

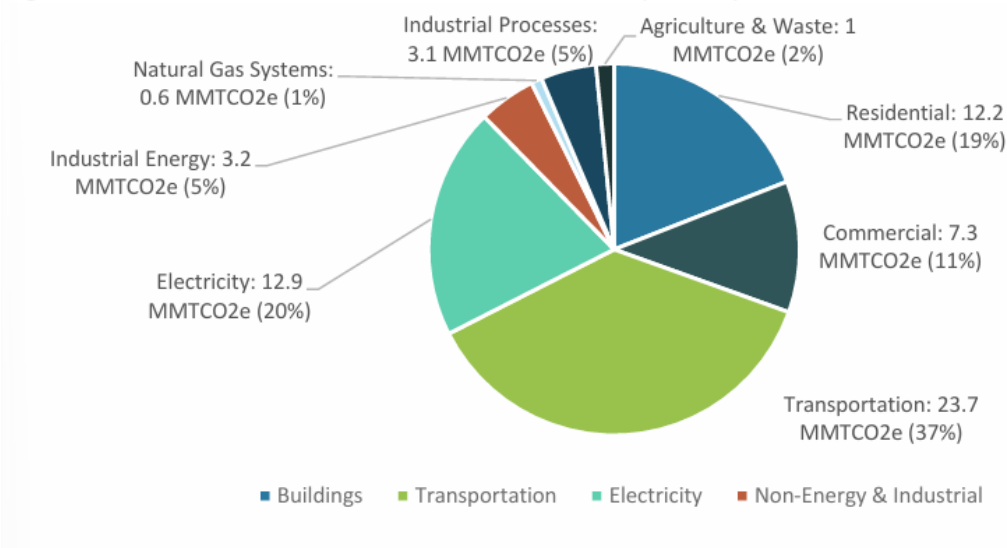
# Summary of the Massachusetts Clean Energy and Climate Plan for 2025 and 2030 (2025/2030 CECP) for SES

## Executive Summary:

- An Act Creating a Next-Generation Roadmap for Massachusetts Climate Policy signed into law by Gov. Baker in 2021
  - Amends Global Warming Act of 2008
  - **Requires the Secretary of the Executive Office of Energy and Environmental Affairs (EEA) to set limits on greenhouse gas (GHG) emissions for 2025 and 2030**
    - Including both economy-wide limits and specific limits on major sources of emissions
    - Requires the creation of a comprehensive plan to achieve required emissions reductions
- The 2025/2030 CECP includes strategies and policies designed to achieve sector-specific GHG emissions sublimits.
  - It also includes goals and actions to reduce emissions and increase carbon sequestration on natural and working lands (NWL)
- Economic analysis suggests that these strategies and policies will help grow the MA economy
- **Transportation** is the largest source of GHG emissions in MA, responsible for 37% of emissions in 2020 (\*see below image for graph of emissions breakdown)
  - GHG emissions sublimit for Transportation is at **18% and 34% reduction from the 1990 level in 2025 and 2030, respectively**
- **Heating in buildings** by oil and gas represented 30% of statewide GHG emissions in 2020
  - GHG emissions sublimits for residential and commercial building heat are at **28% reduction in 2025 and 47% reduction in 2030, relative to 1990 level**
- **Electric power** emissions represented approximately 20% of statewide GHG emissions in 2020, mostly from the combustion of natural gas in power plants
  - GHG emissions sublimits for the electricity sector are set at **53% in 2025 and 70% in 2030, relative to 1990 level**
- **Industrial and non-energy sources** of GHG emissions come from GHG leaks from refrigeration systems, gas-insulated switchgears, and natural gas infrastructure; solid waste management systems; and agricultural processes

- GHG emissions sublimits for this sector are **34% in 2025 and 48% in 2030**, relative to the 1990 level
- A critical component of achieving net-zero GHG emissions in MA will be **natural and working lands' ability to sequester emissions**
  - MA will increase its efforts to permanently conserve at least 28% and 30% of undeveloped land/water by 2025 and 2030
  - MA aims to achieve **net GHG emissions reduction of 25% below 1990 level in 2030 on NWL**

**Figure 1.2. Distribution of Massachusetts GHG Emissions in 2020 (estimate)**



*Notes: Economy-wide emissions were estimated to be 64.1 MMTCO<sub>2</sub>e or about 32% below 1990 level. Subtotals shown may not sum to this total due to rounding. The values presented above represent preliminary estimates (as of June 2022) from Massachusetts Department of Environmental Protection (MassDEP) for 2020. These estimates will be updated as new data become available and published in MassDEP's Annual Greenhouse Gas Emissions Inventory.*

## Chapter 1: Introduction

- The Secretary of the EEA adopted **statewide GHG emissions limits of 33% below 1990 level in 2025 and 50% below 1990 level in 2030**
  - Also adopted sector-specific sublimits
  - This plan includes comprehensive strategies to achieve the emissions limits and sublimits
- **3 basic principles of MA's approach to achieving emissions limits** – must be done simultaneously
  1. Electrify non-electric energy uses
  2. Decarbonize the electric grid

