Appendix A: Advisory Panel Recommendations

Transportation Advisory Panel

Recommended Strategies

May 3, 2021

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NEW YORK STATE OF OPPORTUNITY. Climate Action Council

Transportation Advisory Panel members

- Marie Therese Dominguez, Chair, NYSDOT
- Jared Snyder, NYSDEC
- Julie Tighe, New York League of Conservation Voters
- Kerene Tayloe, WE ACT for Environmental Justice
- Nick Sifuentes, *formerly TriState Transportation Campaign**
- Bob Zerrillo, New York Public Transit Association
- Porie Saikia-Eapen, Metropolitan Transit Authority
- Steve Finch, AAA Western & Central New York
- Nancy Young, Airlines for America
- Dimitris Assanis, Stony Brook University
- Craig Turner, Buffalo Niagara International Trade Gateway Organization
- Paul Allen, M. J. Bradley & Associates
- John Samuelsen, Transport Workers Union of America AFL-CIO
- Kendra Hems, Trucking Association of New York
- Elgie Holstein, Environmental Defense Fund
- Renae Reynolds, *formerly New York City Environmental Justice Alliance*
- Albert Gore, Tesla

Public and Stakeholder Input Process

Panel Meetings: The Transportation Advisory Panel held 12 full Panel meetings that were open to the public; all meeting presentations and notes have been posted to climate.ny.gov.

Public Engagement Sessions: Input from the public received during virtual forums in December 2020 and February 2021 and written comments are being received via email and mail.

Climate Action Council Engagement: Input from the CAC received in December 2020.

Cross Panel Coordination: Input from Ag & Forestry, Waste, Power Gen. and LULG Advisory Panels January – March 2021; input from the Climate Justice Working Group and Just Transition Working Group in February 2021.

Expert Participant Engagement:

December 2020: Public Transportation, Smart Growth and Electrification & Fuels round tables

January 2021: Market Based & Finance round table

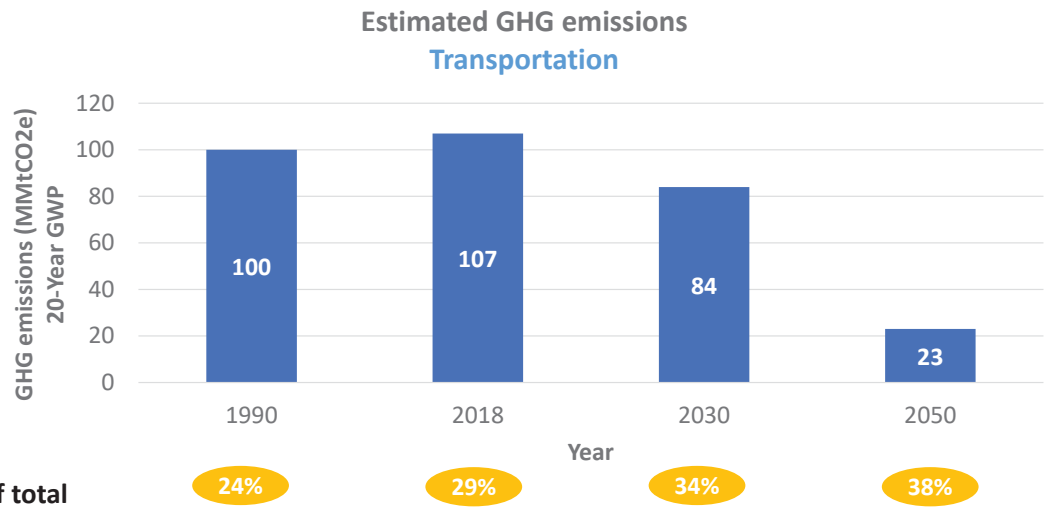
March 2021: Environmental Justice and Health round table.

April 2021: Freight and Logistics round table.

Written comments will continue to be accepted through 2021: E-mail: transportation.publiccomment@dot.ny.gov

Letter: Transportation Advisory Panel: C/O Abigail Schultz, 6th Floor, Room 6N23, 50 Wolf Road, Albany, New York 12232

Aggregate GHG emissions impact of Transportation panel recommendations



% of total NY emissions

Scope (2018 Subtotal):

- Fuel Combustion (80mmt)
- *Imported Fossil Fuels (27mmt)*

2018 emissions data are preliminary draft

Electrification

Mitigation strategy summary

Initiative #	Description	Action type	Emissions impact	Ease of implementation	Cost
1	Transition to 100% zero-emission light duty vehicle sales	Regulatory, Financial, Legislative	High	Medium	$$$
2	Transition to zero emission Medium/Heavy Duty Vehicles & Non-Road Vehicles	Regulatory, Financial, Legislative	High	Medium	$$$

*Note: Draft recommendations and associated timeframes that include regulations will depend on the type of regulation and its governing body and legislation, State Administrative Procedure Act rulemaking requirements and timelines, an ongoing assessment of feasibility, impacts and analysis of what timeframes are needed to meet New York State's climate goals.

Mitigation strategy: 100% Zero Emission Passenger Vehicles - Overview

Description:	Transition to 100% zero-emission light duty vehicle sales		
Action type:	Regulatory, Financial, Legislative		
GHG reduction by 2030:	High	**GHG reduction by 2050:**	High
Cost and funding considerations:	$$$ - Nearly $1B in ratepayer and NYPA funding is already committed for EV charging station installations. ZEV incentives can be supported through a revenue-neutral feebate, but additional assistance may be needed to help LMI New Yorkers replace old gasoline vehicles with ZEVs		
Ease of implementation:	Medium – some elements of this strategy have already been implemented in NYS; others are new to NYS but have been tried elsewhere		

Risks / Barriers to success	Possible mitigants
1. Lack of consumer awareness/interest and consumer concerns about technology & charging/fueling 2. Potentially high cost of supporting charging/fueling infrastructure and ZEV incentives 3. Unmanaged charging could have significant costs for electric grid operators/ratepayers	1. Coordinated and cooperative marketing campaign with industry partners 2. ZEVs are expected to reach price parity with gasoline cars by 2028; charging stations and fueling stations are better investments with more ZEVs on the road 3. Utility managed charging programs and TOU rates can help shift charging to lower cost off-peak times

Mitigation strategy: 100% Zero Emission Passenger Vehicles – Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Adopt Zero Emission Vehicle sales regulations	DEC	1-2 years	NYSERDA, OEMs, car dealers, utilities
Feebate/ZEV purchase incentives: feebates would offer a rebate for ZEVs funded by a small fee on gasoline vehicles; higher rebates for LMI customers who buy new or used ZEVs. For LMI consumers. complement rebates with affordable financing options	DEC, NYSERDA, DOB	1-2 years	Car dealers, OEMs
ZEV Awareness-Building Activities: jointly fund consumer engagement activities (advertising, educational events, dealer engagement) with local partners and OEMs	NYPA, NYSERDA	6-12 months	Car dealers, OEMs, utilities, local businesses
Reduce ZEV sales barriers: allow direct-to-consumer sales by ZEV-only manufacturers, offer dealer incentives for franchise dealers	Legislature, DMV	6-12 months	OEMs, car dealers
Electrify for-hire vehicles: provide incentives or requirements for FHV owners to purchase ZEVs, support charging/fueling stations for FHVs	DEC, NYSERDA, NYPA, NYC	1-3 years	Taxi owners, ridehailing companies, charging station providers

Mitigation strategy: 100% Zero Emission Passenger Vehicles – Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Clean fuel regulations, such as a Low Carbon Fuel Standard for example, that support ZEV technology deployment	DEC, NYSERDA	1-2 years	Fuel producers, utilities, fleet users
EV Charging/Fueling Station investments, focused on disadvantaged communities, multi-unit dwellings, fast charging, EV-ready building codes: provide rebates and additional direct investment in EV charging stations and hydrogen filling stations	DPS, NYPA, Utilities, NYSERDA, NYGB, DOS	3-12 months	EV charging station developers
Utility Rate Design Changes: direct utilities to implement programs that encourage off-peak charging and/or controlled, managed charging, and to create appropriate rate options for high-powered charging	DPS	6 months-2 years	NYPA, NYSERDA, utilities, technology providers, EV charging station developers, fleet owners

Mitigation strategy: 100% Zero Emission Passenger Vehicles – Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Enhanced incentives for residents of disadvantaged communities are essential for faster ZEV adoption in disadvantaged communities. Incentives that support used ZEV purchases and EV charging at multifamily buildings can be especially effective at increasing ZEV adoption among underserved populations. Local ownership of EV charging stations and workforce development can support economic opportunities in disadvantaged communities.
Health and co-benefits	Zero emission vehicles improve local air quality, with public benefits including improved public health, including a reduction in asthma and other respiratory illnesses. Complement electrification with power sector strategies to phase down reliance on peaking units in or near overburdened communities.
Just transition: businesses and industries, workers	Some ZEV components are made in NYS. New jobs will be created to service and fuel EVs. Installing charging stations will provide employment opportunities. Current repair technicians will likely need to be trained to service EVs. Businesses such as vehicle dealerships, parts manufacturing, gas stations, repair shops, and parts retailers may be adversely impacted as vehicle sales shift from internal combustion vehicles to ZEVs. Workforce development in disadvantaged communities.
Other	Regulatory strategies are aligned with other jurisdictions.

Mitigation strategy: Zero emission trucks, buses and heavy equipment – Overview

Description:	Transition to zero emission Medium/Heavy Duty Vehicles & Non-Road Vehicles		
Action type:	Regulatory, Financial, Legislative		
GHG reduction by 2030:	High	**GHG reduction by 2050:**	High
Cost and funding considerations:	$$$ - Incentives will be needed to encourage fleets to buy zero-emission trucks and help them install ZEV charging/fueling infrastructure until total cost of ownership improves compared to diesel trucks and private financing becomes more widely available		
Ease of implementation:	Medium – some elements of this strategy have already been implemented in NYS; others are new to NYS but have been tried elsewhere		

Risks / Barriers to success	Possible mitigants
1. High upfront costs of electric trucks, buses, and equipment 2. Fleets and private financial institutions have very little experience with the technology 3. High-powered charging and hydrogen fueling can be expensive to install and can lead to high demand charges that make operating ZEVs expensive compared to diesel	1. Total cost of ownership parity is expected by 2030 or sooner; private financing can mitigate upfront costs 2. Data collection and reports from early state-funded projects 3. Support for installing charging infrastructure from utilities, others; creative approaches to utility rates that create appropriate rate options for high-powered charging

Mitigation strategy : Zero emission trucks, buses and heavy equipment -- Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Adopt Zero Emission Vehicle sales regulations	DEC	1-2 years	NYSERDA, OEMs, utilities
ZEV purchase incentives: - Provide incentives for the purchase of ZEV trucks and buses, with a focus on fleets operating in disadvantaged communities, small fleets, and school buses - Provide incentives for the purchase of non-road ZEVs, including airport GSE, cargo handling equipment, construction and farm equipment - Provide incentives or offer buybacks for small engines, including electric yard and garden equipment and small marine vessels, and encourage local electrification requirements	DEC, DOT, NYSERDA, PANYNJ, SED, other port facilities	1-5 years	OEMs, fleet operators, airlines, port operators, school bus operators, construction companies, agriculture industry, yard maintenance/lawncare industry, Ag & Markets
ZEV Equipment Use Requirements for State Fleet, Contractors: require an increasing % of equipment and vehicles used for state-funded projects to be ZEVs, up to 100% by a set date, to be determined based on product and related infrastructure availability	DEC, DOT, OGS, Other State Agencies	3-5 years	Construction companies, manufacturers
Fleet-based ZEV Use Requirements (e.g. ports): require trucks in use at certain types of facilities, such as ports or airports, to be ZEVs by a set date, to be determined based on product and related infrastructure availability, and consider adoption of CA Advanced Clean Fleets rules or portions thereof	DEC, PANYNJ, other port facilities	3-5 years	Fleet operators, airlines

Mitigation strategy : Zero emission trucks, buses and heavy equipment -- Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Clean fuel regulations that support ZEV technology deployment	DEC, NYSERDA	1-2 years	Fuel producers, utilities, fleet operators, airlines
Utility Rate Design Changes: direct utilities to implement programs that encourage off-peak charging and/or controlled, managed charging, and to create appropriate rate options for medium-duty and heavy-duty vehicles and fleets	DPS	6 months-2 years	NYPA, NYSERDA, utilities, technology providers, fleet operators
ZEV Charging/Fueling Station investments: provide rebates and additional direct investment in EV charging stations and hydrogen filling stations	DPS, NYPA, Utilities, NYSERDA, NYGB	3-12 months	Fleet operators
Support electrification-based solutions to idle reduction: - Work with utilities to increase use of cold ironing/shorepower for ships - Support the use of technologies to enable idle reduction - Reduce generator use on construction sites through temporary on-site power and DERs	NYSERDA, DPS, Utilities, OGS, DASNY	3-5 years	Fleet operators, marine operators, construction companies, developers
Develop strategies to ensure availability of fuel and power for emergency fleet operations and essential public transportation during power outages	DOT, DPS, utilities, Transit operators	3-5 years	Fleet operators

Mitigation strategy: Zero emission trucks, buses and heavy equipment – Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Diesel trucks and port equipment are one of the largest sources of local air pollution in disadvantaged communities. Removing diesel trucks and port equipment from use and replacing them with ZEV trucks and equipment would have a sizable impact on improving air quality in disadvantaged communities. Local ownership of electric trucks and buses and their associated infrastructure can support economic opportunities in disadvantaged communities. Incentives can be targeted to disadvantaged communities, guided in part by results of community air monitoring.
Health and co-benefits	Although they comprise only a small portion of total vehicles in the state, diesel trucks and buses are responsible for 30% of total PM and NOx emissions from mobile sources. Policies that encourage electrification of trucks, buses, and non-road equipment will generate significant public health benefits. These benefits will accrue across the state but will be especially noticeable along major highways and thoroughfares and in areas proximate to heavy industrial traffic, such as warehouse districts and ports which are often located near disadvantaged communities. Adopt complementary in-use standards to reduce emissions from existing diesel fleet.
Just transition: businesses and industries, workers	Some ZEV trucks, buses, and construction equipment and their components are made in NYS. New jobs will be created to service and fuel ZEVs; training needed for current service technicians. Installing charging stations will provide employment opportunities. Businesses such as vehicle dealerships, parts manufacturing, gas stations, repair shops, and parts retailers may need to adapt as vehicle sales shift from internal combustion vehicles to ZEVs. Workforce development in disadvantaged communities.
Other	Regulatory strategies are aligned with other jurisdictions.

Public Transportation

Mitigation Strategy – Enhanced Public Transportation/Mobility

Initiative #	Description	Action type	Emissions impact	Ease of implementation	Cost
1	Identify implementable strategies to significantly enhance the availability; accessibility; reliability; and affordability of public transportation services with an emphasis on unserved/underserved communities. This includes: • Doubling the service availability/accessibility of municipally sponsored upstate and downstate suburban public transportation services statewide; and. • Implementing policies and programs that support system reliability/network expansion projects identified by the Metropolitan Transportation Authority (MTA) in their current five-year capital pan/twenty-year needs study.	Legislative, Regulatory, Financial	Low/Medium	Medium	$$$

Transportation Oriented Development - Overview

Description:	Transportation Oriented Development		
Action type:	Legislative, Regulatory, Financial		
GHG reduction by 2030:	Low/Medium	**GHG reduction by 2050:**	Medium
Cost and funding considerations:	• Requires new incentives to incorporate community/public transportation friendly development/redevelopment. • Disincentivizing auto dependency/congestion through pricing/parking strategies. • Compels - as a condition of funding/environmental approval - Industrial Development Agencies (IDA) and Metropolitan Planning Organizations (MPO) to participate in the development/implementation of integrated transportation/land-use plans.		
Ease of implementation:	Medium/Hard – May infringe upon exiting local "Home Rule" governance authority.		

Risks / Barriers to success	Possible mitigants
1. Requires fundamental changes to local land use planning/local home rule. 2. May separate the construction/purchase of parking spaces from residential/commercial development. 3. Funding and finance policies to support recommended strategies.	1. Rely on incentives to encourage community-based development approach as opposed to requirements. 2. Develop integrated transportation/land-use plans. 3. Create special assessments/districts to support projects (e.g., TIF, Congestion/Parking Pricing, proceeds from market-based policies).

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Convenience/Connectivity - Overview

Description:	Convenience/Connectivity		
Action type:	Legislative, Regulatory, Financial		
GHG reduction by 2030:	Low/Medium	**GHG reduction by 2050:**	Medium
Cost and funding considerations:	• Operating and capital costs to: ▪ Provide first mile/last mile connectivity through accessible and integrated infrastructure. ▪ Increase the number of destinations that are accessible by public transportation, walking and biking. ▪ Increase service frequency, reliability and hours of operations. ▪ Increase the number of mobility options (e.g., micro-transit, micro-mobility). ▪ Provide high-quality amenities at public transportation facilities/stops. ▪ Accelerating new phone/app-based application technologies that provide real-time schedule information/makes transit easier to use.		
Ease of implementation:	Medium – Requires expanding travel technology development/deployment to public transportation.		

Risks / Barriers to success	Possible mitigants
1. Access to/understanding of new technology/trip planning platforms. 2. Funding and finance policies to support recommended strategies. 3. Influences of emerging technologies on services, workforce, deployment of new technologies.	1. Partner with State/county departments of labor and health and human service organizations to create neighborhood-based mobility management/travel training centers. 2. Create special assessments/districts to support projects (e.g., Tax Increment Financing, Congestion/Parking Pricing, proceeds from market-based policies). 3. Develop/partner with existing community-based organizations on STEM initiatives.

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Fleet Modernization - Overview

Description:	Fleet Modernization		
Action type:	Legislative, Regulatory, Financial		
GHG reduction by 2030:	Medium	**GHG reduction by 2050:**	Medium
Cost and funding considerations:	• Procuring new zero-emission public transportation vehicles appropriate for the community being served. • Partnering with utility companies to consider opportunities for transportation right-of-way to generate energy for public transportation services. • Investigating developments in hydrogen fuel cell bus technologies/other renewable fuels.		
Ease of implementation:	Medium – Requires new workforce skills to operate/maintain rollingstock; manufacturer capacity/capability to support.		

Risks / Barriers to success	Possible mitigants
1. Funding and finance policies to support recommended strategies. 2. Influences of emerging technologies on services, workforce, deployment of new technologies. 3. Costs related to infrastructure/availability of parts/supplies. 4. Availability of alternative fuels (e.g., electricity, hydrogen). 5. Federal "payback" if vehicle replaced prior to FTA-rated service-life.	1. Create special assessments/districts to support projects (e.g., TIF, Congestion/Parking Pricing, proceeds from market-based policies). 2. Develop/partner with existing community-based organizations on STEM initiatives. 3. Establish price signals to suppliers/manufactures to ensure availability. 4. Provide direct capital subsidies to address incremental costs of zero-emission vehicles. 5. Petition USDOT to waive repayment for vehicles replaced prior to the expiration of the rated-service life, provided replacement vehicle is zero-emission.

Mitigation strategies – Enhanced Public Transportation/Mobility - Components of the Initiatives

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Procure/deploy all-electric/zero-emission – expansion and replacement - public transportation vehicles/recharging capacity.	DOT, OGS	7-10 years	NYSDEC, NYSOGS, NYSERDA, Manufacturers utilities, municipal sponsors/authorities.
Provide new incentives to incorporate community-based/public transportation friendly development/redevelopment that mitigates harmful GHG emissions.	DOS, NYSERDA	1-2 years	DEC, DOT, OGS, municipal sponsors/authorities, NYS Commercial Association of Realters, Environmental Justice Alliance, NYS Association for Affordable Housing, other.
Enhance service availability; accessibility; and affordability.	DOT, municipal sponsors/authorities	2-5 years	Federal Transit Administration, Industrial Development Agencies.
Make ready costs for support facilities.	NYPA, DPS, Utilities	1-2 years	DEC, NYSERDA, DOT.
Utility Rate Design Changes	DPS	6 months-2 years	NYPA, NYSERDA, Utilities.
Require inclusion of public transportation considerations early in local/regional planning and development processes.	DOS	3-years	DOT, municipalities, developers/realters.

Mitigation strategies - Enhanced Public Transportation/Mobility - Benefits and Impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	• Mitigating transportation related pollution levels in overburdened communities by accelerating the deployment of zero-emission bus fleets/modernizing rollingstock support facilities; engage impacted communities in development of strategies • Enhancing service availability; accessibility; and affordability; of public transportation services for individuals in rural and urbanized areas. • Making public transportation easier to use/understand. • Providing direct connectivity to longer-distance bus/passenger rail services. • Avoid policies that lead to gentrification
Health and co-benefits	• Reducing harmful pollutants/enhancing air quality. • Mitigating higher asthma/other respiratory illnesses caused by carbon/pollutants. • Facilitating a holistic approach to community development/reducing the environmental footprint of transportation on communities. • Reducing per capita growth in vehicle miles traveled.
Just transition: businesses and industries, workers	• Creating new targeted opportunities/investments in STEM initiatives/disadvantaged communities. • Developing new supply chain/manufacturing capability/capacity and workforce. • Accelerating deployment/implementation of new technologies that support travelers/makes transit easier to use. • Developing/implementing new sustainable building practices and renewable energy innovation into stations/support facilities.
Other	• Provide increased access to existing/attract new retail, hospitality, entertainment venues located within an enhanced transportation improvement district.

Smart Growth

Mitigation Strategies – Smart Growth and System Efficiency

Initiative #	Description	Action type	Emissions impact	Ease of implementation	Cost
1	Support Transportation-Oriented Development (TOD) that enables greater use of public transportation and other low-carbon modes	Legislative, Agency/Program, Financial	Low/Medium	Hard	$$
2	Expand the availability of low carbon transportation modes (biking, walking, carpooling, ride-sharing, micro-transit) statewide	Agency/Program, Financial	Low/Medium	Medium	$
3	Increase Smart Mobility and connected & automated vehicle deployments across NYS to improve transportation system efficiency	Agency/Program, Regulatory, Financial	Low/Medium	Medium	$

Mitigation strategy: Transportation Oriented Development – Overview

Description:	Broaden the traditional concept of Transit-Oriented Development into the concept of Transportation-Oriented Development (TOD) for purposes of aligning land use, development and transportation funding with the goals of doubling public transportation upstate and significantly increasing services downstate by 2035.		
Action type:	Legislative, Agency/Program, Financial		
GHG reduction by 2030:	Low	**GHG reduction by 2050:**	Medium
Cost and funding considerations:	$$ - will require considerable alignment and coordination and inclusion of supportive services in programs		
Ease of implementation:	Hard		
Example case studies:			

Risks / Barriers to success	Possible mitigants
Will require a great deal of inter-governmental, inter-program coordination. The regional, multi-municipal nature of the effort may invoke Home Rule concerns.	Consider building off of existing regional entities and plans, such as the REDCs, NYSERDA Regional Sustainability Plans, NYSERDA Clean Energy Regional Coordinators and DEC Climate Smart Regional Coordinators.

Mitigation Strategy – Transportation-Oriented Development – Components of the Strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Create policies that support local efforts to reduce or eliminate parking requirements to support infill development near public transportation.	DOT, DOS	1-2 years	Municipalities
Encourage and/or require local governments to offer density bonuses around transit, reduced parking requirements, complete streets, other programs that improve transportation system. Expand/emulate NYC Dept of City Planning policies that require easements and access improvements in exchange for density bonuses for projects around rail to other areas and transit entities in the State	DOS, DOT, MTA, NYC	1-3 years	Municipalities, planners, developers
Create a revolving fund or grant program to support GEIS' for re-zonings and projects in TOD districts or overlay zones—if a developer agrees to build according to the TOD zoning and accepts certain community benefits components, such as affordable housing, green infrastructure, green building or public spaces, the developer will pay back into the fund a portion of the cost of the GEIS.	DOT, DOS	1-2 years	Municipalities
Provide technical support (possibly through DOS Smart Growth, NYSERDA Regional Clean Energy Coordinators or DEC Climate Leadership Regional Coordinators and planning grants to local governments to improve their planning and zoning process to reflect transportation- and transit-oriented development.	DOT, DOS	1 year	REDCs, Chambers, planners, transit operators

Mitigation Strategy – Transportation-Oriented Development – Components of the Strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Support the inclusion of freight considerations in planning and zoning decisions • Incentivize location of intermodal facilities (i.e. rail/truck) near transportation corridors eliminating need for longer- distance deliveries • Develop policies on last-mile freight delivery/warehousing in the context of community planning	DOS, DOT	2-3 years	Freight operators, municipalities
Establish a definition and criteria for TOD to be used by state, regional and local entities to evaluate projects and project funding and include in definitions of Priority Development Areas (see LULG initiatives); incorporate the definition of TOD into the State Smart Growth Public Infrastructure Policy Act.	DOT, DOS	6-9 months	Transit agencies, developers
Produce research and materials that demonstrate links between planning & transportation, impacts on local finances • Develop public relations and marketing materials for the public, municipalities and stakeholders that cogently explain the benefits derived from linking municipal/county/regional planning and public transportation infrastructure, jobs, housing, equity and climate change, among others. Incorporate these materials and messages into all relevant state, regional and local venues. • Work with and support the LULG AP's recommendation to create an on-line, iterative, interactive Sustainable Development/Climate Handbook with case studies to help municipalities, CBOs and developers navigate and integrate state assistance • Help develop fiscal impact analyses of smart growth compared with sprawl, regarding both public infrastructure investments for each and tax revenues generated.	DOT, DOS, DEC, NYSERDA	1-2 years	REDCs, Chambers, municipalities, developers, transit operators

Mitigation Strategy – Transportation-Oriented Development – Benefits and Impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Expanding Public transportation, with concomitant land use alignment and coordination, will help lower-income households that spend a disproportionate amount of income and time commuting. Both TOD provides enhanced opportunities for affordable/mixed-income housing within existing communities, which helps address displacement and gentrification. Engage communities in decision-making.
Health and other co-benefits	Any reduction in VMT/transportation-based GHG emissions will improve air quality and help reduce the incidence of disease caused or exacerbated by air pollution. Communities that are walkable/bikeable and provide safe and accessible outdoor spaces promote greater physical activity, which yields enhanced wellbeing and reduces the risk of chronic disease (often referred to as "Active Living by Design"). Communities that enable and promote social interaction, partly through safe and accessible public gathering spaces and walkable design, will generate positive mental health benefits by reducing social isolation, particularly for older New Yorkers who suffer greater incidences of depression and anxiety due to isolation. Access to health care facilities will also be enhanced. The health care system, like the energy system, has become more dispersed and distributed. Locating health clinics and other facilities within communities, and ensuring proximity and access to such services through walkable, bikeable and transit-friendly infrastructure, will help overcome health disparities of disadvantaged communities/communities of color.
Just transition: businesses and industries, workers	As jobs and job locations shift, public transportation and land use will need to align with those changes. In the past, lower-paying/-skilled jobs were an afterthought, leaving disadvantaged communities behind; this initiative allows the state to plan for job shifts to occur simultaneously with the transition to a clean energy economy.
Other	Investments in smart growth—particularly re-development of existing buildings in developed areas—yields significantly greater tax revenues per acre for a municipality and requires significantly less infrastructure costs (construction and maintenance) than sprawling development.

Mitigation strategy: Low-Carbon Modes – Overview

Description:	Facilitate creation of a multi-modal ecosystem with focus on connectivity, accessibility and first/last mile options		
Action type:	Agency/Program, Financial		
GHG reduction by 2030:	Low	**GHG reduction by 2050:**	Medium
Cost and funding considerations:	$ - requires inter-agency coordination and public/private coordination.		
Ease of implementation:	Medium		
Example case studies:			

Risks / Barriers to success	Possible mitigants
1. Required coordination among multiple parties (state, local government, transit, operators of other modes) 2. Challenging business model for shared mobility outside large cities	1. Show state leadership and provide the appropriate tools to other stakeholders that make it easier for them to coordinate 2. Provide operating support where appropriate and support local infrastructure improvements to make multiple modes possible

Mitigation Strategy – Low-Carbon Modes – Components of the Strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Prioritize, incentivize and expand access to funding for bike, pedestrian, transit, and complete streets projects that serve employment centers. • Expand micro-transit options and ride-sharing • Facilitate development of electronic mobility platforms offering seamless multi-modal trip planning and payment options to make public transportation more attractive, accessible and user-friendly • Require that TNCs, bike-share companies and micro-transit operators provide booking APIs to transit agencies operating electronic mobility platforms at transit agencies' request allowing seamless multi-modal trip planning and payment options for customers.	DOT, MTA, Transit operators	1-3 years	Transit operators, mobility providers, municipalities
Support the infrastructure required to shift freight to lower-emission modes, like rail	DOT	1-2 years	Freight operators, municipalities
Prioritize local projects that establish low-emission transportation zones, car-free streets, and similar concepts	DOT, DOS, NYSERDA	2-3 years	Municipalities
Support and inform the MTA's efforts to develop a "First-Mile/Last-Mile Toolkit"; adapt the tool-kit to Upstate transit areas.	DOT	2 years	Truckers, municipalities

Mitigation Strategy – Low-Carbon Modes – Components of the Strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Support Transportation Demand Management behavioral and perceptual changes, such as public art and aesthetic architectural design of stations.	DOT, NYSCA	1 year	Transit agencies
Support businesses in providing low-carbon transportation options: • Encourage and provide technical assistance to businesses seeking economic development incentives (local or state) to consult transit agencies early when seeking to locate or expand in areas with existing multi-modal options and provide services for employees (employee-based trip reduction programs, transit/micro-transit services, ride-sharing, bike-sharing, cycling accommodations, free/reduced transit passes) • Offer local and state tax credits for businesses that accommodate employee public transportation and TDM alternatives and for employees who use alternative mobility options.	DOS, DOT, NYSERDA, DEC, ESD	2-3 years	REDCs, Transit operators, planners, regional planning councils, Chambers, freight operators, economic development authorities

Mitigation Strategy – Low-Carbon Modes – Benefits and Impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Providing and expanding access to public transportation in the context of business location and economic development will largely help provide access to jobs among lower-income/lower-skilled employees since those individuals often need to travel the farthest and spend more money to commute to those jobs.
Health and other co-benefits	Any reduction in VMT/transportation-based GHG emissions will improve air quality and help reduce the incidence of disease caused or exacerbated by air pollution. Communities that are walkable/bikeable and provide safe and accessible outdoor spaces promote greater physical activity, which yields enhanced wellbeing and reduces the risk of chronic disease (often referred to as "Active Living by Design"). Communities that enable and promote social interaction, partly through safe and accessible public gathering spaces and walkable design, will generate positive mental health benefits by reducing social isolation, particularly for older New Yorkers who suffer greater incidences of depression and anxiety due to isolation. Access to health care facilities will also be enhanced. The health care system, like the energy system, has become more dispersed and distributed. Locating health clinics and other facilities within communities, and ensuring proximity and access to such services through walkable, bikeable and transit-friendly infrastructure, will help overcome health disparities if disadvantaged communities/communities of color.
Just transition: businesses and industries, workers	As jobs move and change in the transition to a clean energy economy, businesses will need to accommodate their employees' commuting needs.
Other	

Mitigation strategy: Smart Mobility & Connected / Automated Vehicles – Overview

Description:	Improve transportation system efficiency through policies, technologies, and investments that reduce congestion and increase safety using connectivity, automation, and other innovative approaches		
Action type:	Regulatory, Financial		
GHG reduction by 2030:	Low	**GHG reduction by 2050:**	Medium
Cost and funding considerations:	$ - Implementing connected and automated technologies for transportation will require new infrastructure investments but will generate GHG, economic, safety, and congestion reduction for mobility users statewide		
Ease of implementation:	Medium – some elements of this strategy have already been implemented in NYS; others are new to NYS but have been tried elsewhere		
Example case studies:	15-20% fuel efficiency improvements shown to be achievable through connected vehicles		

Risks / Barriers to success	Possible mitigants
1. Unproven technologies for connected, automated vehicles 2. Automated vehicles could increase overall VMT, including "empty VMT," increasing energy use and emissions 3. Multijurisdictional challenges for coordinating infrastructure compatibility across municipal boundaries	1. Support for R&D, pilot/demonstration projects 2. Policy measures to encourage/require automated vehicles to be ZEVs, discourage empty VMT 3. Need for state leadership from DOT to encourage collaboration, interoperability, data sharing across jurisdictions

Mitigation strategy: Smart Mobility & Connected / Automated Vehicles – Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Invest in R&D, demonstrations of emerging intelligent transportation systems (ITS), connected and automated vehicles	NYSERDA, DOT	1-5 years	Technology providers, local governments
Fund the broader adoption of technologies that prove effective in improving transportation system efficiency, such as smart parking systems, adaptive traffic lights, IoT-enabled streetlights	DOT, NYPA, NYSERDA, DPS	1-5 years	Technology providers, local governments, utilities
Enact policies discouraging "empty" AV miles traveled and requiring AVs used as for-hire vehicles to be ZEVs	DOT, DEC, Legislature	3-5 years	Auto industry, ridehailing industry
Support the adoption of open-source technologies and standard data collection protocols for transportation data and connected infrastructure	DOT, Thruway, local governments	1-3 years	Technology providers

Mitigation strategy: Smart Mobility & Connected/ Automated Vehicles – Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Smart mobility solutions have the potential to improve quality of life in communities across New York, including disadvantaged communities. Reducing congestion in high-traffic areas will reduce local air pollution. ITS solutions that enable greater transit use and more shared mobility options could reduce the cost of transportation generally, making more transportation options more affordable to lower income New Yorkers.
Health and co-benefits	Congestion is a major source of local air pollution and alleviating major bottlenecks could have significant impacts on health and local air pollution. Connected and automated vehicles have the potential to greatly increase transportation safety, saving thousands of lives each year.
Just transition: businesses and industries, workers	New smart mobility technologies like connected and automated vehicles offer the potential for the growth of new industries in New York. Some leaders in smart mobility technologies are based in New York or have operations here. Automated vehicles may replace drivers in limited circumstances for specific types of transportation jobs.
Other	

Enabling Strategy Summary

Initiative #	Description	Action type	Ease of implementation	Cost
1	Create and expand partnerships with businesses, economic development authorities such as IDAs, and local and regional planners to increase smart growth and transit use; encourage the business and economic development community to work more closely with public transportation officials in business location and expansion projects	Agency/Program	Medium	$

Enabling Initiative – Planning & Collaboration Overview

Description:	Encourage the business and economic development community to work more closely with local planners, public transportation officials, and other transportation providers in business location and expansion projects. Launch an Expansive, Multi-Dimensional, Grass-Roots Public Education Campaign on the Links Among Land Use (Smart Growth), Public Transportation and Housing and their roles in reversing climate change.
Action type:	Agency/Program
Cost and funding considerations:	$; will utilize existing programs and resources, but would likely require consultant services.
Ease of implementation:	Medium
Example case studies:	See Appendix

Risks / Barriers to success	Possible mitigants
Some might view this as an impediment to business recruitment by adding another requirement or consideration as businesses make location decisions. Absence of a dedicated funding source.	Handle this as an educational matter, not a mandate; provide incentives, where feasible, such as in IDA tax policies, local planning/zoning incentives and enhanced programmatic assistance.

Enabling Initiative – Planning & Collaboration – Components of the Strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Encourage and/or require collaboration among local authorities, transit operators, freight operators, local and regional planners and economic development entities to more closely incorporate public transportation options into land use planning, transportation planning, and economic development decisions	DOS, DOT	1-2 years	Municipalities, planners, developers, Chambers, transit operators, freight operators, economic development authorities
Achieve Horizontal, Regional coordination among Public Transportation entities and Planning, Economic Development and Sustainability/Climate interests (including DOS Smart Growth, REDCs, Regional Planning Councils, NYSERDA and DEC Regional Coordinators, universities, CBOs and other relevant public and private entities).	DOS, DOT, NYSERDA, DEC	1 year	REDCs, Chambers
Increase communication, coordination and mutual assistance among ESD, the IDAs, local transit entities and local planners early in the business recruitment and location process to incorporate public transit planning expertise, service and accommodations into projects and locate along existing transit routes.	ESD	1 year	REDCs, Transit agencies, planners, regional planning councils
Develop partnerships with truck freight in community planning, particularly complete streets, and share the trip data to find a balance between walkable/bikeable streets and trucking accommodations.	DOT	1 year	Freight operators, municipalities
Work with IDAs to and transit agencies to develop and proliferate tax incentive policies that incentivize transit planning, infrastructure and access.	ESD, DOT, Transit Agencies	1-2 years	IDAs, Chambers, developers, planners
Ensure that transit entities and MPOs (where relevant) are consulted on any plan or GEIS/EIS being produced by a municipality for a development project or re-zoning that is proximate to, or impacts, public transit (rail station or BRT hub).	DOS, DOT	1 year	Transit agencies, planners/regional planning councils

Enabling Initiative – Planning & Collaboration Benefits and Impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Smart growth and expanded public transportation provides enhanced opportunities for affordable/mixed-income housing within existing communities, which helps address displacement and gentrification. A comprehensive, aggressive and persistent educational and awareness campaign provides greater opportunities to teach and infuse the concepts of equity into planning, development and public transportation. Engage communities in decision-making.
Health and other co-benefits	Any reduction in VMT/transportation-based GHG emissions will improve air quality and help reduce the incidence of disease caused or exacerbated by air pollution. Communities that are walkable/bikeable and provide safe and accessible outdoor spaces promote greater physical activity, which yields enhances wellbeing and reduces the risk of chronic disease (often referred to as "Active Living by Design"). Communities that enable and promote social interaction, partly through safe and accessible public gathering spaces and walkable design, will generate positive mental health benefits by reducing social isolation, particularly for older New Yorkers who suffer greater incidences of depression and anxiety due to isolation. Access to health care facilities will also be enhanced. The health care system, like the energy system, has become more dispersed and distributed. Locating health clinics and other facilities within communities, and ensuring proximity and access to such services through walkable, bikeable and transit-friendly infrastructure, will help overcome health disparities if disadvantaged communities/communities of color.
Just transition: businesses and industries, workers	As jobs and job locations shift, public transportation and land use will need to align with those changes. In the past, lower-paying/-skilled jobs were an afterthought, leaving disadvantaged communities behind; this initiative allows the state to plan simultaneously with the transition to a clean energy economy. An educational component to this transition will raise public awareness about this esoteric and misunderstood concept.
Other	This educational campaign provides an ideal forum in which to raise awareness of the fiscal benefits of smart growth.

Market-Based Policies and Financing

Mitigation strategy summary Financing and Market-Based Policies

Description	Action type	Emissions impact	Ease of implementation	Cost
Facilitating Private Financing	Enabling	N/A	Medium	$
Cap&Invest (TCI-P) or Carbon Pricing	Mitigation/Enabling	Medium	Medium	$
Clean Fuel Standard	Mitigation/Enabling	Medium	Medium/Hard	$
Feebates (listed under Electrification)	Enabling	N/A	Medium	$
Curb Pricing	Mitigation	Low	Medium	$
Congestion/Variable/Demand Parking Pricing	Mitigation/Enabling	Low	Hard	$
Mileage Based User Fees	Enabling	N/A	Hard	$$
Tax Increment Financing/Special Assessment Districts	Enabling	N/A	Medium	$
Registration Fees	Enabling	N/A	Easy	$

Mitigation Strategy – Clean Fuel Standard Overview

Description:	Implement a Clean Fuel Standard to support electrification of transportation, achieve near-term emission reductions while the transition to electrification is underway and provide cleaner fuels for hard-to-electrify subsectors such as aviation; freight and passenger rail; and long-haul trucking. A clean fuel standard generally considers total fuel cycle emissions.		
Action type:	Regulatory (DEC); potentially legislative		
GHG reduction by 2030:	Medium (and enables electrification)	**GHG reduction by 2050:**	Low (enabling for electrification)
Cost and funding considerations:	Agency costs for program management and additional staff will be sizable if using NY-specific methodology. A substantial annual transfer would be expected from fossil fuel producers/ consumers to bioenergy producers, electric/hydrogen vehicle owners, charging infrastructure owners, and transit operators.		
Ease of implementation:	Hard if using NY-specific carbon intensity calculations instead of CARB pathways.		
Example case studies:	California Low Carbon Fuel Standard and Oregon Clean Fuel Standard		

Risks / Barriers to success	Possible mitigants
1. Some biofuels would not generate credits under CLCPA accounting; out-of-state waste emission reductions/sequestered emissions may not be creditable towards NY's emission limits under CLCPA methodology 2. Potential cost impacts on low income citizens, who are less able to afford electric vehicles. 3. Lack of regulatory infrastructure (staff/ITS systems)	1. Consider adopting CARB carbon intensity or set program stringency to align with achievable reductions. 2. Provide enhanced ZEV incentives for lower-income consumers; disadvantaged communities will benefit from ZEV and ZEVSE deployment for medium and heavy duty fleets. 3. Staff will need to be increased and IT systems developed; adoption of CARB carbon intensity would reduce the burden.

