern New England for adoption of ACT and/or Low NOx
 - Results broken down by state
- Sophisticated methodology; multiple mathematical models used
 - Primarily MJ Bradley’s STEP (State Emission Pathways)
 - Assumes annual VMT for CT will grow by approx. 0.5% / year through 2050, as projected by the EIA
- By 2050:
 - \$893 million per year delivered in total benefits
 - Population could save up to \$1.4 billion in health expenses

Table C5 Projected Cumulative M/HD Fleet Emissions Reductions (2020-2050)

| | NOx (MT) | PM (MT) | GHG (mill MT) |
|---------------------|----------|---------|---------------|
| ACT | 31,360 | 270 | 15.9 |
| ACT + NOx Omnibus | 88,740 | 270 | 15.9 |
| 100x40 + Clean Grid | 94,990 | 740 | 32.4 |

Table C4 Cumulative Public Health Benefits of Clean Truck Policy Scenarios, 2020–2050

| Health Metric | ACT Rule | ACT + NOx Omnibus | 100 x 40 ZEV + Clean Grid |
|--------------------------------------|----------|-------------------|---------------------------|
| Avoided Premature Deaths | 43 | 104 | 125 |
| Avoided Hospital Visits ^a | 42 | 102 | 123 |
| Avoided Minor Cases ^b | 24,027 | 57,438 | 69,171 |
| Monetized Value, 2020\$ (millions) | \$507 | \$1,218 | \$1,465 |

^a Includes hospital admissions and emergency room visits.

^b Includes reduced cases of acute bronchitis, exacerbated asthma, and other respiratory symptoms, and reduced restricted activity days and lost workdays.



MULTI-STATE MEDIUM- AND HEAVY-DUTY ZERO EMISSION VEHICLE

MEMORANDUM OF UNDERSTANDING

WHEREAS, the Signatory States and the District of Columbia¹ recognize the importance of state leadership and coordinated state action to ensure national progress in the effort to reduce greenhouse gas (GHG) emissions and stabilize global warming;

WHEREAS, the Signatory States have statutory obligations or otherwise seek to significantly reduce statewide GHG emissions by 2050, consistent with science-based targets;

WHEREAS, transportation is now the nation's largest source of GHG emissions, and, after light-duty vehicles, medium- and heavy-duty trucks are the next largest source of transportation sector GHG emissions;

WHEREAS, the Signatory States have a statutory obligation to provide their citizens with air quality that complies with national health-based air quality standards, which are required to be protective of health and the environment with an adequate margin of safety;

WHEREAS, fossil fuel related emissions from medium- and heavy-duty vehicles (MHDVs) are a major source of nitrogen oxides (NO_x), particulate matter, and toxic air emissions, which are preventing many densely populated areas from achieving compliance with federal ambient air quality standards;

WHEREAS, emissions from MHDVs are a widely acknowledged, but unaddressed, environmental justice problem that directly and disproportionately impacts disadvantaged communities located near freight corridors, ports and distribution centers;

Multi-State Medium- and Heavy-Duty Zero-Emission Vehicle Initiative

- Governors' [Multi-State MHD ZEV Memorandum of Understanding](#) (MOU) announced in July 2020
- Commits 17 states, D.C., and Quebec to work to promote rapid and equitable electrification of trucks and buses
- Sets goal for at least 30% of new MHD vehicle sales to be zero-emission by 2030, and 100% of sales by 2050
- Prioritizes deployment of electric trucks and buses in and near frontline and overburdened communities
- Directs ZEV Task Force to develop a *Multi-State MHD ZEV Action Plan* to identify barriers and recommend policies to support widespread MHD vehicle electrification

MULTI-STATE MEDIUM- AND HEAVY-DUTY ZERO-EMISSION VEHICLE ACTION PLAN

*A Policy Framework to
Eliminate Harmful Truck and Bus Emissions*

Draft for Public Comment
March 10, 2022

MULTI-STATE ZEV TASK FORCE



Multi-State Medium- and Heavy-Duty Zero-Emission Vehicle Action Plan

- Identifies the environmental, economic, and social policy drivers of MHD vehicle electrification
- Offers principles to support a just and equitable transition to electric trucks and buses and emphasizes the need for a “whole-of-government” approach to equity
- Describes the state of the MHD ZEV market today
- Discusses the barriers and opportunities associated with widespread MHD vehicle electrification
- Includes [60+ recommendations](#) for state policymakers to promote rapid and equitable MHD ZEV deployment
- Features innovative MHD ZEV policies and programs
- Includes local and federal government recommendations

Request for Public Input

NESCAUM and the participating jurisdictions have released a [draft MHD ZEV Action Plan](#) for public input. Comments can be submitted through NESCAUM's [Public Input Portal](#) by April 25, 2022. Previously submitted comments are available [here](#).



Questions?



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