- 3. Reduce energy costs and the costs of transitioning by increasing efficiency of transportation and energy systems
- Key considerations when developing policies in the Plan included:
  - GHG emissions reductions
  - consumer costs and benefits
  - energy supply and delivery
  - environmental justice (EJ) and equity
  - stakeholder input
  - market transformation
  - implementation feasibility
- Sets benchmarks for adoption of emissions reduction solutions to track MA's progress in achieving 2025 and 2030 limits and sublimits

### *1.1: Background on Global Warming Solutions Act*

- With the passage of the GWSA in 2008, MA became one of the first U.S. states to adopt a comprehensive plan to address climate change consistent with goals established by the IPCC
  - The state successfully met the 2020 GWSA emissions limit of 25% reduction from 1990 level
- 2025/2030 CECP presents the most aggressive decarbonization strategies put forth by MA to date
  - There will be future CECP's which will incorporate new understandings and capabilities
- In 2020, the **Baker-Polito Administration established a 2050 statewide emissions limit of net zero GHG emissions** - put into law by the 2021 Climate Law
  - Means that total GHG emissions emitted by all sources in MA must be equal or less than the total amount of carbon sequestered within MA or through MA's actions
- MA began a **2050 Decarbonization Roadmap Study** process in 2019, to determine the best ways to achieve net zero emissions
- 2050 Roadmap Study identified eight pathways for achieving net zero, which analysis showed can be done affordably
  - **Critical elements to consider when selecting policies include a balanced clean energy portfolio anchored by...**
    - offshore wind resources
    - widespread electrification of transport and building heat

- cost reductions from moving to more efficient technologies when replacing equipment, infrastructure, and systems that use or deliver fossil fuels
- protection, management, and restoration of NWL

## *1.2: Looking Forward to 2025 and 2030: Accelerating Decarbonization for the Commonwealth*

- To meet 2030 limits, the state must focus on transitioning its transportation and heating systems away from the combustion of fossil fuels
- Policies in the Plan focus on **encouraging and incentivizing individual decision-makers to make decisions to support decarbonization**
  - MA residents' collective choices about their next vehicles and heating systems will significantly impact MA's ability to achieve emissions limits
- **Technologies to support emissions reduction**
  - Electric vehicles
  - Advanced energy efficiency measures in buildings, which significantly reduce the energy footprint of buildings
  - Electric heat pumps for homes
- Scaling up the above technologies as well as investing in clean energy infrastructure and alternatives to personal car travel accounts for the majority of emissions reductions in the Plan
- Successful decarbonization requires continual reduction of fossil-fuel electricity generation and replacement with renewable and clean energy
- Local communities play an increasingly important role in deciding the locations of new renewable energy projects
- MA must remain involved in federal and regional policy development that impacts its ability to decarbonize

## *1.3: Setting GHG Emissions, Sublimits, and Plan Development*

- Process of developing limits and plans relied on quantitative and qualitative analyses
  - Equity and environmental justice principles were considered throughout and will remain at the center of the implementation of the Plan
- **General principles**
  - Most cost-effective to replace GHG emitting resources with cleaner technologies at time of replacement

- Policy strategies in the Plan were developed to enable the transition to a clean energy economy, and also...
  - Ensure environmental justice and equity, consider significant stakeholder input, and consider practicality and feasibility
- **Stakeholder feedback**
  - Plan reflects stakeholder feedback and public comments received on Interim 2030 CECP, stakeholder meetings, and additional public comments received in Fall 21 and Winter/Spring 2022
- **Commitment to equity**
  - Baker-Polito admin are committed to ensuring these policies help reduce health and economic disparities experienced in EJ communities and communities of color

## Chapter 2: Ensuring a Just Transition for the Commonwealth

- **Environmental justice** is centered around the principle that “all people deserve protection from environmental pollution and the ability to live in and enjoy a clean and healthy environment, regardless of race, color, income, class, handicap, gender identity, sexual orientation, national origin, ethnicity or ancestry, religious belief, or English language proficiency.”
- Communities of color, low-income neighborhoods, indigenous populations, and communities with high percentages of residents with limited English proficiency face disproportionately higher exposure to pollution, public health and climate risks, and bear a higher energy burden when compared to other communities
- **Environmental Justice (EJ) populations** in MA are defined in the 2021 Climate Law
  - Neighborhoods in which one or more is true...
    - Annual median household income is 65% or < than statewide average
    - Minorities make up 40% or > of the population
    - 25% or > of households report speaking English less than “very well”
    - Minorities make up 25% or > of pop. and annual median income of the municipality does not exceed 150% of statewide average
    - [Environmental Justice Map Viewer](#)
- The transition must include facilitating the adoption of necessary technologies by low- & moderate-income residents
  - Such as EVs and heat pumps
- MA must engage with community representatives to make responsible decisions about the siting of new projects

- Encourage **ownership of renewable resources by EJ populations**, and increase access to these resources
- Future policies around clean energy, decarbonized buildings, and electrified transportation need to be affordable and accessible for low-income residents