Mitigation Strategy – Clean Fuel Standard - – Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Program Development	DEC, DPS, NYSERDA	1 year	Fuel producers and suppliers, airline industry, utilities, public transit operators, PANYNJ
Regulation Promulgation	DEC	1 year	Regulated industry
Develop staff and IT systems	DEC	unknown	ITS, DOB
Investment in fueling infrastructure for advanced fuels, such as green hydrogen, that have zero emissions (tailpipe and production)	NYSERDA	2-5 years	Fuel distributors, service station owners, clean energy providers

Mitigation strategy – Clean Fuel Standard – Benefits and Impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Reduction in localized air pollution in disadvantaged communities from electrification and lower-emission fuels. Benefits will be enhanced by complementary policies to support LMI access to affordable EVs and medium- and heavy-duty vehicle electrification.
Health and co-benefits	In the near term there may be modest reductions in some air pollutants (particularly particulate matter) due to fuel changes. Long term major health benefits will follow from vehicle electrification, the expansion of which may be accelerated by a Clean Fuel Standard
Just transition: businesses and industries, workers	Little initial impact on transportation fuel supply industries. Long term, fossil fuel industries will contract due to increased deployment of low carbon fuels, including vehicle electrification, with electricity and biofuels (and possibly hydrogen) supply industries expanding in their place. Workers from the conventional fossil fuel industry can transition to employment in the low carbon fuel industries, especially liquid biomass-based diesel substitutes.
Other	Implementation of CARB approach would be much simpler from an administrative perspective; CLCPA methodology would still have to be applied in determining progress towards CLCPA emission limits. Transfer of money from petroleum suppliers to electric rail transit operators (primarily MTA) would help fund transit priorities. Option for aviation fuels to opt in would create an opportunity to reduce aviation emissions; would require legislation.

Enabling initiative – Electrification Financing: Overview

Description:	Public & private approaches to electrification financing
Action type:	Financial; NYS agencies' programs & policies that augment public & private fleet electrification financing and EVSE investment and expansion.
Cost and funding considerations:	$$; A combination of existing funding (MHD EV incentive programs, NY Green Bank financing, PSC Make-Ready Program) and new funding (additional MHD EV incentives targeting DACs, financial support to subsidize FLPP, support for electrification transition feasibility studies, support for residual value risk analysis, and financing market gap solutions) will support this effort.
Ease of implementation:	Medium; new programs need to be established, but can be based on proven models
Example case studies:	Financial markets (first loss protection); NY Green Bank financing of distribution center electrification project; Highland Electric: Maryland school bus electrification program

Risks / Barriers to success	Possible mitigants
1. Need to find the right NYS entity to serve as product sponsor for first loss protection (FLP) 2. Current MHD EV program qualifications and restrictions are difficult for lower-income truck owners and small fleets to meet. 3. School districts & transit agencies' hesitancy to transition; statutory inability to 1) convert from CapEx-oriented procurement to OpEx long term service procurement; and 2) commit to long term bus electrification projects. 4. EV stakeholders find NY Green Bank's financing products & terms unattractive. EVSE projects have unfinanceable utilization risk. 5. Extending future transit fuel/maintenance operations savings to support recapitalization not a viable strategy given operations are highly subsidized by federal, State and local funds.	1. Enabling rules/legislation; collaboration with existing private market FLP providers. 2. Liberalized income-criteria & scrappage voucher-program qualifications to facilitate financing in disadvantaged communities. 3. Offer grants for evaluation/feasibility studies; enabling legislation for multi-year Energy Services Agreement (ESA) commitments. 4. Expansion of NYGB programs (incl. beyond NY State-only nexus); capital allocations (through expanded charter) to higher-risk electrification categories. NYSERDA provides a minimum level of revenue certainty to EVSE projects with high level of utilization risk. 5. Alternative financing models for public transit fleets may be needed.

Enabling initiative – Electrification Financing: Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Establish a First Loss Protection product based on existing financial market instrument and practice • Identify a product sponsor (NY State agency/entity) and identify size and type of subsidy/incentive/authorization required to make this product marketable • Conduct Residual Value (RV) risk analysis to price the insurance product • Secure private-market practitioner involvement	NYSERDA, NY Green Bank	1-2 years	Commercial banks & insurance co's; fleet operators; EVSE developers, US DOE LPO; National Climate Bank
Expand MHD EV incentive programs, with a focus on higher incentives for fleets in DACs and small fleets	NYSERDA, DEC, NYSDOT	1-3 years	Fleet operators; EJ stakeholders

Enabling initiative – Electrification Financing: Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Support feasibility studies for MHD fleets, including school districts & transit agencies, to identify benefits, costs, logistical challenges, financing options, other barriers to electrification • In addition to utility fleet assessment services, which focus primarily on charging of EVs	NYSERDA, State Ed, NYSDOT	6 months - 1 year	Utilities, OEMs & EVSE stakeholders; fleet operators; engineering firms; ESD & REDCs
Support additional financing options that expand EVSE adoption • Expand NYGB's mission to take on more risk in defined categories of electrification financing • Supplement CapEx financial support for EVSE (e.g., rebates) with revenue support (e.g. minimum revenue coverage) to qualifying EVSE infrastructure projects	NYSERDA, NY Green Bank, DPS	1-2 years	OEMs & EVSE stakeholders; commercial banks; utilities

Enabling initiative –Electrification Financing: Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Liberalizing voucher qualifications for low-income applicants will drive EV adoption in these communities, and accelerate development of a liquid & deep used-EV commercial vehicle market.
Health and other co-benefits	Collectively, these initiatives will accelerate fleets' electrification transition. Since air quality around ICE/diesel fleet depots is generally impaired by diesel truck emissions, this will bring cleaner air and related health benefits to populations living in vicinity of depots (which are generally disadvantaged communities).
Just transition: businesses and industries, workers	Collectively, these initiatives will bring economic, employment and health benefits to disadvantaged communities: their businesses, employees, and populations. Job training programs are to be considered as complementary initiatives.
Other	These strategies complement public funding to support electrification and modernize transit bus fleets; more successful financing strategies can reduce the public funding needed for electrification incentives.

Mitigation strategy –Cap & Invest/Carbon Pricing Overview

Description:	Policies reduce emissions directly and support further emission reductions and the transition to a cleaner, more efficient transportation system. Transportation Panel recommends potential participation in the Transportation and Climate Initiative program (TCI-P) unless the Climate Action Council opts for a multi-sector carbon pricing approach that provides at least the same level of support for reducing transportation sector emissions.		
Action type:	Regulatory (NY Joins TCI-P); legislative (economy-wide carbon pricing policy)		
GHG reduction by 2030:	Medium (and enables other strategies)	**GHG reduction by 2050:**	Medium (and enables other strategies)
Cost and funding considerations:	This policy will directly reduce emissions and raise revenues by placing an auctioned allowance fee on fossil fuel component of on-road motor fuels. Fuel providers may choose to pass this cost onto consumers. Proceeds from the auction of allowances would be reinvested into improving infrastructure and reducing emissions. Efficient investment of revenues would yield a net positive to society, including improved public health. These policies would constitute an inter-economy transfer and would not impose a net resource cost.		
Ease of implementation:	Medium to hard. Transportation has been part of economy-wide cap-and-invest programs and the TCI-P program provides a regional transportation sector model to adopt, similar in many ways to RGGI. Many stakeholders are supportive with notable exception of some environmental justice organizations and their allies.		
Example case studies:	Carbon prices in Canada and Europe. Economy-wide cap-and-Invest in California and Quebec.		

Risks / Barriers to success	Possible mitigants
1. Potential for funds to be used for unrelated purposes. 2. Some EJ stakeholders are distrustful of market-based programs, which may not deliver equitable benefits to their communities. 3. The level of the TCI-P cap may fall short of the level of transportation reductions needed to meet CLCPA targets and may not raise enough proceeds to fully fund the TAP recommendations that require funding. 4. May increase fuel costs for rural and small city community transit systems	1. A legislative "lock box" could ensure that proceeds can only be spent on clean transportation or other program purposes. 2. Engage impacted communities in decision-making and ensure investments reduce emissions and provide other benefits in disadvantaged communities and areas with high levels of transportation emissions. 3. Increase program stringency at program review or establish a separate program; target funding to most impactful investments. 4. Support electrification of smaller rural/city transit systems or consider exempting fuel used in small transit fleets

Mitigation strategy –Cap & Invest/Carbon Pricing Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Rulemaking process would be necessary for New York to join TCI-P	DEC, NYSERDA, DOT	1 year	Fuel industry, disadvantaged communities, public health practitioners
Alternative policy: multi-sector economy-wide carbon pricing or cap-and-invest policy – if included by Climate Action Council in Scoping Plan. At least one Panel member prefers enactment of the Climate and Community Investment Act (CCIA) to participation in TCI-P.	NA	NA	NA

Mitigation strategy – Cap & Invest/Carbon Pricing Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Although a cap-and-invest policy does not necessarily achieve emissions reductions in specific locations, the investments can be targeted to achieve that goal. The highest and best use of the proceeds would be to invest more than at least 35-40% of the proceeds in programs that specifically reduce emissions and provide other benefits in disadvantaged communities. Engage disadvantaged communities in developing investment priorities that will reduce existing air quality disparities. Community air monitoring outcomes can be used to guide investment strategies.
Health and co-benefits	Health benefits would come from the investment of proceeds. Prioritizing investments in electric trucks and buses in areas of high pollution or high population density can maximize the reductions in air pollutants.
Just transition: businesses and industries, workers	Proceeds can be invested in ways that support a just transition for workers and disadvantaged communities. Investments can also lessen the impact on businesses such as helping convenience stores transition to providing EVSE and can also help ease the transition to new fuels technologies by funding opportunities to train mechanics to service new vehicles. Participation in the regional TCI-P would maintain level playing field for NY businesses in regional economy.
Other	Cap-and-invest programs ensure emissions reductions; carbon pricing does not. As a regional program, TCI-P ensures a designated level of regional reductions, but resulting reductions might vary among the participating states. Implementation of a cap-and-invest program should not be considered to preclude other strategies to fund maintenance of current infrastructure.

Mitigation strategy – Various market-based/financing policies: Overview

Description:	Various market-based policies will support electrification, public transportation, smart growth and other transportation goals. These policies complement the other more specified strategies, including recommendations for TCI-P participation, clean fuel standard, private financing strategies and feebates		
Action type:	Regulatory, financing, legislative		
GHG reduction by 2030:	Low	**GHG reduction by 2050:**	Low
Cost and funding considerations:	All policies are intended to be self-funding and will provide financial support for other policies and goals		
Ease of implementation:	Various		
Example case studies:	Oregon - VMT/MBUF pilot; London - Congestion Pricing; Seattle - Curb Pricing; Hudson Yards/#7 Line Extension - Tax Increment Financing; Demand Parking Pricing – Washington DC; California – registration fees to fund EVSE		

Risks / Barriers to success	Possible mitigants
1. Individuals may object to paying for services, like parking, that were previously free or lower cost 2. Drivers may object to incurring fees for access to locations that were previously complimentary, especially in EJ Communities 3. Home rule would preclude state action without local partnership for some policies	1. Fees can fund access to improved transit service and other alternatives to driving 2. Provides more livable communities 3. Engage with localities; provide them with portion of proceeds

Mitigation strategy – Various market-based/financing policies Components of the strategy

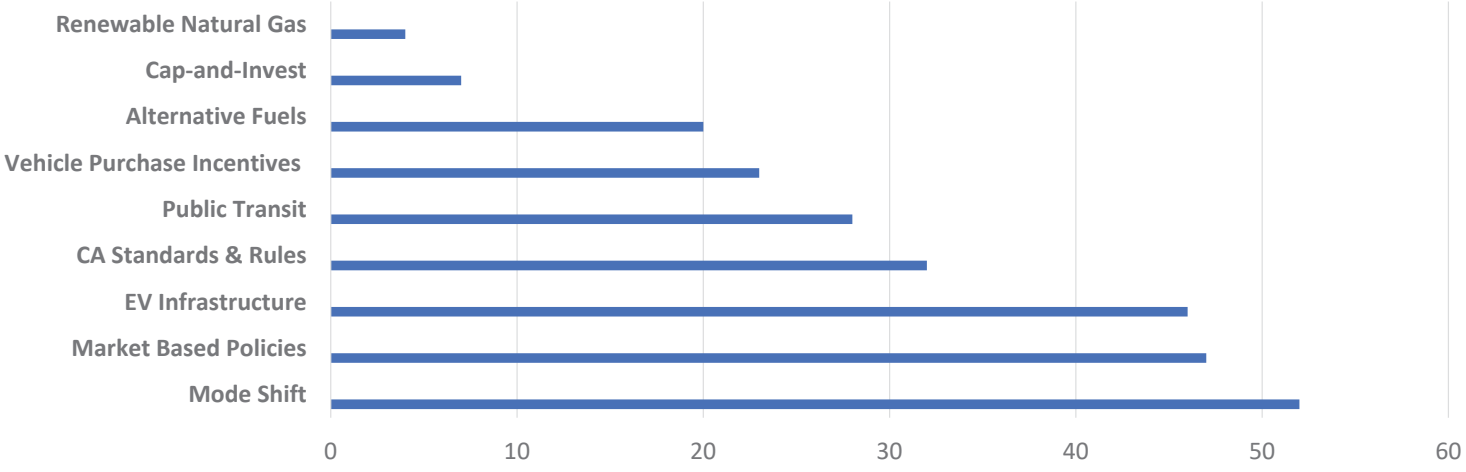
Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Congestion/Variable Pricing/Demand Parking – coordinate with municipalities; State Legislature; Federal Highway Administration	DOT, municipalities	1-3 years	Municipalities, parking authorities,
Vehicle registration fees. Legislation would be required.	DMV	1 year	Car dealers, AAA
Mileage-Based User Fees – evaluate pricing level to maintain investment level first with and eventually without gas tax revenues. Legislation would be required	DOT, Tax & Finance	3-years	Fuel/charging providers, AAA, public transportation sponsors
Tax Increment Financing/Special Assessment Districts	Municipalities, Tax & Finance	1-2 years	Municipalities, public transportation sponsors, developers
Curb Pricing	Municipalities, Tax & Finance	1-2 years	Public transportation sponsors, developers

Mitigation strategy – Various market-based/ financing policies Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	As a direct result of these funding mechanisms, disadvantaged communities will benefit from reduced pollution in congested urban areas, increased infrastructure investment and from enhanced transit access. These funding mechanisms can raise revenue to support emission reduction activities put forward in the other Transportation Advisory Panel recommendations, which are targeted toward disadvantaged communities.
Health and co-benefits	As a direct result of these funding mechanisms, there would be a decline in peak hour pollution with resulting public health benefits. These funding mechanisms can raise revenue to support emission reduction activities put forward in the other Transportation Advisory Panel recommendations, which will result in broader health and economic benefits.
Just transition: businesses and industries, workers	Projects funded by tax increment financing will create jobs; may potentially drive-up housing costs
Other	

Summary of Comments Received by Transportation Advisory Panel

The Transportation Advisory Panel received comments from 69 organizations/individuals discussing the following subjects:



Just Transition Principles Review

Stakeholder-Engaged Transition Planning & Collaborative Planning for a Measured Transition Toward Long-Term Goals

- A diverse range of stakeholders were engaged during the recommendation development process including:
  - Two TAP Public Engagement Meetings
  - Five Expert Roundtables
  - Cross Panel coordination meetings held with other Advisory Panels
- Consumer engagement and stakeholders key to the continued development of each strategy have been identified.
- Proposals to make local planning processes more collaborative and inclusive in finding solutions that help increase low-carbon transportation options are recommended.

Just Transition Principles Review

Realize Vibrant, Healthy Communities Through Repair of Structural Inequities & Equitable Access to High Quality, Family-Sustaining Jobs

- Recommendations are designed to help accelerate decarbonization in and around LMI and EJ communities.
- Public Transportation increases and Smart Growth recommendations support connecting workers to employment and community sustainability.

Climate Adaption Planning and Investment for a Resilient Future

- A focus on enhancing active mobility options, more public transportation frequency, and smart growth to provide a level of resiliency in the transportation system.

Protection and Restoration of Natural and Working Lands Systems & Resources & Redevelopment of Industrial Communities

- Smart Growth development will help concentrate land uses and development in areas that are targeted for growth and redevelopment while preserving natural and working lands from development pressures.

Energy Efficiency and Housing Advisory Panel

Recommendations to the NYS Climate Action Council for Consideration in the Scoping Plan

May 3, 2021

NEW YORK STATE OF OPPORTUNITY. Climate Action Council

Key Terms as Used in the Recommendations

All-electric building: No combustion equipment is used as part of the building heating, cooling, hot water, cooking, and laundry.

Building decarbonization: The reduction of carbon emissions (aka GHG emissions), through the conversion of existing equipment and systems powered by combustion processes, to highly efficient equipment and systems powered by emissions-free sources.

Building electrification: The conversion of an existing building's heating, cooling, hot water, cooking, and laundry equipment and systems powered by combustion processes, to highly efficient equipment and systems powered by electricity.

Commercial building: All buildings or facilities that are not included in the definition for "Residential building"

Disadvantaged communities (DACs) (interim definition): Properties located in census block groups that are below the HUD 50% Area Median Income threshold and within DEC PEJAs (income + race/ethnicity) or NYS Opportunity Zones.

Electric readiness: The installation of electrical service and panel capacity, conduit, fixtures, and outlets for a future installation of electric equipment for space heating and cooling, hot-water, cooking, and laundry.

Electric vehicle (EV) readiness: The installation of electrical service and panel capacity, conduit, fixtures, and outlets for a future installation of EV chargers.

Embodied carbon: The sum of all GHG emissions resulting from the mining, harvesting, processing, manufacturing, transportation and installation of materials and buildings.

Energy efficiency: Minimized consumption of energy required to perform useful work.

Energy storage readiness: The installation of electrical service and panel capacity, conduit, fixtures, and outlets for a future installation of electric batteries.

HFCs or hydrofluorocarbons: greenhouse gases, manufactured for use in refrigeration, air conditioning, foam blowing, aerosols, fire protection and solvents.

Low- to moderate-income (LMI): LMI households have incomes at or below 80 percent of area median income.

Multifamily building: A residential building with five or more dwelling units.

NYStretch Energy Code: A model code for voluntary adoption by local jurisdictions in New York State, to be enforced as the local Energy Conservation Construction Code, which sets energy conservation standards more stringent than the NYS Energy Conservation Construction Code.

Resilience: The capacity to withstand and recover from events that incur stress and damage.

Residential building: A building where the main or dominant use is to provide complete independent facilities for living, sleeping, eating, cooking, and sanitation including single-family and multifamily but not to include transient uses classified as R-1 in the Building Code of NYS

Single family building: A residential building with one to four dwelling units.

State Energy Code: The NYS Energy Conservation Construction Code promulgated pursuant Article 11 of the Energy Law

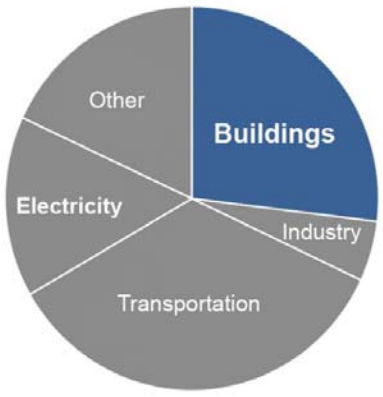
Acronyms

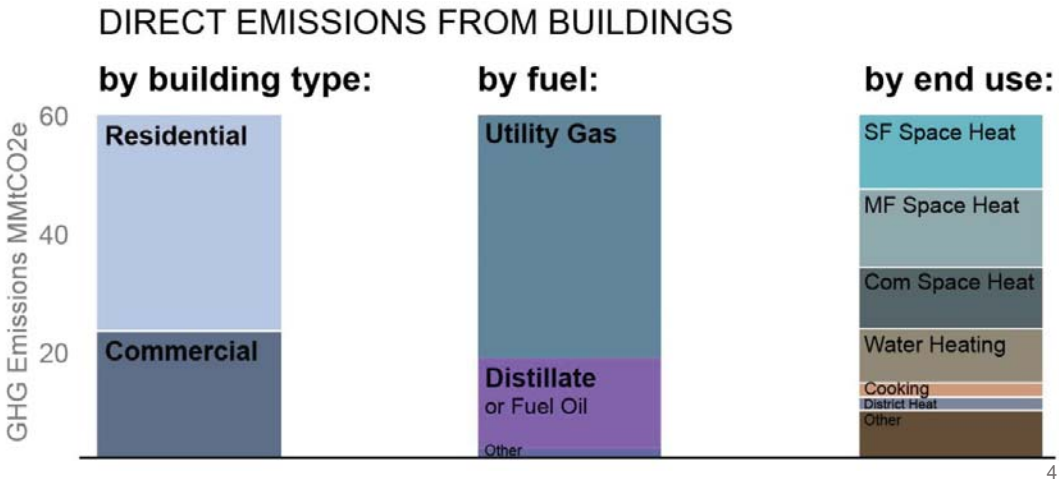
CO2e: Carbon Dioxide equivalent
DAC(s): Disadvantaged Communities
EJ: Environmental Justice
EV: Electric Vehicle
GHG: Greenhouse gas
GWP: Global Warming Potential
HFCs: Hydrofluorocarbons
HVAC: Heating, ventilation, and air conditioning
LMI: Low- to moderate-income
MMt: Million Metric Tons
MWBE: Minority/Women-Owned Business Enterprise
PACE: Property Assessed Clean Energy
PV: Photovoltaic
R&D: Research and Development
SDVOB: Service-Disabled Veteran Owned Business
T&D: Transmission and Distribution
VRF: Variable Refrigerant Flow
WAP: Weatherization Assistance Program

Government agencies and authorities:
DEC: Department of Environmental Conservation
DASNY: Dormitory Authority of the State of New York
DFS: Department of Financial Services
DOH: Department of Health
DOS: Department of State
DOT: Department of Transportation
DOTF: Department of Taxation and Finance
DPS: Department of Public Service
HCR: New York State Homes and Community Renewal
HPD: NYC Dept. of Housing Preservation and Development
HUD: U.S. Department of Housing and Urban Development
NYCHA: NYC Housing Authority
NYPA: New York Power Authority
NYSERDA: New York State Energy Research and Development Authority
PHA: Public Housing Authority
PSC: Public Service Commission
SHPO: State Historic Preservation Office

Emissions from our Buildings Today

- **Onsite fossil fuel combustion is attributed as *direct* emissions** from the buildings sector. Electricity usage (indirect emissions) is accounted for in the electricity generation sector.
- Direct emissions in buildings are dominated by fossil-fuel combustion (mostly gas) for space heating and hot water – thus, **electrification is the largest driver of direct emissions reductions.**





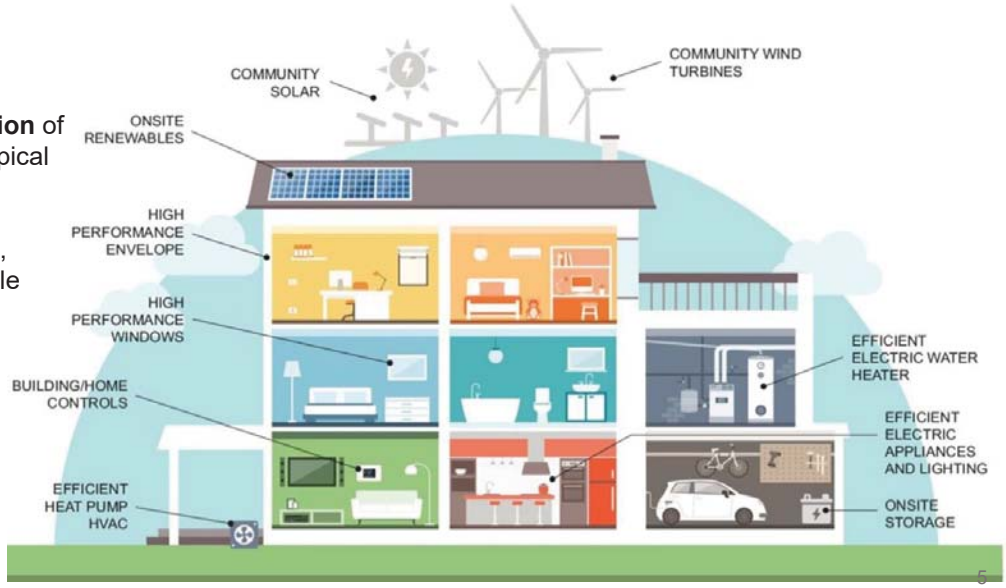
Beneficial Building Electrification & Energy Efficiency

Electrification of heating and hot water systems in nearly all buildings is a key strategy for building decarbonization and depends upon **energy efficiency improvements** in all buildings and **100% zero-emissions electricity** by 2040 under the Climate Act.

Scope of Panel

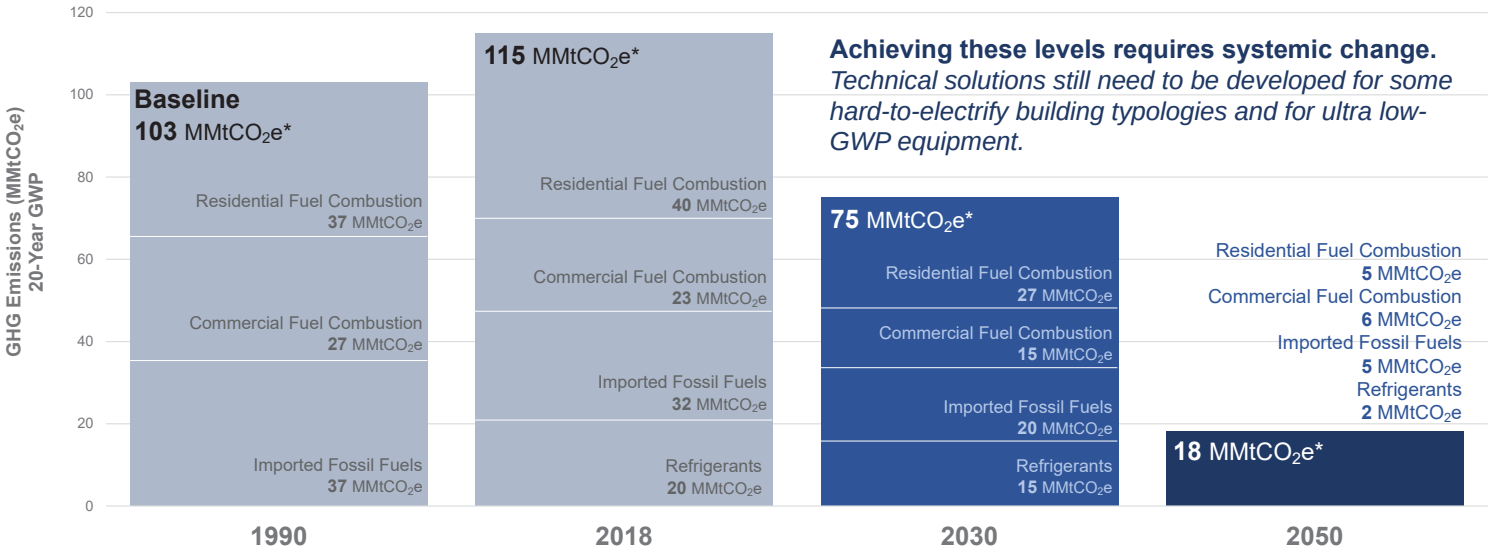
- **On-site GHG emissions from combustion** of fossil fuels for heating and hot water in typical building types:
  Residential
  (single family; multifamily including coops, condos and rentals; market rate; affordable including regulated and unregulated)
  Commercial and Institutional
  (office, retail, education, etc.)

The Panel adopted a building-level focus; further analysis is needed in campus/community thermal networks and specialized uses in industry or critical care.



Aggregate GHG Emissions Impact of Recommendations

Energy Efficiency & Housing Advisory Panel



Achieving these levels requires systemic change.
Technical solutions still need to be developed for some hard-to-electrify building typologies and for ultra low-GWP equipment.

* million metric tons carbon dioxide equivalent
Draft values subject to public review process for annual emissions accounting

Scale of the Solution Demands New Resources

6.2 million buildings in New York State

- 4.9 million single family homes
- 250,000 multifamily buildings
- 370,000 commercial and institutional buildings

Eliminating GHG emissions from New York's building stock by 2050 will require broad, systemic changes.

- By 2030, more than 200,000 homes *every year* will need to upgrade to all-electric and energy efficient systems
- The 370,000 office, retail, restaurant, school, and other commercial and institutional buildings in New York State will need to cut energy use in half and stop using fossil fuels for heating and hot water
- Widespread awareness in a well-informed public, with clear market signals, can change behaviors and practices, accelerate decarbonization, and lower the costs

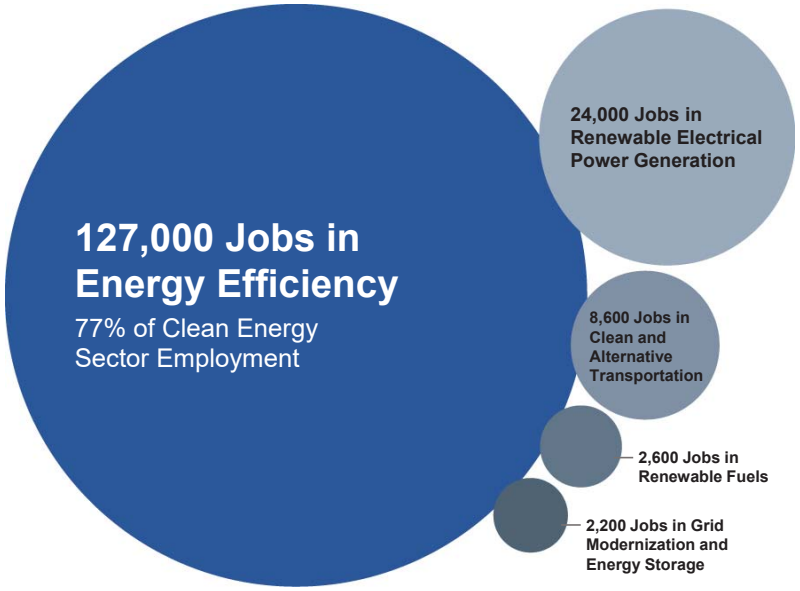
An equitable transformation at this scale requires new resources.

- Focusing the investment of private capital needed to construct, upgrade, and operate highly efficient buildings powered by zero-emissions electricity
- Investing public resources to support market-enabling initiatives and incentives for early adoption of technologies
- Investing public resources to fund building efficiency and electrification in LMI homes, affordable and public housing, and disadvantaged communities – while supporting energy affordability, safe and healthy housing, economic opportunities, and the repair of structural inequalities

Building Decarbonization and Economic Development

Decarbonizing New York's building stock will deliver **significant job growth and economic opportunity**, in every region of the state.

- New York's **energy efficiency industry employs the largest share** of clean energy workers, accounting for **77% of clean energy sector employment** and **88% of industry establishments.**
- The efficiency sector continues to **add workers installing high-efficiency HVAC equipment and heat pumps**, which account for **over half of the sector's employment.**



Source: 2020 Clean Energy Industry Report

Approach to Recommendations

Equitably advance building electrification and energy efficiency at scale

- **Address new construction and retrofits for single family housing, multifamily housing, and commercial and institutional buildings**, with attention to:
  - **Equity and affordability**: Identify and mitigate any potential negative impacts on low- to moderate-income (LMI) households and disadvantaged communities (DACs), with special attention to affordability; preventing tenant displacement; repair of structural inequalities; and supporting compact, vibrant, and healthy communities
  - **Practicality**: Identify and mitigate implementation challenges for owners and building operators, including cost/benefits
  - **Minimizing costs:** Identify ways to make building decarbonization upgrades cheaper and cost competitive
  - **Expanding solutions**: Identify ways to bring better technologies and solutions to NYS
  - **Benefits**: Identify both energy and non-energy benefits including health, comfort, and productivity
  - **Sustainable and resilient outcomes:** Identify and avoid outcomes that lead to less sustainable development patterns and development in climate at-risk areas
- Address key enabling policies, including **access to financing and financial incentives, affordability, workforce development,** and broad **public awareness and engagement** that motivates behavioral change
- Consider implementation, with attention to equity, feasibility, commercial availability, and grid readiness
- **Lead by example** in the State's own facilities and construction activities, to reduce GHG emissions from State buildings and to accelerate market adoption of building decarbonization technologies, design approaches, and operational practices
- Recognize that this is a national and global problem. New York State is a leader but will need significant **help and partnership with the Federal government** to bring these recommendations to fruition at an economy-wide scale

Outreach

- **Public Panel Meetings**
  - 8 public meetings, September 2020 – March 2021
- **Expert Round Tables**
  - 3 round tables in November 2020
  - Builders, installers, designers of single family/ multifamily housing; landlords, owners, agents
- **Stakeholder Survey**
  - October – December 2020
  - ~65 responses
- **Carbon Neutral Buildings Roadmap outreach process**
  - 15 stakeholder engagement sessions; notes distributed to Panel members
  - >950 stakeholder participants across sessions
- **Public Engagement Session, February 4, 2021**
  - 270 attended, ~330 including NYS agency staff
  - Written comments received through 2/18/21
  - 110 unique comments (session and email)
  - ~320 comments via two coordinated emails
- **Meetings with REBNY condo/coop managers**
  - February 2020 (x2)
- **Meeting with residential property owner associations**
  - Rent Stabilization Association (RSA), Community Housing Improvement Program (CHIP), New York State Association for Affordable Housing (NYSAFAH) in March 2021

Consultation with other Panels

Panel-level Coordination

- Oct. 2020 – CJWG presented at EEH Panel about DACs
- Dec. 2020
  - EEH Panel delegates attended CJWG
  - DEC/DOS/NYSERDA presentation on Resilience and Climate Adaption, with LULG reps
- Jan. 2021
  - Local Building Decarbonization Laws and Services learning session, with LULG
  - EEH Panel reps attended bioeconomy subgroup of Agriculture and Forestry
- Feb. 2021
  - 2/5 subgroup meeting with Power Gen & utilities on gas transition, rates, grid impacts of electrification
  - HFCs learning session, with Waste Panel
- March 2021
  - Engagement session with residential property owner associations, with Power Gen

Staff-level Coordination

- Land Use and Local Government (LULG)
  - Adaptation and Resilience
  - Clean energy recommendations
- Power Generation Panel
  - LMI/DAC
  - Equitable access to solar
  - Electrification and gas system transition
- Agriculture and Forestry; Energy-Intensive and Trade-Exposed Industries
  - Embodied carbon and mass timber
- Waste
  - HFCs and embodied carbon
- Just Transition Working Group
  - Workforce development

Mitigation Strategy Summary

	Description	Action type	Emissions impact by 2050	Ease of implementation	Cost*
1	Enact enabling legislation and adopt codes, standards, and regulations to improve energy efficiency, reduce emissions, and enhance building resilience. Adopt regulations that phase out fossil fuel use in buildings, requiring energy-efficient electric heating and cooling, electric hot water heating, and electric appliances.	Legislative, regulatory, programmatic	High	Medium/Hard	$$$
2	Require measuring building energy usage, benchmarking energy performance, and making that information accessible via disclosure or labeling.	Legislative, regulatory, programmatic	Low (but enables other mitigation)	Easy	$
3	Advance a managed, phased, and just transition from reliance on fossil gas and the gas distribution system to a clean energy system, including elimination of embedded subsidies for fossil gas.	Legislative, regulatory	High (overlap with #1)	Hard	$$$
4	Advance a managed and just transition from reliance on HFC use as refrigerants and in all products used in building construction.	Legislative, regulatory	High	Hard	$$

Cost estimates for mitigation strategies reflect total resource costs statewide, expressed as an equivalent annualized cost. The total resource cost approach measures costs to upgrade buildings and utility infrastructure net of energy savings across all entities (public and private sector). The categories used for **equivalent annualized total resource cost are: $ (<$250M, resources are already on hand), $$ ($250M - $1B, requires some new resources), and $$$ (>$1B, requires high degree of new resources).*

Mitigation Strategy – Initiative #1 Codes and Standards

Overview

Description:	**Enact enabling legislation and adopt codes, standards, and regulations to improve energy efficiency, reduce emissions, and enhance building resilience. Adopt regulations that phase out fossil fuel use in buildings, requiring energy-efficient electric heating and cooling, electric hot water heating, and electric appliances.**		
Action type:	Legislative, regulatory, programmatic		
GHG reduction by 2030:	Medium	**GHG reduction by 2050:**	High
Cost and funding considerations:	$$$		
Ease of implementation:	Medium/Hard		
Example case studies:	California, Massachusetts, Norway		

Mitigation Strategy – Initiative #1 Codes and Standards

Risks / Barriers to success	Possible mitigants
1. Legal challenge (e.g., federal preemption)	1. Legislation to enable emissions-based codes and standards that are not subject to federal preemption
2. Lack of awareness/confidence in market	2&3. Clear market signal with phased-in dates for implementation to allow market to adapt, invest and build capacity
3. Limited workforce/supply chain readiness to design and install efficient, non-fossil solutions	2. Education for consumers and market participants broadly
4. Cost premium to owners and renters	3. Workforce and supply chain development across builders, trades, professions, contractors, suppliers, retailers
5. Potential negative impacts on LMI households, tenants, DACs and public housing, incl. disproportionate burden of cost premiums and on housing affordability. Specific challenges for LMI rental housing incl. the property owner's ability to finance and recoup capital costs; equitable distribution of energy costs for heating and cooling with electrification; and risk of triggering rent increases, de-regulation of housing units, gentrification	4. Control costs by targeting natural investment points in life cycle of a building (e.g., construction, equipment replacement, sales/leasing). Upgrade equipment at its end of life, adopt capital planning for large buildings. Strategic market incentives and subsidies for LMI/DACs. Reduction in capital cost of efficient and electric building equipment/systems (via enabling investments, market scale); change in relative energy costs over time (via rate design, depreciation policies for utility assets, possible economy-wide carbon fee)
6. Resource constraints prevent local governments from adequate code enforcement	5. Provide adequate financial and technical assistance for LMI homeowners and building owners within DACs and public housing; provide for alternative compliance pathways and exemptions where there are extenuating circumstances, such as related to housing affordability; collaborate with housing advocates to identify and streamline solutions to allocate heating and cooling costs equitably across building owners and income-eligible residents; monitor for and use policy to mitigate potential risks re: affordable housing, disinvestment in low-income properties, gentrification
7. Opposition from builders, current suppliers of fossil fuels	6. Provide State funding and resources for local code enforcement (staff, training, materials), especially focused on supporting low-income New Yorkers
8. Grid reliability and need for substantive upgrades to electric system to meet increase in demand as buildings electrify (T&D, system lines, and customer panel upgrades)	7. Industry education and engagement; transition opportunities for current suppliers of fossil fuels
	8. Energy efficiency and capital improvements for building resilience to grid failure (high-performance walls/roofs/windows, batteries, PV); incentive structures that encourage ground source heat pumps, which mitigate peak electric demand as buildings electrify; required grid-interactive controls on major electric equipment; investments in the electric grid to ensure reliability and resilience; also see cross cutting recommendation on resilience

Mitigation Strategy – Initiative #1 Codes and Standards

The following components would require that new construction (and additions and alterations as applicable) of residential and commercial buildings are built to a highly efficient, zero emission standard and incorporate requirements for building resilience, where feasible.

Components required for delivery	Implementation lead	Time to adopt regulation/action	Other key stakeholders
As soon as possible: Adopt **highly efficient State Energy Code for new construction** (and additions and alterations as applicable) of residential and commercial buildings.	NYSERDA, DOS	2-4 years	DASNY, local gov'ts, builders, manufacturers, consumers
Starting in 2023: Amend the **relevant State codes for new construction** (and additions and alterations as applicable) of residential and commercial buildings to require: • solar PV on feasible areas; • grid-interactive electrical appliances as feasible (e.g., batteries, hot water heaters); • energy storage readiness; • electric readiness for space conditioning, hot water, cooking, and dryers; and • EV readiness where parking is already provided.	NYSERDA, DOS	2 years	DASNY, local governments, builders, manufacturers, consumers
Adopt **all-electric State codes** (prohibit gas/oil equipment for space conditioning, hot water, cooking, and appliances) for **new construction** (and additions and alterations as applicable), • **2025** - single family • **2030** - multifamily and commercial buildings.	NYSERDA, DOS	2-4 years	DASNY, local governments, builders, manufacturers, consumers
Enabling action: Encourage local governments to adopt NYStretch Energy Code, until highly efficient, all-electric codes are adopted statewide.	NYSERDA	ongoing	DOS, DASNY, local governments
Enabling action: Provide State funding for local code enforcement (staff, training, materials) and State credentialing of third-party Energy Code inspectors.	DOS, NYSERDA	6 months	Local governments

Note: Timeframes associated with recommended regulations will depend on the type of regulation and its governing body and legislation, State Administrative Procedure Act rulemaking requirements and timelines, and ongoing assessment of feasibility, impacts and analysis of what timeframes are needed to meet New York State's climate goals. 15

Mitigation Strategy – Initiative #1 Codes and Standards

The following components would require the sale and installation of energy efficient and zero emission new equipment, when replaced at the end of useful life in residential and commercial buildings, as well as efficiency upgrades for certain large buildings.

Components required for delivery	Implementation lead	Time to adopt regulation/action	Other key stakeholders
As soon as possible: Adopt **energy efficiency standards for appliances** that are exempt from federal preemption (e.g. computers, monitors, fluorescent and LED light bulbs, air purifiers).	NYSERDA, DOS	12-18 months	Builders, manufacturers, retailers, consumers
2030: Require **lighting upgrades** to current Energy Code standards for existing commercial properties larger than 25,000 sq. ft.	NYSERDA, DOS	4 years	Local governments
2030: Adopt an **energy efficiency performance standard** for existing commercial properties larger than 25,000 sq. ft. (with credit for building electrification). 2030 will begin compliance periods. Compliance standards will be informed by statewide benchmarking data.	NYSERDA, DOS	6-7 years; after ~3 yrs. of benchmarking data is available	NYPA, DASNY, DOTF, PSC/DPS, local governments, utilities
Adopt **zero emission standards** that prohibit gas/oil replacements (at end of useful life) of heating and cooling and hot water equipment, • **2030**: single-family • **2035**: multifamily and commercial buildings.	NYSERDA, DOS, DEC	2-4 years; promulgate standards at least 5 yrs. before they take effect	Builders, manufacturers, retailers, consumers
Adopt **zero emission standards** that prohibit gas appliance replacements (at end of useful life) for cooking and dryers, • **2035**: single family and multifamily buildings.	NYSERDA, DOS, DEC, DOH (lead/support TBD)		Manufacturers, retailers, consumers
Provide for thoughtful development of alternative compliance pathways from recommended codes and standards for extenuating circumstances (including but not limited to housing affordability-related matters, health and safety/emergency needs). This would apply to pre-existing building stock recommendations.	NYSERDA, DOS, DEC, SHPO	Concurrently with regulatory action	Builders, manufacturers, retailers, consumers

Note: Timeframes associated with recommended regulations will depend on the type of regulation and its governing body and legislation, State Administrative Procedure Act rulemaking requirements and timelines, and ongoing assessment of feasibility, impacts and analysis of what timeframes are needed to meet New York State's climate goals. 16

Mitigation Strategy – Initiative #2 Benchmarking & Disclosure

Overview

Description:	**Require measuring building energy usage, benchmarking energy performance, and making that information accessible via disclosure or labeling.**		
Action type:	Legislative, regulatory, programmatic		
GHG reduction by 2030:	Low	**GHG reduction by 2050:**	Low
Cost and funding considerations:	$		
Ease of implementation:	Easy/Medium		
Example case studies:	New York City, Washington DC, Seattle, Boulder, London		

Risks / Barriers to success	Possible mitigants
1. Building owners need access to consumption data statewide 2. Lack of awareness in market may limit the effective use of data on energy usage and performance to inform decision making 3. Risk of disinvestment in disadvantaged communities if disclosure/labeling makes properties less attractive to potential renters and buyers	1. Ongoing coordination among NYS agencies and utilities to set statewide standards for the provision of energy usage data and to expand provisions in place in NYC (including automatic upload of data for benchmarking) to utilities statewide 2. Education for consumers, brokers and building owners on how to use the energy usage and benchmarking information 3. Adequate technical and financial assistance for LMI homeowners and building owners in disadvantaged communities to scope and finance energy upgrades

Mitigation Strategy – Initiative #2 Benchmarking & Disclosure

Components required for delivery	Implementation lead	Time to adopt regulation/action	Other key stakeholders
Starting in **2023** - Statewide energy **benchmarking and disclosure** program - Require owners of multifamily and commercial properties larger than 10,000 sq. ft. to annually report whole building energy and water consumption data to NYSERDA.	NYSERDA	1-2 years	DOS, NYPA, DASNY, HCR, DOTF, PSC/DPS, utilities, local governments
Starting in **2025** - Require owners of all residential and commercial buildings to obtain and publicly disclose, as part of **sale or lease** listing of a building, housing unit, or commercial space, the prior-year energy consumption of the building, unit, or space (e.g., at least 12 consecutive months of energy bill data). Starting in **2027** – Require owners of single-family buildings to obtain and disclose an energy performance rating (e.g., a Home Energy Rating System (HERS) index) as part of **sale listing**.	DOS, NYSERDA	2 years	PSC/DPS, utilities, local governments
Starting in **2025** - Require multifamily and commercial properties larger than 25,000 sq. ft. to undertake at least once every ten years a **comprehensive building energy assessment** (audit) that: • evaluates the building's systems; • identifies opportunities to invest in energy efficiency upgrades; electrification or electrification-readiness for building systems; and • resilience measures. Filing an assessment report with NYS would be required on a cycle established by NYS or at the time that a building permit is needed for specified work that must conform to Code, whichever comes first.	DOS, NYSERDA	2 years	DOS, NYPA, DASNY, HCR, DOTF, local governments
Policy implementation: Ensure consistency and alignment, where appropriate, across State and local government requirements (e.g., NYC local laws), incl. in reporting templates and timeframes. Use statewide benchmarking data to inform subsequent programmatic and policy design.	NYSERDA		DOS, local governments, housing agencies

Mitigation Strategy – Initiative #3 Gas System Transition

Overview

Description:	**Advance a managed, phased, and just transition from reliance on fossil gas and the gas distribution system to a clean energy system, including elimination of embedded subsidies for fossil gas.**		
Action type:	Legislative, regulatory		
GHG reduction by 2030:	Medium (overlap with #1)	**GHG reduction by 2050:**	High (overlap with #1)
Cost and funding considerations:	$$$; long-term planning expected to mitigate the risk of stranded assets		
Ease of implementation:	Hard		
Example case studies:	Netherlands (revocation of obligation to serve, subsidized gas phase out). To date, no U.S. states have created formal transition plans or limited expansion of gas distribution infrastructure altogether; California, Massachusetts, and NYS (Case 20-00652) have opened PSC proceedings to investigate the role of gas distribution companies in a future clean energy system and long-term gas planning procedures.		

Mitigation Strategy – Initiative #3 Gas System Transition

Risks / Barriers to success	Possible mitigants
1. The utility has an obligation to provide gas service to buildings located within an established distance from the utility's existing facilities and as governed by NYS statute 2. Industry and consumer opposition (e.g., gas industry, developers/construction, manufacturers, large end-users) 3. If not coordinated with broader codes and standards, could drive customers to other fossil fuels 4. End uses with high dependence on gas (hard-to-electrify) 5. Costs burdens placed upon remaining gas customers, with disproportionate burden on LMI households and DACs 6. Maintaining reliability and safety of gas system throughout transition 7. Grid reliability and need for substantive upgrades to electric system to meet increase in demand as buildings electrify (T&D, system lines, and customer panel upgrades)	1. Legislative change 2. Phased planning process that is inclusive of stakeholders including industry, consumer, and LMI/DAC representatives; gas workforce protections and transition plan; consumer education on benefits of the transition 3. Broader codes and standards, consumer education 4. Gas infrastructure planning effort and strategic investments in innovation can work with these sectors to develop feasible and economic decarbonization options 5. Comprehensive equity strategy and resources to enable LMI/DAC households to make energy efficiency upgrades and electrify affordably and expeditiously; planning and regulatory analysis of accelerated depreciation approaches 6. Utility planning and operational practices to meet current customer needs and maintain safe and reliable service while minimizing infrastructure investments 7. Phased approach to consider and mitigate/manage impacts on the electric grid. Regulators work with utilities on their long-term capital planning to help mitigate costs (e.g., utilities to account for code changes in their infrastructure planning)

Mitigation Strategy – Initiative #3 Gas System Transition

Components required for delivery	Implementation lead	Time to adopt regulation/action	Other key stakeholders
Undertake a planning study and process to examine the regulatory, legislative, and other policy changes needed for a managed and just transition of the gas system and infrastructure. Planning and subsequent changes would proceed in a phased manner, with attention to: • safety, equity, and reliability and affordability of service; • assessment of existing gas infrastructure and options for contraction; • identification of end-users highly reliant on gas, technically feasible alternatives, and economic impacts; • a new requirement that each utility regularly file a proposal for how it would meet the State's 2030 and 2050 GHG emissions reduction goals within its customer base, incl. annual utility projections for key metrics (e.g., emissions, fossil gas sales and number of customers by customer class); • alternative models for the gas utility's long-term role, business model, ownership structure, and regulatory compact, as part of a managed transition.	PSC and DPS, in collaboration with utilities, NYSERDA	Phased (build on PSC Case 20-00652); steps in 2 years to 10+ years	Consumers, builders, local governments LMI/DAC households, public housing authorities, EJ and affordable housing groups Utility workers, unions, local governments
Develop a **comprehensive equity strategy** to incorporate the needs of LMI households and DACs in the transition, ensuring they are not left behind. This requires meaningful LMI/DAC engagement in the transition process and prioritizing technical and financial assistance to enable LMI/DAC households to make energy efficiency upgrades and electrify affordably.	PSC and DPS, in collab. with utilities, NYSERDA, DOL	Concurrent with planning process	
Create an **equitable transition plan for the gas industry workforce**, including protections, retraining and training that leverages transferrable skills, and job transition opportunities with attention to opportunities at dual-commodity utilities.This requires both a comprehensive system-wide equity strategy and utility-level equity strategies that include adequate accountability and oversight.			
Minimize new investments in gas delivery infrastructure, not otherwise needed for safety/reliability. Change utility incentives and planning to promote (non-pipes) alternatives to conventional gas infrastructure investment. Align long-term utility planning with the adoption cycle for updated building codes and standards.	PSC and DPS, utilities	Concurrent with planning process	Consumers, builders, solution providers for non-pipes alternatives

Mitigation Strategy – Initiative #3 Gas System Transition

Components required for delivery	Implementation lead	Time to adopt regulation/action	Other key stakeholders
Stop utilities advertising fossil gas as "clean," "natural," "climate friendly," or in similar terms.	PSC and DPS	6 months	Utilities
Phase-out incentives and rebates for fossil gas equipment that are offered by utilities or NYSERDA.	PSC and DPS	1 year to adopt phased approach	Utilities, NYSERDA, consumers
Undertake analysis and provide resources for building-readiness for electrification (to address common building typologies today and over the next decade) and **undertake analysis, planning, and information sharing for electric grid-readiness for electrification** (to include sub-feeder level information for each electric distribution utility and to support planned, transparent upgrades to the grid so that building owners know when access to sufficient electrical service will be available to fully electrify their building).	PSC and DPS, NYSERDA, utilities	1-2 years	Local governments, builders, property managers, consumers
Undertake analysis and **planning for decarbonization of the ConEd district steam system**.	PSC and DPS, ConEd	2-3 years	Steam customers
Level the playing field for adoption of clean heating solutions by **eliminating the "100-foot rule"** which can bias customer decision-making around heating choices. (The 100-foot rule covers most or all of the cost of new gas connections for residential customers and significant costs for new non-residential firm gas customers). **Clean heating choices should be considered policy in the public interest** to support healthy homes, with the provision of heating service to homes (rather than specifically gas or steam service) recognized in State Policy as necessary for the preservation of health and general welfare.	Legislative action, PSC and DPS	2-3 years	Utilities, builders, consumers, local governments
Develop **easement rules to allow access for thermal/ground source loops** to use utility and public (e.g., municipal) rights of way on reasonable terms.	NYSERDA	2-3 years	PSC and DPS, utilities, local governments

Mitigation Strategy – Initiative #4 Transition from HFCs

Overview

Description:	**Advance a managed and just transition from reliance on the use of hydrofluorocarbons (HFCs) as refrigerants and in all products used in building construction.**		
Action type:	Legislative, regulatory		
GHG reduction by 2030:	Medium	**GHG reduction by 2050:**	High
Cost and funding considerations:	$$		
Ease of implementation:	Hard		
Example case studies:	California Short-Lived Climate Pollutants Strategy; US Climate Alliance SLCP Roadmap; Washington and other state legislative actions to address building codes		

Risks / Barriers to success	Possible mitigants
1. HFC use is currently widespread in products being recommended to electrify space conditioning and in foams that provide insulation for higher efficiency buildings 2. Introduction of a replacement with other deleterious environmental and/or health effects 3. Refrigerants are global commodities; a single state is unlikely to spur manufacturers to shift to low-GWP refrigerant technologies	1. Resource toolkits, programs and incentives that make low-global warming potential (low-GWP) refrigerant technologies and low-GWP alternatives in building/construction foams available and affordable to customers now; training installers and contractors on handling, equipment maintenance, and disposal; enforcement of HFC disposal 2. Research into long term health effects of exposure to new chemicals in building materials 3. Ongoing collaboration with US Climate Alliance ensures widespread alignment on policy and mitigates impacts to manufacturers and costs for consumers

Mitigation Strategy – Initiative #4 Transition from HFCs

Components required for delivery	Implementation lead	Time to adopt regulation/action	Other key stakeholders
Update the relevant **NYS codes** to allow low-GWP refrigerants.	DOS	3-5 years	Manufacturers and servicers
Require **reclamation or destruction** of refrigerants from appliances at end-of-life, with verification and reporting, and require leak detection for certain commercial refrigeration (align with Waste Panel recommendations). Provide education and training, technical assistance, and economic support (e.g., incentives to purchase leak detection and reclamation equipment, compensation for refrigerant reclamation) to aid local industry with this transition.	DEC, NYSERDA	1-5 years	Manufacturers, servicers, contractors, property managers
Support **workforce training** and education for low-GWP refrigerants and technologies and for low-GWP alternatives in building/construction spray foam.	DEC, NYSERDA, SUNY	1-3 years	Manufacturers, servicers, contractors
Expand the scope of the NYS **Significant New Alternatives Policy (SNAP) Rule** which prohibits certain HFCs in refrigerator/freezers, chillers, commercial refrigeration, and aerosols/foams/solvents; and lower the GWP threshold over time as low and ultra-low GWP options become available. Align NYS policy with anticipated federal (US EPA) policy measures to meet HFC reduction requirements as well as with other US Climate Alliance states, in order to send a strong market signal to manufacturers and industry while mitigating costs of the transition.	DEC	2 years	Manufacturers, servicers, contractors
Support **further research** into known data gaps, including analysis of typical leak rates and charge size for VRF systems and research into long term health effects of exposure to new chemicals in building materials.	NYSERDA	2 years	Manufacturers, designers, property owners
Continue to support **demonstration projects** for low-GWP refrigerants in HVAC and hot-water systems, and for refrigerant leakage detection and reduction strategies. Develop case studies in alternative refrigerants and refrigerant management, showing the safety, performance, and cost impacts.	NYSERDA	ongoing	Manufacturers, designers, and property managers

Enabling Strategy Summary

	Description	Action type	Ease of implementation	Cost*
Cross-cutting: The scale of transformation will require mobilizing private capital and a significant increase in public resources. The CAC should conduct an economy-wide analysis to identify public and private resources and funding mechanisms.				
1	Public Financial Incentives	Financial, regulatory, programmatic	Hard (given scale)	$$$
2	Public and Private Low-cost Financing	Financial	Hard (given scale)	$$$ + mobilize private capital
3	Workforce	Financial, regulatory, programmatic	Medium	$$
4	Consumer Education	Programmatic	Medium	$$
5	Innovation	Financial, programmatic	Easy	$$
6	Embodied Carbon	Financial, regulatory, programmatic	Easy	$
Cross-cutting recommendations also address federal support, energy prices, resilience, and the importance of energy efficiency.				

Cost estimates for enabling strategies reflect new State resources above current levels of investment, through 2030. State investments in market enabling strategies will be needed for at least the coming decade, with ongoing State resources thereafter to support LMI households and DACs. The categories used for **new State resources (through 2030) are: $ (<$25M, resources are already on hand), $$ ($25M - $100M, requires some new resources), and $$$ (>$100M, requires high degree of new resources).*

Cross-Cutting Recommendation: Economy-wide Analysis to Identify Resources

Realizing transformation at this scale - and doing so in ways that advance equity - will require new resources:

- Focusing the investment of private capital that will be needed to construct, upgrade, and operate highly efficient buildings powered by zero-emissions electricity
- Investing public resources to support market-enabling initiatives and incentives for early adoption of technologies
- Investing public resources to fund building efficiency and electrification in LMI homes, affordable and public housing, and disadvantaged communities – while supporting energy affordability, safe and healthy housing, economic opportunities, and the repair of structural inequalities

Cross-cutting Recommendation: Currently identified funding/financing mechanisms will not address the scale of transformation needed.

- The CAC should conduct an economy-wide analysis to identify public and private resources and funding mechanisms, including federal resources and mechanisms to mobilize private capital, at scale. These resources should holistically support the CAC's Scoping Plan including, but not limited to, all sectors, markets, and building types.
- The CAC also should form an advisory body comprised of members with relevant expertise to advance ways to engage private sector sources of capital and financial institutions (e.g., mortgage, municipal, and community development financial institutions), in support of the economy-wide analysis and on an ongoing basis.

Enabling Initiative #1 Public Financial Incentives

Overview

Description:	**Provide incentives for single family, multifamily, and commercial and institutional building owners that speed uptake and help to transform the market for building efficiency, electrification, and decarbonization, with a focus on enabling uptake that benefits LMI households, affordable housing and public housing, and DACs.**
Action type:	Financial, Programmatic, Regulatory
Cost and funding considerations:	$$$ The Panel estimates: • A **minimum <u>$1B annually</u> in funding is needed specifically for programs that serve LMI households, affordable and public housing, and disadvantaged communities**, on an ongoing basis. • **Financial incentives to motivate early adoption in market-rate housing and commercial buildings also will be needed for at least the coming decade**, supported by public funding at levels comparable to or higher than current energy efficiency and building electrification programs. NYS currently invests (through 2025, across programs administered by NY's Utilities, NYSERDA, HCR, and OTDA): • ~ $250M annually for energy efficiency programs that specifically serve LMI households and affordable housing, as part of > $1B annually to support energy efficiency and building electrification across residential, commercial, and institutional buildings statewide. Also see prior slide on Economy-wide Analysis to identify new resources
Ease of implementation:	Hard, given scale
Example case studies:	NY-Sun, Statewide LMI Portfolio of energy efficiency programs, NYS Clean Heat, Comfort Home Pilot

Enabling Initiative #1 Public Financial Incentives

Overview

Risks / Barriers to success	Possible mitigants
1. Ensuring sufficient funding levels and broader funding sources; specifically, there is a need to expand revenue sources beyond charges on electric and gas ratepayers 2. Incentive programs can be complicated for consumers to navigate 3. Incentive programs do not always provide equitable access or funding to those most in need, and the charges to raise the revenue for such programs can be regressive 4. Barriers to sharing data and administrative “silos” can prevent targeting services and benefits to those households and communities with the highest energy burdens	1. Potential for assistance from federal government, given interest in advancing the climate agenda and investing in infrastructure 2. In program design, emphasis on ease of access to available and relevant resources for consumers/installers, particularly for LMI households and buildings in DACs that can need resources from multiple programs 3. Maximize use and access to existing State programs and incentives to enhance the efficacy of energy efficiency and electrification work; align and streamline WAP, EmPower, and utility programs to optimize use of available resources; review HEAP formulas for the provision of funding for electrification and shell improvements. Create new incentive programs to support both energy and non-energy building improvements that are necessary for building decarbonization 4. Ongoing coordination among State agencies (NYSERDA, OTDA, NYSDOH, HCR, DPS) and the utilities, including through the State’s Low-Income Energy Task Force, to assess the feasibility of consolidating program applications for relevant energy, housing, and other assistance and for sharing data, with appropriate data-privacy practices

Enabling Initiative #1 Public Financial Incentives

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Identify and pursue modifications to **regulatory frameworks** for energy efficiency and building electrification programs to further align the programs with State objectives. This includes, but is not limited to, consideration for and implications of accounting for full (societal) costs and benefits of energy upgrades in buildings.	DPS, PSC	2 years	utilities, NYSERDA, DOS, clean energy industry
Create a program to **provide direct cash incentives for electrical service upgrades** and in-building wiring and equipment, to offset costs associated with preparing a building for electrification (similar to the EV Make-Ready Program).	DPS, PSC, utilities	2 years	Real estate industry, local governments
Expand/create **new direct cash incentives for energy efficiency and electrification** in residential and commercial buildings, with priority on LMI households, affordable housing, public housing, and DAC's. Incentives that help enable uptake and transform the market broadly will be needed for at least the coming decade, with ongoing resources thereafter for LMI/DACs.	State-level entity (TBD on design)	2 (scale up from ongoing)	NYSERDA, DPS, utilities, housing agencies/authorities, LMI/DAC households, EJ and affordable housing groups
Support and accelerate **efficiency, electrification, and resilience in public housing**, statewide (e.g., in NYCHA and other Public Housing Authority developments). Identify funding sources to support deeper retrofits and electrification. Support resiliency centers in public housing developments that provide safe temperatures, backup power (including solar-storage pilots), and community spaces to coordinate disaster relief.	PHAs, NYPA, NYSERDA	2 years	PHA residents, HCR, DPS, NYC agencies (DOB, MOS, HPD),utilities, EJ and affordable housing groups
Create a **"Retrofit and Electrification Readiness Fund" for LMI households, affordable housing, public housing, and residential buildings in DACs** to cover costs of non-energy building improvements that are necessary to install energy measures and broadband installation costs when funding energy projects.	NYSERDA, DPS and PSC, HCR	3-4 years	HPD, LMI/DAC households, EJ and affordable housing groups
Leverage healthy homes services and funding across housing, health, and energy improvements for low-income households to fund green and healthy housing retrofits, e.g.: • Build on the NYS Healthy Homes VBP pilot and further leverage NY Medicaid's Value-Based Payment (VBP) program for Managed Care Organizations to contribute to healthy housing services and home energy efficiency improvements; • Expand use and leveraging of both state and federal funding (e.g., use of WAP funds for health and safety improvements, new HUD Older Adult Home Modification Program); • Engage with non-profit hospitals in community health needs assessments.	NYSERDA, DOH	4 years (scale up from pilots)	OTDA, HCR, HPD, DPS, utilities, community-based organizations, nonprofit hospitals, healthcare professionals

Enabling Initiative #2 Public and Private Low-cost Financing

Overview

Description:	**Low-cost financing for energy efficiency, electrification, electrification readiness, solar PV, and related improvements in buildings to provide single family, multifamily, and commercial and institutional building owners with access to low-cost capital at the scale needed to pay for the building upgrades necessary for decarbonization.**
Action type:	Financial
Cost and funding considerations:	$$$ + unlock private capital
Ease of implementation:	Hard, given scale
Example case studies:	GJGNY; mobilize low-cost capital at a scale comparable to the NYS Environmental Facilities Corp (Clean Water State Revolving Fund)

Risks / Barriers to success	Possible mitigants
1. Lack of awareness in market; predatory lending	1. Provide for consumer protections in financing products
2. Lender interest	2. Lender education and outreach
3. Perceptions of risk in underwriting to energy performance	3. Sufficient resources and case studies available to lenders to provide adequate modeling for underwriters
4. Complexity of developing a large-scale, financing structure with the credit-worthiness elements that institutional investors will view as AAA	4. Models exist for bond-backed State/local revolving fund
5. Current economic conditions for building owners	5. Scale of transformation will require both unlocking private capital and raising substantial public revenue

Enabling Initiative #2 Public and Private Low-cost Financing

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Provide support for **lenders to underwrite to energy performance standards** and applicable regulatory requirements.	HCR, NYSERDA	Ongoing	DFS, private lenders
Continue to scale up **green requirements in affordable housing deals** while ensuring that sufficient resources are available to maintain, preserve and produce clean, safe and affordable housing. Streamline access to all incentives and resources for regulated affordable housing building decarbonization to go through housing agencies making projects affordable, to also make projects energy efficient, all-electric or electric-ready, and resilient.	HCR, HPD	Ongoing	NYSERDA, DPS, OTDA, NYCMOS
Provide **greater access to low-cost financing products** for upgrades, including for low-income homeowners and/or DACs (e.g., low-interest financing coupled with credit enhancement/insurance).	NY Green Bank/NYSERDA, HCR	2 years	DFS, Private banks licensed by DFS; CDFIs
Expand the **use of performance contracting** to achieve goals for State, municipal, and K-12 school building upgrades.	Legislative action	1-2 years	NYPA, NYSERDA, State agencies
Provide a **revolving loan fund for building decarbonization**: e.g., enable public mandates coupled with access to low-cost capital.	Bond-issuing government authority	4 years	DASNY, DOS, DEC (EFC), NYPA, local gov'ts

Enabling Initiative #3 Workforce

Overview

Description:	**Support workforce education, training, job placement and development that equip the state's current and future workforce to design, install, inspect, maintain and operate healthy, comfortable, low-carbon buildings while increasing clean energy job placement for DACs and advancing industry diversity.**
Action type:	Financial, programmatic, regulatory
Cost and funding considerations:	$$; building upon NYSERDA's $100M clean energy workforce training initiative
Ease of implementation:	Easy to develop programs and robust training infrastructure; medium-effort to coordinate/deliver training and placement services at scale, and operationalize support needed for DAC access
Example case studies:	NYSERDA's clean energy workforce programs

Risks / Barriers to success	Possible mitigants
1. Insufficient skilled new entrants to meet labor demand; industry capacity limited by certain workforce gaps (e.g., drilling is a pinch point in geothermal industry capacity) 2. Training does not lead to job placement 3. DAC residents face additional barriers/challenges to securing or retaining jobs 4. Job losses for fossil-fuel related industries 5. Cost pressure of upgrades results in wage depression for certain segments (e.g., building service workers)	1&2. Ensure training investments are driven by industry/employers' needs and demand for new workers. Offer curriculum/career guidance in K-12 and technical schools; develop/scale recruitment models. Provide training integrated with hiring support services. Incl. training/mentorship for current workers and leaders in HVAC and delivered fuel companies to transition to heat pumps. 3. Prioritize investment in DAC outreach, career pathways and placement support. Invest in foundational skills and wrap-around support (e.g., childcare subsidy, free MetroCard). Require employers taking public subsidies conduct periodic racial bias training. 4. Ensure a just transition; prioritize for retraining and job placement. Also see point 1 above. 5. Support retention of workers and equitable access to high-quality, family-sustaining jobs (coordinate with Just Transition Working Group).

Enabling Initiative #3 Workforce

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Scale up training for incumbent and new clean energy workers and adjacent industries, through investments in training infrastructure/delivery, career pathways, on-the-job-training, industry partnerships. Support expanded or new training for: • Local government workforce of code officials and building inspectors; • Building operations, maintenance, and service workers; • Healthy homes training, to equip energy auditors and health/social workers who make home visits to identify health and safety issues and contractors/installers to address these issues; • Training/industry partnership to increase the number of qualified geothermal drillers; • Training for workers in fossil fuel industries to transfer their skills to clean energy opportunities.	NYSERDA	2020-2025	DOL, DOS, state agencies, unions, industry/trade orgs, training orgs, local gov'ts, manufacturers, distributors, impact investors/foundations
Prioritize DACs/low-income residents and other priority populations for training and job placement by creating community-to-employment pipelines and career pathways; analyze current on-the-job training investments for their effectiveness as an employment pathway and refine as appropriate. Promote good wages, benefits, local and targeted training and hiring through Community Benefits/Workforce Agreements and On the Job Training Funding where appropriate, feasible and permitted by law. Leverage State agencies' spending and regulatory influence to advance commitments around job access and job quality for DACs.	NYSERDA, DOL	2-3 years	ESD, community-based orgs, unions, training providers, community colleges, social service agencies, workforce one-stops, foundations
Increase ranks of **MWBE and SDVOB** (Service Disabled Veteran Owned Business) and cooperatives through increased access to workforce training and business development support; increase MWBE and SDVOB participation across broader array of State-funded investments and projects.	NYSERDA, DOL, ESD	2 years	State agencies, local govts, workforce, community-based orgs, one-stops, training providers
Require building decarbonization **curricula and career services** in State-funded education incl. K-12, technical schools, apprenticeships, and engineering and architecture programs at public universities, and encourage this curricula at private universities.	NYSERDA, NYS Board of Regents, SUNY, CUNY	2-4 years	DOL, unions, private colleges & univs, accrediting boards
Require **continuing education on building decarbonization** (e.g., energy efficiency, electrification, embodied carbon) as part of licensing for architects, engineers, trades, contractors, building ops. and maintenance, real estate professionals (inspectors, brokers, etc.).	DOS, NYSERDA, DOL, local licensing agencies	3 years	unions, industry orgs, accrediting boards
Support **retention** of experienced building service workers.	NYSERDA, DOL	2 years	Unions, Building Owners, DOS, local licensing agencies

Enabling Initiative #4 Public Awareness and Consumer Education

Overview

Description:	**Support broad public awareness and consumer education, create strategic partnerships including with trusted community leaders, and scale-up targeted outreach and decision-making support to increase market demand and accelerate the transition to low-carbon, energy-efficient, all-electric buildings.**
Action type:	Programmatic
Cost and funding considerations:	$$
Ease of implementation:	Easy to develop content; medium effort to develop integrated strategic plan and coordinate aligned messaging and dissemination; high touch/volume, delivered through range of channels to effectively reach broad range of audiences.
Example case studies:	Clean Energy Hub model (under development)

Enabling Initiative #4 Public Awareness and Consumer Education

Risks / Barriers to success	Possible mitigants
1. Low awareness of Climate Act, building inefficiencies, climate solutions for buildings, and steps to take	1. Broad-based public outreach campaign with clear customer journey to resources/programs; drive participation through retargeting and repeated exposure; create sense of shared responsibility
2. Competing demands on consumers' attention	2. Trusted, high-visibility resources/channels (e.g., local elected officials, social media influencers, sponsored content); embed messages in TV/film (e.g., home improvement or cooking shows)
3. Perception of natural gas as clean, opposition campaigns from fossil fuel industry	3. Direct utilities to sunset "clean gas" messaging; public education on the negative indoor air quality and climate impacts of combustion appliances
4. Lack of familiarity with heat pumps or inaccurate perceptions	4. Ample data/case studies/customer testimonials (e.g., Maine leading on heat pumps); engage validators; offer tours
5. Partisan polarization in news/info sources	5. Early local community engagement (regional working groups, Hubs) to build trust, drive engagement, and provide transparency; use varied channels to deliver message; engage younger generations to influence parents
6. Raised awareness does not translate into action	6. Streamlined customer access to programs (e.g., one-stop shop/Hub to help DAC customers); deliver info when customers are making energy-related decisions (e.g., during home purchase, at home improvement stores, through utility marketplaces, as part of asset management plans)
7. Reluctance to electrify due to grid reliability / risk of losing heat	7. Address grid reliability, resilience head-on as part of all messaging; showcase technical solutions and demonstrate improvements to increase public confidence

Enabling Initiative #4 Public Awareness and Consumer Education

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Support and scale up **multilingual public and consumer education** efforts through large-scale, coordinated awareness, inspiration and education campaign; traditional and broad reaching media, digital communication, “influencer” style campaigns, user-generated campaigns, out of home displays, zines, mailers, virtual tours; resources for installers, distributors, home-visiting workforce, other supply chain actors to educate consumers, customer-facing resources and tools.	NYSERDA, utilities	2 years	Utilities, installers, distributors, manufacturers, real estate industry, unions, trade associations, home improvement retailers.
Create **Strategic Partnerships** that can have Broad Impact: including utilities (promote decarbonization and sunset 'clean gas' messaging), trusted community leaders and organizations (e.g. churches), cooperative extensions, business councils, industry orgs/large corps, unions, schools/teachers, film and public venues, state and local elected officials. Build on experience from Heat Smart programs.	NYSERDA	2-3 years	Utilities, PSC, community-based orgs, industry orgs, local coop. extensions, Heat Smart campaigns
Ensure messages, messengers, and media **reflect DACs** in marketing efforts and prioritize education and technical assistance for DACs. Maintain a “one-stop shop” website for clean energy, electrification, and energy efficiency programs, and establish and fund community hubs to offer education, resources, local contractors, technical assistance and program navigator support. Build on the commitment of NYSERDA and NYS Utilities to maintain the NY Energy Advisor website and coordinated marketing for a statewide portfolio of LMI programs, and on NYSERDA’s development of regional Clean Energy Hubs.	NYSERDA	1-2 years	Utilities, community-based grassroots organizations, cooperative extensions, manufacturers, installers, state and local elected officials.
Publicize **best practices** for efficient building operations and recognize leaders/innovators in efficient operations for early adopters. Create an incentive program/challenge to attract others or encourage others to sign **a pledge to commit to neutrality**.	NYSERDA	1-2 years	Industry groups, unions, local govts.
Provide **technical assistance and resource toolkits** for building decision-makers and residents including playbooks for low-carbon solutions in common building types, free in-home or virtual audits to homeowners, and capital planning support for large buildings. Provide info resources and tools to support tenant engagement. Demonstrate low-carbon solutions through challenges, case studies. Develop case studies showing the feasibility, performance, and costs for three paths to transition to all-electric buildings: full electrification, partial electrification, and electrification ready.	NYSERDA, utilities	2-3 years	Building decision-makers; real estate orgs; Service providers (A&E firms, MEPs); tenant organizations; residential contractors.

Enabling Initiative #5 Innovation

Overview

Description:	**Support research and development (R&D), demonstration projects, and more companies and manufacturers operating in NYS to bring innovative solutions to the marketplace for: highly efficient, all-electric, and resilient buildings; grid-interactive buildings, with revenue opportunities; and reducing embodied carbon in buildings.**
Action type:	Programmatic
Cost and funding considerations:	$$; building upon NYSERDA's $60M annual commitment
Ease of implementation:	Easy
Example case studies:	New York Battery and Energy Storage Technology (NY-BEST), ARPA-e, California Public Interest Energy Research (PIER) project, MassCEC

Risks / Barriers to success	Possible mitigants
1. NYS funding and the NYS market opportunity alone are not large enough to drive needed R&D. 2. Industry inertia and building-as-usual culture favor familiar building practices and materials. 3. Need to expedite solutions for certain building typologies. 4. Cost is the primary driver for choice of solutions and few current solutions successfully compete on current cost and value proposition 5. Market-driven innovation may leave behind LMI households, DACs	1. Advocate for federal government R&D funding and work in partnership with like-minded states and entities. Concurrently increase NYS funding of R&D, which has a strong multiplier for jobs and economic development. 2. Leverage New York's robust innovation ecosystem; codes and standards to sunset fossil fuel use in buildings would provide strong market signal. 3. Develop NYS demonstrations and case studies for emerging technologies in prevalent building typologies. 4. Orient innovation toward cost reduction as well as additional value. 5. Fund innovation opportunities that target solutions for LMI/DACs and locate demonstration projects in DACs.

Enabling Initiative #5 Innovation

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Advocate for, and leverage, **Federal and National Laboratory resources** focused on identifying and commercializing advancements in technologies for building decarbonization and building resilience.	Chamber	ASAP	NYSERDA, SUNY
Scale up resources to identify and promote **tech. transfer** for innovative building decarbonization technologies and design approaches that are in use internationally and could be transferred to the NYS market, e.g., via support adapting for NYS standards, demonstrations, market research, partnering with NYS entities, and manufacturing assistance.	NYSERDA, ESD	Scale up from ongoing, over 1-2 years	manufacturers, designers, like-minded states/orgs.
Provide support and outreach for **MWBEs, cooperatives, and B Corps**, e.g. dedicated access to expert advisory services; internships, fellowships, and board placement in innovative companies; access to venture capital for underrepresented women and minority entrepreneurs, via New York Ventures.	NYSERDA, ESD	Scale up, over 1-2 years	
Continue to support R&D, demonstrations, and technology transfer/commercialization for next generation HVAC systems and building envelopes that deliver high performance, meet technical needs, and lower costs, incl. for: continued improvement in cold climate performance across a range of heat pump products/sizes; improved domestic hot water heat pump technologies; solutions for harder-to-electrify buildings; community thermal loops; advanced heat recovery and ventilation; improved thermal storage for HVAC applications; innovative materials, construction approaches, and manufacturing methods that improve building envelopes; and other technologies.	NYSERDA	Continue ongoing	Federal government, SUNY campuses and researchers, manufacturers, designers, building decision-makers, utilities, like-minded states/organizations
Support R&D, demonstrations, technology transfer/commercialization, and development of standards across manufacturers and equipment for **Grid-Interactive Efficient Buildings** (GEBs), to deliver energy efficiency, load flexibility, and modulation capabilities that contribute to efficient grid management and grid reliability.	NYSERDA	Scale up from ongoing, over 1-2 years	
Support the development of market signals incl. revenue streams **for Grid-Interactive Efficient Buildings,** via analysis of opportunities to provide grid services and electric/thermal services to neighboring buildings, assessment of market mechanisms for supporting desired policy outcomes, and pilots/demonstrations to inform rulemaking/ratemaking.	PSC/DPS, NYSERDA, utilities	Scale up, over 1-2 years	
Assess and then support R&D needs with respect to building resilience (with electrification and more frequent extreme weather**); flexibility and resilience** of the electrical system; and related energy and thermal storage solutions.	NYSERDA, DEC		

Enabling Initiative #6 Embodied Carbon

Overview

Description:	**Establish procurement requirements and design specifications for State-funded projects and support education, building reuse, R&D, and in-state manufacturing of alternative products in order to lower the embodied carbon of products and materials used in the buildings sector and to create broad carbon literacy regarding the impact of materials, while increasing attention to carbon-sequestering products (e.g., cross-laminated timber, hempcrete).**
Action type:	Education, Financing, Regulatory
Cost and funding considerations:	$
Ease of implementation:	Easy, via a diversified approach
Example case studies:	Port Authority NY/NJ calls for EPDs in some specifications; NYSERDA takes embodied carbon into account in awarding support for building construction projects; EC3 is a viable, free tool gaining traction

Risks / Barriers to success	Possible mitigants
1. Lack of awareness of embodied carbon impacts regarding products in use in building industry (designers, contractors, and manufacturers) 2. Industry inertia and building-as-usual culture favor familiar building practices and materials. 3. Inaccurate impression that reducing embodied carbon will cost more and damage economy	1. Create method to require transparency and therefore engagement with data on embodied carbon as part of daily practice (in all state work). 2. Lead-by-example by requiring reduction of embodied carbon in State-funded projects. Incorporate into project calculations the value of carbon guidance issued by DEC for use by State agencies, to create awareness of the cost of GHG emissions and embodied carbon. 3. Harness NYS forestry economy to develop carbon negative building retrofit products in state, thus supporting carbon and economic development and DAC support goals.