## *2.1 Environmental Justice Policy*

- The most recent iteration of **MA's Environmental Justice Policy**, released in 2021, will guide implementation of this Plan
  - EEA must take action to...
    - restore degraded natural resources
    - increase access to open space and parks
    - address environmental and health risks of existing and potential new sources of pollution
    - appropriately address climate change
    - improve overall quality of life
- Plan includes specific actions to achieve above aims

## *2.2 Advancing Equity Through Decarbonization*

- The implementation of the Plan will consider equity in all policy and programs, including efforts to:
  - Engage EJ populations with outreach in multiple languages
  - Prioritize climate investments in EJ neighborhoods while ensuring this doesn't cause the displacement of residents
  - Developing metrics to track progress over time, particularly for air quality in EJ neighborhoods
  - Advance policies to reduce the cost of clean energy for low- and moderate-income people
  - Ensure workforce development training and education for workers in clean energy, prioritizing "traditionally hard-to-reach" and EJ populations
  - Minimize negative outcomes on EJ populations
    - Requires greater community engagement and public participation in all review, siting, and permitting processes
    - Energy Facilities Siting Board will continue to improve and use analysis of impacts and mitigation procedures in its review of energy facilities, and include measures to mitigate impacts for affected communities in their decisions

## Chapter 3: Emissions Sublimits and Pathways

### *3.1: Setting sector specific sublimits for 2025 and 2050*

- **2021 Climate Law** Mandates Greenhouse Gas emissions sublimits for specific sectors.
  - **Residential heating and cooling**- On site combustion of fossil fuels for residential, industrial and commercial sectors
  - **Transportation**- emissions from combustion fuels due to vehicles, aircraft and farm equipment
  - **Electric Power**- Power plants, energy generated and imported
  - **Natural Gas Distribution and Service**- The carbon dioxide potency equivalent of methane as a byproduct of gas pipelines, services, compressors and meters within natural gas sectors only.
  - **Industrial Processes**- CO<sub>2</sub> as a byproduct of lime production and the carbon dioxide potency equivalent of chlorofluorocarbons
  - **All other processes**- Waste decomposition, agriculture, and wastewater disposal are included in this sector.

### *3.2 Updated Pathways for Analysis to set Limits and Sublimits for 2025 and 2030*

- The **2050 Roadmap Study** emphasizes pathways to reach **Net Zero** emissions in 2050 and focuses on **Long Term** changes.
- The goal is to achieve a 50% decrease in greenhouse gas emissions by 2030 from 1990 levels.
- Some aspects considered are implementing offshore wind, zero emission vehicle standards, heating decarbonization and electric heat pumps.
- **Clean Heat Scenarios**- to achieve by 2050
  - **Clean Fuels**- Residential consumers switching from oil and liquid propane to gas heating and carbon neutral options.
  - **Hybrid**- Fossil fuels and electric heat pumps
  - **Phased**- Allowing carbon emitting sources but implementing electric options.
  - **High Electrification**- Rapid adoption of whole heat pumps.
  - **Full Electrification**- Maximum adoption of fossil fuel free heat pumps.

### *3.3 Defining the 2025 and 2050 Greenhouse Gas Emissions Limits and Sublimits Based on Analytical Results*

- 'Phased' means that the process benefits short term and long term decarbonization scenarios.
  - Phased scenario has the lowest cost, but the savings are offset in other scenarios.
- If clean fuels and gases don't become abundant and cheap in the 2030's, the phased approach will process long term electrification.

## Chapter 4: Transforming our Transportation Systems

### *4.1 Sector Overview*

- **Transportation** is the largest source of greenhouse gas emissions in Massachusetts.
  - In 2019, the transportation sector accounted for **42%** of total emissions in Massachusetts.
  - Aside from carbon dioxide emittance, transportation also increases particulate matter in the air, otherwise known as air pollution, as well as NO<sub>2</sub>, which is bad for public health.
  - As total statewide vehicle mileage increases, so do emissions and particulate matter.
  - The 2020 COVID pandemic reduced commuting and transportation in general.
    - This contributed to suburban sprawl, which reduced MBTA and public transportation usage, but also decreased total miles traveled.
  - **Heavy Duty Vehicle** emissions **doubled** from 1990 to 2019, due to an increased popularity of e-commerce.
  - Pollution from air travel has increased from 4 to 4.3 MMTCO<sub>2</sub> from 1990 to 2019, but Massachusetts has limited jurisdiction over airline travel.
- Greenhouse gas emission sublimits for the transportation sector are planned to have an 18% reduction from 1990 level by 2025, and a 24% reduction from 1990 level by 2030.
  - Some factors that are considered regarding electric vehicles are production rates, hybrid vehicles, and the electric vehicle market.
    - To achieve the 2025 sublimit, Massachusetts plans for there to be 200,000 electric vehicles on the road and 15,000 public charging stations by 2025.



- To achieve the 2030 sublimit, Massachusetts plans for there to be 900,000 electric vehicles on the road and 75,000 public charging stations by 2030.

## *4.2 Getting to 18% Reduction by 2025 and 34% Reduction by 2030*

- **2 Major Goals**

- Achieve modest **reduction in total vehicle miles traveled** with factors considered which can be achieved by...
  - Investing in public transit
  - Improving and upkeeping bike and walking path infrastructure
  - Investing in walkable communities
- Increase amounts of **electric vehicles** on roads
  - The benefits of battery electric vehicles include
    - Decrease in greenhouse gas emissions
    - Decrease in air pollutants
  - People who live near major highways and roads are breathing in poor quality air, an example of environmental injustice
  - Some barriers of battery electric vehicles include
    - Limited availability which leads to accessibility issues
    - Limited charging infrastructure
    - Higher up front cost

- **Transportation Pollution & Environmental Injustice**

- Communities near highways & dense urban areas face higher levels of pollution due to vehicle traffic and particulate matter
- Communities near freight corridors, ports, warehouses and distribution centers are exposed to greater levels of particulate matter and nitrous oxide from diesel and commercial freight operations.
- The main reduction strategy is electrifying diesel vehicles. Electrification of these large vehicles has the largest potential to improve air quality. These vehicles include **Delivery Vehicles and School Busses.**
- Continuing to improve public transport is on the agenda.
  - Increase accessibility to low- and moderate-income residents
  - This helps maximize the climate benefit from these actions
  - The Commonwealth is working to provide more housing near MBTA routes to increase accessibility.

- The Commonwealth is implementing the Accelerating Clean Transportation for All program, which includes e-bike and electrical vehicle sale incentives.
- Massachusetts Clean Transportation Strategies to achieve the transportation sector sublimits by 2025 and 2030
  - **Strategy T1: Promote alternatives to personal vehicle travel**
    - The problem: walkable, bikeable areas, as well as areas along an MBTA route, make that area more expensive. So, people who don't live in those areas need personal vehicles for everyday life, which creates a need for lots of changes.
    - Encourage multifamily zoning near transit stations
      - This means building housing near transportation stations, but many current zoning requirements prohibit multifamily housing which makes a powerful permitting process, But, not with recent changes, which requires at least one zoning district within a community to allow for the multifamily housing.
    - Support and execute the MBTA Bus Modernization Program
      - MBTA to convert to electric vehicles by 2040
        - New & Cleaner busses
      - MBTA Bus Modernization Program
        - Improves working conditions
        - Expand capacity
        - Increase electric charging infrastructure.
      - Changing MBTA transportation routes to meet demand for said routes.
    - Increase support for the MassDOT complete & shared streets programs
      - Invests over \$100,000,000 to encourage active transportation such as...
        - Bike lanes
        - Bus lanes
        - Better sidewalks
        - Accessibility for those with disabilities
        - Community spaces
        - Street designs that promote pedestrian safety
          - Which...

- Makes communities safer by reducing vehicle speeds & providing cyclists and pedestrians with protection from cars
  - Decreases the need for short distance vehicle usage
- Work with employers to reduce single occupancy commutes
  - Reduce Single occupancy vehicles by 25%
- Launch an e-bike incentive program
- **Strategy T2: Implement Coordinated Advanced Clean Vehicle emissions & sales standards**
  - Massachusetts and other participating states can choose to adopt the California vehicle emissions standards
  - Advanced clean cars program
    - Requires auto manufacturers to build and sell an increasing amount of zero emission vehicles (ZEV).
    - Requires continued growth in zero emission passenger vehicle sales until 100% ZEV are sold in 2025.
  - Advanced Clean Trucks
    - Requires increasing percentage of a zero-emission medium and heavy-duty vehicles
- **Strategy T3: Expand Electric Vehicle Incentives**
  - MOR-EV program offers rebates for EV purchases
  - Maintain MOR-EV trucks
    - Large vehicles account for less than 10% of vehicles on the road, but account for 40% of their emissions
    - The commonwealth has created purchase incentives
- **Strategy T4: Accelerate Electrification in Fleets with Critical Equity & Public Health Implications**
  - The commonwealth will accelerate electrification of public and private fleets, especially school busses
  - Community organizations are receiving grants to reduce transportation emissions
- **Strategy T5: Build Electric vehicle charging stations and encourage smart charging**
  - Build out fast charging along highway corridors
  - Support direct current fast charging deployment by investing in fast charging infrastructure

- Require make-ready charging for all new buildings
  - 10% or more parking spaces in commercial lots and apartment buildings
- **Strategy T6: Engage consumers and facilitate markets**
  - Provide technical support for fleet operators considering transition to electric vehicles by developing an advisory program to inform operators.
  - Outreach and customer support
  - Support building a workforce for electric vehicles
  - Investigate and pilot options for hard to electrify segments
    - Developing strategies for electrifying freight, port, and marine vehicles
  - Support short haul aviation

## Chapter 5: Transforming Our Buildings

### 5.1 Sector Overview

- 2 million+ individual buildings in MA
- GHG emissions from fuel combustion in buildings have generally trended downward since 1990
  - But these incremental changes are not enough and achieving **deep decarbonization** (meaning dramatic reductions, to get to zero emissions) will require burning less fossil fuels for space and water heating
- MA's total number of buildings is increasing, leading to increasing energy demands and emissions
- Energy transition in buildings sector must also focus on protecting low- and middle-income citizens from potential cost increases