Enabling Initiative #6 Embodied Carbon

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Drive embodied carbon reductions through procurement in State-funded projects **(leading by example**), initially by requiring Environmental Product Declarations (EPD) for structural building materials and products used in the project and promoting the use of available modeling software/design tools for embodied carbon calculations. In parallel, require that State-funded projects follow lower-carbon specifications for the most carbon intense building materials and products (e.g. concrete, foam insulations, glass, window units). Subsequently set a target embodied carbon reduction level (below the established mean carbon budget as illustrated over the previous years) for projects.	Under GreenNY, incl. DASNY, NYSERDA, DOS; explore procurement specs. under Exec.Order 4 and potential links to public bid process for construction projects	~2 yrs. for EPD/tools; ~4-5 yrs. for carbon specs; and rigorous carbon budget reduction goals by 2030	PA NY/NJ, DOT, DEC, OGS, NYPA, NYC DDC, builders, designers, manufactures, local gov'ts. AIA ACEC, AGC…
Support **R&D, demonstration projects, and technology transfer/commercialization** for enhanced low embodied carbon construction, including preference for re-use of existing buildings.	NYSERDA for products to market, DASNY and SUCF for design practices	~2 yrs.	AIA, ACEC, AGC, like-minded states/orgs.
Provide assistance to expand **in-state manufacturing** for products that are lower in embodied carbon (e.g., low carbon concrete) or made of carbon sequestering materials also known as biogenic or agriculture-based materials (e.g., hempcrete and sustainable wood products).	SUNY ESF, NYS Wood Products Development Council	2-5 years aggressive build-out	NESEA and other green building organizations, Sustainable Business Council
Identify and pursue financial incentives, changes to building codes, and other strategies specifically to encourage **building reuse**, beginning in urban centers where returning vacant buildings to use and maintaining the existing building facade and architectural style and can be an additional benefit to the embodied carbon reduction.	*[to be identified]*	5 years for projects meeting certain requirements (size, cost, etc.)	Real Estate Associations, IDAs, local governments

Cross-Cutting Panel Recommendations

Initiative	Panel Recommendation
Federal Agenda	The Panel recommends the CAC **advocate for Federal resources and policy support** in the scoping plan. Climate change is a national and global problem. New York State is a leader but will need significant assistance and partnership from the Federal government to bring these recommendations to fruition.
Revenue Sources	The Panel recommends the CAC **conduct an economy-wide analysis to identify resources** and funding mechanisms to support the final scoping plan. While the Panel identified and recommended some potential funding/financing mechanisms, these do not address the full need outlined in the recommendations. Further analysis and expert/stakeholder input is needed to identify resources for this scale of transformation.
Energy Costs and Price Signals	The Panel recommends **ongoing PSC attention to rate design and retail rate price signals for both electricity and gas**, to ensure affordability as buildings electrify and to promote demand flexibility.
Adaptation and Resilience	**Adaptation and Resilience recommendations are of material importance** as buildings electrify heating systems, and as the frequency of extreme weather events increases the probability and scale of grid outages. At the building level, the Panel recommends several changes in the State codes that support more resilient buildings and efficient, flexible technologies that can enhance grid reliability and resilience, including high-performance walls/roofs/windows to improve passive survivability, solar PV along with energy storage readiness, grid-interactive appliances, and EV readiness to position for vehicle-to-grid/vehicle-to-building applications. The Panel also supports multiple specific recommendations advanced by the cross-panel Adaptation and Resilience group, notably: (i) to develop policies and programs to reduce human risks associated with new patterns of thermal extremes (e.g., community-based cooling and warming centers, weatherization from thermal extremes, cool roofs); (ii) to ensure the reliability, resilience and safety of a decarbonized energy system (e.g., modernize the energy system, energy efficiency upgrades and capital improvements to buildings to endure grid failures and to accept power when the system is re-energized); and (iii) to strengthen meaningful community engagement and public education and build adaptive capacity (e.g., train building operations staff in disaster preparedness, provide home and small business resilience audits/refinancing). The Panel underscores the need for additional research, analysis, and policy development on this critical topic.
Energy Efficiency Upgrades for Existing Homes	Although the Panel's recommendations do not include a regulatory requirement to perform energy efficiency upgrades to existing residential buildings, the Panel **underscores the importance of insulation/weatherization and energy efficiency measures** to make homes comfortable and to reduce emissions, heating costs, and seasonal demand peaks. Either regulations and/or substantial subsidies likely will be needed in the future to effectuate this at scale. Given market challenges and costs, the Panel recommends that the first step is to require energy benchmarking and disclosure as described in Mitigation Strategy #2, which can then inform future policy deliberations and programs to assist low-income New Yorkers. In the meantime, funding for LMI weatherization/energy efficiency efforts will need to be substantially increased.

Additional Panel Perspectives Summary

Initiative	Panel Recommendation
Federal Advocacy	Some members of the Panel recommend **specific Federal advocacy items**, including for increased federal funding for efficiency and electrification upgrades (e.g. for weatherization, HEAP, P-12 schools); attention to federal tax credits (e.g., increase the geothermal commercial tax credit to 30%, boost federal tax credits for affordable housing without reducing unit production); federal support for critical R&D investments (e.g. in ultra low-GWP equipment, long-duration storage, resilience solutions); and to expand guidelines in WAP to allow/increase funding for electrification and healthy homes.
Carbon Fee	Some members of the Panel recommend that the CAC and NYS policymakers consider an **economy-wide carbon fee**, both to level the relative cost of electricity and gas and to fund investments in building upgrades and workforce initiatives that directly benefit LMI households and disadvantaged communities. If a carbon fee is applied to electricity generation, it will be important to establish an aligned carbon fee applied to fossil fuels combusted in buildings. Some members of the Panel support the **Climate and Community Investment Act** (introduced in the NYS Senate as S4264A) to raise and direct funding.
Low-Cost Financing and Financial Incentives	Some members of the Panel identified **additional financing and financial incentive mechanisms** for further consideration by the CAC, including: on-bill “pay as you save” financing (or inclusive financing) products for clean energy upgrades as a service to utility customers, with consumer protections; engaging mortgage lenders to require compliance with regulations and to provide lower interest rates for low-emissions buildings; exploring additional ways to expand PACE-like and municipal financing; extending State and local sales tax exemption and/or income tax credits to heat pump equipment; and creating or modifying property tax abatements to incent early adoption of deep building decarbonization.
Energy Costs and Price Signals	Some members of the Panel proposed **specific electric rate design modifications** for consideration, including time-varying rates that encourage electricity use when it is least expensive; voluntary demand-based delivery rates for residential customers that reinforce the storage capability of ground source heat pumps; seasonal rates that take advantage of NY’s current summer peak to provide lower prices for winter heating; specific rate classes for electric heating, all-electric buildings, or all-electric affordable housing; and progressive rate design to mitigate potential energy cost increases for LMI households. In addition to an analysis of natural gas distribution asset depreciation policies for ratemaking purposes, some Panel members proposed **gas rate design modifications** for consideration, including the elimination of block rate structures that provide lower volumetric rates to customers who use more natural gas.
Codes & Standards	Some members of the Panel recommend a **more accelerated schedule for adopting an all-electric State Code**, starting for single family homes in 2023 and for multifamily and commercial buildings in 2026.

Additional Panel Perspectives Summary (continued)

Initiative	Panel Recommendation
Integration Analysis	The Panel's recommendations do not fully solve for hard-to-electrify buildings, which may require alternative solutions or transition strategies. The Panel recommends **further analysis of viable solutions for hard-to-electrify buildings**, to be undertaken by NYSERDA. Some members of the Panel further propose that the Integration Analysis process consider additional solutions that include (but are not limited to) some use of hybrid electric-fossil fuel systems as a transition strategy and some use of low-carbon fuels in buildings (e.g., high-percentage biodiesel blends in heating fuel, renewable natural gas, hydrogen, wood). Initial analysis suggests that for the buildings sector, the package of policies advanced by this Panel are generally consistent with driving an 85% reduction of emissions by 2050 (relative to 1990 levels), but likely will fall short of driving a 40% reduction of emissions by 2030. Some members of the Panel recommend that the Integration Analysis consider the extent to which the following **additional policy options could accelerate emissions reductions over the next decade**: a more accelerated schedule for adopting an all-electric State Code; a more accelerated schedule for emissions-based standards in existing low-rise multifamily buildings or existing commercial buildings; a requirement that existing residential buildings meet an insulation/air sealing standard (for single family and low-rise multifamily) or a building performance standard (for large multifamily); more funding to drive near-term voluntary adoption of energy efficiency/weatherization; and introduction of a carbon price (in conjunction with regulatory measures) to influence energy conservation as well as capital investment decisions. For these policy options, benefits/costs and practicality of implementation would need to be assessed.

Benefits & Impacts **Disadvantaged Communities**

Mitigation Strategy #1 **Codes and Standards** Mitigation Strategy #4 **HFC Transition**	Cost premiums for installation of efficient and electric equipment/systems will need to be subsidized with adequate financial and technical assistance for LMI homeowners, public housing, and building owners within DACs; Avoid potential disinvestment in low-income properties and disadvantaged communities; Training, job placement and workforce development prioritized in DAC and for priority populations.
Mitigation Strategy #2 **Benchmarking & Disclosure**	Energy affordability is a challenge for many LMI households and required energy disclosure provides important information (incl. on ongoing energy costs) when buying or renting a home, informing decision-making and budgeting; Energy disclosure may lead to higher prices for efficient homes and apartments, which could price out LMI households.
Mitigation Strategy #3 **Gas System Transition**	NYS faces a risk that LMI/DAC households will be among those left carrying the rate-base for gas infrastructure, creating an unfair burden; Planning process needs to involve stakeholders from disadvantaged communities, to ensure policies maximize benefits and minimize unintended harm to these communities; Provide dedicated resources to help LMI/DAC households and public housing make energy efficiency upgrades and electrify affordably; refine affordability policy to account for household energy burden.

Benefits & Impacts **Disadvantaged Communities**

Enabling Initiative #1 **Low-cost Financing**	Lending tools to incentivize projects benefitting LMI households and/or DACs and public housing to ensure equal participation in decarbonization would provide a convenient alternative financing mechanism that could be appealing and prioritize LMI households and DACs Provide protections from predatory lending Do not create incentives that undermine general affordability and denser living patterns (associated with lower emissions per capita)
Enabling Initiative #2 **Financial Incentives**	Direct cash incentives to LMI households and DACs would encourage energy efficiency upgrades and early transitioning from fossil fuels Early adoption by LMI and DACs would mean these populations are not left on an increasingly costly gas system Do not create incentives that undermine general affordability and denser living patterns associated with lower emissions per capita
Enabling Initiative #3 **Workforce**	Training, job placement and workforce development prioritized in DACs and for priority populations. Quality, good-paying jobs for DAC residents and priority populations
Enabling Initiative #4 **Consumer Education**	Inspire and increase participation in clean energy (more public subsidy going to disadv community residents) Reduced energy costs/burden; Low carbon upgrades improve quality/value of building stock which may further reduce healthcare costs Increased local capacity to participate in and benefit from clean energy transition.
Enabling Initiative #5 **Innovation**	Innovation that drives down the installed cost of building decarbonization upgrades is particularly valuable for disadvantaged communities, which spend a disproportionate share of their income on energy and housing. Affecting manufacturing can address many EJ issues where siting of dirty manufacturing is often in lower-income and black and brown communities. NYSERDA's innovation program is supporting specific product development and demonstration for heat pump units that fit into affordable multifamily retrofits.
Enabling Initiative #6 **Embodied Carbon**	Any reduction in embodied carbon in building materials will, over time, benefit distressed and disadvantaged communities by greening up manufacturing, and reducing negative air/soil/water impacts. Attention should be paid to achieving cost parity for low-embodied carbon products compared to conventional. Solutions will need to address remediation of present building conditions where needed to facilitate reuse and also can return vacant buildings to use.

Benefits & Impacts **Health & Co-Benefits**

Mitigation Strategy #1 **Codes and Standards**	Improved outdoor and indoor air quality resulting in better health outcomes; Improved building occupant comfort and productivity; Safety benefits from removing indoor combustion sources, such as reduced risk of fire and carbon monoxide poisoning; Reduced environmental damages associated with fossil fuel combustion and production, including spills and groundwater contamination
Mitigation Strategy #2 **Benchmarking & Disclosure**	Energy disclosure and market competition are likely to attract buyers/renters for efficient homes, apartments, and commercial spaces; energy-efficient properties have higher occupancy levels, rental premiums, and sale prices relative to less-efficient properties.
Mitigation Strategy #3 **Gas System Transition**	Avoiding gas infrastructure build-out and requiring new homes to be all-electric will lead to improved outdoor and indoor air quality resulting in better health outcomes; Safety benefits from removing indoor combustion sources, such as reduced risk of fire and carbon monoxide poisoning; Reduced environmental damages associated with fossil gas combustion and production.
Mitigation Strategy #4 **HFC Transition**	Proper management of refrigerant-containing appliances will decrease overall pollution from disposal of this material. Adverse health effects of exposure to new chemicals need to be further understood.

Benefits & Impacts **Health & Co-Benefits**

Enabling Initiative #1 **Low-cost Financing**	Electrification, efficiency, and readiness measures would improve the quality of life for people living and working in many buildings, improve air and environmental quality, and address other environmental hazards (e.g. mold/asthma triggers)
Enabling Initiative #2 **Financial Incentives**	Electrification, efficiency, and readiness measures designed and installed by a well-trained workforce would improve the quality of life for people living and working in many buildings, improve air and environmental quality, and address other environmental hazards (e.g. mold/asthma triggers, vulnerability to extreme heat/cold)
Enabling Initiative #3 **Workforce**	Cross-training of clean energy workforce on health and in-home health workforce on energy to more effectively identify and address home health hazards Skilled workforce will result in healthier, more comfortable buildings for occupants
Enabling Initiative #4 **Consumer Education**	Promotes messaging that building electrification improves indoor and outdoor air quality and supports human health, Highlights improved comfort; provides tenants greater control over their heat, higher cognitive functioning with better air quality Highlights efficiency in new technology that delivers cooling as well as heating Demonstrates need for improved resiliency
Enabling Initiative #5 **Innovation**	Cleaner air as onsite combustion in phased out Innovation is expected to deliver healthy, more comfortable buildings for occupants via solutions that are technically feasible and economic for a broad range of building typologies Retrofits will add value to properties
Enabling Initiative #6 **Embodied Carbon**	A transition to wood-based products, and other biogenic carbon products, can directly improve well-being of building occupants through stress reduction and connection to Nature. Additionally, wood and linoleum, for example, kill off bacteria on their surfaces significantly faster than steel or plastics (99.9% dead after 3 minutes on wood, none died on plastics). Many natural, low-embodied carbon products have significantly lower off-gassing than synthesized products such as spray foam insulation.

Benefits & Impacts **Just Transition: Businesses and Industries, Workers**

Mitigation Strategy #1 **Codes and Standards**	Couple codes/standards with workforce development to grow the workforce equipped to deliver electrification and energy efficiency services and to ensure incumbent workers have paths to transition; Training/upskilling of design professionals, HVAC, and construction industries; New industries and jobs in the clean energy economy
Mitigation Strategy #2 **Benchmarking & Disclosure**	Better market information about building performance unlocks demand for energy-efficiency services and skilled workers such as design professionals, energy auditors and building raters, facility managers, and HVAC and construction workers (with appropriate protections against potential predatory targeting of LMI/DAC households); Training/upskilling new and incumbent workers in these fields to meet demand, as well as real estate professionals.
Mitigation Strategy #3 **Gas System Transition**	Displaced gas utility workers must have a just transition path to other positions within the utility or alternate employment. Examples include utilities coupling the roll out of smart meters with job retraining for meter readers to fill other positions and agreements negotiated in the planned closure of the Diablo Canyon nuclear plant in California and of the TransAlta coal plant in Washington.
Mitigation Strategy #4 **HFC Transition**	New jobs and industries created in refrigerant service, recovery, and destruction. Training opportunities in new technologies provide access to a growing jobs field.

Benefits & Impacts **Just Transition: Businesses and Industries, Workers**

Enabling Initiative #1 **Low-cost Financing** Enabling Initiative #2 **Financial Incentives**	Through program design, the following JTWG Principles can be addressed: #4: Realize vibrant, healthy communities through repair of structural inequalities #8: Climate Adaption Planning and Investment for a Resilient Future #10: Mutually-Affirming targets for State Industrialization and Decarbonization
Enabling Initiative #3 **Workforce**	Job growth and economic development in every part of NYS Business development and growth for MWBE and cooperatives. Will build local capacity to ensure stakeholder-engaged just transition planning process Job losses in fossil fuel industries (fuel oil supply chain, conventional HVAC industry); mitigate through direct investment in retraining and new business development
Enabling Initiative #4 **Consumer Education**	Will ensure a stakeholder-engaged transition planning process Gets in front of mandates and creates the opportunity for a timely transition away from fossil fuels Builds awareness for building decarbonization
Enabling Initiative #5 **Innovation**	Clean energy industries are poised for significant growth; investment in innovation and anchoring an in-state supply chain of growing businesses and manufacturing will make it easier for the State to achieve its climate goals while also attracting new investments and jobs.
Enabling Initiative #6 **Embodied Carbon**	A just transition can be created by working toward knowledge and transparency first, allowing the market to recognize the importance of embodied carbon reductions. The cost burden for transparency can be mostly met by manufacturers, is relatively minor, and is already well underway. Connecting financial mechanisms to transparency can put the biggest effort onto the biggest projects, thereby creating a balanced approach. There is little/no effect on workers beyond education of the market, which will happen through specifications on projects. In addition, wood-based products are beneficial to New York's forestry industry.

Benefits & Impacts **Other**

Mitigation Strategy #1 **Codes and Standards**	Education for consumers, trades, professions, contractors, suppliers, retailers; Invest in building resilience and community-scale resilience to avoid grid failure; Prioritize investments in the reliability, resilience, and affordability of the NYS electric grid
Mitigation Strategy #2 **Benchmarking & Disclosure**	Benchmarking building energy on a regular basis helps to identify energy efficiency opportunities and is correlated with reduced energy consumption by an average of 2% to 3% annually across multiple benchmarking efforts; Benchmarking data provides market actors and government agencies insight into how buildings perform, enabling more informed investment decisions, lead generation, targeting of public resources, and public policy development; Education for consumers around using energy data, real estate transactions, and hiring a professional energy rater/auditor also will support informed decision-making.
Mitigation Strategy #3 **Gas System Transition**	Cross-sector: Implement energy infrastructure planning, land use planning, and building codes in ways that are complementary and support larger policy goals (e.g., infrastructure, economic development).

Enabling Initiative #1 **Low-cost Financing**	Resiliency note: Financing could be tied to being located outside the Special Flood Hazard Area to encourage relocation. This could also leave households behind that do not or cannot relocate.
Enabling Initiative #2 **Financial Incentives**	Program design for incentive programs should be collaborative and engage a wide variety of stakeholders in order to best serve LMI households and DACs
Enabling Initiative #4 **Consumer Education**	Increased awareness and education will increase demand and adoption of new technology and practices Increased demand will reduce cost and stimulate the economy Builds support for decarbonizing the built environment Promote workforce needs and support job growth
Enabling Initiative #6 **Embodied Carbon**	Creating market awareness of carbon in products will be the most effective strategy for activating responses in all industries. Once products have a clear role in our carbon reduction, every sector will change, from building, to transportation, to manufacturing, to food production.

Appendix

Energy Efficiency and Housing Advisory Panel Members

CHAIR

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Laura Vulaj
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SL Green Realty Corp.

Category definitions (1 of 2)

	Low	Medium	High
Emissions impact (1990 baseline)* – EE&H Panel adopted a 1990 baseline to benchmark to economy-wide targets	Strategy results in <10% of the reductions needed from the sector for each target year (2030 and 2050) OR Less than 1.5 million metric tons (MMT) of emissions reductions in 2030 or 3 MMT 2050	Strategy results in 10-33% of the reductions needed from the sector in at least one of the target years OR greater than 1.5 but less than 4 MMT of emissions reductions in 2030 or over 3 but less than 8 MMT in 2050	Strategy results in >33% of the reductions needed from the sector in at least one of the target years OR over 4 MMT of emissions reductions in 2030 or over 8 MMT in 2050.
	Easy	**Medium**	**Hard**
Ease of implementation	• Strategy has been implemented many times and/or can build off an existing NYS program • Proven and widely available technology • Key stakeholders are strong supporters; no strong opponents	• Strategy is new to New York State but has been successfully implemented in other comparable states/countries • Proven technology with known GHG impact, but still small-scale • Key stakeholders are neutral, or balanced mix of supporters and opponents	• Strategy is unproven in comparable settings • Early-stage technology (e.g., need for pilots to prove feasibility and significant capital to scale up) • Key stakeholders oppose the strategy

*Estimated reductions may also account for a Business-As-Usual scenario that predicts emissions growth in the sector

Category definitions (2 of 2)

	$	$$	$$$
Mitigation Strategy Cost – expressed for EE&H Panel as equivalent annualized cost	• <$250M total resource cost • Most resources required for successful implementation are already on hand	• $250M - $1B total resource cost • Requires some new resources for successful implementation	• Over $1 Billion total resource cost • Requires high degree of new resources (people, equipment, technology) • Strategies with cost >$10B should indicate the range of anticipated costs
	$	**$$**	**$$$**
Enabling Strategy Cost – expressed for EE&H Panel as new State resources through 2030	• <$25M total cost • Most resources required for successful implementation are already on hand	• $25M - $100M total cost • Requires some new resources for successful implementation	• Over $100M total cost • Requires high degree of new resources or is a demonstration project • Strategies with cost >$250M should indicate the range of anticipated costs

Power Generation Advisory Panel Recommendations

May 3, 2021

NEW YORK STATE OF OPPORTUNITY. | Climate Action Council

PowerGenPanel@dps.ny.gov

Power Generation Panel Members

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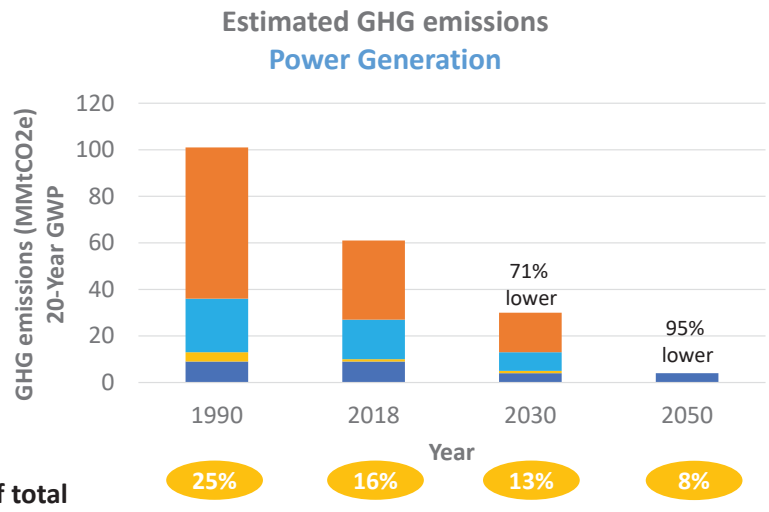
Description of Recommendation Types

- **Mitigation strategies:** actions that directly reduce emissions and contribute to the achievement of the greenhouse gas emission limits or carbon sequestration needed to achieve net zero, where applicable. Consider how the collective estimated emissions impact of these strategies amount to the Pathways reduction target for the panel (if applicable) and support attaining the greenhouse gas limits.
- **Enabling initiatives:** actions without direct emissions benefit that enable or magnify the mitigation strategies, enhance climate justice, or just transition
  - Examples of such initiatives include outreach, education, and increasing awareness; capacity building; workforce development; and research and development.

Aggregate GHG emissions impact of Power Generation panel recommendations



% of total NY emissions

2018 emissions data are preliminary draft

Electricity Sector

Emissions (2018 Subtotal)

- Fuel Combustion (34mmt)
- Imported Fossil Fuels (17mmt)

Panel Goals:

- 2030: 70% RE is equivalent to 50% emission reduction from 2018 levels above
- 2050: Align with 100% Zero Emission by 2040

Other Sectors

- NYS Oil and Gas Methane Leakage
  - Recommendations reduce leakage 50% from 2018 levels (9mmt to 4mmt)
  - Additional actions by other Panels not included
- Electricity T&D
  - Phase-Out SF6 by 2050 (<1mmt to 0mmt)

Power Generation Advisory Panel Considerations

Electrifying buildings and transportation is crucial to meeting CLCPA goals.

Principles

> Reliability
> Equity
> Affordability
> Zero-emission
> Timely

Approach to Electrification Must…

> Minimize the system costs of electrification and balance the behind-the-meter costs with grid-side costs, with both bulk and local solutions
> Optimize the deployment and operation of resources – locationally and for flexibility – through storage, managed load, and clean dispatchable generation
> Look to utilities, DER providers, and bulk providers for this – as makes most sense and with steady and improvement and rules
> Provide for improved holistic planning of the electric system and across energy systems to accommodate significant changes in characteristics of generation and significant changes in load due to electrification
> Pay heightened attention to resilience and reliability as the energy system becomes more electric
> Support solutions in technologies, regulation, markets, and systems management and oversight

Mitigation & Enabling Strategy Summary

Initiative #	Description	Action type	Ease of implementation	Cost
1	Growth of Large-Scale Renewable Energy Generation	Procurement, Regulatory	Medium	$
2	Clean Energy Siting & Community Acceptance	Executive, Regulatory	Medium - Hard	$$
3	Clean Distributed Generation / Distributed Energy Resources	Procurement, Regulatory	Medium	$$
4	Existing Storage Technology	Legislative, Regulatory, Executive	Medium	$$
5	Demand Side	Executive, Regulatory	Medium	$
6	Reliability for the future grid	Executive, Regulatory	Easy	$

Mitigation & Enabling Strategy Summary

Initiative #	Description	Action type	Ease of implementation	Cost
7	Access and Affordability for All	Executive, Regulatory	Medium	$$
8	Workforce Development	Executive	Easy	$$
9	Market Solutions	Regulatory, Executive	Medium	$
10	Technology Solutions	Research & Development	Medium	$$$
11	Long Duration Storage Technology	Executive, Regulatory, Research & Development	Hard	$$-$$$
12	Energy Delivery & Hosting Capacity	Executive, Regulatory	Hard	$$$
13	Gas Infrastructure, Transmission & Methane Leakage	Executive, Regulatory	Easy - Medium	$$
14	Retirement of Fossil Fuel-Fired Facilities	Regulatory	Hard	$

Enabling initiative – Initiative #1: Growth of Large-Scale Renewable Energy Generation

Description:	Accelerate deployment of renewable energy systems including solar, land-based wind, and offshore wind in alignment with the Clean Energy Standard.
Action type:	Procurement, Regulatory
Cost and funding considerations:	$; NYSERDA's existing Tier 1, Tier 4, and OSW programs.
Ease of implementation:	Medium (acceleration of current actions)
Example case studies:	

Risks / Barriers to success	Possible mitigants
• Ensuring efficient processes for installing renewable generation (procurement, siting, interconnection, construction) and for constructing and upgrading the transmission and distribution networks is necessary to effectively deploy renewables within the time needed.	• The Power Generation Advisory Panel's recommendations on siting, interconnection, and energy delivery to address these barriers. • NYSERDA should continue to evaluate its procurement programs for effectiveness to ensure continual, swift, progress is being made.

Enabling initiative – Initiative #1: Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Continue to evaluate and adjust policies and procurement targets as necessary in order to achieve the CLCPA targets.	DPS/NYSERDA	Ongoing	PSC, DEC, Utilities, Renewable Energy Developers, siting communities
Continue to support successful programs and regulatory changes, such as Build Ready and The Accelerated Renewable Energy Growth and Community Benefit Act through funding and hiring adequate staff in the Office of Renewable Energy Siting and other relevant State Agencies (NYSERDA, DPS, DEC, etc.)	DOB	Ongoing	DPS, DEC, NYSERDA, ORES, Utilities, Renewable Energy Developers
Identify key transmission and distribution upgrades, improvements, and new line construction needed to deliver renewable energy from where it is built, to where it is needed.	DPS/NYSERDA	ASAP	PSC, DEC, NYISO, Utilities, Transmission Developers, renewable developers, innovation companies
Establish a non-binding metric/goal for the Office of Renewable Energy Siting (ORES) with respect to megawatts of renewable energy which should be permitted each year, based on what is required to reach 70% renewables by 2030.	ORES	ASAP	

Enabling initiative – Initiative #1: Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Ensuring the delivery of community benefits from siting of renewable generation (See Community Benefits Recommendation) and closing of fossil fuel plants in disadvantaged communities will alleviate undue burdens on disadvantaged communities. In addition, electrification will cause significant load growth between now and 2040. Without sufficient buildout of large-scale renewables, continued reliance on fossil fuel-fired facilities will be needed and emissions will not decrease.
Health and other co-benefits	Aggressive deployment of renewable technologies and upgrades and construction of transmission and distribution systems will make it possible to close fossil fuel generation facilities, improving air quality and decreasing emissions. In 2016, in-state fossil fuel combustion accounted for 163.47 MMtCO_2e (80% of all state emissions).
Just transition: businesses and industries, workers	Increases in jobs available in renewable energy system and transmission construction, as well as operation and maintenance of these systems.
Other	

Enabling initiative – Initiative #2: Clean Energy Siting & Community Acceptance

Description:	Support the development and use of information and resources for local communities to make beneficial decisions about renewable energy projects in their community.
Action type:	Executive, Regulatory
Cost and funding considerations:	$$; NYSERDA's Clean Energy Communities program could be leveraged for some activities, but the State should also seek federal funding from the administration's stimulus and infrastructure bills. Community credit subsidies.
Ease of implementation:	Medium - Hard
Example case studies:	Scenic Hudson's Roadmap to a Clean Energy Future, Long Island Solar Roadmap, Tompkins County, NYS Geographic Information System, NY Solar Map, WindExchange.Energy.gov, NYC Community Energy Planning Tool, Temiscouata and Apuiat Wind Farms, NYCHA and Brooklyn Army Terminal RFP's

Risks / Barriers to success	Possible mitigants
• Efficient processes for installing renewable energy projects and for upgrading the local transmission and distribution networks will be necessary to effectively deploy renewables. • Local community opposition for projects if benefits are not realized locally.	• Strong community communication, engagement, and public outreach will be important for these projects to be possible.

Enabling initiative – Initiative #2: Components of the strategy

Components required for delivery	Implement-ation lead	Time to implement	Other key stakeholders
Clean Energy Development			
Research and incentive viability agrivoltaics to integrate into the agricultural community and provide habitat improvement for threated and endangered species.	NYSERDA	ASAP	ORES, NYSERDA, DPS, DEC, DOS, AGM, Utilities, NYISO, Renewable Energy Developers, Transmission and Distribution System Operators, municipalities and local communities
Develop a Clean Energy Development Mapping tool to help municipal representatives and local communities make informed land use decisions, and communicate local wants to developers.	NYSERDA	ASAP	
Offer NYS support and funding for Regional Planning Associations to assist municipalities in planning for renewable energy development.	NYSERDA	ASAP	
Refine NYSERDA process/evaluation and incentivize for "buildable projects".	NYSERDA	ASAP	
Study and advise communities how to best implement options for decommissioning of community owned projects at the end of their production life.	NYSERDA	ASAP	
Public Education and Outreach			
NYS should launch a statewide public education campaign to inform New Yorkers about the climate crisis and the benefits of shifting to a clean energy economy.	NYSERDA	ASAP	
Equity & Local Community Benefits			
Ensure community benefits and avoided costs are tracked in dollars.			
Allow all NYPA customers to benefit from electric utility value stack NYS-wide.	PSC/DPS	ASAP	
Determine who needs benefits and then create municipal/cooperative structures in disadvantaged communities. Examine laws regarding cooperatively owned enterprises and establish consumer protections in this new market.		ASAP	

Enabling initiative – Initiative #2: Components of the strategy

Components required for delivery	Implement-ation lead	Time to implement	Other key stakeholders
Equity & Local Community Benefits (cont'd)			
Make host community benefits more robust and targeted (ex. NYSERDA's Host Community Billing Program)	NYSERDA	ASAP	NYSERDA, DPS, DEC, DOS, Utilities, NYISO, Renewable Energy Developers, Transmission and Distribution System Operators, municipalities and local communities
Empower local governments to take a leadership role in educating the community in clean energy.	NYSERDA/DOS	ASAP	
Provide funding for non-profits and community-based organizations to do education and outreach about clean energy benefits.	NYSERDA/DPS	ASAP	
Expand and streamline incentives for energy efficiency, including funding for customers based on utility payment history instead of credit scores.	NYSERDA/DPS/ Utilities	ASAP	
Invest in local weatherization assistance and energy efficiency programs. Enable host towns to speed up rural broadband expansion.		Ongoing	
Incentivize local "climate resilience hubs", a central location that has solar + storage and becomes a location the community gather during power outages.		ASAP	
Improve NYC DCAS for more renewable energy projects. - loan loss reserve program - LMI community subscriber benefits program	NYSERDA	ASAP	
Commercial Rooftop & Parking Lot Solar			
Conduct further analysis that looks for ways to build economic/incentive structures to increase development of commercial rooftop and parking lot solar installations paired with storage.	NYSERDA	Ongoing	

Enabling initiative – Initiative #2: Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	These will provide municipalities, local communities, and disadvantaged communities valuable information and resources to make beneficial decisions about renewable energy projects in their communities. Municipalities, local communities, and disadvantaged communities will also have more control over local land use and development. Local renewable energy projects could provide utility cost savings, local infrastructure development, and job opportunities.
Health and other co-benefits	Aggressive deployment of renewable technologies and upgrades and construction of transmission and distribution systems will make it possible to close fossil fuel generation facilities, improving air quality and decreasing emissions.
Just transition: businesses and industries, workers	Local renewable energy projects could provide utility cost savings for businesses, local infrastructure development opportunities, and job opportunities for local workers.
Other	

Enabling initiative – Initiative #3: Clean Distributed Generation / Distributed Energy Resources

Description:	By generating smaller amounts of clean electricity closer to end-users, we can increase energy efficiency, reduce carbon pollution, improve grid resiliency, and potentially curtail the need for costly transmission investments.
Action type:	Procurement, Regulatory
Cost and funding considerations:	$$
Ease of implementation:	Medium
Example case studies:	

Risks / Barriers to success	Possible mitigants
• An efficient process for installing DG/DERs (procurement, siting, interconnection, construction) and for constructing and upgrading the delivery system is necessary. • Local community opposition for projects if benefits are not realized locally.	• Focus on "high benefit" projects and programs that serve local communities, including dual-use solar/ag, affordable multifamily housing, and landfills/brownfields, and continue to invest in energy delivery. • Regional discussion forum(s) between local communities and those involved in the projects to have dialogue and understand everyone's perspective.

Enabling initiative – Initiative #3: Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Hosting Capacity: Proactive and timely investments in local transmission and distribution infrastructure, and associated cost-sharing/allocation associated with the utilities in these upgrades. Accelerate adoption of innovative technologies and programs that increase hosting capacity such as flexible interconnection, hybrid systems and coupling with energy storage or controlled load, smart inverters, and solutions that enable maximum back feeding at substation level from distribution to transmission as part of local transmission and distribution planning process.	PSC/DPS, NYSERDA	ASAP	NYISO, NYSERDA, developers, transmission & distribution operators, communities, DEC, DOH, DOT
Interconnection: Address pace of processing interconnection applications and need for right-sizing human resources at utilities to mitigate delays in application processing.		Ongoing	
Rate Design: Consider need for dynamic underlying electric rate structures and programs(e.g., dynamic load management) that provide appropriate price signals to customers to incentivize DER deployment and usage.		Ongoing	
Compensation: Address improvements to VDER stack to more accurately reflect value provided by DERs incorporating the social cost of carbon calculation and avoided transmission costs.		Ongoing	

Enabling initiative – Initiative #3: Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Incentives: Target incentives to stimulate high-benefit DER projects (dual-use solar/ag, multifamily housing, heat pumps/geothermal, collective solar projects) and paired with electrification serving LMI and EJ communities. Expand NYSERDA's Solar Energy Equity Framework programs; Low Income Community Solar Concept and Adder for Inclusive Community Solar Projects.	PSC/DPS, NYSERDA	Ongoing	NYISO, developers, transmission & distribution operators, communities, DEC, DOH, DOT
Ground-Mounted Siting: Address resistance and concerns to siting of ground-mounted projects, particularly upstate and western NY.	NYSERDA	Ongoing	
Rooftop and Parking Lot Solar Permitting: Need for streamlined permitting process across authorities having jurisdiction that reduces processing times and soft costs.	DOS/NYSERDA	Ongoing	
Codes: Provide model zoning ordinances to municipalities for residential/commercial properties to require new construction be designed as "solar-ready".	DOS/NYSERDA	Ongoing	
Resources & Education: Create or expand on regional discussion forums, between NYS, local communities, and projects to connect communities with resources, information, and address local concerns.	NYSERDA	Ongoing	
Aggregations: Encouraging aggregations of distributed resources will provide additional value for grid management	PSC/DPS, NYSERDA	ASAP	

Enabling initiative – Initiative #3: Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	DG/DER is a primary way (alongside energy efficiency) to meet the social equity requirements of the CLCPA. Renewable energy from DG/DERs sources can help addressing reliability needs and air quality issues from the closing of fossil fuel facilities in EJ communities. If properly developed, clean DG/DER projects can also allow communities to participate in the process, provide economic development and workforce development opportunities, and bolster resiliency.
Health and other co-benefits	Deployment of clean DG/DERs and upgrades to energy delivery systems will make it possible to close fossil fuel generation facilities, improving air quality and decreasing emissions.
Just transition: businesses and industries, workers	Development and jobs for renewable energy systems, transmission construction, and operation and maintenance of these systems.
Other	

Enabling initiative – Initiative #4: Existing Storage Technology

Description:	The State developed a 3GW goal for energy storage in the 2018 energy storage roadmap based on a 50% renewable target for 2030. 70% renewables and the transition to a carbon-free grid requires higher levels of energy storage as exemplified in the recent Power Grid Study identifying a need for >15GW.
Action type:	Legislative, Regulatory, Executive
Cost and funding considerations:	$$; Potential to expand NYSERDA's existing Market Acceleration Bridge Incentive program.
Ease of implementation:	Medium (rapid deployment and scaling)

Risks / Barriers to success	Possible mitigants
• Deployment needs are greater than initially envisioned and existing program are likely insufficient to meet expanding need. • Buyer-side mitigation (BSM) rules in NYISO Capacity Market • NYISO and Utility interconnection study methods • Limitations in the NYISO and Utility interconnection study methods	• Eliminate BSM for CLCPA resources. • Future programs considered should be harmonized with BSM and how it might change in the future such that access to the capacity market for these resources is maximized. • Public outreach, community engagement, and addressing host community concerns will be important for success of these projects.