### 5.2 Achieving 28% Reduction in 2025 and 47% in 2030 for Building Heat

- Although the technologies to use biofuels, clean biogas, and green hydrogen are available, using those resources to heat buildings will require the development of new supply chains, with uncertainties around the availability and cost of resources
- Therefore, **MA's dominant building decarbonization strategy continues to be maximizing energy efficiency and electrifying heating demands**
- The Plan will increase energy efficiency through implementation of standards that drive investment in energy efficiency technologies

- Many technologies allow MA consumers to move away from fossil fuels as an energy source
  - **Heat pump systems** are much more efficient than combustion-based heating systems, reducing a building's total energy use
- The **Commission on Clean Heat** has been working since the beginning of 2022 to provide recommendations to Baker-Polito Admin on specific policies that would support the reduction of GHG emissions from building heat
  - Chapter includes preliminary recommendations
  - [Massachusetts Commission on Clean Heat Final Report - November 30 2022](#)
- **Policy objectives for Commission on Clean Heat**
  - Public service campaign to educate consumers on MA's energy efficiency and electrification efforts in building sector
    - **Consumer engagement initiatives** to help residents understand the options and the impacts of each purchase/operational decision
  - MA will explore **financing and investment initiatives**
  - **Regulatory and policy structures** must support decarbonization
  - Pilot and demonstration **projects with academic and private partners** can drive new solutions, address technology gaps, and establish best practices for building decarbonization
  - **Workforce development** will expand educational and training opportunities
  - **Industry support** initiatives will help those currently working in other sectors to develop skills to work for companies expanding into advanced building technologies
- **GHG emissions sublimits**
  - Residential heating and cooling: 29% reduction from 1990 level in 2025 and a 49% reduction in 2030
  - Commercial and industrial heating and cooling sector: 35% reduction from 1990 level in 2025 and a 49% reduction in 2030

Table 5.1. Emissions from Residential, Commercial, and Industrial Heating

Residential Heating and Cooling	1990	2010	2015	2020	2025	2030
Gross Emissions (MMTCO <sub>2</sub> e)	15.3	13.7	13.6	12.2	<b>10.8</b>	<b>7.8</b>
% Reduction (Increase) from 1990		10%	11%	20%	29%	49%
Commercial & Industrial Heating and Cooling	1990	2010	2015	2020	2025	2030
Gross Emissions (MMTCO <sub>2</sub> e)	14.2	10.6	11.1	10.5	<b>9.3</b>	<b>7.2</b>
% Reduction (Increase) from 1990		26%	22%	26%	35%	49%

Note: GHG emissions in 2020 are based on preliminary estimates from MassDEP as of June 2022, while historical GHG emissions for years before 2020 are based on MassDEP's preliminary estimates in February 2022.

- **Strategy B1: Cap on Emissions from Heating**

- Sublimits on emissions from heating fuels are a legally binding and declining cap
  - MassDEP is responsible for creating a program and regulations to meet emissions limits for residential, commercial, and industrial heating
- One of the regulatory options being considered by the Commission on Clean Heat is to develop a **Clean Heat Standard** for buildings
- **Strategy B2: Performance Benchmarks & Standards**
  - Encourage the design of new buildings and building energy systems to be 2050-compliant – buildings built now will likely remain until 2050
  - Several different emissions standards could incentivize developers to meet declining emissions cap for heating
  - DOER is announcing a high-efficiency **specialized opt-in energy code** which municipalities can choose to adopt in Dec. 2022
    - [Massachusetts Building Energy Code Adoption by Municipality](#)
    - **Amherst has adopted the Specialized Energy Code**
  - DOER is updating the **stretch energy code** which most municipalities have adopted as a prereq. to enrolling in the **Green Communities Grant Program**
  - When constructing a new building, highly efficient building envelopes with wide-spread adoption of electric heat pumps or other clean heating solutions can be used with little or no extra cost
  - Commission on Clean Heat is considering new standards that create a **uniform and consistent energy performance reporting approach** for a range of building types that cities and towns could opt-in to
    - Reporting can support market transparency and inform the decisions of homeowners, renters, and landlords
- **Strategy B3: Delivering Results at Scale**
  - **Climate finance** programs can help address some of the cost barrier to deploying heat pumps and other clean heat solutions
    - Commission on Clean Heat is considering recommendations for a **climate financing mechanism** that could be used to attract and leverage private capital
  - Commission on Clean Heat has discussed MA setting up a **centralized clean heat clearinghouse** to provide assistance and grant financing to increase the number of buildings using emissions reducing technology
  - **Mass Save:** among the top state-sponsored energy efficiency programs in the U.S.

- Has begun aligning itself with MA's emissions reduction goals
- **Massachusetts Environmental Policy Act (MEPA)** reviews include the environmental impacts of large construction projects and develop approaches to mitigate impacts, including reducing GHG emissions
- MassCEC's **EmPower** initiative supports community-based orgs and non-profits in creating programs or projects that allow underserved populations to access the benefits of clean energy
- **MassCEC** programs seek to encourage the development of innovative technologies and ways to reduce costs for building decarbonization
- **Strategy B4: Infrastructure Planning and Technology Innovation**
  - Transitioning buildings from oil and natural gas to electricity will have significant impacts on the state's electric grid and natural gas distribution infrastructure
  - **Energy infrastructure planning** is important for building decarbonization

## Chapter 6: Transforming Our Energy Supply

### 6.1 Sector Overview

- MA has made significant progress in decarbonizing its electricity generation and energy supply systems
  - Since 1990, power sector emissions decreased by nearly 50%, largely due to closure of coal- and oil-fired plants
- Energy sector in MA produced about 20% of statewide emissions in 2020
- Renewable and clean energy sources – wind, solar, nuclear energy, hydroelectric, etc. – meet about half of the New England grid's total electricity demand
  - Electricity demand projected to increase significantly by 2050
- **Offshore wind** is expected to be the primary source of electricity in a decarbonized system
  - **Solar power** important complementary source
- Solar and offshore wind are intermittent sources of power, so the use of complementary technologies will be needed
  - Such as **firm clean energy** imports, which can generate power 24/7
- 2050 Roadmap Study shows that the transmission and distribution systems will need major upgrades to support decarbonization
- MA will work with ISO-New England and other New England states to improve energy systems

## 6.2: Achieving 53% in 2025 and 70% in 2030 for Electricity Sector

- To achieve the MA economy-wide limits, GHG emissions from the electricity sector must decrease drastically
  - Emissions in 2030 are expected to come from...
    - In-state fossil fuel generation
    - Municipal solid waste combustion
    - Imported fossil fuel generation
- MA and other New England states have instituted policies and regulations to advance the use of clean energy resources
  - Coordination between states is necessary to achieve decarbonization in energy sector and allow the entire Northeast to transition to clean energy
- **GHG Emissions Sublimits for Electric Power**
  - The sublimit for the electric power sector is a 53% reduction from 1990 level in 2025 and a 70% reduction in 2030
- **Strategy E1: Execute Clean Energy Procurements**
  - Current clean energy procurements planned to be in service by 2030 will help MA achieve deep decarbonization
  - Offshore wind is an abundant resource that MA can use as a driver of economic development and emissions reductions for the New England electricity grid
  - Developing and sharing clean energy resources across more technologies and broader areas has been shown to reduce costs and increase grid reliability
  - **New England Clean Energy Connect (NECEC)** transmission project is a critical component of MA's ability to achieve its emissions limits
  - Various sources of clean energy will be needed to meet the net zero goal
- **Strategy E2: Clean Energy Attribute Markets**
  - Various **portfolio standards** require that MA's electricity suppliers sell an increasing share of electricity from clean resources
  - MassDEP has proposed to increase the Clean Energy Standard (CES) minimum standard to 60% by 2030
    - CES includes clean energy that doesn't qualify for other standards, such as nuclear and large hydroelectric generation
  - The various standards will require clean energy supply to serve more than 75% of MA's electric load
  - **The Electric Generator Units (EGU) emissions cap** sets a declining cap on carbon dioxide emissions from large power plants in MA



- RGGI (Regional Greenhouse Gas Initiative): a market-based program to reduce emissions from electricity generation in the Northeast
- **Strategy E3: Develop and Coordinate Regional Planning and Markets**
  - Regional cooperation between Northeast states on electricity system planning and advancing electricity market reforms will be necessary to achieve a decarbonized electricity grid
  - Necessary reforms include
    - Market-based mechanisms to encourage growth in clean energy resources
    - Planning that proactively addresses state clean energy needs
    - Ensure grid resiliency and reliability
  - New England States Committee on Electricity (NESCOE) issued recommendations in 2021 on how to begin to address the misalignment between the regional electricity system and states' decarbonization goals
    - Consistent with the direction of the Federal Energy Regulatory Commission (FERC)
- **Strategy E4: Support Offshore Wind and Solar Industry Development**
  - SMART program launched in 2018 incentivizes the use of more solar panels via a declining block tariff
  - MA and the region will need to deploy **increasing solar generation** over next few decades to meet increased electricity demand in 2050
    - The estimated solar resources needed in 2050 would be greater than the total area of rooftops in the region
  - DOER started a study in 2022 to analyze what locations would be better for solar in MA and create policy recommendations
  - **Challenges to deployment of solar resources:** interconnection of distributed energy resources and impacts on natural and working lands
  - **Offshore wind** is one of the most reliable clean energy resources available to MA
    - Critical to the development of a low-cost decarbonized electricity system for the region
  - To develop offshore wind industry, MA must ...
    - Work with nearby states to design transmission systems to integrate the many offshore wind sites on the East Coast
    - Build vibrant local economy around offshore wind that creates new jobs and economic investment in MA
      - MA already leading country in the offshore wind industry