Enabling initiative – Initiative #4: Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Update State's Energy Storage Roadmap, as soon as practicable, to update and revise storage deployment goals recognizing the substantially higher requirements identified in the Power Grid Study.	NYSERDA	ASAP	DPS, developers, NYISO
Provide increased funding for energy storage deployment. The State should initiate a new docket that establishes new binding targets and creates a dedicated funding mechanism similar to the clean energy standard for storage as soon as practicable and no later than the end of 2022.	PSC	ASAP	DPS, NYSERDA, developers
Expand CES to better integrate storage.	NYSERDA	ASAP	DPS, developers, utilities
Incorporate energy storage into energy delivery and transmission planning	NYSERDA/DPS	ASAP	NYISO, utilities
Further refined modeling of the future grid is needed to evaluate the potential system reliability needs anticipated for the future grid. The modeling should identify the need for storage resources with longer durations that may develop with technology innovation, to show the true breakdown of potential storage vs. fully dispatchable generation needs.	NYSERDA	Ongoing	DPS, NYISO, utilities, developers
Incentives for companies that provide systems sufficiently tested for the higher safety standards required in urban environments such as NYC.	NYSERDA	ASAP	DPS, developers, utilities
Continued work with NYISO on market enhancements that facilitate the resource transition, support investment, minimize costs to consumers, eliminate BSM for CLCPA resources, and meet reliability. Future programs should be harmonized with BSM and how it might change in the future such that access to the capacity market for these resources is maximized	NYSERDA/DPS	Ongoing	NYISO, utilities, developers

Enabling initiative – Initiative #4: Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Increased energy storage deployment can reduce peaker plant usage and decrease health impacts on disadvantaged communities.
Health and other co-benefits	Aggressive deployment of these technologies will it make possible to reduce peaker plant dependence and close fossil fuel generation facilities, thereby improving air quality and decreasing emissions.
Just transition: businesses and industries, workers	Growth and career paths for new workers who want to enter this new field and incumbent energy workers who are looking to transition. Development and jobs for renewable energy systems, transmission construction, and operation and maintenance of these systems.
Other	Will need large scale testing and demonstration ensure these new assets work properly on the existing grid.

Enabling initiative – Initiative #5: Demand Side

Description:	Analyze and appropriately model responsive demand as part of future generation and energy supply. Consider those modeled impacts on costs and timelines of power generation by decade and incorporate into system planning. It is imperative that flexible, responsive loads are analyzed and modeled appropriately to optimize for the lowest system cost and the most expeditious deployment of both clean supply and demand solutions.
Action type:	Executive, Regulatory
Cost and funding considerations:	$; The potential costs must be thoroughly analyzed and evaluated through the lens of avoided grid upgrade costs as well as health and economic benefits, especially for disadvantaged communities. Funding sources could come from NYSERDA, expanded federal Weatherization Assistance Programs and clean energy programs.
Ease of implementation:	Medium

Risks / Barriers to success	Possible mitigants
• Successful implementation will require a vision, commitment and directive from the state to structure a broad and long-term collective effort from all parties, adequate funding, transparency and education.	

Enabling initiative – Initiative #5: Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Complete a study on avoiding or reducing grid upgrade costs with such things as demand response and the use of geothermal, including district thermal systems, especially downstate, with a focus on low and moderate income individuals and disadvantaged communities.	DPS, Utilities, NYSERDA	Ongoing	PSC/DPS, NYSERDA, NYISO, local governments, contractors and community-based organizations especially those that provide Weatherization Assistance Programs.
Identify and make available key pieces of data needed for markets to facilitate the clean energy transition is real-time marginal, average emissions, and/or zonal resource/fuel mix data, as needed from NYISO and as defined by NYC and pert. State Agencies (a number of assumptions including for imports and exports from other RTO/ISOs must be determined) to facilitate cost-effective implementation of the CLCPA, LL97, and to improve VDER values and demand response programs.	PSC/DPS, NYISO, NYSERDA	ASAP	
Prioritize state and federal appliance standards. Adopt State equipment standards (or advocate for the federal government to adopt standards) that require a universal, standardized communication protocol in electric and heat pump water heaters, as well as in space heating heat pumps, EVs, and in-home batteries.	NYSERDA	Ongoing	
Develop standards to enable “opt out” programs rather than “opt in”. Make demand flexibility programs opt-out, not opt-in as long as standards are developed to ensure that customers would reap savings on their bills and service delivery is not reduced.	PSC/DPS	Ongoing	

Enabling initiative – Initiative #5: Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Rethink cost-benefit tests. In order to accurately assess the true value of EE and demand response while complying with the CLCPA, the PSC should reopen the generic BCA proceeding to update costs and benefits, including CLCPA compliance costs (carbon and other environmental impacts), important non-energy benefits (localized health impacts, equity, etc.), and inclusion (or lack thereof) of customer cost contributions.	PSC/DPS	ASAP	PSC/DPS, NYSERDA,DEC, NYISO, local governments, contractors and community-based organizations especially those that provide Weatherizatio n Assistance Programs.
Ensure that energy storage does not face double rules and unfair charges. NYS should consolidate its permitting rules for energy storage so they can be evaluated in one process. Utility commissions should reexamine their tariffs on energy storage resources and ensure they are applied fairly.	PSC/DPS	ASAP	
Prioritize under-resourced communities. - Utilities should engage the community and partner with CBOs to learn about communities and identify needs and shared objectives. - New funding should be directed toward low-income and disadvantaged communities and existing funds should be made more accessible. - In planning for a sustainable future, NYS should work with communities to ensure appropriate metrics to track program success and partner with local governments to establish appropriate consumer protections.	PSC/DPS, Utilities, NYSERDA	ASAP	

Enabling initiative – Initiative #5: Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	The concentration of the dirtiest peaking plants in zones J and K, sited in disadvantaged communities, provides an opportunity to back down that generation in the near term through efficiency and load responsiveness, while transmission and large-scale renewables get built to serve downstate. Targeting EE and DR in disadvantaged communities is an opportunity to provide these communities with ownership of clean energy solutions that will provide benefits at the household, utility, and community level. Greater investment should be paired with tracking and transparency around spending and benefits for disadvantaged communities. EE, DERs, and load flexibility are effective avenues for EJ communities to own clean energy solutions that provide benefits at the household, utility, and community levels.
Health and other co-benefits	Reducing demand through efficiency, and creating demand flexibility, especially downstate, will yield large GHG and criteria pollutant reductions/health benefits in the near term due to the current grid mix.
Just transition: businesses and industries, workers	Scaling up investments in dynamic load management and energy efficiency will create jobs in the part of the clean energy sector with the most growth potential. Energy efficiency and load management implementation will help businesses reduce energy costs. There will be power sector benefits from investing in demand reduction in fossil fuels through increased building efficiency (through weatherization), to reduce gas supply pressures in winter, and avoid dual-fueled peakers switching to oil during gas peaks.
Other	

Enabling initiative – Initiative #6: Reliability for the future grid

Description:	Generation resources combined with the transmission and distribution systems, control centers, and wholesale markets provide a continuously operating, reliable system to service New York's electric needs. All of these elements will need to transition and come together effectively to manage the transitioning grid to provide continuity of a reliable power system, while implementing the CLCPA. The recommendations to implement and achieve the CLCPA must support the high reliability standards in place in NY by implementing improvements and enhancements where needed and sustaining the practices that provide high quality electric service. If properly integrated the additional clean distributed generation, storage and large-scale renewables which the CLCPA will provide will help to build a more flexible and resilient grid to address and mitigate the impacts of climate change.
Action type:	Executive, Regulatory
Cost and funding considerations:	$; The costs of establishing an effective process to complete the necessary reliability reviews are minimal. Funding sources for investment include recovery through electric rates, wholesale market revenues, state and federal infrastructure funding.
Ease of implementation:	Easy – The process for ensuring reliability is well established

Risks / Barriers to success	Possible mitigants
• Achievement of the CLCPA mandates must progress with a continued eye on reliability and as issues arise, solutions must be identified and implemented timely to ensure that both reliability needs and CLCPA mandates are met. • Transmission constraints limit the flexibility of the grid and will make it more challenging to integrate new resources. Constraints between upstate and downstate (particularly zone J) is a current barrier to reliability which needs to be addressed. • Solving the reliability issues will be a challenging but necessary part of a successful transition.	• Effective communication processes across the multitude of agencies and organizations that support reliability. • Enhancing market rules so that all resources can participate in the market, based on their attributes, to provide the products and services needed for reliability. • Increased transmission is needed in order to mitigate the scope and scale of reliability challenges; helping to address the need for peakers and lowering the downstate local capacity requirements.

Enabling initiative – Initiative #6: Components of the strategy

Components required for delivery	Implement-ation lead	Time to implement	Other key stakeholders
Established biennial checkpoints should be conducted to assess the state of bulk power system reliability in consultation with the federally designated electric bulk system operator (NYISO) and the state and federally jurisdictional entity the New York State Reliability Council (NYSRC). These checkpoints will ascertain if any program adjustments are needed to ensure continued safe and adequate electric service and will be informed by the review of NY power system performance in conformance with established operations requirements and by relevant studies including the NYISO's Reliability Needs Assessment.	PSC/DPS	Ongoing	PSC, DPS, NYISO, Utilities, NYSRC, FERC, Generators, Transmission Developers, NYSERDA (Climate Assessment)
Power system studies and planning should consider analyses to integrate climate change impacts as needed for reliability and resiliency. Studies will need to reflect that risks and reliability challenges will change through time due to the impacts of climate change and the changes to the power system.	PSC/DPS	Ongoing	
To the extent any changes are proposed within the Scoping Plan that could alter the current regulatory structure and statutory approach to meeting reliability in NY, input and review must be solicited by the DPS, the NYISO, the NYSRC, and the Utilities	PSC/DPS	ASAP	
Actions needed to ensure reliability while working to achieve CLCPA will additionally be reflected in the State Energy Plan.	PSC/DPS/ NYSERDA	Ongoing	
Continued efforts to improve reliability and resiliency to extreme weather events, which will be exacerbated by climate change, should occur. This work should include continued infrastructure investment such as: storm hardening, elevating equipment and substations, and moving lines underground. Additionally, design criteria must change through time and reflect the impacts of climate change as needed. Given the impacts of storms on communities, investment in community outreach to provide effective communication and support from the time of storm preparation through restoration must be made.	Utilities	Ongoing	
The market products, requirements and technology standards needed to maintain reliability should be updated through time so that all resources can participate in the market, based on their attributes, to provide the products and services needed for reliability. Undue costs should not be imposed which would impair meeting CLCPA goals, including creating barriers to renewables. Reliability needs and risks will change through time and the markets should reflect these changes as well.	NYISO	Ongoing	

Enabling initiative – Initiative #6: Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Affordability is a real concern for disadvantaged communities. However, power outages have a disproportionate impact on disadvantaged communities because they are less able to afford measures to mitigate the human safety and health risks or recover from the potential loss of property. Now and continuing into the future, disadvantaged communities should be prioritized in terms of restoration of service.
Health and other co-benefits	Prevention of the high costs and consequences of electric service interruptions in New York, including exposure to extreme cold or heat and loss of property.
Just transition: businesses and industries, workers	Prudent steps to ensure a reliable power system are necessary to support businesses, industry and workers. New York cannot afford a decrease in the reliability of the electric grid, which is already challenged under current conditions. Additionally, poor power quality can negatively impact industrial processes. The clean distributed generation investments required by the CLCPA (e.g., rooftop solar, community solar, EE/DG and storage) can also provide much needed clean generation for, reduced energy costs and investments in disadvantaged communities.
Other	

Enabling initiative – Initiative #7: Access and Affordability for All

Description:	Prioritize helping low-income utility customers and disadvantaged communities, while also assuring that these communities will be able to afford and fully benefit from the State's transition to electrification
Action type:	Executive, Regulatory
Cost and funding considerations:	$$; Federal Relief funds should be first, directed to equity related costs to help with the implementation associated with these recommendations
Ease of implementation:	Medium (there are fiscal/unknown costs that must be accounted for)
Example case studies:	DPS' Low-Income Affordability Program (Case: 15-M-0565), NYC's Energy Cost Savings Program for small businesses

Risks / Barriers to success	Possible mitigants
• Expanding the PSC's Low-Income Affordability Program could result in higher rates for non-eligible customers. • The State's ability to project how much financial support will be adequate while assuring that low-income customers will not surpass the 6% energy burden during the transition to electrification. • With regards to efforts to modify financial assistance programs, such as HEAP, there is a concern that tenants will be unable to achieve certain benefits associated with changes to these programs, if their landlord does not prioritize making such technology upgrades and renters usually do not have control over their fuel source. • State budget pressures could make it difficult to create new positions.	• Examine and monitor whether existing utility financial assistance programs are reaching all eligible customers who need help affording their energy bills, while also modifying such programs to adequately support the electrification and energy efficiency. • Complete a study on avoided grid upgrade costs with energy efficiency, demand response, and the use of geothermal downstate, with a focus on low-moderate income individuals. • Re-assigning existing State staff roles and duties could ameliorate the need to hire a new position & Agency coordination.

Enabling initiative – Initiative #7: Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Continually examine and monitor PSC's Low Income Affordability Program and ensure that all low-income utility customers are identified and utility discounts are reflective of low-income utility customers' actual income levels.	DPS	Ongoing	
Improved coordination of State agencies and expansion of pilots and programs to assist small businesses with the transition to electrification	NYSERDA, OTDA	Ongoing	ESD, DAM, DPS, DOH
Modify the Home Energy Assistance Program (HEAP) to help encourage electrification, energy efficiency, and reduce continued use of fossil fuels for both tenants and homeowners	OTDA, NYSERDA	ASAP	
Increase access to energy efficiency and low-income customer support programs	OTDA, NYSERDA	Ongoing	DOH, HCR
Consider studying alternative rate structures as a means of protecting low-income, disadvantaged communities and small businesses from large cost shifts	PSC/DPS	ASAP	
Study how to avoid grid upgrade costs with energy efficiency and investment in downstate NY, with a focus on geothermal and Long Island	NYSERDA/DPS	ASAP	
Coordination across State Agencies is essential.	OTDA	Ongoing	NYSERDA, DOH, ESD, DAM, DPS

Enabling initiative – Initiative #7: Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
The New York State Department of Public Service should be open to alternative rate structures as a means of protecting low-income, disadvantaged communities and small businesses from large cost shifts.	DPS	Ongoing	NYSERDA
Appoint a lead at the New York State Department of Public Service specifically for Equity and Environmental Justice to better incorporate environmental justice and equity concerns into the Commission's decision-making process by creating a new senior position to coordinate that work.	DPS	ASAP	
Implement intervenor funding for nonprofits and community-based organizations ("CBOs") who work on DPS, NYSERDA, NYISO cases, matters and proceedings. Intervenor funds will help support the nonprofits and CBOs who are actively advocating on behalf of low-income individuals and disadvantaged communities, providing an important balance in such proceedings and programs.	DPS, NYSERDA	Ongoing	OTDA, DOH, HCR
Develop a comprehensive and publicly available accounting system to track the spending and the actual benefits of state spending pursuant to CLCPA. Definition of benefits should cover positive outcomes associated with costs and spending, and include benefits to businesses, investors, and other market actors as well as those flowing to ratepayers and disadvantaged communities. To the extent possible, accounting should distinguish between funding designed to help accrue benefit members of disadvantaged communities, and the actual benefit realized by members of these communities.	DEC, NYSERDA	ASAP	ESD, DPS, OTDA, DOH, HCR
Publish yearly reports on allocation of benefits, both in terms of program scale and actual implemented benefit and establish remediation plans for non-attainment of 40% minimum allocation of benefits.	DEC, NYSERDA	ASAP	ESD, DPS

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Enabling initiative – Initiative #7: Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Provides economical support to low-income customers so they can afford the transition to electrification • The benefits of energy efficiency is also a central element that when paired with direct assistance, will be tremendously helpful for low-income individuals to control their energy costs. • The State's work will continue to include prioritizing building electrification with a focus on the low-income and disadvantaged communities.
Health and other co-benefits	Emissions reductions from implementation of the CLCPA will be seen on an aggregate statewide basis, but it will be important to triage implementation to assist Clean Air Act non-attainment areas and emissions Environmental Justice areas first and most deeply. Efforts to support low-income communities so that they can afford full electrification will result in positive health benefits.
Just transition: businesses and industries, workers	If not instituted carefully, the cost of energy for businesses may become uncompetitive and prove economically difficult for high energy-using industries to afford.
Other	Access and affordability to clean energy programs, energy efficiency, and other assistance programs improves living and housing conditions.

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Enabling initiative – Initiative #8: Workforce Development

Description:	Make it a priority to provide education and career opportunities for individuals with a focus on disadvantaged communities to enter the clean energy industry. Ensure a just transition for people currently employed in fossil industries so their needs are met.
Action type:	Executive
Cost and funding considerations:	• $$; HS/College technical training is approx. $6-10K/student based on past program data. • Federal Relief funds should be first, directed to equity related costs. • Expand the NYS Fossil Fuel Plant Closure fund and specifically target funds for worker transitions and supporting lost taxes in communities.
Ease of implementation:	Easy

Risks / Barriers to success	Possible mitigants
• Campaigns work best when they originate in the communities themselves and interest tends to be reduced when programs try to bridge income classes. • This type of recruitment and job training for private solar companies is a year-round commitment and a significant investment to get a person ready. • Will need to engage with companies that may be potentially put out of business and convince them to allow their workforce to be retrained in other skills.	

Enabling initiative – Initiative #8: Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Establish continuing education, certifications, and licensing in trades and professions for current fossil fuel workers. Work with companies to help transition their workforce to building operations and maintenance, design, construction, and real estate professionals and into clean energy jobs. Partner with NYS agencies (NYSERDA, DOL, etc.) to work with unions to ensure they are aware of project bid opportunities.	NYSERDA	ASAP	NYS Energy/Labor/ Social Service/Edu Agencies, K-12 schools, vocational/technical & higher education, education & workforce development non-profits, fossil fuel & energy companies, renewable energy companies, construction/ repair/ buildings businesses
Leverage RFPs from the public sector agencies for clean energy and workforce development. (ex. Solarize Brownsville)	NYSERDA	Ongoing	
Scale up training and workforce opportunities for new clean energy workers and in LSR siting locations with preferences in training and job placement to priority populations. Emphasize these principles within RFPs.	NYSERDA	Ongoing	
Create community-to-employment pipelines and career pathways and prioritize individuals in disadvantaged communities. Ensure a clear ladder/pathway to secure jobs and careers with family sustaining wages and labor unions, where possible.	NYSERDA	ASAP	
Scale up strategic partnerships in education/outreach efforts with an emphasis on disadvantaged communities and provide state agency coordination with various benefit programs in a "one stop shop" that prioritizes LMI communities.	NYSERDA	Ongoing	
Focus on businesses and job opportunities around not only installation, but also manufacturing and the entire supply chain. Engage with clean energy providers to evaluate current and future workforce needs. Align training with industry needs and potential jobs, including consideration of needs by geographical areas, to develop a successful pipeline.	NYSERDA	Ongoing	

Enabling initiative – Initiative #8: Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Create opportunities for Minority and Women Owned businesses and in disadvantaged communities to gain a foothold in the industry and work up the value chain. Increase ranks of MWBEs, coops., employee-owned businesses, community projects through capacity building and business development support.	NYSERDA	ASAP	NYS Energy/Labor/ Social Service/Edu Agencies, K-12 schools, vocational/technical & higher education, education & workforce development non-profits, fossil fuel & energy companies, renewable energy companies, construction/ repair/ buildings businesses
Require labor standards such as Prevailing Wage, PLA's and use of accredited apprenticeship programs to ensure that the jobs are long lasting careers for NY residents that live in the local communities hosting renewable industries	NYSERDA	ASAP	
Enhance Climate and Clean Energy/decarbonization curricula in State-funded education in K-12, technical schools, BOCES programs, CUNY/SUNY, engineering and architecture programs at universities. Increase investment in STEM education curricula within K-12 student populations from disadvantaged communities to facilitate entry into targeted career pathways (eg. wind, solar, building decarbonization, etc.). Leverage BOCES, CUNY/SUNY education platforms and job placement opportunities in their programs. Ensure an 'all government approach' by obligating the state education department, SUNY, the Department of Labor, NYSERDA and other relevant agencies to help design, implement and resource the above-referenced efforts.	NYSERDA	Ongoing	

Enabling initiative – Initiative #8: Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Open community career pathways/workforce development through education, skills and training in clean energy can provide much needed education, skills and training to communities and open career pathways. Develop business opportunities for MWBEs and community development.
Health and other co-benefits	Helping to ensure a strong and vibrant clean energy workforce will facilitate the opportunities to expand deployment of renewable energy technologies. This will help to more quickly shutdown fossil fuel generating facilities, improving air quality in communities that host these facilities.
Just transition: businesses and industries, workers	Provides businesses and workers increased transition opportunities to clean energy industries.
Other	

Enabling initiative – Initiative #9: Market Solutions

Description:	Markets that incentivize resources with the desired attributes, provide optimal reliable grid management, and are sufficiently flexible to allow for technology innovation will help achieve the CLCPA objectives, while ensuring benefits for, and reducing impacts on, disadvantaged communities.
Action type:	Regulatory, Executive
Cost and funding considerations:	$
Ease of implementation:	Medium

Risks / Barriers to success	Possible mitigants
• Will require several forward-looking market designs and the implementation of each design must be structured in a way that sends the correct price signal at the appropriate time	• Coordination across DPS, NYSERDA, the NYISO, and utilities.

Enabling initiative – Initiative #9: Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Expand wholesale market eligibility participation rules for new policy resources. The NYISO is in the process of implementing the first part of a Hybrid Storage Model, where hybrid resources will be allowed to participate as two separate resources located at the same site. The current expectation is for a second potentially more versatile "Aggregated" model market design in 2021. The NYISO is also working on a Distributed Energy Resources (DER) Participation Model. The NYISO is working toward but has not yet implemented a full wholesale DER market design. The NYISO should make changes consistent with FERC Order 2222 requirements.	NYISO	Ongoing	PSC, NYSERDA, Utilities, Suppliers
Continue assessing opportunities to improve accuracy and granularity of wholesale market energy price signals, including shortage pricing, congestion relief, and peak/off-peak pricing. Inclusion, and valuation, of ancillary market services will need to be evaluated in the context of integrating increasing quantities of renewable resources and other products.	NYISO	Ongoing	
Adapt current ancillary service market designs and look to add products that are needed to incent flexibility as needed to efficiently integrate renewables. The NYISO supports markets for energy, ancillary services, and capacity. The fundamental relationship among these markets will likely need to evolve. For example, more revenue will likely shift to ancillary service markets over time as system needs are reevaluated in the context of integrating increasing quantities of renewable resources. Be proactive in developing new products needed, however they should be structured properly to only reflect current system needs to not cause unnecessary costs. A balancing act is needed between developing the products and services of the future while not implementing changes before they are needed.	NYISO	Ongoing	

Enabling initiative – Initiative #9: Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Expand Demand-Side Opportunities and Opportunities for Flexible Resources. It is anticipated that demand response resources will play a more critical reliability role in the future as the grid becomes more electrified and the load shape shifts. Demand Response can also supply some amount of needed system flexibility without emitting carbon which is consistent with the 2040 CLCPA policy objective. There should be a holistic evaluation of both wholesale and retail demand response programs to identify gaps and opportunities for new programs or program changes to meet the needs of a changing grid. As the grid evolves with State policy, it will become more important that incentives are adequate for the participation of flexible resources in the real-time (RT) energy market. An efficient RT market can create opportunities for resources to compete and meet rapidly changing system needs. The NYISO is evaluating prospective changes to the energy market in the context of its Grid in Transition project.	NYISO/DPS	Ongoing	NYSERDA, Utilities
Improve access for Distributed Resources and continue improvements to cost causation retail rate price signals. Continue to promote and improve VDER- Rate Design. Continued innovation in DSM and DER programs, with a focus on expanding utility customer enrollment and performance. Continue to promote and improve Standby rates. Increase deployment and efficient use of Distributed Energy Resources (DER) - Continue design and implementation of Distributed System Platforms (DSP) and markets for DER products and services.	DPS	Ongoing	NYSERDA, Utilities, Suppliers

Enabling initiative – Initiative #9: Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Determine most effective approach to Incorporate Environmental Values in Market Pricing and/or in Policy and Investment Benefit Cost Analysis. Consider Improvements to current State Programs to incent CLCPA resources through mechanisms such as Renewable Energy Certificates, Offshore Wind Renewable Energy Certificates, and storage solicitations. Consider Changes and/or Augmentation to RGGI program to more fully reflect the cost and impact of emissions as represented in NY policy. Consider if (Electric Only) Carbon Pricing in the Wholesale Markets will help achieve the CLCPA mandates, including a more rapid increase in renewable and storage build out and a transition of the fossil fleet. If Carbon Pricing is not adopted, consider alternate mechanisms to fully enable Wholesale Markets to support the grid transition. Consider if an Economy-wide Carbon charge will help achieve the CLCPA mandates. Consider a Clean Dispatch Credit for emission-free, fully dispatchable assets that dispatch during peak load times.	DPS	Ongoing	NYSERDA, DEC, Utilities, Suppliers, NYISO
Examine all Resource Adequacy options and continue to improve resource adequacy contribution compensation. Consider alternative market structures of procuring Resource Adequacy. New York should ensure that BSM will not be applied to CLCPA resources and should advocate at FERC for alternatives to BSM that maximize access to the capacity market for public policy resources. New York and the NYISO should investigate how best to include all resources in the capacity markets, with the goal of reflecting energy efficiency and dynamic smart loads in resource adequacy. Continue to evaluate the capacity market value of all resource types so that resources are paid for capacity consistent with the value they provide to the grid. Allow fair access to the capacity market for energy limited resources and accurately reflect the value of such resources especially as the need for grid flexibility grows over time.	DPS	Ongoing	NYISO, NYSERDA, Utilities, Suppliers
Enhance/augment the availability of public information to assist developers in making informed project development decisions.	NYISO/DPS	Ongoing	NYSERDA, Renewable developers

Enabling initiative – Initiative #9: Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Proactive Advocacy. New York State should fund expansion of the existing office and team within Department of Public Service (DPS) that systematically focuses on proactive advocacy at NYISO and FERC to provide the necessary resources to DPS to ensure that wholesale markets and planning processes align with CLCPA goals and support environmental justice concerns, while maintaining reliability. The expanded office should focus on improved coordination with other essential State agencies including NYSERDA and DEC. The office should also monitor the developments of FERC's soon to be created Office of Public Participation and work with both that office and its Environmental Justice senior advisor to assist and support increased participation by low-income New Yorkers at FERC.	DPS	ASAP	NYSERDA, DEC, Utilities, Suppliers, NYISO, FERC
Earnings Adjustment Mechanisms. The PSC should initiate a generic proceeding for Earnings Adjustment Mechanisms (EAMs) to review and evaluate how existing EAMs are working, lay the groundwork and create consistency across the utilities where it makes sense to do so, and consider additional EAMs related to the decarbonization and social equity goals of the CLCPA and the process to do so. This review should be done on a periodic basis, and EAMs should be adjusted as necessary to encourage the needed outcomes.	PSC	ASAP	DPS, NYSERDA, Utilities, Suppliers

Enabling initiative – Initiative #9: Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Effective and flexible markets help to lower costs for consumers, including those in disadvantaged communities.
Health and other co-benefits	Effective and flexible markets enables clean technologies to come forward and displace undue burdens from fossil fuel generation on environmental justice communities.
Just transition: businesses and industries, workers	The transition away from fossil plants which will impact workers of those facilities and host communities. Complementary just transition and equity policies are needed to both transition current fossil workers to these new opportunities and ensure that workers from disadvantaged communities will benefit from new opportunities.
Other	

Enabling initiative – Initiative #10: Technology Solutions

Description:	Increase research, development, and appropriately-scaled demonstration and deployment of emissions-free technology needed to reach our goals.
Action type:	Research & Development
Cost and funding considerations:	$$$; Continued and increased support of NYSERDA's existing programs.
Ease of implementation:	Medium (accelerating and expanding existing processes)
Example case studies:	NYSERDA's Innovation Team

Risks / Barriers to success	**Possible mitigants**

• Significant scaling of current efforts:
  • Coordination of multiple entities to scale current innovation efforts.
  • Increasing funding and staffing of the needed programs.
  • Rapidly developing technologies today to be deployed at scale by 2040.
• Current studies have identified that even after full deployment of available clean energy technologies, there is a remaining need for 15-25 GW in 2040 to meet demand and maintain reliability, although that gap may change over time.
• Whether the answer is new long duration battery technology, RNG, advanced green hydrogen, nuclear, overbuilding of renewable technologies or other new technologies that may emerge due to R&D efforts over the next two decades, the costs are likely to be high and aggressive action and smart planning will be challenging to make these fundamental shifts in our energy systems in two decades. And yet the health, societal, and economic benefits of the transition are also immense, and the cost of inaction or insufficient action are tremendous and would far outweigh the costs of action.
	• Federal policy and action
	• NYSERDA acting as a "hub" for research and development to ensure a coordinated and efficient effort.
	• Increased funding and staffing of relevant programs needed

Enabling initiative – Initiative #10: Components of the strategy

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** *(Entities that need to be engaged)*
Achievement of 70 by 30: Focus on Aggressively Deploying Currently-Available Solutions			
Focus on energy delivery, energy efficiency, the economics of long duration and seasonal storage, siting, and identifying technology gaps.	NYSERDA	Ongoing	NYISO, DPS, Utilities, developers.
Aggressive deployment of current renewable energy and storage technologies.	NYSERDA	Ongoing	DPS, DEC, NYISO, Utilities, siting communities
Continued build out of transmission and transmission upgrades	DPS	Ongoing	Utilities, Transmission developers, Utilities, DEC, siting communities
Supporting utility-scale demonstration projects of new technologies, including storage and transmission and distribution.	Utilities	Ongoing	Developers/researchers, Utilities, DPS, NYISO

Enabling initiative – Initiative #10: Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Achievement of 100 by 40: Focus on Identifying and Developing Needed Solutions for Dispatchable Technologies			
Identify, explore, evaluate, and develop dispatchable technologies and solutions as they emerge. Focus on solutions we know are desirable.	NYSERDA	Ongoing	Developers/Researchers
Detailed, holistic, modeling within a zero-emissions world. Modeling should include holistic integration of load, generation, and energy delivery, and be flexible in the solutions chosen. While modeling is being completed, the State should move forward with known needs.	NYSERDA	Ongoing	NYSERDA, DPS, NYISO
Support NYSERDA in its innovation efforts. NYSERDA should act as a hub for technological innovation and convene stakeholders and conduct strategic research on untapped renewables and storage projects. NYSERDA should develop of consortium of NYISO, utilities, developers, and solution providers to bring technologies to large-scale deployment faster and more cost-effectively.	NYSERDA	Ongoing	Developers/researchers, Utilities, DPS, NYISO
Supporting utility-scale demonstration projects of new technologies, including storage and transmission and distribution.	Utilities	Ongoing	Developers/researchers, Utilities, DPS, NYISO

Enabling initiative – Initiative #10: Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
During planning, emissions-free resources (e.g., storage, energy efficiency, renewable energy) should be prioritized where feasible when considering end-uses, technology limitations, impacts, and costs. However, should a substitute for natural gas still be needed, advanced green hydrogen and possibly RNG could fill this gap in order to maintain reliability, if scalability, feasibility, and environmental impact and air quality issues can be addressed.	NYSERDA	Ongoing	PSC/DPS, DEC, NYISO, Utilities, Power Plant Owners/ Operators, Researchers & Developers
DPS and NY DEC should begin a process and rulemaking to define "emissions free" compliant with the CLCPA for advanced fuels	DEC/DPS	ASAP	
Further analysis, technical development, and research is needed in order to determine the feasibility, climate impact, and health impacts of advanced fuels prior to infrastructure investment: • Determine the lifecycle GHG accounting framework of RNG and advanced green hydrogen. Priority utilization should be provided for feedstocks with the lowest GHG emissions, with strong preference given to zero- or negative-emissions sources. • The potential air quality and health impacts of producing and using these fuels and best practices/end-uses to minimize these impacts. • The safety of advanced green hydrogen, storage, and pipeline operation. • Technological innovation, development, and scaled-deployment is needed in order to prove the effectiveness and economics of the technologies.	NYSERDA	Ongoing	

Enabling initiative – Initiative #10: Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
The contribution of nuclear power to the 2040 resource mix and any additional policy actions needed should be evaluated prior to the cessation of the Zero Emissions Credit (ZEC) Program in 2029. • Analysis should occur prior to the ending of the ZEC program in 2029 to determine whether subsidizing any of the State's remaining nuclear reactors will be necessary for meeting the 2040 emissions mandate and/or whether more cost effective and environmentally-friendly alternatives are available . The analysis should consider the inflexible baseload attributes of nuclear plants as well as reliability, cost, health, safety, community impact and environmental concerns of nuclear power generation.	PSC/DPS	2029, and in alignment with NRC re-licensing	Customers, hosting communities, environmental groups, EJ, labor, NYSERDA, DEC, nuclear generating facilities, NYISO
o Should public policy mechanisms be proposed for the continuation of nuclear power generation, effective mechanisms for input and comments by stakeholders and the public should be implemented (specifically customer, environmental, environmental justice, labor, local and indigenous communities).	PSC/DPS	2029, and in alignment with NRC re-licensing	

Enabling initiative – Initiative #10: Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Consideration of the impacts of new technologies on environmental justice communities in relation to air quality and overall health effects.
Health and other co-benefits	Aggressive deployment of current renewable energy technologies and development of new technologies well help to more quickly shutdown fossil fuel generating facilities, improving air quality in these communities.
Just transition: businesses and industries, workers	With the right policies in place, new businesses and industries will grow in New York State centered around clean energy technologies (energy efficiency, solar, wind and offshore wind and battery storage) and the supply chain for these technologies. Becoming a "hub" for clean energy technology development will attract clean energy research and development companies to New York.
Other	Care must be taken to ensure that new technology deployment is collaborative and complimentary to other grid investments such that the lowest overall cost is incurred to achieve the CLCPA goals.

Enabling initiative – Initiative #11: Long-Duration Storage Technology

Description:	Achieving the CLCPA's high renewable energy, zero emission electricity system will require substantial amount of energy storage operating over various timescales—spanning from minutes to hours, days, weeks and even longer—to maintain grid flexibility, reliability, and resiliency.
Action type:	Executive, Regulatory, Research & Development
Cost and funding considerations:	$$-$$$
Ease of implementation:	Hard (predicting, modeling, and developing of new technologies)

Risks / Barriers to success	Possible mitigants
• The specific technologies, products, and use/business cases for long-duration storage are still being developed • Scaling new technologies so they will be commercially viable in the grid • Large scale testing and demonstration needed to ensure assets work properly on the existing grid	• Further R&D and the establishment of a Center of Excellence to accelerate the deployment of long-duration storage • Change formula for funding Centers of Excellence and demonstration projects

Enabling initiative – Initiative #11: Components of the strategy, Benefits and impacts

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Focus State programs and funding on research and demonstration projects for the development of large scale and longer duration storage	NYSERDA/DPS	Testing and commercial deployment by 2030	NYISO, utilities, developers
Develop and expand a Storage Center of Excellence so that new technologies can be matured and deployed on the grid for large scale testing	NYSERDA	ASAP	DPS, utilities, developers
Attract and engage relevant parties in collaborative efforts to address the challenges unique to long-duration storage	NYSERDA	Ongoing	DPS, utilities, developers, NYISO, ESD

Anticipated Benefits and Impacts	
Disadvantaged communities	Development and deployment of long duration storage would significantly impact our ability to reach the 2040 goal, and would allow high-emitting fossil fuel generation facilities to no longer be needed for reliability. As these facilities are often located in disadvantaged communities, it would alleviate environmental burdens in these communities.
Health and other co-benefits	Further reduce peaker plant dependence decreases emissions and improves air quality.
Just transition: businesses and industries, workers	NYS has the opportunity to be a leader in the "grid of the future", be the hub of a new clean energy field, and ensure these investments lead to new workforce development and job growth.

Enabling initiative – Initiative #12: Energy Delivery & Hosting Capacity

Description:	Pursue planning and implementation processes to facilitate necessary energy delivery options for the renewable energy buildout.
Action type:	Executive, Regulatory
Cost and funding considerations:	$$$; There are existing mechanisms for state and FERC rate recovery. The State should also seek federal funding from the administration's stimulus and infrastructure bills.
Ease of implementation:	Hard – Building or upgrading energy delivery system infrastructure will be difficult. It will require thorough planning and technology advancements.
Example case studies:	

Risks / Barriers to success	Possible mitigants
• Complex upgrades to the energy delivery system will be required. • Some upgrades may be costly. • Host community opposition if engagement and public outreach are not done properly.	• Strong community communication, engagement, and public outreach will be important for these projects and upgrades to be possible.

Enabling initiative – Initiative #12: Components of the strategy

Components required for delivery	Implement-ation lead	Time to implement	Other key stakeholders
Expand Electricity Transmission and Distribution Systems to Support Energy Delivery			NYSERDA, DPS, DEC, Utilities, NYISO, Transmission and Distribution System Operators, municipalities and local communities where projects are sited and where energy is delivered.
Continue with strategic long-term transmission and distribution investments by NYPA and utilities for expedited projects needed in the short term (within ~5 years), by utilities for local transmission and distribution investments within a utility's footprint, and declare public policy needs in the current NYISO PPTN process through FERC Order 1000.	PSC/NYPA	Ongoing	
Focus on increasing hosting capacity with a holistic/top-down approach and to accelerate adoption, while being mindful of the tradeoffs between siting resources in high-cost areas and investments in T&D infrastructure to reach the most equitable cost option.	PSC/DPS	ASAP	
Create a database to track penetration and identify where there may be headroom for Renewable Energy Zones. Recommend process to 1) establish Renewable Energy Zones, 2) determine quantity of renewable energy targeted within each zone, and 3) develop a plan for each REZ to build sufficient transmission to ensure energy delivery within and out of the zone.	DPS/NYSERDA	ASAP	
Offshore Wind (OSW)			
Conduct further planning and pursue system upgrades on Long Island and in NYC to facilitate 9,000 MW of OSW.	DPS/NYSERDA	Ongoing	
Promote multiport infrastructure investment to support and facilitate the growth of the offshore wind industry in NY. Future offshore wind solicitations should continue to include a multi-port strategy and requirement for offshore wind generators to partner with any of the 11 prequalified NY ports to stage, construct, manufacture key components, or coordinate operations and maintenance activities.	NYSERDA	Ongoing	

Enabling initiative – Initiative #12: Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Advanced Grid Technologies & Future Studies for Planning Processes			NYSERDA, DPS, DEC, Utilities, NYISO, Transmission and Distribution System Operators, municipalities and local communities where projects are sited and where energy is delivered.
Building on the Power Grid Study, continue R&D and rapid deployment of advanced grid technology to: a) alleviate transmission system bottlenecks to allow for better deliverability of renewable energy throughout the State; b) unbottle constrained resources to allow more hydro and/or wind imports and the ability to reduce system congestion; c) optimize the utilization of existing transmission capacity and right of ways; d) increase circuit load factor through dynamic ratings; e) encourage utilities to accelerate investments in their local systems that will facilitate renewables development and enhancing the electrification of transportation, but also grow safety and resiliency.	DPS/NYSERDA	ASAP	

Enabling initiative – Initiative #12: Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Advanced Grid Technologies & Future Studies for Planning Processes (continued)			NYSERDA, DPS, DEC, Utilities, NYISO, Transmission and Distribution System Operators, municipalities and local communities where projects are sited and where energy is delivered.
Examine and, if needed, modify planning processes (timeframe of processes, forward looking, technology deployment alignment, address defaulting to regulated solutions) to encourage the incorporation of advanced technologies	DPS/NYSERDA	ASAP	
Conduct a study that looks more closely at short- and long-duration storage, clean dispatchable energy, and T&D investments to get a more precise view of the long-term needs of the grid; further informing public policy decisions and market design	DPS/NYSERDA	ASAP	
Develop and publish LT&D system information in time to support renewable developer decision making timelines.	PSC/Utilities	ASAP	
Interconnection			
Explore additional areas of openness and engagement with the NYISO and other stakeholders to improve the interconnection/Class Year process.	PSC/DPS	ASAP	
NYS can be more involved with stakeholders in planning optimal locations for clean energy projects, either through community energy studies, stakeholders' processes, or other connections, while serving as a resource for technical information and a bridge to communicate with the NYISO.	DPS/NYSERDA	Ongoing	
Further engagement, outreach, education, and support for local municipalities, communities and residents to improve acceptance of energy delivery projects.	DPS/NYSERDA	Ongoing	

Enabling initiative – Initiative #12: Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Rapid improvements and upgrades to the energy delivery system will allow more renewable energy into the system reducing the need for fossil fuel generational facilities. Closing fossil fuel generation facilities in disadvantaged communities will improve air quality.
Health and other co-benefits	Aggressive upgrades and construction of transmission and distribution systems will make it possible to close fossil fuel generation facilities, improving air quality and decreasing emissions.
Just transition: businesses and industries, workers	Renewable energy developers will be able to site and construct projects more easily and quickly, bringing more projects to NYS and increasing renewable energy development activity.
Other	

Mitigation strategy – Initiative #13: Gas Infrastructure, Transmission & Methane Leakage

Description:	This recommendation intends to address methane leakage and the infrastructure related to fossil natural gas, though it also applies to any potential future gas technologies. This recommendation aligns with what was proposed by the Energy Efficiency & Housing Panel, but includes a broader scope beyond that of the end-use gas distribution sector. Transition away from gas with a managed, phased, and just transition from natural gas and decommission natural gas infrastructure to the maximum extent possible and as quickly as possible.		
Action type:	Executive, Regulatory		
GHG reduction by 2030:	Medium	**GHG reduction by 2050:**	High
Cost and funding considerations:	$$		
Ease of implementation:	Easy - Medium		

Risks / Barriers to success	Possible mitigants
• Natural gas infrastructure is an extensive statewide network, much of it underground and within buildings. Leakage detection and repair (LDAR), as well as decommissioning may be challenging in populous areas. • As New York transitions away from natural gas, it will need to ensure proper system maintenance and investment, and chart a path to avoid stranded assets. • The Federal Energy Regulatory Commission oversees interstate natural gas transmission and plays a significant role in approving natural gas infrastructure, which presents additional regulatory considerations for this category of facilities.	• Improved planning, including inventorying infrastructure components and characterizing emissions to allow for prioritization of LDAR. • Coordination with local regional and federal entities. • Advances in LDAR technology.