- Work with other states and BOEM (federal agency) to explore the expansion of offshore wind areas in federal waters
- ***Strategy E5: Incorporate Decarbonization Goals into Distribution System Modernization***
  - Distribution system planning and grid modernization will be needed to maintain a reliable system as clean energy policies increase the amount of distributed energy resources (DERs) interconnected to the grid
  - Grid modernization includes using analytics to monitor and potentially control electricity usage
    - This could mean consumers will have access to current emissions rates of power plants, allowing them to reduce energy consumption when emissions are high
  - Planning is especially needed because electrification of the Transportation & Building sectors is a dominant decarbonization strategy for MA
- ***Strategy E6: Driving a Just Clean Energy Transition***
  - To effectively consider environmental justice and equity in energy transition planning, MA must...
    - Ensure that siting/permitting considers the impacts of energy projects on EJ populations
    - Including voices of those traditionally underrepresented in policy/regulatory decisions
    - Ensuring well-paying jobs and economic benefits reach those traditionally left out of such benefits
  - Incorporate diversity and equity in all programs and regulator processes - “learning by doing” philosophy
  - DPU and Energy Facilities Siting Board (EFSB) are developing Enviro Justice strategies, including a public engagement plan
    - Developing ways to improve the accessibility of public notices and increase public involvement in processes, particularly to those with limited English proficiency in EJ communities

## Chapter 7: Greenhouse Gas Emissions from non-energy sources and industrial use

### 7.1 Sector overview

- Massachusetts has a small industrial sector- but it consumes electricity, natural gas, and petroleum to manufacture products such as kilned ceramics, semiconductors, and heavy equipment.
- In 2020, emissions from industrial energy were about 3.2 MMTCO<sub>2</sub>, which was about 5% of Massachusetts's gross total emissions.

### 7.2 Achieving 35% in 2025 and 48% in 2030 in the industrial energy and other sectors

- The commonwealth will enact policies that will achieve zero growth rate industrial and non-energy greenhouse gas emissions.
- The commonwealth is working to greatly reduce sublimit levels to reduce the state's overall emissions rates, except the industrial processes, which have quadrupled from the 1990 level.
- Massachusetts has made strategies and plans for 2025 and 2030 to achieve emissions requirements, excluding agricultural sectors.
- Strategy N1: Target non-energy emissions that can be abated or replaced
  - Minimizing growth of non-energy emissions, which has previously been impactful.
- Strategy N2: Implement best practices around residual non-energy emissions
  - Reducing solid waste in all sectors
  - Stabilize emissions from wastewater processing
    - Anerobic digestors would help the treatment process avoid methane emissions
  - Improving soil health to reduce agricultural greenhouse gas emissions

## Chapter 8: Protecting our Natural and Working Lands

### Introduction to NWL (Natural Working Lands)

- The benefits of NWL, called ecosystem services, include
  - Clean air and water
  - Wildlife habitat
  - Carbon sequestration

- Recreational opportunities
  - Food and wood production
- Massachusetts's NWL stores about 0.6 gigatons of CO<sub>2</sub>.
- The Commonwealth is working to protect these lands.

### 8.1: An overview of NWL in Massachusetts

- There are 4 categories of NWL, they are listed below along with their percentages.
  - Forests, 57%
  - Settlements, 25%
  - Wetlands, 10%
  - Croplands and Grasslands, 7%
- NWL mitigates climate change by capturing CO<sub>2</sub> and storing it in biomass and soils. This process is called carbon sequestration. The plants on these lands also remove CO<sub>2</sub> from the atmosphere through the process of photosynthesis, which is unique to plants.
- These lands have negative net emissions, which means that they sequester carbon.
  - Most of CO<sub>2</sub> sequestration in Massachusetts is thanks to forest land.
  - 65% of forest land is privately owned.
  - The state of Massachusetts owns 525,000 acres of forest land.
- Massachusetts has about 1.3 million acres of settlement land, trees and forests which account for about 25% of the state's area. These lands' net sequestration was 1.3 MMTCO<sub>2</sub> in 2019. But, planting more trees on these lands can increase the net sequestration through biomass and increase photosynthesis.
- Massachusetts is protecting wetlands as well, which in Massachusetts, are mostly freshwater.

#### Forest land

- Accounts for over 50% of Massachusetts land
- 82% of non-working land carbon sequestration occurs on forest land.
- Timber harvest has declined by 62% while carbon stock in forest land has increased by 66%, and natural mortality has increased by over 200% between 1985 and 2019.
  - This mortality has increased dramatically due to the increase in invasive species and increased frequency of severe weather events.
- Forest lands are managed by the state for wildlife habitat, water supply protection, public recreation, wood production, and to demonstrate sustainable forestry.

#### Settlement land, trees and forests

- 25% of land in Massachusetts is settlement land, which is 1.3 million acres
- Net carbon sequestration on settlement lands was 1.3 ZMMTCO<sub>2</sub>e in 2019.