Mitigation strategy – Initiative #13: Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Undertake a detailed economic analysis to determine the most equitable and cost-effective strategy for transitioning off of gas, maintaining public safety and customer reliability, and decommissioning gas systems/infrastructure. A strategic approach to decommissioning the distribution system should be considered while considering both end-use customers and growth in the power generation sector with electrification. This analysis should be completed in parallel with decommissioning power plants and the NYISO Reliability Needs Assessment.	DPS	ASAP	DPS, NYSERDA, DEC, Utilities, natural gas producers, infrastructure owners, local municipalities
Initiate a proceeding to establish emission reductions targets for transmission and gas utilities, allocating specific targets (short, medium and long term) to establish the trajectory for the gas utility sector to achieve the 2050 emissions reductions targets.	DPS/DEC	Ongoing	
Implement Legislative changes to the provisions of the public service law and transportation corporations law so as not to promote gas system expansion by creating a customer right to gas service and requiring that existing customers subsidize gas system extensions to new customers as they are currently written.	DPS	ASAP	
Deny additional gas infrastructure permits to avoid creating additional stranded assets and exacerbating GHG emissions. Furthermore, NYS should advocate to FERC for denial of gas infrastructure projects that will exacerbate GHG emissions. These actions should be taken to the extent consistent with reliability.	DPS/DEC	ASAP	

Mitigation strategy – Initiative #13: Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Support the current DEC effort to promulgate regulations to decrease methane emissions from gas infrastructure, including upstream emissions, and in coordination with the PSC, mandate specific emission reduction targets (including interim targets) for transmission, storage and gas distribution utilities upstream of the meter. These targets are necessary to guide utility gas system planning.	DEC	Ongoing	DPS, NYSERDA, DEC, Utilities, natural gas producers, infrastructure owners, local municipalities
Support future efforts from DEC to further control, reduce, and eliminate methane emissions from gas infrastructure. This may include: Implementation of the usage of leak detection and repair enhanced technology, developing an inventory of all infrastructure and sources of methane emissions potentially subject to State regulation, and operation and maintenance requirements resulting in reduced methane emissions	DPS/DEC	ASAP	
Continued research and development of leakage detection technologies, including continuous monitoring technologies and survey (aerial or land) for the production, transmission and storage of natural gas.	DPS	Ongoing	
Develop a program to accurately characterize gas infrastructure components through information requests better estimate emissions and improve inventory reporting.	DEC	ASAP	

Mitigation strategy – Initiative #13: Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Develop an integrated plan and coordinate efforts with utilities, gas producers, infrastructure owners, and local municipalities to decommission infrastructure by implementing non-pipes alternatives (NPAs) and detect and repair leaks in remaining gas infrastructure while maintaining affordable, safe and reliable service.	DPS	ASAP	DPS, NYSERDA, DEC, Utilities, natural gas producers, infrastructure owners, local municipalities
Identify funding sources and appropriately fund efforts to locate and cap abandoned wells.	DEC	ASAP	
Develop an online registry for submission of data to organize the data and information in a manner that informs and directs infrastructure decommissioning. The CLCPA [75-0105(4)] states that the DEC shall consider a registry but does not direct the DEC to create one. The online registry should have a transparent planning and reporting process, include emissions from the gas industry (from wells to end of distribution network pipes/burner tips) and sources of "fugitive" methane from other methane sources such as landfills, wastewater treatment etc. The information collected shall track and collect data needed for interim targets. The registry shall Account for, report, and track environmental attributes of any advanced fuel project or fugitive methane avoidance project that assures no double counting of reductions or environmental benefits. The CAC should determine the best and highest environmental attributes.	DEC	ASAP	

Mitigation strategy – Initiative #13: Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	In addition to being a greenhouse gas (GHG), methane is a precursor to ozone which impacts disadvantaged communities disproportionately. Reducing methane emissions from natural gas infrastructure improves local air quality, especially in neighborhoods that have significant and/or older infrastructure. Rebuilding gas infrastructure will increase the likelihood of stranded assets, increase rate pressures, and exacerbate equity impacts, especially for LMI customers, as customers transition off of the gas system.
Health and other co-benefits	• 2017 (20 yr GWP) emissions from the oil and natural gas sector was 8,950,000 MTCO2e. • LDAR at wells, compressors and storage sources may reduce GHG emissions by 375,000 MTCO2e. • Additional reductions can be realized with further requirements, including capping abandoned wells, regulation of operation and maintenance and other activities. • Methane is a precursor to ozone which impacts disadvantaged communities disproportionately, the reduction of methane has the potential to also reduce ozone.
Just transition: businesses and industries, workers	As the natural gas system transitions, job availability and roles within the sector may change to: Shuttering of natural gas power plants; Decommissioning of the system; Leakage detection and repair services; and Need to understand and operate a changing system (different infrastructure needs, footprint, or equipment, and different gas compositions).
Other	

Enabling initiative – Initiative #14: Retirement of Fossil Fuel-Fired Facilities

Description:	Develop a plan and implement regulations to phase out fossil fuel-fired baseload and peaking generation resources as quickly as practicable while retaining system reliability by prioritizing efforts to lower emissions of co-pollutants in disadvantaged and environmental justice communities. Leverage existing technology, innovative zero-emissions technology where feasible, transmission and distribution investment, targeted energy efficiency and demand response, market design, and policy or regulatory mechanisms.
Action type:	Regulatory
Cost and funding considerations:	$; Renewable and storage resources can compete to displace fossil-fuel fired plant capacity payments. Potential revenue from regulatory compliance should be considered in all cost assessments.
Ease of implementation:	Hard – Retiring all fossil sources on the system will be difficult, requiring thorough and innovative planning, as well as technology advancements.
Example case studies:	DEC "Peaker Rule," 6 NYCRR Subpart 227-3

Risks / Barriers to success	Possible mitigants
• Effective deployment of renewables, flexible generation or storage, and distributed resources, as well as energy efficiency and demand response solutions that can reliably replace existing fossil resources will be critical. • Transmission and distribution upgrades are needed to complement the zero emissions resource build out, in order to ensure energy delivery.	• The recommendations from the Power Generation Advisory Panel focus on enabling strategies to assist in the transition away from fossil fuels. These include strategies to more rapidly deploy renewable technologies, including flexible resources, addressing barriers to renewables deployment, transmission and distribution upgrades, developing and deploying technology innovations, encouraging effective market structures, and ensuring a just and equitable transition.

Enabling initiative – Initiative #14: Components of the strategy

Components required for delivery	Implement-ation lead	Time to implement	Other Key Stakeholders
Non-Consensus Recommendation with Majority Support: Temporary Moratorium on New or Repowered Fossil Fuel-Fired Facilities until the Full Recommendation is Adopted			
Moratorium on New Fossil Generation: A moratorium will be placed on the permitting, licensing, siting and construction of any new (including repowered, partially repowered) fossil fuel electric generating facility until, as described in the consensus recommendation, (a) the final CAC recommendations are adopted by the state; and (b) NYSDEC has completed its Assessment and Determination of Emissions reduction targets and finalized Emissions Reductions regulations setting ratcheted down emission limits and targets to zero by 2040; and (c) the New York State Planning board and the PSC have finalized the electric sector gas planning process in order to support and ensure the achievement of the emissions reductions targets and compliance with the promulgated emissions reduction regulations by DEC unless a system reliability need is certified as described in the paragraph below. System Reliability: No new, repowered or partially repowered fossil fuel generation facility would be allowed unless (a) NYISO and the local transmission owner certify the existence of a reliability need that cannot otherwise be addressed through a local or bulk transmission system upgrade and that can only be addressed by the fossil generator; (b) the PSC determines based on demonstration from the local transmission distribution company, the utility, and NYISO that no combination of transmission, energy storage, emissions free electric generation, demand response and energy efficiency can address the reliability need within the relevant time frame; (c) if repowering, the fossil fuel generation facility would result in "a significant reduction in criteria and hazardous air pollution from a representative baseline 12 month period within the prior 24 months, as determined by DEC; (d) NYSDEC conducts a thorough equity analysis as mandated under the CLCPA and as required by NYSDEC Commissioner Policy 29; (e) all projects will be subject to Article 10; and (f) the license and permits or renewed permits for any such facility shall be terminated by 2040.	CAC	ASAP	

Enabling initiative – Initiative #14: Components of the strategy

Components required for delivery	Implement-ation lead	Time to implement	Other Key Stakeholders
Non-Consensus Recommendation with Majority Support: Temporary Moratorium on New or Repowered Fossil Fuel-Fired Facilities until the Full Recommendation is Adopted (cont'd)			
New Fossil Generation Through 2040: After the promulgation of the regulations and processes described above and fully detailed in the consensus recommendations below, new, repowered or partially repowered fossil fuel generation facilities may only be licensed or permitted if they comply with these regulations, processes and plans and if their licenses, permits and any permit renewals will terminate by 2040. In its permitting decisions and in the development of the regulations noted above, DEC is required under the CLCPA to "prioritize reductions of greenhouse gas emissions and co-pollutants in disadvantaged communities" and to ensure that a project "shall not disproportionately burden disadvantaged communities."	CAC	ASAP	

Alternative Viewpoint on Non-Consensus Recommendation
The CLCPA requires state agencies to integrate consistency with the CLCPA into their decision-making. In order to achieve the 2030 mandate it is necessary to substantially build out NY's infrastructure; including renewable and storage resources, along with transmission and distribution to support energy delivery. This work, combined with the comprehensive planning and regulatory process to determine how to phase down fossil reliably in a fact based manner by 2040, is what is needed to achieve the CLCPA goals.

Enabling Initiative – Initiative #14 Retirement of Fossil Fuel-Fired Facilities

Principles for Retiring, Repowering and New Fossil Fuel-Fired Facilities

> Fossil-fuel fired facilities should not be permitted to operate after 2040.

> Reducing greenhouse gas emissions and co-pollutants in disadvantaged communities is a priority, and we must ensure an equitable and affordable transition.

> The State must move quickly and take strong action both to invest in renewable electricity, storage, energy efficiency, and transmission and distribution to phase out fossil fuel generation, all while maintaining reliability.

- Electrification of buildings of transportation are critical to achievement of the CLCPA and will increase load on the electric grid.
- Continued provision of safe and adequate electrical service is required as alternative solutions are implemented.
- Not all solutions are yet known, and the transition requires innovative and holistic planning.

> Public and stakeholder input must be considered in any such planning.

> State agency decision-making and approvals must consider consistency with GHG emissions limits.

Enabling initiative – Initiative #14: Retirement of Fossil Fuel-Fired Facilities

> **There are 3 main components to the Fossil Fuel Generation Recommendation:**

1. A planning process to determine emissions reduction targets to reach zero emissions by 2040.

2. Promulgation of emissions regulations by DEC in order to reach the 2040 goal.
   - *Similar to the "Peaker Rule" (DEC 6 NYCRR Subpart 227-3), any closures designated by the emissions regulations of fossil fuel generation facilities would prompt a reliability needs analysis and identification of alternatives.*

3. An iterative planning process that builds on #1 in which the progress, the reduction targets, the regulations, and the other mechanisms being utilized are evaluated and revised as necessary in order to reach the 2040 goal.

The above components shall be enacted as soon as possible by the relevant State Agencies.

Enabling initiative – Initiative #14: Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other Key Stakeholders
A planning process to determine emissions reduction targets to reach zero emissions by 2040			
Determine the potential for greenhouse gas emission and co-pollutant reductions from fossil fuel generation by 2030 and set a corresponding timeline for emissions reduction targets. The timeline from present to 2030 for possible emission reductions shall be determined in conjunction with the renewable energy procurement and interconnection schedule and shall represent a continual decline in emissions from present to 2040 while ensuring reliability. The process shall include effective mechanisms for input and comments by stakeholders (including but not limited to: generators, utilities, and environmental, environmental justice, public health, labor, and electricity consumer advocates and organizations, as well as local communities) and the public.	New York State Energy Planning Board	As soon as possible, but no later than 2023	NYSERDA, PSC, DEC
When setting emission reduction targets, consideration should be given to the location and emissions profile from fossil generating units across the state , as well as relevant planning studies from involved organizations (e.g., the Power Grid Study, NYISO reliability analyses, etc.) in order to inform decisions to address these emissions in the most efficient and effective manner possible.	New York State Energy Planning Board	As soon as possible, but no later than 2023	NYSERDA, PSC, DEC
Disadvantaged communities shall be considered when determining the emissions reduction targets, as required by the CLCPA.	New York State Energy Planning Board	As soon as possible, but no later than 2023	NYSERDA, PSC, DEC

Enabling initiative – Initiative #14: Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other Key Stakeholders
Promulgation of emissions regulations by DEC in order to reach the 2040 goal			
Following the above analysis, DEC shall examine all potential regulatory options, including new regulations and/or permit requirements or amendment of current regulations and/or permitting requirements, to determine the most efficient, effective and enforceable format to achieve the determined emissions reduction targets and the CLCPA goals. Evaluation of emissions, benefits, reliability needs, cost, and available replacements and solutions (and their subsequent impacts) must be executed. Specific focus should also be given to reducing emissions and co-pollutants in disadvantaged and environmental justice communities. The process shall include effective mechanisms for input and comments from stakeholders prior to formal proposal under SAPA, similar to the process used in promulgating the DEC "Peaker Rule," 6 NYCRR Subpart 227-3. Once completed DEC shall follow SAPA in promulgating the identified regulation(s). The effectiveness of the regulations shall be evaluated every two years. This evaluation should coincide with the resource planning review.	DEC	As soon as possible, but no later than 2024	NYSERDA, PSC, NYSEPB
Coordination of closures and the necessary reliability assessments should take place between State Agencies (e.g., DEC, PSC, NYSERDA) and other key stakeholders (e.g., the NYISO, utilities and fossil fuel facility owners and operators), similar to the process used in promulgating the DEC "Peaker Rule," 6 NYCRR Subpart 227-3.	DEC	As soon as possible, but no later than 2024	NYSERDA, PSC, NYSEPB, NYISO, Utilities

Enabling initiative – Initiative #14: Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other Key Stakeholders
An iterative planning process in which the progress, the reduction targets, the regulations, and the other mechanisms being utilized are evaluated and revised as necessary in order to reach the 2040 goal.			
The New York State Energy Planning Board shall commence an iterative planning process in order to support and ensure the continued achievement of the emissions reduction targets and compliance with promulgated regulations including identification of alternatives and barriers to those alternatives, and analysis or additional mechanisms needed.	New York State Energy Planning Board	Performed every two yea rs and timed to serve as a critical input into future Clean Energy Standard, Stat e Energy Plan and/or Climate Action Council updates.	NYSERDA, DEC, PSC, NYISO, Utilities
Examine options to reduce or eliminate emissions from fossil fuel-fired generation facilities, including behind-the-meter fossil resources as expeditiously as practicable but not later than 2040, identifying the nature, feasibility, cost and avoided costs, risks and risk mitigants, and impacts on emissions and health as well as reliability.			
Outline the impacts on communities and workers of such options and the ability to repurpose these facilities to take advantage of their location and infrastructure to ensure reliability while meeting of the CLCPA goals.			
Examine and prioritize options to reduce greenhouse gas emissions and co-pollutants in disadvantaged communities.			
Investigate and implement market mechanisms to assist in the removal of fossil fuel-fired generating facilities from the system, including but not limited to the opportunity for carbon pricing, Clean Dispatch Credits, and valuing of environmental attributes.			

Retirement of Fossil Fuel-Fired Facilities

> Only after alternative solutions (or combination thereof) such as storage (of any duration), zero-emissions resources, transmission upgrades or construction, energy efficiency, or demand response, are fully analyzed and determined to not be able to solve the identified grid reliability need, shall fossil fuel-fired generation facilities be considered in order to meet DEC emissions reduction regulations.

> **Fossil fuel-fired generation facilities shall only be considered if:**

- The NYISO and local transmission operators confirm that the fossil fuel-fired facility is required to maintain bulk or non-bulk power system reliability and that need cannot be reasonably met with any zero-emissions alternatives or combination of zero-emissions alternatives (above).
- A fossil fuel-fired generation facility results in:
  - A fossil fuel-fired generation or low carbon facility provides needed electric system qualities necessary for the reliable operation of the electric system that the alternatives cannot provide.
  - A greater integration of zero-emissions resources
  - A reduction of fossil fuel-fired generation capacity while decreasing greenhouse gas emissions and co-pollutants
  - A significant reduction of greenhouse gases and co-pollutants (reduction requirements to be defined by DEC regulations and analysis)
- A fossil fuel-fired generation facility addresses a specific environmental justice concern (as required by the CLCPA)
- Public and stakeholder input must be incorporated into the decision-making process (as required by Article 10)

> **For all scenarios, a thorough analysis of equity considerations, as required by the CLCPA, is completed by the relevant State Agency.**

Enabling initiative – Initiative #14: Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Closure of high-emitting fossil units should be prioritized in environmental justice communities through measures such as energy efficiency, battery storage, renewables deployment, and necessary transmission and distribution upgrades. As fossil generation facilities close, the impact of the lost tax revenue must also be examined within these communities and a transition must be identified.
Health and other co-benefits	Phasing out fossil fuel-fired generating facilities, especially the largest emitters, will decrease emissions and improve air quality, particularly in the communities where fossil fuel generation is located. In 2016, in-state fossil fuel combustion accounted for 27.72 MMtCO2e (14% of all state emissions).
Just transition: businesses and industries, workers	The closure of fossil units will impact workers. Training and support in the transition to new jobs will be important (see Workforce Development recommendation for additional information).
Other	

Appendix

Category definitions (1 of 2)

	Low	Medium	High
Emissions impact (2018 baseline)	Strategy results in <10% of the reductions needed from the sector for each target year (2030 and 2050) OR Less than 1.5 million metric tons (MMT) of emissions reductions in 2030 or 3 MMT 2050.	Strategy results in 10-33% of the reductions needed from the sector in at least one of the target years OR greater than 1.5 but less than 4 MMT of emissions reductions in 2030 or over 3 but less than 8 MMT in 2050.	Strategy results in >33% of the reductions needed from the sector in at least one of the target years OR over 4 MMT of emissions reductions in 2030 or over 8 MMT in 2050.
	Easy	**Medium**	**Hard**
Ease of implementation	• Strategy has been implemented many times and/or can build off an existing NYS program • Proven and widely available technology • Key stakeholders are strong supporters; no strong opponents	• Strategy is new to New York State but has been successfully implemented in other comparable states/countries • Proven technology with known GHG impact, but still small-scale • Key stakeholders are neutral, or balanced mix of supporters and opponents	• Strategy is unproven in comparable settings • Early-stage technology (e.g., need for pilots to prove feasibility and significant capital to scale up) • Key stakeholders oppose the strategy

Category definitions (2 of 2)

	$	$$	$$$
Mitigation Strategy Cost	• <$250M total resource cost • Most resources required for successful implementation are already on hand	• $250M - $1B total resource cost • Requires some new resources for successful implementation	• Over $1 Billion total resource cost • Requires high degree of new resources (people, equipment, technology) • Strategies with cost >$10B should indicate the range of anticipated costs
Enabling Strategy Cost	• <$25M total cost • Most resources required for successful implementation are already on hand	• $25M - $100M total cost • Requires some new resources for successful implementation	• Over $100M total cost • Requires high degree of new resources or is a demonstration project • Strategies with cost >$250M should indicate the range of anticipated costs

Energy-Intensive and Trade-Exposed Industries Advisory Panel

Recommended Strategies

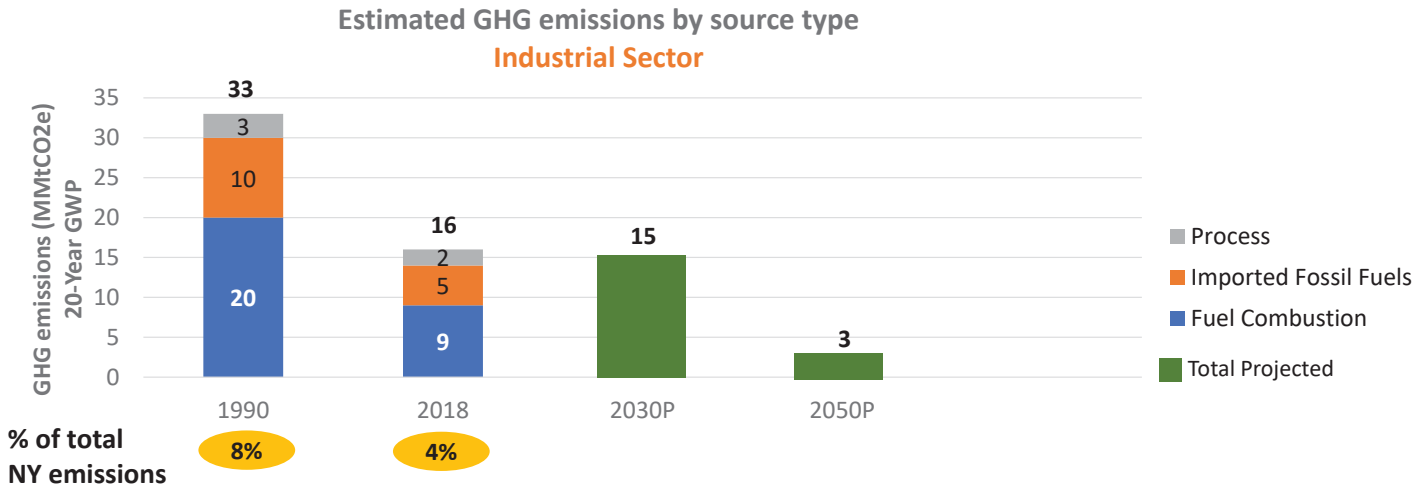
April 5, 2021

NEW YORK STATE OF OPPORTUNITY. Climate Action Council

Public and Stakeholder Input Process

- All EITE Advisory Panel meetings have been open for viewing by the public; all meeting presentations and notes have been posted to climate.ny.gov.
- December – input from Climate Action Council, Climate Justice Working Group
- January – input from public in virtual forum (verbal and written)
- Ongoing – written comments accepted at:
  - E-mail (preferred): climate@esd.ny.gov
  - Letter:
    - EITE Advisory Panel
    - c/o Empire State Development
    - 633 Third Avenue
    - New York, NY 10017
- February – input from EITE advisory panel on draft strategies
- March – finalized EITE advisory panel strategies for Climate Action Council

Industrial sector GHG emission estimates with EITE panel strategies



Source: Draft DEC/NYSERDA analysis subject to public review, 2018 emissions data are preliminary draft
Notes: Excludes indirect emissions from electricity consumption and product use emissions; "Imported Fossil Fuels" includes estimates of upstream GHG emissions associated with fuel combustion; "Fuel Combustion" GHG emissions include combustion of all fuel types at industrial facilities; "Process" GHG emissions include all non-combustion emissions related to industrial production; 2030P and 2050P values shown are based on E3 Pathways report under pre-CLCPA accounting and should be considered illustrative only.

EITE considerations for Industrial emission mitigation strategies

- Industrial sectors within EITE panel scope (Manufacturing, Mining) total a small share (~4%) of State emissions
- "Heterogeneous" nature may result in higher cost per tons of emissions reduced.
- "EITE" industries are likely to represent a high share of Industry sector emissions; non-incentive-oriented approaches may cause leakage.
- Emissions will decline with decarbonization of Power Generation sector; near-term opportunities likely focused on energy efficiency, while most deep decarbonization (carbon capture, low-carbon fuels, etc.) is est. to occur further into the future as new technologies scale, mature and become more viable.

EITE Strategies

Mitigation strategies: Directly reduce emissions and contribute to the achievement of the GHG emission limits or carbon seq. needed to achieve net zero, where applicable:

1. Provide financial incentives and technical assistance for the decarbonization of EITE sectors
2. Create procurement incentives for business to capitalize on low-carbon economic opportunities

Enabling initiatives: No direct emissions benefit, but enable or magnify the mitigation strategies, enhance climate justice, or just transition. (*Examples: outreach, education, and awareness; capacity building; workforce development; and research and development.)*

3. Identify and support technological innovation to enable deep industrial decarbonization
4. Workforce development training to support Energy-Intensive and Trade Exposed (EITE) industries
5. Increase the available data on industrial GHG emissions to help prioritize efforts and monitor progress
6. Provide economic incentives to grow the green economy

Mitigation strategy – Initiative #1: Financial and Technical Assistance

Description:	Provide technical assistance to help identify economically viable decarbonization projects and provide comprehensive energy management planning. Provide financial assistance for decarbonization projects and leverage low-cost hydropower to support industry.		
Action type:	Engineering support and financial incentives		
GHG reduction by 2030:	Low	**GHG reduction by 2050:**	High
Cost and funding considerations:	Costs to support industry can be through utility collections of a System Benefits Charge, agency funding or federal grants and support.		
Ease of implementation:	Easy		
Example case studies:	NYSERDA's Clean Energy Fund, NYPA's Low-Cost Power Program, Investor-Owned Utility Energy Efficiency Programs.		

Risks / Barriers to success	Possible mitigants
Industries' internal competition for resources may prohibit investment in implementation of GHG reduction strategies	Provide clear market signals of long-term resource commitments and benefits to industry

Mitigation strategy – Initiative #1: Financial and Technical Assistance

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
NYSERDA financial and technical initiatives • Approval of continuation of Clean Energy Fund • Market Engagement and Outreach	NYSERDA	Ongoing	DPS, NYSERDA, NYPA Utilities, Regional Economic Development Councils
Utility Energy Efficiency Programs	Utilities	Ongoing	DPS, NYSERDA, NYPA
Low-cost Hydro Power Programs	NYPA	Ongoing	DPS, Utilities

Mitigation strategy – Initiative #1: Financial and Technical Assistance

Anticipated Benefits and Impacts	
Disadvantaged communities	Industrial facilities implementing GHG emission reduction projects or receiving low-cost hydro power may be located within a disadvantaged community.
Health and co-benefits	Significant health benefits are expected from lowering GHG emission reductions at energy intensive industrial facilities in which some facilities are in heavily populated areas.
Just transition: businesses and industries, workers	Over 127,000 clean energy jobs exist in energy efficiency in New York and as increased investments in GHG emission reduction projects occur opportunities exist for job growth in the sector.* *2020 New York Clean Energy Industry Report, p. 37.
Other	

Mitigation strategy – Initiative #2: Low-Carbon Procurement Policies

Description:	Develop preferential procurement standards for low-carbon building materials and remove impediments to the State's purchase of low-carbon materials. Low-carbon materials will be required to reduce emissions in the built environment. Providing a value proposition for manufacturers to produce low-carbon products will help reduce process related emissions.		
Action type:	Legislative/Regulatory		
GHG reduction by 2030:	Low	**GHG reduction by 2050:**	Medium
Cost and funding considerations:	Low-carbon products available in the near have comparable cost characteristics to legacy materials. Long-term costs can be controlled by capping preferential standards (e.g. maximum % discount on bid price when proposal contains low-carbon products)		
Ease of implementation:	Medium		
Example case studies:	Buy Clean California; EU 2014 Public Procurement Directives		

Risks / Barriers to success	Possible mitigants
• Availability of different types of low-carbon products • Life Cycle Analyses (LCAs) of products require standardized accounting frameworks to ensure accurate accounting of emission reduction.	• RD&D funding for product development • Work with federal government as well as other states and municipalities on LCA best practices to ensure that compliance is favorable to business interests.

EITE - Mitigation strategy – Initiative #2: Low-Carbon Procurement Policies

Colmponents required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Develop a list of the most carbon intense building materials and products (e.g. concrete, steel, glass, etc.) eligible for incentives or preferential treatment in procurement.	GreenNY , NYSERDA, DEC	<1 year	NYSERDA, DASNY, OGS, NYSERDA, DEC, DOT, PANYNJ
Determine a standard for assessing the Global Warming Potential (GWP) of products	GreenNY, NYSERDA, DEC	1-2 years	NYSERDA, DASNY, OGS, NYSERDA, DEC, DOT, PANYNJ, Other States, Federal gov.
Implement project scoring criteria that provide advantages to projects/bids utilizing products that meet or exceed GWP targets	Multiple	2+ years	Builders/architects/ manufacturers
Continuous monitoring and updating of standards	GreenNY, NYSERDA, DEC	Ongoing	NYSERDA, DASNY, OGS, NYSERDA, DEC, DOT, PANYNJ, Other States, Federal gov

Mitigation strategy – Initiative #2: Low-Carbon Procurement Policies

Anticipated Benefits and Impacts	
Disadvantaged communities	The production methods utilized to manufacture low-carbon products often reduce other harmful co-pollutants relative to the production of the legacy products being replaced. As a result, production of low-carbon products may have beneficial local health impacts in disadvantaged communities where industrial facilities are often located.
Health and co-benefits	See above.
Just transition: businesses and industries, workers	Development of low-carbon products and associated markets will offer new business opportunities, including to NYS-certified M/WBE and SDVOBs. Technologies that will enable large scale production of low-carbon goods will be developed by startups and other new business ventures that will spur job growth and new innovative industries in NY State.
Other	

Enabling initiative – Initiative #3: Research Development & Demonstration (RD&D)

Description:	Develop a comprehensive Innovation Roadmap to determine priorities for deep decarbonization RD&D investment. Meeting the CLCPA goals for industry is not technically and/or economically feasible with currently available technologies alone. This research effort should analyze the social, financial, and technological characteristics of solutions that will enable industry to meet CLCPA goals. The research should consider the intersection of the industrial/manufacturing, agriculture, transportation, and power generation sectors when determining investment priorities.
Action type:	Research initiative
Cost and funding considerations:	• Funding required for initial roadmap analysis with additional funding for further research and early-stage pilots to be determined pending the outcome of analysis. • Potential to leverage federal spending in these areas given developments with the new administration
Ease of implementation:	Easy
Example case studies:	*Electrifying U.S. Industry* (Renewable Thermal Collective); *Getting to Neutral* (Lawrence Livermore National Lab); *Low-Carbon Heat Solutions for Heavy Industry* (Columbia University)

Risks / Barriers to success	Possible mitigants
• Research scope will need to be tightly defined to ensure meaningful recommendations can be ascertained	• Form collaborative stakeholder group to provide input on research scope

Enabling initiative – Initiative #3: Research Development & Demonstration

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to support)*
Development of research scope of work	NYSERDA	< 1 year	
Release of a solicitation to conduct the research and analysis	NYSERDA	1-2 years	
Provide funding for additional research and pilot/demonstration projects	NYSERDA	Ongoing	ESD, NYPA, DEC

Enabling initiative – Initiative #3: Research Development & Demonstration

Anticipated Benefits and Impacts	
Disadvantaged communities	Research must take into account environmental justice concerns when making recommendations for areas of action and investment.
Health and co-benefits	Research must take into account public health concerns when making recommendations for areas of action and investment.
Just transition: businesses and industries, workers	A robust RD&D program will attract private investment, highly skilled personnel resources, and new businesses to NY state.
Other	

Enabling initiative – Initiative #4: Workforce Development

Description:	Provide workforce development training on existing and new innovative emission reduction technologies
Action type:	Regulatory (Clean Energy Fund)-- NYS Labor
Cost and funding considerations:	Costs for training are mitigated by expanding job opportunities for clean energy workforce in addition to cost savings at facilities as GHG strategies are implemented.
Ease of implementation:	Easy
Example case studies:	NYSERDA Workforce Development Programs , NYS Dept of Labor Programs

Risks / Barriers to success	Possible mitigants
• Training programs not aligned with business needs • Risk aversion for businesses to invest in training • Long lead time to find skilled workers	• Develop and or expand training to meet the needs and capacity • Offset cost of training

Enabling initiative – Initiative #4: Workforce Development

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** (*Entities supporting)*
NYSERDA will partner with training organizations and businesses to expand training capacity in NY and update training content to prepare workers for jobs with clean energy technologies. • Issue Competitive Solicitations • Develop strategic partnerships with industry organizations • Support training activities that will include job preparation and job placement initiatives • Support business-facing intermediaries such as community-based organizations	NYSERDA	Ongoing	NYSDOL, ESD, Utilities

Enabling initiative – Initiative #4: Workforce Development

Anticipated Benefits and Impacts	
Disadvantaged communities	Many industrial facilities are in or near disadvantaged communities, efforts will encourage participation by and job placement for disadvantaged workers.
Health and local air quality	Significant health benefits are expected from lowering GHG emission reductions at energy intensive industrial facilities, some of which are in heavily populated areas.
Just transition: businesses and industries, workers	Opportunities exist for worker training, especially within disadvantaged communities, including partnering with unions, engineering companies, energy efficiency service providers.
Other	

Enabling initiative – Initiative #5: GHG Reporting

Description:	Expand the universe of facilities that are required to report on their GHG emissions.
Action type:	Regulatory
Cost and funding considerations:	Reporting facilities would be the bearer of cost. DEC would be the bearer of cost for data collection and review.
Ease of implementation:	Medium – regulation adoption takes 12-24 months typically, but process is well established.
Example case studies:	Existing regulations (6 NYCRR Part 202-2) that require GHG reporting for major sources of criteria pollutants.

Risks / Barriers to success	Possible mitigants
- Establishing a GHG emissions threshold at which reporting will be required. There will likely be disagreement between state and regulated community as to what the threshold should be. - Concern about placing additional regulatory requirements on facilities already highly regulated by DEC.	- Evaluate whether to align this requirement with reporting already done to meet EPA GHG Reporting Program. - To the extent possible the new regulatory requirement should make clear that EITE industries already reporting GHG emissions to DEC would not be required to also report under any new reporting requirement.

Enabling initiative – Initiative #5: GHG Reporting

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** (*Entities that need to support)*
Develop Rule Initiation Memorandum (RIM)	DEC	1 month	N/A
Initial draft of GHG reporting regulation	DEC	4 months	N/A
Public outreach to get input on initial draft regulation	DEC	4 months	Regulated facilities, business council, industrial sector organizations, environmental advocacy organizations.
Finalize draft regulation	DEC	3 months	N/A
Public notice of draft regulation	DEC	1 – 2 months	As above
Prepare response to comments and finalize regulation	DEC	3 months	N/A
Adopt regulation	DEC	1 month	N/A

Enabling initiative – Initiative #5: GHG Reporting

Anticipated Benefits and Impacts	
Disadvantaged communities	Having a more complete picture of GHG emitting facilities will allow a more focused effort to reduce GHG emissions as much as possible. Since most often GHG emissions are the result of fuel combustion any reduction in fuel combustion will also result in lower emissions of criteria and hazardous air pollutants, which tend to be elevated in Disadvantaged Communities.
Health and local air quality	As described the initiative has the potential to result in lower criteria pollutant emissions. Reductions in criteria pollutant emissions have long been known to be beneficial to the health of individuals.
Just transition: businesses and industries, workers	Collecting emissions data from a larger universe of industrial facilities will enable a more complete picture of greenhouse gas emissions, allowing the State to better track its emission reduction progress, identify the potential for additional reductions in the EITE sectors and prioritize emission reduction efforts.
Other	

Enabling initiative – Initiative #6: Economic incentives

Description:	Leverage the State's climate policies to develop an in-state supply chain of green economy companies by engaging in business development discussions and offering loans, grants, tax credits, and other economic incentives.
Action type:	Economic Incentives
Cost and funding considerations:	Costs are offset by attracting additional spending, which produces State and local tax revenues; State programs already in existence: Excelsior Jobs Program, NY Ventures, NYSERDA, etc.
Ease of implementation:	Easy / Operational
Example case studies:	In April 2020, New York State created special "Green Economy Tax Credits" as economic incentives under the Excelsior Jobs Program, which have helped to attract several projects, including: • Li-cycle: Will recycle lithium-ion batteries, resulting in 100 jobs. NYS committed $5 million. • Plug Power: Will produce hydrogen fuel cell stacks and electrolyzers, resulting in 377 jobs. NYS committed $13 million in tax credits.

Risks / Barriers to success	Possible mitigants
• Many green industries will require additional conditions to grow in NYS; greater market demand, workforce and suppliers. • Many jurisdictions are competing for green economy jobs.	• To be effective, economic incentives may need to be supported by workforce planning and other efforts to stimulate demand (e.g., clean energy and low-carbon procurements).

Enabling initiative – Initiative #6: Economic incentives

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities supporting)*
• **Offer economic incentives to secure green economy attraction and expansion projects, including**: o Engagement with green economy businesses to identify potential in-state economic opportunities; o Engagement with awardees and suppliers of State green procurements (e.g., offshore wind energy and port investment solicitation) and contests (e.g., 76 West clean energy business plan competition) to discuss potential in-state economic opportunities; o Coordinating with State partners to identify all relevant incentives (ESD, NYSERDA, NYPA, etc.) o Offering and administering economic incentives where necessary.	ESD	Ongoing	NYSERDA, NYPA
• **Implement complementary initiatives to grow workforce, supplier base and market demand.**	Various	Ongoing	NYSERDA, NYPA, SUNY

Enabling initiative – Initiative #6: Economic incentives

Anticipated Benefits and Impacts	
Disadvantaged communities	• Green economy projects may occur within disadvantaged communities. Project location decisions are typically business-driven, not State-driven.
Health and local air quality	• Certain green economy projects, while bringing local jobs and investment, may also bring air quality or other environmental impacts, which would be need to be reviewed under State law.
Just transition: businesses and industries, workers	• Certain former power plant facilities may be available to be repurposed for green economic development projects – e.g., offshore wind projects that leverage fossil fuel electric generation facilities as interconnection points – potentially offsetting economic losses from decarbonization. • Green economy companies may provide supplier opportunities to EITE businesses, and vice versa.
Other	• Green economy industries are poised for significant growth, and anchoring an in-state supply chain of growing green businesses will both make it easier for the State to achieve its climate goals while also attracting new investments and jobs.