#### Wetlands

- Wetlands account for 0.5 million acres of Massachusetts, which is about 10%
- Wetland alteration can release methane gas
- Salt marshes are facing environmental stressors such as sea level rise, pollution, and flow alterations. These factors can contribute to the breakdown of a salt marsh.
- Protecting marshes is especially important

#### Croplands and grasslands

- These lands account for 7% of Massachusetts lands
- These lands sequester carbon in its vegetation and soil
- Massachusetts is introducing a Farmland Action Plan
  - Farmland protection, access, food security, economic and environmental viability

### 8.2 Goals for Natural Working Lands for 2025 and 2030

- 1.4 million acres and 27% of Massachusetts land is protected from development, but the goal is 30% by 2030
- The Commonwealth of Massachusetts has the following goals for Natural Working Lands
  - Incentivize 20% of privately owned forests and farms to adapt to climate smart management practices by 2030
  - Plant more than 5000 acres of new urban/riparian trees by 2025, and 16,100 acres by 2030
  - Achieve no net loss of stored carbon in wetlands by 2030
  - Incentivize increased utilization of harvested wood in durable products

### 8.3 Strategies and Policies for Natural Working Lands

- Natural Working Land Plan facilitates achievement of goals
  - Protect, manage, restore NWL
  - Explore additional carbon sequestration solutions
- Strategy L1: Keep Natural Working Lands as Natural Working Lands
  - Expand landscape and watershed scale conservation
    - Prioritize protecting forests vulnerable to development, carbon rich forests, wetlands, and upstream areas.

- Increase annual budget of land protection grants and programs
    - No net loss of forest and farmland
    - Encourage Natural Working Land conservation
  - Limit Natural Working Land development
    - Adopt Natural Resources Protection Zoning, NRPZ, and tree protection bylaws.
- Strategy L2: Manage Natural Working Lands
  - Forest Resilience program
  - Launch of a soil health program through the Massachusetts Department of Agriculture
- Strategy L3: Restore natural working lands
  - Increase tree coverage in non-forested areas
  - Launch the Riparian Tree Planting Program
  - Increase greening the gateway cities program funding
    - Accelerates urban tree plantings in environmental justice communities
  - EEA will dedicate at least \$3 million per year in the municipal vulnerability preparedness program
  - Improve and expand wetland restoration
    - No net loss of stored carbon in wetlands
- Strategy L4: Incentivize long lived durable wood products
  - Locally harvested wood has a lower carbon footprint than materials such as steel
  - The Department of Conservation and Recreation (DCR) will collect more data on wood harvesting and mill recovery
  - DCR will expand the forest viability program to fund technical assistance and financial incentives for timber efficiency.
- Strategy L5: Explore additional carbon sequestration
  - Developing carbon sequestration accounting framework by 2025
    - Eligibility, registry, measurement, crediting, monitoring and enforcement

# Chapter 9: Employment, Macroeconomic Impact, and Equity Analysis of the 2025 & 2030 Decarbonization Plan

## 9.1 Research Methodology

- Research was conducted through extensive literature review and economic modeling
- IEO's: Initial employment outputs- are estimates in changes in the numbers of jobs.
- SEO's: secondary employment outputs are estimates of how employment will change by occupation, wage and geographical region.

## 9.2 Employment and Economic Impacts of Decarbonization

- IEOs
  - In 2019-2030, the number of jobs added is going to be 4x the number of jobs lost.
  - There will be an 8% increase in employment
    - 22,600 full time jobs will be created between 2019-2030
      - Electricity sector: +10,700 jobs by 2030
      - Buildings sector: +7,100 jobs by 2030
      - Other sources of jobs from sectors including EV, solar, residential buildings, transmission, and offshore wind
      - Construction jobs account for 59% of net jobs created
- SEO's
  - Installation, maintenance and repair jobs make up 79% of new energy related jobs
    - But, about 96% of these are current positions held by men
  - Management and Professional roles will increase by 20%
  - 95% of energy related jobs by 2030 will earn at least \$25 per hour
- Household energy expenditure impacts
  - Increased adoption of electrified transportation and heating systems mean that the average household will spend less money on energy every year.
    - Projected to decline by 8% with average household savings of \$400 per year
    - People in environmental justice communities are projected to see a greater percentage of savings at 11%
- Other social, economic and environmental benefits
  - Air quality improvements will increase health and avoid healthcare costs

- Decarbonization plans in each sector present benefits throughout Massachusetts
  - Health benefits
  - Less greenhouse gas emissions
  - Less air pollutants
  - Increasing energy security
  - Decreasing energy cost
  - Increasing energy efficiency
  - Increasing water quality
  - Reducing power and maintenance costs

## How can students and higher education play a role?

- Being mindful of how much energy they use, and especially the origin and impacts of that energy
- Changing habits to reduce fossil fuel consumption
  - Using public transportation
  - Supporting the PVTA and other public transportation
  - Carpooling, walking and biking when able
- Universities and colleges can partner with MA agencies to develop technologies or conduct research to support decarbonization
- Opportunities for public comment on future iterations of the CECP or similar plans
  - [The Global Warming Solutions Act \(GWSA\) Public Meetings | Mass.gov](#)
- Students can learn about efforts being made to support decarbonization by UMass and the towns/cities they live in
- Consider decarbonization when voting for or supporting politicians
  - MA governors impact the passage of relevant laws and appoint the Secretary of the EEA