Summary:
- Mitigation Strategies
- Enabling Initiatives

Initiative #	Description	Action type	Emissions Impact	Ease of Implementation	Cost
1. Mitigation Strategy	Provide financial incentives and technical assistance for the decarbonization of EITE sectors	Financial and technical assistance	High	Easy	$$$
2. Mitigation Strategy	Create procurement incentives for business to capitalize on low-carbon economy opportunities	Low-carbon procurement policies	Low	Medium	$$
3. Enabling Initiative	Identify and support technological innovation to enable deep industrial decarbonization	Research, Dev. & Demonstration	N/A	Medium/Hard	$$
4. Enabling Initiative	Workforce development training to support Energy-Intensive and Trade-Exposed (EITE) industries	Workforce development	N/A	Easy	$$
5. Enabling Initiative	Increase the available data on industrial GHG emissions to help prioritize efforts and monitor progress	Reporting requirement	N/A	Medium	$
6. Enabling Initiative	Provide economic incentives to grow the green economy	Economic incentives	N/A	Easy	$

Agriculture and Forestry Advisory Panel

Emissions Reduction and Carbon Sequestration Recommendations

April 5, 2021

NEW YORK STATE OF OPPORTUNITY. Climate Action Council

Contents

Detailed Contents

Acronyms

AEM: Agricultural Environmental Management

AgNPS: Agricultural Non-point Source Pollution

BIPOC: Black Indigenous People of Color

CALS: Cornell College of Agriculture and Life Sciences

CCA: Certified Crop Advisors

CCE: Cornell Cooperative Extension

CNCPS: Cornell Net Carbohydrate and Protein System

CRF: Climate Resilient Farming

EJ: Environmental Justice

ENGO: Environmental Non-Governmental Organization

ESFPA: Empire State Forest Products Association

NASS: National Agricultural Statistics Service (USDA)

NRCS: National Resources Conservation Service (USDA)

NYGB: New York Green Bank

NYSSWCC: New York Soil and Water Conservation Committee

PES: Payment for Ecosystem Services

REDCs: Regional Economic Development Councils

SAF: Society of American Foresters

SUNYESF: State University of New York College of Environmental Science and Forestry

SWCD: Soil and Water Conservation District

TNC: The Nature Conservancy

USDA: United States Department of Agriculture

WI-DNR: Wisconsin Department of Natural Resources

WPDC: Wood Products Development Council

NYS Agencies and Authorities

AGM: Department of Agriculture and Markets

DEC: Department of Environmental Conservation

DASNY: Dormitory Authority of the State of New York

DOH: Department of Health

DOS: Department of State

DOT: Department of Transportation

DOTF: Department of Taxation and Finance

DPS: Department of Public Service

ESD: Empire State Development

HCR: Homes and Community Renewal

NYPA: New York Power Authority

NYSERDA: New York State Energy Research and Development Authority

OGS: Office of General Services

PANYNJ: Port Authority of New York and New Jersey

PSC: Public Service Commission

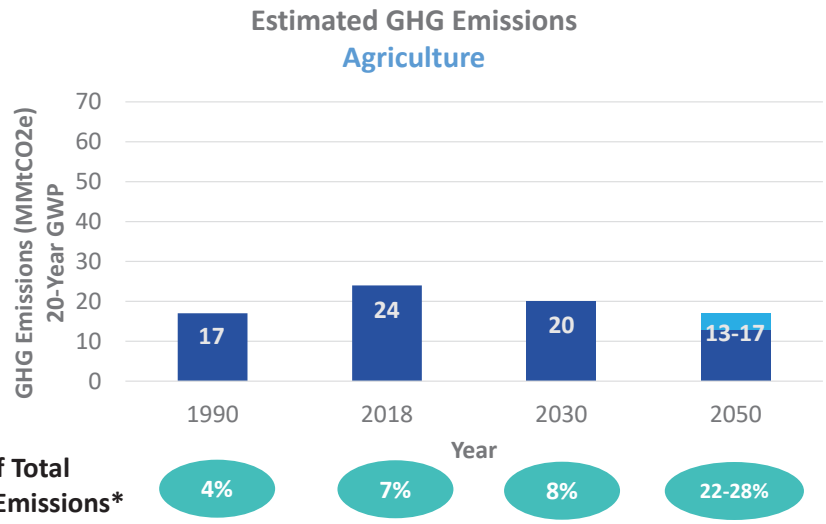
SWCC: NYS Soil and Water Conservation Committee

Description of Recommendation Types

From the Recommendations Guidance document

- **Mitigation strategies:** actions that directly reduce emissions and contribute to the achievement of the greenhouse gas emission limits or carbon sequestration needed to achieve net zero, where applicable. Consider how the collective estimated emissions impact of these strategies amount to the Pathways reduction target for the panel (if applicable) and support attaining the greenhouse gas limits.
- **Enabling initiatives:** actions without direct emissions benefit that enable or magnify the mitigation strategies, enhance climate justice, or just transition
  - Examples of such initiatives include outreach, education, and increasing awareness; capacity building; workforce development; and research and development.
  - While enabling initiatives do not need to be tied to specific mitigation strategies, an enabling initiative should be tied to specific mitigation strategies wherever possible.
- **Adaptation and resilience strategies**: actions to help adapt to the effects of climate change and increase resilience to climate hazards
- Not all panels will have all of these types of recommendations
- While advisory panels should try to answer each question in the companion guidance document when filling in the recommendations template, there may be cases where not all questions are relevant or answerable. In such cases, it is fine to leave questions unanswered.

Aggregate GHG Emissions impact of Agriculture and Forestry panel recommendations



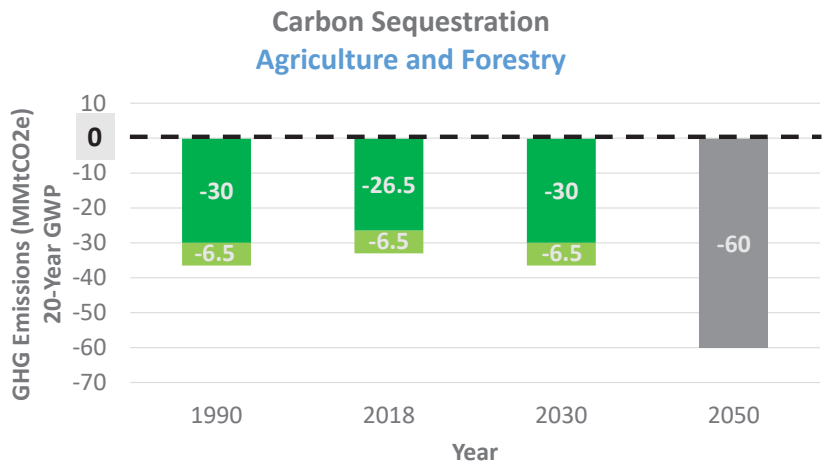
*Not including carbon sequestration.
2018 emissions data are preliminary draft

Scope (2018 Subtotal DRAFT):
- Agricultural Emissions: Livestock and Fertilizer (24 MMt)

Emission Reduction Goals
- 2030: Reduce 15% from current levels
- 2050:
  - Reduce 30% (return to 1990 levels)
  - Reduce 45% (additional ambition)

Additional Goals
- Avoid leakage by maintaining and enhancing agriculture in NYS
- Increase carbon sequestration on agricultural lands (next slide)

Carbon Sequestration impact of Agriculture and Forestry panel recommendations



Scope (2018 Subtotal DRAFT):
- Forestry and Agroforestry Sequestration (-26.5MMt)
- Cropland, Grassland, Urban Trees, Harvested Wood Products Sequestration (-6.5MMt)

Carbon Sequestration Goals
- 2030: No Net Loss Forests (= 1990 levels)
- 2050: Achieve full Net Zero Goal <u>across all sectors in NYS</u> by enhancing carbon sequestration in Agriculture and Forestry

Mitigation strategy summary – Agriculture

Initiative #	Description	Action type	Emissions impact	Ease of implementation	Cost
1A	Soil Health Management Practices (also referred to as Regenerative Agricultural Practices)	Executive/ Financial/ Legislative	Low – 2030 Medium - 2050	Easy-Hard	$$
2A	Nutrient Management	Executive/ Financial/ Legislative	Low-Medium – 2030 Medium-High- 2050	Easy-Medium	$
3A	Alternative Manure Management	Executive/ Financial/ Legislative	Medium - 2030 High – 2050	Easy - Medium	$$
4A	Precision Feed, Forage and Herd Management	Executive/ Financial/ Legislative	Medium – 2030 Medium – High - 2050	Easy	$
5A	Agroforestry	Executive/ Financial/ Legislative	Low-2030 Medium - 2050	Easy-Medium	$$

Mitigation strategy – Initiative 1A Soil Health: Overview

Description:	Reduce net GHG emissions and increase carbon sequestration/storage and other environmental benefits through adoption of soil health management practices (e.g., cover/double crops, reduced tillage, perennial crop systems. Also referred to as Regenerative Agricultural Practices).		
Action type:	Agricultural Emission Reduction/Sequestration (Executive, Legislative, Financial)		
GHG reduction by 2030:	Low	**GHG reduction by 2050:**	Medium
Cost and funding considerations:	$$, funding from Environmental Protection Fund (EPF) through Climate Resilient Farming (CRF), Agricultural Environmental Management (AEM) Base Program, Agricultural Non Point Source Abatement and Control (AgNPS) Program (water quality), and other state and federal programs, seek new and enhanced funding sources, including private investments as many soil health practices have the potential to generate cost savings, improve yields and quality, and diversify farm products.		
Ease of implementation:	Easy, infrastructure and cost-share funding programs exist to support soil health including the implementation of regenerative farming practice systems; Medium, develop soil health standard to help further adoption of BMPs, develop an annual acre goal for the most common practices (cover and double crops/reduced tillage); Hard, quantification and verification tools.		
Example case studies:	Carbon Farm Study, Healthy Soils NY, Soil Health Characterization Report, Whole Farm Nutrient Mass Balance (Cornell Spear Program), US Climate Alliance Toolkit, Carbon Reduction Potential Evaluation (CaRPE) Report		

Risks / Barriers to success	Possible mitigants
• Upfront costs to adoption • Uncertainty in potential mitigation and impermanence of increasing soil carbon – Difficult to verify • Proving additionality • Equipment affordability and access • Planting windows – highly dependent on weather conditions throughout growing season • Need for continued research, field trials, and pilot projects for data collection and monitoring • (Im)Balance of imports/exports of carbon (soil health) and nutrients at the farm, landscape, and regional scales • Practice adoption on rented/leased land	• Increase CRF and AgNPS funding, increase payment rates and access to cost-share programs, increase technical assistance, • Increase adoption of soil health practices; Support cover & double-crop practices, encourage coupling of practices (e.g., no-till & cover cropping together) • Make efforts under Healthy Soils NY visible to farmers and public • Advance quantification and measurement and reporting tools • Advance research in perennial grain production • Convert annual cropland to perennial hayland/pasture where appropriate (e.g., steep slopes, highly erodible lands, etc.) • Expand on-farm planning to include site specific, explicit carbon sequestration goals • Establishing a Payment for Ecosystem Services (PES) mechanism to assist in incentivizing long-term adoption • Outreach to landowners to incentivize adoption of practices on rented lands

Mitigation strategy – Initiative 1A Soil Health: Components of the strategy

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Increase financial support for currently available and implemented practices - Expand funding for NYS CRF, AEM Base, AgNPS; increase payment rates, increase access, build equity into programs, increase technical assistance, encourage adoption of a system of practices, develop soil health standard, establish annual goal for common practices. Increase awareness and support for urban soils and agriculture.	NYSAGM, NYSSWCC, SWCDs	6-12 months	USDA, Cornell, CCE Farmers
Quantification and measurement - Develop tools for verification of benefits, invest in remote sensing to quantify adoption of practices.	NYSAGM, NYSSWCC, Cornell	1-2 years	SWCDs, USDA, NYSERDA, Farmers, ESF, TNC
Establish and maintain a comprehensive research, development, and demonstration strategy for monitoring and verification of soil health that address additionality and permanence to support State climate goals and enable Federal and private funding of GHG mitigation practices.	NYSAGM, NYSSWCC, Cornell	2-4 years	SWCDs, USDA, NYSERDA, Farmers, ESF, TNC
Support perennials - Convert annual cropland to perennial hayland/pasture and where appropriate (e.g., steep slopes, highly erodible lands, etc.).	NYSAGM, NYSSWCC, SWCDs	6-12 months	CCE, Farmers, USDA
Establish and maintain a comprehensive research strategy in soil health to bring new practices and approaches (e.g., enhanced rock weathering, biochar) that increase sequestration rates, productivity, other environmental benefits, and scale for adoption.	NYSAGM, Cornell, SUNYs, USDA	2-4 years	NYSSWCC, SWCDs, Farmers, Other Colleges and Universities
Support continued development and implementation of precision/digital agricultural tools and sustainable intensification, which is the sustainable increase in yields on current cropland to reduce stress on marginal cropland to support this mitigation strategy.	NYSAGM, NYSSWCC, Cornell, CCE, SWCDs	3-5 years	Farmers, NYSERDA, USDA

Mitigation strategy – Initiative 1A Soil Health: Components of the strategy

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
AEM Planning – Conduct comprehensive on-farm planning to include carbon sequestration goals, GHG emission, nutrient management, and soil health.	NYSAGM, NYSSWCC, SWCDs	continuous	Farmers, CCE, Cornell, USDA
Make efforts visible to farmers and public through outreach campaign making information more available, expand regenerative agricultural practices in marketing programs (e.g., NY Grown & Certified), improve information provided to public to help customers understand practices involved in products they purchase.	NYSAGM, CCE	1-2 years	NYSSWCC, SWCDs, Farmers
Expand education and outreach to include all farmers and to support practice adoption and encourage coupling of practices into systems for maximum benefit. Emphasize agricultural and soil health instruction in schools to connect students with farms and farmers and knowledge of ecological benefit of healthy soils.	NYSAGM, NYSSWCC, Cornell, SWCDs, CCE	continuous	USDA, NYSERDA, Farmers, ESF
Expand capacity of SWCDs and partners to aid on farm implementation of GHG reduction and sequestration management practices.	NYSAGM, NYSSWCC, SWCDs	continuous	Farmers, CCE, Cornell, USDA, Land Trusts, Non-Profits

Mitigation strategy – Initiative 1A Soil Health: Components of the strategy

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Identify practice systems that can generate revenue and/or added value to the farm, identify variety of public and private funding sources.	NYSAGM, NYSSWCC, Cornell, CCE, SWCDs	6-12 months	Farmers, NYSERDA, USDA
Peer to peer networking to elevate long-term adoption of SH practices (local farmer SH discussion groups). Seek feedback from groups/communities not currently engaged in practices and programs (e.g., holding focus groups or surveys, addressing urban soils and urban agricultural operations). Improving access reflects the need to ensure that all farmers can take part in these practices and programs.	NYSAGM, NYSSWCC, SWCDs, Cornell, CCE	6-12 months	Farmers, USDA, NYS Farm Bureau, NYFVI, Other farm organizations
Increase adoption on rented and leased land. Seek feedback regarding support needed for farmers not currently engaged in practices and programs. Engage, educate, and incentivize landowners to increase adoption of practices on land they rent to farmers.	NYSAGM, NYSSWCC, SWCDs, Cornell, CCE	6-12 months	Farmers, USDA, NYS Farm Bureau, NYFVI, American Farmland Trust, Other farm organizations
Establish a Payment for Ecosystem Services (PES) mechanism to provide a new structure for establishing and maintaining practice systems, to incentivize carbon sequestration, carbon storage, GHG reduction, and other environmental benefits.	NYSAGM, NYSSWCC, SWCDs	1-2 years	Farmers, USDA, Cornell, CCE

Mitigation strategy – Initiative 1A Soil Health: Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Increasing research, planning, technical services and financial assistance improves access to programs and effective practices for all farmers. The strategy will also prioritize disadvantaged communities by placing emphasis on access to conservation technical assistance and funding programs to historically underserved and disadvantaged community members, e.g., BIPOC, women, LGBTQIA+, low income, veteran, or beginning farmers. Components of the strategies include: considering a higher percentage of cost share funding for state programs designed to assist historically underserved farmers and/or creating program targets for funding for such farmers, in implementing GHG reductions strategies; collecting data on the number of farms in disadvantaged communities, the demographics of farmers in the state, and the experiences of minority farmers to allow greater access to programs and technical assistance. Improvements in food production capacity, resiliency and diversity have a positive effect on disadvantaged communities. Additional focus will be on connecting availability of fresh, local food to disadvantaged communities through programs like NY Fresh Connect, farm to school programs, and others. Emphasize agricultural and soil health instruction in schools to connect students with farms and farmers and knowledge of ecological benefit of healthy soils.
Health and co-benefits	Increased soil health; increased farm viability; adaptation and resilience to extreme weather (increased water retention during drought and erosion prevention during extreme precipitation), potential profitability of harvesting a double-crop, and improved water quality due to nutrient and sediment retention.
Just transition: businesses and industries, workers	Inter-generational family transfer provides opportunities to encourage and incentivize soil health management practices. Emphasis will be on improved access to technical and financial support for historically underserved and beginning farmers. This strategy will include youth engagement, internships, educational opportunities, public and private sector job creation through increased technical assistance and implementation (e.g., climate conservation corps, tree corps), and potentially on-farm job creation.
Other	

Mitigation strategy – Initiative 2A Nutrient Management: Overview

Description:	Nutrient Management - Reduce nitrous oxide (N2O) emissions while achieving desired crop yield and quality through continued and expanded nutrient management planning and implementation on crop fields, hay fields, pastures, orchards, vineyards, and other agricultural lands receiving nutrients.		
Action type:	Agricultural Emission Reduction (N2O) (Executive, Financial, Legislative)		
GHG reduction by 2030:	Low-medium (based on fertilizer N and manure use efficiency)	**GHG reduction by 2050:**	Medium-high (based on fertilizer N and manure use efficiency)
Cost and funding considerations:	$, funding from EPF through Climate Resilient Farming, AEM Base Program, AgNPS Program (water quality), other state and federal programs, and private sector investment where practices provide a reasonable return.		
Ease of implementation:	Easy for implementation of nutrient management. Medium for more advanced as well as future approaches.		
Example case studies:	Carbon Farming Report; N Fertilizer Mgt (Info Sheet #5);. Whole Farm Nutrient Mass Balance (Cornell Spear Program), US Climate Alliance Toolkit, CaRPE Report		

Risks / Barriers to success	Possible mitigants
• New processes, technologies, costs, and returns to evaluate • Demands sustained, adaptive management by farmers and crop advisors for most benefit • Learning curve by farmers, crop advisors, and fertilizer industry • Gaps in applied research as well as field monitoring technology • Weather variability changes N efficiency performance • Lack of necessary equipment	• On-farm research partnerships to continue to identify efficient, site specific management strategies (N eff. with crop yield and quality) • More public and private sector investment • More public and private sector planning capacity • Fertilizer industry-led priorities focused on 4Rs of nutrient mgt • Improved methods of monitoring performance via crop yield measurement and N use efficiency • Peer-to-peer crop yield and N efficiency contests • Crop insurance options

Mitigation strategy – Initiative 2A Nutrient Management: Components of the strategy

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Technical Assistance - Increase cost-share support for technical assistance (planning) and soil health/nutrient management practice implementation through AEM Programs, such as the Climate Resilient Farming Program. Seek feedback from groups not currently engaged in practices and programs to remove obstacles (e.g., holding focus groups or surveys).	NYSAGM, NYSSWCC, SWCDs	6-12 months	CCE, CCAs, Cornell, USDA, Fertilizer Industry, Farmers
Increase Financial Support - Expand cost-share eligibility in AEM Programs, such as the Climate Resilient Farming Program, for equipment needed by farms to implement more advanced soil health and nutrient management practices. Build equity into programs	NYSAGM, NYSSWCC, SWCDs	6-12 months	CCE, CCAs, Cornell, USDA, Fertilizer Industry, Farmers
Evaluation – Further use of improved methods of monitoring performance via crop yield measurement, N use efficiency, and Whole Farm Nutrient Mass Balances (NMB for farm-wide N management). Document benefits of NM to farmers, policymakers, and public.	Cornell, CCE, CCAs, Fertilizer Industry, Farmers	Continuous	NYSAGM, NYSSWCC, SWCDs
Collaboration with industry led Nutrient Management Initiatives/services. N efficiency x yield crop contests for peer-to-peer competition and informational opportunities.	Fertilizer Industry, CCA, Farmers, Cornell	Continuous	CCE, Cornell, USDA, NYSAGM, NYSSWCC, SWCDs

Mitigation strategy – Initiative 2A Nutrient Management: Components of the strategy

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Expand capacity of custom farming service providers to aid on farm implementation of nutrient management practices.	NYSAGM, NYSSWCC, SWCDs	6-12 months	CCE, CCAs, Cornell, USDA, NYSDEC, Fertilizer Industry, Farmers
Expand capacity of SWCDs and partners to aid on farm implementation of GHG reduction and sequestration management practices.	NYSAGM, NYSSWCC, SWCDs	Continuous	Farmers, CCE, Cornell, USDA, Land Trusts, Non-profits
Implement long-term funding support for nutrient management applied research and outreach (management approaches, technology, new inputs with lower GHG inputs, etc.).	Cornell, CCE, CCAs, Fertilizer Industry, Farmers	Continuous	NYSAGM, NYSSWCC, SWCDs
Increase outreach to all farmers, that's consistent with the research and technical standards used in NY, and make steps taken by farmers more visible to consumers.	Fertilizer Industry, CCAs, Farmers, CCE, Cornell, USDA, NYSAGM, NYSSWCC, SWCDs	6-12 months	
Continue and enhance training for planners and farmers.	NYSAGM, NYSSWCC, SWCDs, Cornell, CCE	Continuous	USDA, Farmers, CCAs

Mitigation strategy – Initiative 2A Nutrient Management: Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Increasing planning, technical services and financial assistance improves access to programs and effective practices for all farmers. The strategy will also prioritize disadvantaged communities by placing emphasis on access to conservation technical assistance and funding programs to historically underserved and disadvantaged community members, e.g., BIPOC, women, LGBTQIA+, low income, veteran, or beginning farmers. Components of the strategies include: considering a higher percentage of cost share funding for state programs designed to assist historically underserved farmers and/or creating program targets for funding for such farmers, in implementing GHG reductions strategies; collecting data on the number of farms in disadvantaged communities, the demographics of farmers in the state, and the experiences of minority farmers to allow greater access to programs and technical assistance. Improvements in food production capacity, resiliency and diversity have a positive effect on disadvantaged communities. Nutrient management improves downstream community water resources, including disadvantaged communities.
Health and co-benefits	Nutrient management improvements have the potential to elevate local food production and resiliency, improve water quality, air quality, economic development and jobs.
Just transition: businesses and industries, workers	Inter-generational family transfer provides opportunities to incentivize changes in farm management for GHG emission reduction. Emphasis will be on improved access to technical and financial support for historically underserved and beginning farmers. This strategy will include youth engagement, internships, educational opportunities, public and private sector job creation through increased technical assistance and implementation (e.g., climate conservation corps, tree corps), and potentially on-farm job creation.
Other	

Mitigation strategy – Initiative 3A Alternative Manure Management: Overview

Description:	Alternative Manure Management - Reduce methane emissions by implementing practice systems specifically planned and designed for each farm, such as cover and flare systems, anaerobic digester systems, and other/innovative systems that collect, capture and combust methane from manure storages or prevent methane production from manure storage.		
Action type:	Agricultural Emission Reduction / (Executive, Financial, Legislative)		
GHG reduction by 2030:	Medium – High	**GHG reduction by 2050:**	High
Cost and funding considerations:	$$, funding from EPF through AEM Base, CRF, and AgNPS Program (water quality), Federal funds, private investment where practices provide a sufficient return, NYSERDA (related to energy generation)		
Ease of implementation:	Easy for systems with a track record of use in NYS and medium for more advance manure management systems.		
Example case studies:	Climate Resilient Farming Program; Carbon Farming Report; Manure Storage GHG Mitigation (Info Sheets #2 and #3); Cornell PRO-DAIRY Environmental Systems (research and on-farm case studies); NYSERDA Programs/projects.		

Risks / Barriers to success	Possible mitigants
• New processes, technologies, costs, and returns to evaluate • Storage retrofit and bedding challenges • Operation and maintenance necessary for optimal methane capture and combustion • Methane loss risk relative to ambient manure storage baseline • Gaps in applied research as well as in-field leak monitoring processes • Potential nutrient imbalances with increase in imported organic waste processing • Quantifying and verifying outcomes	• AEM Planning – develop specific mitigation strategies for each farm • Performance based funding; building performance measures into access to public funds; include GHG monitoring into implementation of new GHG mitigation practices • Increase adoption of cover and flare systems for existing manure storages. Track performance of GHG reductions of completed projects • More public and private sector investment • More private sector engineering, technology, operation, and verification support. • Mitigation services for other sectors (e.g., food waste, energy) • Dairy farmer-led industry priorities toward net zero GHG • University and on-farm research partnerships to continue to identify effective, value-generating manure management systems for a range farm management scenarios

Mitigation strategy – Initiative 3A Alternative Manure Management: Components of the strategy

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Expand funding for NYS Climate Resilient Farming Program & AgNPS. Increase payment rates, access, technical assistance, and eligible manure management practice systems, build equity into programs.	NYSAGM, NYSSWCC, SWCDs	Ongoing	CCE, PEs, Cornell, NYSERDA, USDA, Farmers, Lenders
Expand funding for advancement of energy production, methane mitigation, including measurement and abatement of methane leakage, and future innovations based upon the recommendations from the biomass action plan.	NYSERDA	5 Years	NYSAGM, Farmers, PEs, Cornell, NYS DEC
Expand Public/Private Partnerships - Align manure management systems designed for energy production, organic waste management, and methane mitigation with markets (existing or future; LCFS; industry net zero initiatives; etc.) and private sector investment.	Industry, NYSAGM, PEs, Cornell, CCE, NYSERDA, USDA, Farmers, Lenders	5 Years	NYSSWCC, SWCDs
Increase technical assistance and engineering capacity for feasibility assessment, planning, design, operation, maintenance, and monitoring of systems.	Industry, PEs, Cornell, CCE, NYSERDA, USDA, NYSAGM, NYSSWCC, SWCDs	5 Years	Farmers, NYSDEC, Lenders
Refine policies to encourage new manure storages funded through the state programs to incorporate methane mitigation strategies including retrofit capacity.	NYSAGM, NYSSWCC, SWCDs	6-12 months	CCE, PEs, Cornell, NYSERDA, USDA, Farmers
Expand capacity of SWCDs and partners to aid on farm implementation of GHG reduction and sequestration management practices.	NYSAGM, NYSSWCC, SWCDs	Continuous	Farmers, CCE, Cornell, USDA

Mitigation strategy – Initiative 3A Alternative Manure Management: Components of the strategy

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Pursue further methane leakage research and monitoring to guide systems and management to minimize losses and optimize GHG reduction benefit.	NYSAGM, NYSERDA	Ongoing	CCE, PEs, Cornell, USDA, Farmers
Through training, expand capacity of technical service providers and farm staff to design, build, operate, and maintain alternative manure management systems.	NYSAGM, Cornell, PEs, SWCDs	1-2 years	CCE, NYSERDA, USDA, Farmers, NYS Farm Bureau, Other farm organizations
Implement long-term funding support for alternative manure management applied research and outreach, including processes for realizing additional value from manure and analyses for strategic development/siting of methane mitigating manure and organic waste management systems.	NYSAGM, NYSERDA, Cornell, NYSDEC	6-12 months	SWCDs, CCE Farmers, Pes
Develop a NYS-funded loan guarantee program to stimulate investment in alternative manure management systems.	NYSAGM, NYSERDA, Cornell, Lenders	1-2 years	NYSSWCC, SWCDs
Develop NYS-bulk buying programs to reduce core material and equipment costs (covers, flares, separators, standardized controls, other components, etc.). Similar to solar industry and energy efficient heating programs.	NYSAGM, NYSERDA, Industry	2-4 years	Farmers, NYSDEC, Lenders
Improve connections/markets between farms with alternative manure management systems and other businesses able to supply organic co-products or use products generated by such on-farm systems (e.g., electricity, heat, gas, organic soil amendments).	NYSAGM, NYSERDA, NYSDEC	1-2 years	CCE, PEs, Cornell, USDA, Farmers

Mitigation strategy – Initiative 3A Alternative Manure Management: Benefits

Anticipated Benefits and Impacts	
Disadvantaged communities	Increasing planning, technical services and financial assistance improves access to programs and effective practices for all farmers. The strategy will also prioritize disadvantaged communities by placing emphasis on access to conservation technical assistance and funding programs to historically underserved and disadvantaged community members, e.g., BIPOC, women, LGBTQIA+, low income, veteran, or beginning farmers. Components of the strategies include: considering a higher percentage of cost share funding for state programs designed to assist historically underserved farmers and/or creating program targets for funding for such farmers, in implementing GHG reductions strategies; collecting data on the number of farms in disadvantaged communities, the demographics of farmers in the state, and the experiences of minority farmers to allow greater access to programs and technical assistance. Improvements in food production capacity, resiliency and diversity have a positive effect on disadvantaged communities.
Health and co-benefits	Manure management improvements for methane mitigation have the potential to elevate local food production and resiliency, water quality, and air quality, economic development, energy, higher use of organic waste, and jobs by reducing the negative impacts of climate change from short-lived climate pollutants. NYSDEC regulates emissions from engines and flares associated with alternative manure management systems. Flares associated with ambient temperature covered manure storages are exempt from registration and permitting, because emissions, such as hydrogen sulfide, sulfur dioxide, nitrogen oxides, carbon monoxide, particulate matter, and volatile organic compounds, are below regulatory thresholds. Engines and flares associated with anaerobic digester systems process gases in higher concentrations, so such emissions are regulated via registration or permit for monitoring and compliance with State and federal air quality standards.
Just transition: businesses and industries, workers	Inter-generational family transfer provides opportunities to incentivize changes in farm management for GHG emission reduction. Emphasis will be on improved access to technical and financial support for historically underserved and beginning farmers. This strategy will include public and private sector job creation through increased technical assistance and implementation (e.g., climate conservation corps, tree corps), and potentially on-farm job creation.
Other	

Mitigation strategy – Initiative 4A Precision Feed, Forage and Herd Management: Overview

Description:	Precision Feed, Forage and Herd Management – Reduce methane and nitrous oxide emissions while achieving desired ruminant growth and lactation goals. Strategy acknowledges that additional methane emission reduction may be realized from feed additives developed in the future.		
Action type:	Agricultural Emission Reduction (methane and nitrous oxide) / (Executive, Financial, Legislative)		
GHG reduction by 2030:	Medium (based on feed and forage mgt. only; higher potential with future feed additives)	**GHG reduction by 2050:**	Medium (based on feed and forage mgt. only; higher potential with future feed additives)
Cost and funding considerations:	$, funding from EPF through AEM Base, CRF, and AgNPS Program (water quality), Federal Programs, private investment where practices provide a sufficient return.		
Ease of implementation:	Easy for implementation of precision feed and forage management with continued and enhanced training delivered to farms/industry.		
Example case studies:	Carbon Farming Report; Dairy Manure Mgt and GHG Opportunities (Info Sheet #2); Cornell Net Carbohydrate and Protein System (CNCPS) research and extension; Precision Feed Management projects in NYC Watershed.		

Risks / Barriers to success	**Possible mitigants**
• New processes, technologies, costs, and returns to evaluate • Demands sustained, adaptive management by farmers and advisors for most benefit • Learning curve by farmers, advisors, and feed industry • Gaps in applied research • Weather and market disruptions can influence performance (low quality forage)	• University and on-farm research partnerships to continue to identify efficient, site specific management and herd strategies • More public and private sector investment • More public and private sector planning capacity • Dairy farmer-led industry priorities toward net zero GHG. • Improved methods of monitoring performance throughout forage and feeding systems on farms

Mitigation strategy – Initiative 4A Precision Feed, Forage and Herd Management: Components of the strategy

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Expand outreach and education of precision feed and forage management to more ruminant livestock farmers, nutritionists, and feed industry professionals.	Cornell, CCE, Farmers, Independent Nutritionists, Feed Industry Nutritionists, CCAs, SWCDs, NRCS	Ongoing	Milk Cooperatives and Processors
Expand access to precision feed and forage management monitoring (e.g., for feeding, production, intake) and decision tools (e.g., CNCPS) applicable to a range of farm conditions and management. Increase on-farm use of methane module within CNCPS and develop statewide benchmarks to gauge improvement overtime.	Cornell, CCE, Farmers, Independent Nutritionists, Feed Industry Nutritionists, CCAs, SWCDs, NRCS	Ongoing	Milk Cooperatives and Processors
Expand capacity of SWCDs and partners to aid on farm implementation of precision feed and forage management practices.	NYSAGM, NYSSWCC, SWCDs	continuous	Farmers, CCE, Cornell, USDA

Mitigation strategy – Initiative 4A Precision Feed, Forage and Herd Management: Components of the strategy

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Implement long-term funding support for precision feed and forage management applied research and outreach (including basic and applied research for methane mitigating feed additives).	NYSAGM, NYSSWCC, Cornell, SWCDs	2 Years and Continuous	Milk Cooperatives and Processors
Explore establishment of a co-product market (e.g., food "wastes" supplied from food processors, retailers, or institutions) for best uses (including as livestock feed).	Food Processors, Food Retailers, Food Institutions, NYSDEC	2 Years	Cornell, CCE, Farmers, Independent Nutritionists, Feed Industry Nutritionists, NYSAGM
Develop a science-based strategy focused on improving herd management decision making which positively impacts cow efficiency to reduce GHG emissions while optimizing milk yield and return on investment. Provide technical assistance for implementation.	NYSAGM, Cornell CALS, PRO DAIRY	1-2 Years	Dairy farmers, NYSDEC, CCE, SWCDs, Farm organizations

Mitigation strategy – Initiative 4A Precision Feed, Forage and Herd Management: Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Increasing planning, technical services and financial assistance improves access to programs and effective practices for all farmers. The strategy will also prioritize disadvantaged communities by placing emphasis on access to conservation technical assistance and funding programs to historically underserved and disadvantaged community members, e.g., BIPOC, women, LGBTQIA+, low income, veteran, or beginning farmers. Components of the strategies include: considering a higher percentage of cost share funding for state programs designed to assist historically underserved farmers and/or creating program targets for funding for such farmers, in implementing GHG reductions strategies; collecting data on the number of farms in disadvantaged communities, the demographics of farmers in the state, and the experiences of minority farmers to allow greater access to programs and technical assistance. Improvements in food production capacity, resiliency and diversity have a positive effect on communities.
Health and co-benefits	Precision feed and forage management improvements have the potential to elevate local food production. Feed and forage management can result in higher production, quality, and returns on investment, enhancing profitability and farm resiliency. Additional co-benefits include water quality improvements, air quality, economic development and jobs by reducing the negative impacts of climate change from short-lived climate pollutants.
Just transition: businesses and industries, workers	Inter-generational family transfer provides opportunities to incentivize changes in farm management for GHG emission reduction. Emphasis will be on improved access to technical and financial support for historically underserved and beginning farmers. This strategy will include youth engagement, internships, educational opportunities, public and private sector job creation through increased technical assistance and implementation (e.g., climate conservation corps, tree corps), and potentially on-farm job creation.
Other	

Mitigation strategy – Initiative 5A Agroforestry: Overview

Description:	Agroforestry - Adding trees into areas of agricultural production to reliably increase carbon sequestration and other environmental benefits.		
Action type:	Agricultural Emission Reduction/Sequestration (Legislative, Executive, Financial)		
GHG reduction by 2030:	Low	**GHG reduction by 2050:**	Low - Medium
Cost and funding considerations:	$, funding from EPF through Climate Resilient Farming and AgNPS Program (water quality); Watershed-wide funding opportunities; Federal Funding, USDA Programs, (CSP, CRP, EQIP), private investment where practices provide a sufficient return.		
Ease of implementation:	Easy for implementation of buffers; Medium for silvopasturing and alleycropping; Medium for ensuring survivability of tree plantings		
Example case studies:	Buffers: AgNPS, USC Buffer Pilot, Watershed Groups; Silvopasture: CRF Program, CCE field research, Cornell Forest Connect; Plantation Silvopasture, Woodland Silvopasture) Angus Glen Farms, Schuyler County.		

Risks / Barriers to success	Possible mitigants
• Upfront costs to adoption • Land access and transfer • Workforce gaps • Gaps in research, field trials, pilot projects, and market analyses in agroforestry systems • Long-term management and maintenance • Tree species selection and survivability	• Increase adoption of agroforestry practices; support (research (applied R&D & case studies of economics of practices), education, & technical asst) for farms diversifying operations (e.g., nut/orchard/maple/Christmas tree). that have revenue potential for farms • Set goals for acres of practices implemented (based on ~3M acres available land) # acres technically available & # acres feasible for implementation • **Buffers**: increasing incentives for implementation through existing programs; developing new incentive structures for buffers (PES), elevating workforce to plan, design, implement and establish buffers • **Silvopasture**: expand the Climate Resilient Farming Program to include a track for agroforestry/silvopasture; expand education and technical assistance; expand programs that plan, design and implement intensively managed rotational grazing systems • **Alleycropping**: conduct field trials and pilot projects, expand education and technical assistance

Mitigation strategy – Initiative 5A Agroforestry: Components of the strategy

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** *(Entities that need to be engaged)*
Expand NYS Climate Resilient Farming Program to include agroforestry track. Set acreage targets for priority practices.	NYSAGM, NYSSWCC, SWCDs	6-12 months	Cornell, CCE, USDA, Farmers
Continue emphasis on forested buffers through AgNPS and Source Water Buffer Program, USDA CRP/CREP.	NYSAGM, NYSSWCC, SWCDs, Land Trusts	6-12 months	USDA, Farmers, Watershed Coalitions, municipalities
Expand Trees for Tributaries Program, Non-Ag NPS, DEC Division of Fish and Wildlife Programs.	NYSDEC, NYSAGM, NYSSWCC	1-2 years	SWCDs, CCE, Farmers, Watershed Coalitions
Expand education and technical assistance for beginning farmers and generational transfer. Assist farmers with business planning and modeling. Expand supply chain development for new products.	NYSAGM, CCE, Cornell	continuous	American Farmland Trust, Land Trusts, CCE, SWCDs, Farmers, Landowners, Farm Bureau, Financial lenders, Watershed Coalitions
Alleycropping: conduct field trials and pilot projects, expand education and technical assistance.	NYSAGM, NYSSWCC, Cornell, CCE, SWCDs	2-4 years	Farmers, Farm Bureau, Other farm orgs.
Silvopasture: expand programs that plan, design, and implement intensively managed rotational grazing systems with a focus on proper site and species selection for adding trees.	NYSAGM, NYSSWCC, SWCDs, CCE	2-4 years	Farmers, NYSDEC, TNC, USDA

Mitigation strategy – Initiative 5A Agroforestry: Components of the strategy

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Establish a Payment for Ecosystem Services (PES) mechanism to provide a new structure for establishing and maintaining practice systems, to incentivize carbon sequestration, carbon storage, GHG reduction, and other environmental benefits.	NYSAGM, NYSSWCC, SWCDs	1-2 years	Farmers, USDA, Cornell, CCE
Farmland access: Assist farmers in securing long term leasing and farm transfer to beginning farmers – long term leases required for long term perennial systems.	NYSAGM, NYSSWCC, American Farmland Trust, Land Trusts	continuous	Cornell, CCE, Financial Lenders
Conduct outreach to financial lenders/insurance providers	NYSAGM, CCE, Cornell	continuous	Financial Lenders, American Farmland Trust, Land Trusts, SWCDs, Farmers, Landowners, NYFB
Collaboration with federal partners to better align federal and state policy priorities	NYSAGM, NYSSWCC, Cornell, CCE, SWCDs	2-4 years	Farmers, Farm Bureau
Expand capacity of SWCDs and partners to aid on farm implementation of GHG reduction and sequestration management practices.	NYSAGM, NYSSWCC, SWCDs	continuous	Farmers, CCE, Cornell, USDA

Mitigation strategy – Initiative 5A Agroforestry: Benefits and Impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Increasing planning, technical services and financial assistance improves access to programs and effective practices for all farmers. The strategy will also prioritize disadvantaged communities by placing emphasis on access to conservation technical assistance and funding programs to historically underserved and disadvantaged community members, e.g., BIPOC, women, LGBTQIA+, low income, veteran, or beginning farmers. Components of the strategies include: considering a higher percentage of cost share funding for state programs designed to assist historically underserved farmers and/or creating program targets for funding for such farmers, in implementing GHG reductions strategies; collecting data on the number of farms in disadvantaged communities, the demographics of farmers in the state, and the experiences of minority farmers to allow greater access to programs and technical assistance. Improvements in food production capacity, resiliency and diversity have a positive effect on disadvantaged communities.
Health and co-benefits	Agroforestry practice systems have the potential to elevate local food production, diversify farm incomes and increase farm profitability. Systems also provide resiliency, water quality, air quality, storm/flood mitigation, public infrastructure protection, drought resiliency, habitat, scenic vistas/tourism, market diversification, economic development and jobs.
Just transition: businesses and industries, workers	Inter-generational family transfer provides opportunities to incentivize changes in farm management for GHG emission reduction, improved access for historically underserved including, BIPOC and beginning farmers. Emphasis will be on improved access to technical and financial support for historically underserved and beginning farmers. This strategy will include youth engagement, internships, educational opportunities, public and private sector job creation through increased technical assistance and implementation (e.g., climate conservation corps, tree corps), and on-farm job creation.
Other	Woody perennial buffers are small reliable practices that have a high value of carbon sequestration per acre. Silvopasture and alleycropping have the potential to increase income streams for farms, providing an economic return on investment.

Enabling (or Support) Strategy Summary – Agriculture

Initiative #	Description	Action type	Ease of implementation	Cost
1A	AEM Planning for Climate Mitigation/Adaptation, aka "Carbon Farm Planning"	Planning (Exec/Financial)	Medium	$
2A	Establish a program for long-term, annual monitoring and benchmarking of GHG mitigation, carbon sequestration, and adaptation performance across applicable areas of management on farms in NYS. Information products provide useful, farm-level data for confidential benchmarking by farmers as well as publicly available data through farm case studies (with farmer agreement) and aggregated datasets to support future policy, research, and implementation.	Monitoring (Executive/ Financial/ Legislative)	Medium	$$

Enabling initiative – Initiative 1A: AEM Planning for Climate Mitigation/Adaptation, aka "Carbon Farm Planning": Overview

Description:	AEM Planning for Climate Change Mitigation/Adaptation
Action type:	Planning/Evaluation/Estimating Impact (Executive/financial)
Cost and funding considerations:	$; funding that supports AEM planning; expansion of models, planning framework, education and training of SWCDs and AEM planning workforce, pilot plans on various sizes and types of farms, potential for farmers to develop their own plans (also with training, minimum required standards, and at certain scales)
Ease of implementation:	Easy for overview planning; moderate for comprehensive planning, including forest management, energy consumption, feed management, etc.
Example case studies:	COMET Planner, COMET Farm, Forestry Management, NYSERDA Ensave Agricultural Energy Audits, CNCPS and Precision Feed and Forage Management Guidelines, CNMP Guidelines, USDA-NRCS Carbon Planning Guidance, other existing tools/guidelines

Risks / Barriers to success	Possible mitigants
• Funding for planning template • Maintaining strong emphasis on water quality and soil health planning, while planning for GHG and adaption • Workforce demands and gaps • Challenges with farmer interest or incentives for these planning efforts • Coarse models and quantification methodology • Challenges with matching scales and levels of planning rigor with various levels of yet defined goals/outcomes	• Increase state and federal funding • Assemble technical advisory committee to develop planning protocols appropriate to scale(s) and accuracy(s) of existing models and methods, farmer interests/goals, and mitigation/adaptation goals • Develop protocols proportional to scale and accuracy of existing tools • Add GHG mitigation and climate adaptation to existing plans for water quality/soil health • Train additional SWCDs and AEM Planners for intentional climate mitigation/adaptation planning and implementation • Depending on applicability and scale, develop tools and train farmers to develop their own plans • Inform and educate farmers on climate impact and mitigation opportunity, match incentives to plans • Invest in model evaluation and development and quantification methods

Enabling initiative – Initiative 1A: AEM Planning for Climate Mitigation/Adaptation, aka "Carbon Farm Planning": Components of the strategy

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Form technical advisory panel.	NYSAGM, NYSSWCC	6-12 months	Cornell, SWCDs, Farmers, USDA, CCE, NYSDEC
Technical advisory panel to define different levels of planning goals and outcomes (e.g., overview, whole farm scale; detailed management area scale; to inform directionally correct change; to inform change leading to quantifiable or even marketable outcomes; what information are farmers most interested in).	NYSAGM, NYSSWCC, Cornell, SWCDs, Farmers, NRCS, CCE, NYSDEC, NGOs	1-2 years	Other entities with mitigation/adaptation tools and methods
Technical advisory panel to develop planning protocols (including methods, preferred models, and recommended planner skills) for the levels defined, above. Iterative process, as some planning levels may not be supported by existing methods and models. Process will identify gaps for future development. Strive for compatibility among State and federal programs. Design methods for collection and aggregation of outcomes from planned and implemented practice systems (e.g., estimates for GHGs, sequestration, metrics for adaptation).	NYSAGM, NYSSWCC, Cornell, SWCDs, Farmers, NRCS, CCE, NYSDEC, NGOs	1-2 years	Other entities with mitigation/adaptation tools and methods

Enabling initiative – Initiative 1A: AEM Planning for Climate Mitigation/Adaptation: aka "Carbon Farm Planning": Components of the strategy

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
On-farm piloting of those planning protocols deemed currently feasible by the panel (supported through AEM Base Program among Districts and farmers).	NYSAGM, NYSSWCC, SWCDs, Farmers	1-2 years	Cornell, NRCS, CCE, NYSDEC
Technical advisory panel reviews pilots and refines planning protocols.	NYSAGM, NYSSWCC, Cornell, SWCDs, Farmers, NRCS, CCE, NYSDEC, NGOs	2-3 years	Other entities with mitigation/adaptation tools and methods
Training of feasible planning protocols to public- and private-sector Ag service providers.	NYSAGM, NYSSWCC, Cornell, SWCDs, NRCS	2-3 years	
Communication of AEM Planning for Climate Mitigation/Adaptation with farmers (case studies, learning from pilot farmers, training on farmer developed planning protocols/tools, etc.).	NYSAGM, NYSSWCC, Cornell, SWCDs, Farmers, NRCS, CCE, NGOs	2-3 years	
Inclusion of planning protocols in AEM Base Program and perhaps federal programs for full use with farmers. Priority practice systems from plans lead to implementation via direct investment by farmers, other private investors, and/or lenders, as well as State and federal cost-share programs and incentives.	NYSAGM, NYSSWCC, SWCDs, NRCS, Farmers, NYS DEC	Continuous	Cornell, CCE, NGOs
Technical advisory panel uses new science and feedback from on-farm use to adapt, advance, train, and implement new planning protocols over time.	NYSAGM, NYSSWCC, Cornell, SWCDs, Farmers, NRCS, CCE, NYSDEC, NGOs	Continuous	Other entities with mitigation/adaptation tools and methods

Enabling initiative – Initiative 1A: AEM Planning for Climate Mitigation/Adaptation, aka "Carbon Farm Planning: Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Increasing planning, technical services and financial assistance improves access to programs and effective practices for all farmers. Emphasis on access to conservation technical assistance and funding programs to historically underserved and disadvantaged community members, e.g., BIPOC, women, LGBTQIA+, low income, veteran, or beginning farmers. Improvements in food production capacity, resiliency and diversity have a positive effect on disadvantaged communities.
Health and other co-benefits	AEM Planning for Climate Mitigation/Adaptation has the potential to elevate local food production and resiliency, water quality, air quality, storm/flood mitigation, public infrastructure protection, drought resiliency, habitat, scenic vistas/tourism, economic development and jobs.
Just transition: businesses and industries, workers	Inter-generational family transfer provides opportunities to incentivize changes in farm management for GHG emission reduction. Emphasis will be on improved access to technical and financial support for historically underserved and beginning farmers. This strategy will include youth engagement, internships, educational opportunities, public and private sector job creation through increased technical assistance and implementation (e.g., climate conservation corps, tree corps), and potentially on-farm job creation.
Other	

Enabling initiative – Initiative 2A: Benchmarking and Monitoring: Overview

Description:	A new program for long-term, annual monitoring and benchmarking of GHG mitigation, carbon sequestration, and adaptation performance across applicable areas of management on farms in NYS. Information products provide useful, farm-level data for confidential benchmarking by farmers as well as publicly available data through farm case studies (with farmer agreement) and aggregated datasets to support future policy, research, and implementation.
Action type:	Program establishment and development (Executive/Financial/Legislative)
Cost and funding considerations:	$$; Necessary annual costs likely to include staff and program overhead; incentives for farmer participation; costs of data products (e.g., remotely sensed data); cost for contractors where specialty services in information management, on-farm analyses, or applied research are necessary; and web service and IT expenses.
Ease of implementation:	Medium; requires development of methods for efficient and meaningful monitoring, benchmarking (including establishing feasible performance goals), aggregated summarization, and delivery (communication at various scales). Expectation that methods will adapt with future knowledge and technology.
Example case studies:	Whole Farm Nutrient Balance (Cornell Spear Program); Dairy Farm Business Summary (Cornell PRO-DAIRY and Farm Credit East); Precision Feed Management Benchmarking (Cornell and CCE); Ag Census and Annual Surveys (NASS); Soil Health Case Studies (American Farmland Trust); NYS and EPA GHG inventories.

Risks / Barriers to success	Possible mitigants
• New program development (ramp-up expenses: time, funding, defining best initial direction/methods, sample sizes, and scales for various areas of farm management) • Trust and participation among Ag-sector participants • Potential sampling bias stemming from subpopulation of participating farms	• Experienced advisory committee to shape the program based on comprehensive knowledge of existing approaches, NYS agriculture, and CLCPA • Incentives for farm participation (useful for farm performance; pathway to other markets or programs; funding for participation; marketing benefit for farm; others) • Private sector partnership (e.g., dairy processors or co-ops) where goals align among programs

Enabling initiative – Initiative 2A: Benchmarking and Monitoring: Components of the strategy

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Establish funding line for a CLCPA agricultural benchmarking and monitoring program.	NYSAGM, NYSDEC	1 year	Cornell, NYSSWCC, Farmers, CCE, Farm Credit East, SWCDs, CCAs, NASS, food processors and co-ops
Co-develop methods for program (program staff and advisory committee).	NYSAGM, NYSSWCC Cornell, NYSDEC	1-2 years	ESF, Farmers, SWCDs, CCE, Farm Credit East, CCAs, NASS, TNC, American Farmland Trust, food processors and co-ops
Introduce program with farmers and farm advisors (field).	NYSAGM, NYSSWCC, Cornell	2-3 years	ESF, Farmers, SWCDs, CCE, Farm Credit East, CCAs, NASS, TNC, American Farmland Trust, food processors and co-ops
Initiate program with farmers.	NYSAGM, NYSSWCC, Cornell	2-3 years	ESF, Farmers, SWCDs, CCE, Farm Credit East, CCAs, NASS, TNC, American Farmland Trust, food processors and co-ops
Deliver data summaries for confidential farm-scale use and aggregated summaries for public use.	NYSAGM, NYSSWCC, Cornell	2-3 years	ESF, Farmers, SWCDs, CCE, Farm Credit East, CCAs, NASS, TNC, American Farmland Trust, food processors and co-ops
Repeat method annually.	NYSAGM, NYSSWCC, Cornell	Continuous	ESF, Farmers, SWCDs, CCE, Farm Credit East, CCAs, NASS, TNC, American Farmland Trust, food processors and co-ops

Enabling initiative – Initiative 2A: Benchmarking and Monitoring: Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	This enabling initiative will increase access to methods/programs that help farmers generate their own farm-scale information for decision making, with an emphasis on assisting historically disadvantaged farmers, e.g., BIPOC, women, LGBTQIA+, low income, veteran, or beginning farmers. Improvements in food production capacity, resiliency and diversity have a positive effect on disadvantaged communities.
Health and other co-benefits	Improved farm-level data and broader-scaled, aggregated information about farm management have the potential to elevate local food production and resiliency, water quality, air quality, storm/flood mitigation, public infrastructure protection, drought resiliency, habitat, scenic vistas/tourism, economic development and jobs.
Just transition: businesses and industries, workers	Inter-generational family transfer provides opportunities to incentivize changes in farm management for GHG emission reduction. Emphasis will be on improved access to technical and financial support for historically underserved and beginning farmers. This strategy could include youth engagement, internships, educational opportunities, public and private sector job creation through increased technical assistance and implementation (e.g., climate conservation corps, tree corps), and potentially on-farm job creation.
Other	

Mitigation Strategy Summary – Avoided Conversions

Initiative #	Description	Action type	Emissions impact	Ease of implementation	Cost
1	Keep Forests as Forests: Maintain and enhance the state's carbon sequestration potential through avoided forest conversion	Legislative (Budget, Programmatic); Regulatory	High	Easy for land acquisition. Difficult for new tax incentives and regulatory changes	$$$

Mitigation strategy – Initiative # 1: Avoided Forest Conversion: Overview

Description:	Keep Forests as Forests: Maintain and enhance the state's carbon sequestration potential through avoided forest conversion		
Action type:	Legislative (Budget, Programmatic); Regulatory		
GHG reduction by 2030:	High	**GHG reduction by 2050:**	High
Cost and funding considerations:	$$$: Land acquisition funding, tax incentives, staffing needed to implement land acquisition goals, administer tax incentive, implement regulations and provide technical assistance		
Ease of implementation:	Easy for land acquisition. Difficult for new tax incentive and regulatory changes		
Example case studies:			

Risks / Barriers to success	Possible mitigants
• Dependent on passage of Legislation • Cost to taxpayers for acquisition and tax incentives • Landowner interest to participate varies • Nearly 700,000 forest landowners • Large number of municipalities/home rule • Potential tax base impact to municipalities • Sprawl needs to be managed effectively	• State reimbursement of municipalities must be sufficient to address tax shift caused by Forest Tax Law • Prioritize conservation easements as appropriate, and provide resources for adequate long-term stewardship • Invest in partner capacity • Bolster local forest economies • Restore state open space conservation funding to historic levels (2008 Environmental Protection Fund included $60 million), environmental bond act • Reinvigorate NYS Open Space planning process with emphasis on conservation as a climate strategy • Increasing focus of state economic development incentives to reduce sprawl and spur climate smart investments in community development

Mitigation strategy – Initiative #1: Avoided Forest Conversion Components of the strategy

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** *(Entities that need to be engaged)*
Land Acquisition (fee and conservation easement) by state, municipalities, land trusts	DEC	10 years	Municipalities, land trusts, communities, OPRHP, SUNY ESF
Statutory change to Real Property Tax Law amending current 480a and creating tracks including forest carbon management. Address deficiencies in current 480a to make program more attractive to private forest landowners, easier to administer, lower acre threshold, and further sustainability goals. (see Forest Management recommendations for further details)	DEC	3 years	DTF, DEC, Municipalities, Legislature, NYFOA, ESFPA, SAF, land trusts and NGOs, SUNY ESF
Keep Forests as Forests Law – Require mitigation of forest carbon loss due to conversion for development.	DEC	3 years	Municipalities, NYFOA, ESFPA, SAF, land trusts and NGOs, SUNY ESF
Forest Carbon Markets	TBD	5 years	Municipalities, NYFOA, ESFPA, SAF, land trusts and NGOs, SUNY ESF
Note: LULG is leading on local land use recommendations.			

Mitigation strategy – Initiative #1: Avoided Forest Conversion Components of the strategy

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** *(Entities that need to be engaged)*
Continued sustainable management of NYS forests which maintains or increases forest carbon stocks, while producing an annual sustained yield of bio-based feedstocks from the forest.	DEC, AGM	Ongoing	CAFRI, SAF, NYFOA, ESFPA, SUNY ESF
Enhance local capacity for land conservation – Statewide authorization of Community Preservation Act (incl working lands), Conservation Partnership Program, etc.	DEC, AGM, municipalities	Ongoing	Land trusts, NGOs, SWCDs
Strengthen Right to Practice Forestry Law	DEC	1 year	Municipalities, DOS, ESFPA, NYFOA
Outreach and technical assistance to landowners on forest management, estate planning/intergenerational transfer, outreach to public on importance and contribution of working forestlands	DEC	Ongoing	SUNY ESF, Cornell, CCE, AGM, land trusts and NGOs, SWCDs
Research agenda to support avoided conversion – quantification for No Net Loss, prioritize conservation activities, monitoring to quantify policy impacts	DEC	1 year, ongoing	SUNY ESF, Cornell, AGM, land trusts and NGOs
State legislation to secure local government ability to maintain roads as minimum maintenance roads to reduce development pressure	Municipalities, DOT	1 year	Municipalities, landowners, DOS

Mitigation strategy – Initiative #1: Avoided Forest Conversion
Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Include measures to increase access to land, resources, education, training, and incentives for BIPOC. Include indigenous consultation and deeper community engagement Payment of taxes on state-owned lands varies
Health and co-benefits	Air and water quality. Numerous studies in the U.S. and around the world are exploring the health benefits of spending time outside in nature, green spaces, and, specifically, forests. Reduce emissions from vehicle use from prevented sprawl development. Wildlife habitat, outdoor recreation, flood mitigation
Just transition: businesses and industries, workers	Include provision for alternative locations of housing and business development
Other	Allows lower and middle income landowners to keep their lands and manage them more sustainability. Harvested wood product markets support this strategy and are discussed in the Advance Markets for Sustainably Harvested Long-Lived Wood Products and Sustainable biomass feedstock action plan for 2050 hard-to-decarbonize products strategies. This strategy will be supported by the LULG Advisory Panel's recommendation on facilitating and supporting collaborative county-wide and regional smart growth comprehensive planning. Inter-agency collaboration is occurring to advance renewable energy development in a way that avoids, minimizes and mitigates impact to prime agricultural soils, and forest carbon stocks and ecosystems.

Enabling strategy summary – Avoided Conversions

Initiative #	Description	Action type	Ease of implementation	Cost
1	Avoided agricultural land conversion - Maintain and protect the states' potential for carbon sequestration on agricultural lands through avoided farmland conversion	Legislative (Budget, Technical/ Programmatic)	Easy	$$
2	Bolstering Local Agricultural Economies	Legislative (Budget, Technical/ Programmatic)	Easy	$-$$
3	Enhance local government planning for land conservation	Legislative, Technical Assistance	Easy	$

Enabling strategy – Initiative #1: Avoided Agricultural Land Conversion: Overview

Description:	Maintain and protect the states' potential for carbon sequestration on agricultural lands through avoided farmland conversion; enhance farm viability, increase food security, and implement smart growth to reduce future GHG emissions from Vehicle Miles Traveled.
Action type:	Legislative (Budget, Technical/ Programmatic)
Cost and funding considerations:	$$: Environmental Protection Fund, staffing needed to implement farmland protection goals and provide technical assistance
Ease of implementation:	Easy for land acquisition.
Example case studies:	US Climate Alliance Toolkit, Carbon Farm Study

Risks / Barriers to success	Possible mitigants
• Cost to taxpayers for acquisition of conservation easements and tax incentives • Landowner interest in selling their land or CE • Number of municipalities/home rule • Data for land conversion and quantification of GHG reduction • Land access and intergenerational transfer	• Incentives for intergenerational transfer and farmland access • Incentives for intergenerational family transfer and support for farm succession. • Support for farmland protection and improved access for historically underserved including, BIPOC and beginning farmers • Youth engagement, internships and educational opportunities • Leasing state land to new farmers, prioritizing beginning, socially disadvantaged, limited resources and women farmers • Providing tax incentives for farmers to lease or sell land to qualified farmers, with a higher tax incentive for lease or sale to beginning, socially disadvantaged, limited resource and women farmers

Enabling strategy – Initiative #1: Avoided Agricultural Land Conversion: Components of the strategy

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Increase funding for Farmland Protection programs to plan for agriculture and purchase Development Rights (through conservation easements) by state, municipalities, and land trusts.	AGM	10 years	Farmers, Municipalities, land trusts, SWCDs
Farmland access: Assist farmers in securing long-term leasing and farm transfer to historically underserved including, BIPOC, beginning farmers, socially disadvantaged, limited resources, and women farmers. Support youth engagement, internships and educational opportunities.	AGM	Ongoing	Farmers, Municipalities, land trusts, SWCDs
Continue and strengthen agricultural assessment and agricultural districts programs	AGM	1 year	Farmers, Municipalities, land trusts, SWCDs
Enhance local capacity for land conservation – Statewide authorization of Community Preservation Act (incl working lands), Conservation Partnership Program, transfer of development rights, etc.	DEC, AGM, municipalities	Ongoing	Farmers, land trusts, SWCDs
Support and enhance farmland access and succession programs	AGM	Ongoing	Farmers, Municipalities, land trusts, SWCDs

Enabling strategy – Initiative #1: Avoided Agricultural Land Conversion: Components of the strategy

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Make connections between existing programs (e.g., AEM, CRF, AgNPS) to increase co-benefits. Target protected farmland for agricultural BMPs that reduce GHG emissions and sequester carbon like soil health management practice systems.	AGM, DEC, NRCS, FSA	Ongoing	Farmers, Municipalities, land trusts, SWCDs
Develop new data sets to support avoided conversion. Develop monitoring and quantification methodology to measure impacts of avoided conversion.	AGM, Cornell	1 year, ongoing	Cornell, SWCDs, Municipalities, farm owners, NRCS
Expand education and technical assistance for beginning farmers and generational transfer. Assist farmers with business planning and modeling. Expand supply chain development for new products.	AGM, CCE, Cornell, SWCDs	Ongoing	American Farmland Trust, Land Trusts, Farmers, NRCS, Landowners, Farm Bureau, Financial Institutions
State legislation to secure local government ability to maintain roads as minimum maintenance roads to reduce development pressure	Municipalities, DOT	1 year	Municipalities, DOS, landowners

Enabling strategy – Initiative #1: Avoided Agricultural Land Conversion: Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Increasing planning, technical services, and financial assistance improves access to programs and effective practices for all farmers. Emphasis on access to conservation technical assistance and funding programs to historically underserved and disadvantaged community members, e.g., BIPOC, women, LGBTQIA+, low income, veteran, or beginning farmers. Include indigenous consultation and deeper community engagement. Utilize existing programs that provide economic support to farms, like farmers markets or the Fresh Connect Checks Program, to connect vulnerable populations to healthy local food.
Health and co-benefits	Agricultural land protection captures carbon in the land base and prevents future emissions from vehicle use from prevented sprawl development. Protecting farmland has the potential to maintain or improve local food production, community resiliency, water quality, air quality, storm/flood mitigation, public infrastructure protection, drought resiliency, wildlife habitat, economic development and employment. All of these may have associated health benefits.
Just transition: businesses and industries, workers	Include provision for alternative locations of housing and business development (infill) Improve the resiliency of communities by improving food security Inter-generational family transfer, improved access for BIPOC and beginning farmers, youth engagement, internships and educational opportunities, public and private sector job creation, on-farm job creation.
Other	Reducing emissions from prevented sprawl development will only be achieved through strategic farmland protection, coupled with planning and smart growth. This strategy will be supported by the LULG Advisory Panel's recommendation on facilitating and supporting collaborative county-wide and regional smart growth comprehensive planning. Inter-agency collaboration is occurring to advance renewable energy development in a way that avoids, minimizes and mitigates impact to prime agricultural soils.

Enabling initiative – Initiative #2: Bolstering Local Agricultural Economies: Overview

Description:	Support emission reductions by enhancing existing programs, and promoting the expansion of those programs, that encourage farm viability and resilient communities through the production and consumption of local food
Action type:	Legislative (Budget, Technical/Programmatic)
Cost and funding considerations:	$-$$: Funding needed to support programmatic needs and staffing
Ease of implementation:	Easy; supporting existing initiatives
Example case studies:	There is a lot of research on impacts of food miles, institutional purchasing of local products, community agriculture, etc.

Risks / Barriers to success	Possible mitigants
- Cost of expanding programs - Interest in participation from farms and communities	- Promote expansion of farmers markets and incentive programs for disadvantaged communities such as seniors, veterans and SNAP recipients within these markets through programs like the Fresh Connect Checks Program and Farmers Market Nutrition Program - Improve implementation of the 2013 Food Metrics Law to enhance state procurement of local foods - Enhance urban food production and greening efforts through programs such as the Community Gardens Program - Connect institutions, like schools, universities, food banks, hospitals and prisons, who procure large volumes of food from out of state to local buying opportunities through initiatives like Farm-to-School and Nourish NY

Enabling initiative – Initiative 2: Bolstering Local Agricultural Economies: Components of the strategy

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Expand existing programs in the state that support local procurement of NYS agricultural products (e.g., Fresh Connect Checks Program, Farmers Market Nutrition Program, Farm-to-School, Nourish NY).	AGM; OGS; ESD	0-3 years depending on resources	Institutions, NGOs, SWCDs
Engage with communities and producers to advertise these opportunities	AGM- Council on Hunger and Food Policy; ESD	0-3 years depending on resources	Municipalities, NGOs, Agricultural Associations , SWCDs
Expand education and technical assistance for beginning farmers and generational transfer. Assist farmers with business planning and modeling. Expand supply chain development for new products.	NYSAGM, CCE, Cornell	Continual	American Farmland Trust, SWCDs, Farmers, Landowners, Farm Bureau, Financial lenders

Enabling initiative – Initiative #2: Bolstering Local Agricultural Economies: Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Provide additional resources to existing programs that connect vulnerable populations, such as SNAP recipients and underserved communities of color, to healthy local food. Emphasis on access to conservation technical assistance and funding programs to historically underserved and disadvantaged community members, e.g., BIPOC, women, LGBTQIA+, low income, veteran, or beginning farmers. Improvements in food production capacity, resiliency and diversity have a positive effect on disadvantaged communities.
Health and other co-benefits	Increase the availability of local nutritious food to mitigate and prevent chronic disease. Potential to elevate local food production, diversify farm incomes and increase farm profitability. Systems also provide community resiliency, water quality, air quality, storm/flood mitigation, public infrastructure protection, drought resiliency, wildlife habitat, scenic vistas/tourism, market diversification, economic development and employment. All of these may have associated health benefits.
Just transition: businesses and industries, workers	Improve the resiliency of communities by improving food security Support economic viability of farms to maintain agricultural careers
Other	

2

Enabling initiative – Initiative #3: Enhance local government planning for land conservation: Overview

Description:	Encourage and provide guidance for the inclusion of farmland and forestland protection in municipal comprehensive plans. Require inclusion of farmland and forestland protection in state funded municipal comprehensive plans. Encourage and fund development of Natural Resource Inventories.
Action type:	Legislative, Technical Assistance
Cost and funding considerations:	$ - Technical assistance staff, grants, support for Environmental Management Committees and Conservation Advisory Councils.
Ease of implementation:	Easy – enhance existing programs
Example case studies:	Smart Growth program, Hudson River Estuary Program (HREP)

Risks / Barriers to success	Possible mitigants
Home rule Resources needed for planning	Replication of HREP style support across state Support planning through Smart Growth and other programs

Enabling initiative – Initiative #3: Enhance local government planning for land conservation: Components of the strategy

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Develop guidance for the inclusion of farmland and forestland protection in municipal comprehensive plans. Require inclusion of farmland and forestland protection in state funded municipal comprehensive plans. Fund development of Natural Resource Inventories.	DOS, DEC, AGM	3 years	Municipalities, muni cipal associations, NGOs, SWCDs, SUNY ESF
Technical Assistance to implement guidance effectively, including strategies and best practices for land conservation, and identifying priority areas for conservation. Encourage development of Natural Resource Inventories.	DOS, DEC, AGM	Ongoing	municipalities, municipal associations, NGOs, SWCDs, ESFPA, NYFOA, SUNY ESF

Enabling initiative – Initiative #3: Enhance local government planning for land conservation: Components of the strategy

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Create resources to support local and regional smart growth planning and decision-making (e.g., maps to identify suitable reforestation locations, highest value cropland, idle lands for farming, etc.)	DOS, DEC, AGM	Ongoing	municipalities, municipal associations, NGOs, SWCDs, SUNY ESF
Conduct quantitative survey of land resources across the state and identification of critical barriers including options of using idle and underutilized lands.	DOS, DEC, AGM	Ongoing	municipalities, municipal associations, NGOs, SWCDs, SUNY ESF

Enabling initiative – Initiative #3: Enhance local government planning for land conservation: Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Include recreational access as a component of forest planning. Include farm and forest land access for disadvantaged communities including BIPOC. Include indigenous consultation and deeper community engagement. Food security enhanced by keeping land in farming in communities.
Health and other co-benefits	Air and water quality. Maintain food and crop production in NYS communities, maintain carbon sequestration of farm and forest land in NYS. Numerous studies in the U.S. and around the world are exploring the health benefits of spending time outside in nature, green spaces, and, specifically, forests. Wildlife habitat, outdoor recreation, flood mitigation. Avoided vehicle emissions from avoided development. Increase the availability of local nutritious food to mitigate and prevent chronic disease.
Just transition: businesses and industries, workers	Include provision for alternative locations of housing and business development (infill) Improve the resiliency of communities by improving food security
Other	This strategy will be supported by the LULG Advisory Panel's recommendation on facilitating and supporting collaborative county-wide and regional smart growth comprehensive planning.

Mitigation strategy summary – Forest Management

Initiative #	Description	Action type	Emissions impact	Ease of implementation	Cost
1	Maintain and increase carbon sequestration in NYS forests by securing forest regeneration, improving forest health and productivity, and restoring degraded forests through the widespread adoption of improved, sustainable forest management practices	Statutory, Incentives	High. 3.3-11.0 million metric tons of CO2 e per year	Medium	$$-SSS
2	Increase forested acres through afforestation and reforestation efforts to establish climate adapted and resilient forests. There are potentially 1.7 million acres of marginal lands available for establishing forests.	Statutory, Incentives	High 5-12 million metric tons CO2 e per year	Medium	$$$
3	Increase and maintain tree cover in urban and developed areas to reduce energy use and corresponding GHG emissions through the shading and cooling effect of trees. Increase carbon sequestration through tree establishment and extending the average life of urban trees through improved maintenance.	Statutory, Incentives	Medium	Medium	$$

Mitigation strategy – Initiative #1:
Improved, Sustainable Forest Management: Overview

Description:	Maintain and increase carbon sequestration in NYS forests by securing forest regeneration, improving forest health and productivity, and restoring degraded forests through the widespread adoption of improved, sustainable forest management.		
Action type:	Legislative (RPTL 480a), Regulation, Incentive		
GHG reduction by 2030:	Carbon sequestration-High.	**GHG reduction by 2050:**	Carbon sequestration-High
Cost and funding considerations:	$$-$$$. Substantial investment in NYS forests and forest sector over current levels. Overall cost will depend on state reimbursement levels to local municipalities under current and new tax abatement programs. Increase in funding to cost share and grant programs for private landowners, current and future forest health mitigation efforts and increases in funding to improve forest management on state and municipal lands. Increase agencies staffing levels to deliver and manage programs. Goal of 5 million acres under professional management by 2030 through these proposals		
Ease of implementation:	Medium. Mechanisms, practices and programs for improved forest management exist. Mitigation costs per acre can be high due to invasive species and regeneration issues. Strategy needs to be delivered on a such a scale to improve millions of acres of existing forest to have a significant carbon impact		
Example case studies:	Vermont Current Use Program, Family Forest Carbon Program, FLEP and EQIP, Working Woodlands		

Risks / Barriers to success	Possible mitigants
• High cost to private landowners in time and money • High cost to local municipalities and state budget • Immense, scale of effort to reach 13.6 million acres of privately owned forest • Low landowner interest or skepticism in government programs • Workforce gaps in private and public sectors • The unpredictability of current and future forest health threats • Lack of landowner knowledge of public and private forestry programs	• Diverse, private wood markets • Simplifying programs and removing administrative barriers for landowners • Private industry/public partnership for funding grants/cost sharing projects • State reimbursement to local governments must be sufficient for tax incentives to work • Building forest resiliency measures into all efforts and programs • Creative Financing through NY Green Bank or creation of Forest Carbon Bank • Widespread landowner outreach

Mitigation strategy – Initiative #1:
Improved, Sustainable Forest Management: Components

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Create a new RPTL 480b real property tax incentive to allow private forest landowners to manage for multiple benefits (e.g., wildlife habitat) and, if desired, conserve their forests in natural conditions to participate in tax programs. Tax benefit to landowners increases as the years of commitment increase, recognizing the accumulated sequestration benefits over time. 25-acre eligibility. A carbon forest management plan written by a carbon certified forester is required if harvesting. Initial benefit starts at a lower level than 480a and 480c. Up to 100% reimbursement to local municipalities.	DEC	3 years	Legislature, NYFOA, ESFPA, SAF, NGO's, Landowners, NYS Tax and Finance, Local municipalities, SUNY ESF
Create a real property tax incentive, RPTL 480c to provide forest landowners a tax incentive to undertake practices that increase carbon stocks while addressing need for additionality. A carbon forest management plan written by a carbon certified forester is required if harvesting. 25-acre eligibility. Practice and/or forest carbon inventory based. Tax benefit to landowners increases as the years of commitment increase, recognizing the accumulated sequestration benefits over time. Up to 100% reimbursement to local municipalities	DEC	3 years	Legislature, NYFOA, ESFPA, SAF, NGO's, Landowners, NYS Tax and Finance, Local municipalities, SUNY ESF
Amend 480a statute and regulations to induce greater landowner participation and integrate stronger sustainability provisions (e.g., forest regeneration). The primary goal remains to encourage sustainable timber management. Tax abatement benefit for landowners remains unchanged. Up to 100% reimbursement to local municipalities.	DEC	3 years	Legislature, NYFOA, ESFPA, SAF, NGO's, Landowners, NYS Tax and Finance, Local municipalities, SUNY ESF

Mitigation strategy – Initiative #1: Improved, Sustainable Forest Management: Components

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Enhance agency and partner capacity to deliver free forest carbon and forestry technical assistance and education programs (e.g., Forest Stewardship Program, AEM, PRISM, Master Forest Owners, etc.) to forest landowners. Improve agency and partner coordination in delivery and reporting of forestry services to maximize efficiency	DEC/CCE/SWCD/NGO's/ SUNY ESF	1 Year	SWCD NYFOA, ESFPA, SAF, NGO's, CCE, Landowners, USDA
Expand funding for cost share programs, such as Regenerate NY and AEM to assist forest landowners in widespread implementation of project-based practices to protect and increase carbon stocks on private forestland. Projects would focus on forest regeneration, restoring degraded forests and installation of best management practices for forest carbon.	DEC/CCE/SWCD/AGM/ NGO	1 year	Legislature, SWCD NYFOA, ESFPA, SAF, NGO's, Landowners, USDA
Establish caches across the state to allow operators to borrow forestry and logging equipment and devices on a short-term basis needed for implementing best management practices during logging operations.	DEC, SWCD, NGO, Wood Products Development Council	1-2 Years	SWCD, Industry, NGO's
Provide funding for low interest loans or grants for upgrading to new logging or manufacturing equipment to facilitate, increased utilization, improved forest management or best management practices (e.g. lower site impacts). Example: Machine tracks for wheeled harvesters to lower soil impacts.	Wood Products Development Council, NGO's	1 year	Legislature, SWCD NYFOA, ESFPA, SAF, NGO's

Mitigation strategy – Initiative #1: Improved, Sustainable Forestry: Components

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Increase prevention of invasive forest pests and diseases entering New York and the U.S (e.g. SMART trade). Work with federal and state partners to strengthen regulations, inspection and enforcement of wood packaging material and live plant imports. Improve surveillance for forest health and disease	DEC	1-2 years	USDA-APHIS, AGM, ESFPA, SAF,
Reduce the loss of forest carbon due to acute forest health issues on private and public forest. Facilitate an increase in capacity for rapid response teams for forest pest and disease outbreaks (e.g., ALB) or invasive vegetation issues that negatively impact forest carbon (e.g. forest regeneration).. Priority would be on intervening where rapid, extensive loss of forest carbon sequestration capacity could occur.	DEC	1 year	Legislature, SWCD NYFOA, ESFPA, SAF, NGO's
Create a NY Forest Carbon Bank. A carbon bank would allow New York State to finance Greenhouse Gas (GHG) reduction and carbon sequestration activities by NYS farm forests and forest landowners by allowing entities to buy tons of carbon from forest landowners generated through improved land management practices that increase carbon sequestration.	DEC, NYSERDA	1-2 years	Legislature, SWCD NYFOA, ESFPA, SAF, NGO's/SUNY ESF

Mitigation strategy – Initiative #1: Improved, Sustainable Forestry: Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Strategy will benefit rural economically disadvantaged communities, including those in EJ areas, by improving the forest-based economy and increasing job opportunities. Allows lower to middle income landowners to hold on to their lands, maintain open space, keep forest as forest, and sustainably manage their lands.
Health and co-benefits	Numerous studies in the U.S. and around the world are exploring the health benefits of spending time outside in nature, green spaces, and, specifically, forests. Co-benefits to this strategy include avoided forest conversion, supporting forest and forestry sector jobs in rural communities, improved forest ecosystem resiliency and soil health, improved forest productivity, enhancing wildlife habitat, protecting water quality, maintaining rural character and providing public recreational opportunities.
Just transition: businesses and industries, workers	Mitigation strategy would expand the opportunities available to forestry-based businesses in rural areas of New York; by increasing the demand for forestry services including natural resources professionals, certified herbicide applicators, forestry equipment operators, and mill operators. Ancillary benefits of forest recreation and forest-based recreation businesses.
Other	Sustainability measures already in place or being developed through this strategy are integral to many of the proposed Bioeconomy recommendations.

Mitigation strategy – Initiative #2: Afforestation/Reforestation: Overview

Description:	Increase forested acres through afforestation and reforestation efforts to establish climate adapted and resilient forests. There are potentially 1.7 million acres of marginal lands available for establishing forests.		
Action type:	Regulation (DEC, AGM), Incentive (DEC, AGM)		
GHG reduction by 2030:	Carbon Sequestration-High	**GHG reduction by 2050:**	Carbon Sequestration-High
Cost and funding considerations:	$$$. Upgrading state tree nursery capacity. Costs of labor, trees, tree protection and long-term maintenance. Specialized tree planting equipment will be needed. Increased staffing and volunteers.		
Ease of implementation:	Hard. Need to identify priority acres where afforestation and reforestation are likely to succeed. Seek out opportunities for enhancing natural afforestation success. Long term maintenance on private lands is needed for long term survivorship of established forests		
Example case studies:	CCC efforts in the 1930's and 40's planted around 300,000 acres in NYS		

Risks / Barriers to success	Possible mitigants
• High Cost • Challenge of establishing resilient forests • Many competing land uses for marginal lands (agriculture, development) • Very labor intensive to establish forests either by planting or natural means • Workforce gaps in private and public sectors • Current nursery capacity needs to increased • Deer herbivory is costly to control and increases tree mortality • Seed and seedling availability (lag time for nursery stock) • Term of enrollment must be sufficient to deliver benefit	• Private industry/public partnership for funding projects • State of the Art Marketing Campaign • Reforestation resources and services covered for landowners; landowners provide land • Corp or internships, technology to reduce labor costs • Federal Assistance • Investments in nursery capacity and seeding technology • Statewide deer management and local controls (e.g., hunting, culling, fencing) • Increased investment in PRISMs, tree-smart trade, and other related strategies

Mitigation strategy – Initiative #2: Afforestation/Reforestation: Components

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** (*Entities that need to be engaged)*
Establish NY Tree Corp (or Climate Corp) to provide direct tree establishment and maintenance services to public and private landowners. Regionally based Tree Corp would be provided with staff and equipment to establish and maintain seedlings at no or low cost.	SWCD/DEC/AGM	3 years	Legislature, NYFOA,SWCD, ESFPA, SAF, NGO's, landowners, USDA
Expand cost share funding for existing tree establishment and maintenance programs such as Regenerate NY and AEM programs. These existing programs can help move reforestation/afforestation efforts forward while larger efforts, such as the NY Tree Corp become established.	DEC/SWCD/AGM	1-2 years	Legislature, SWCD, USDA NYFOA, ESFPA, SAF, NGO's
Increase state tree nursery capacity to support large scale afforestation and reforestation efforts. Upgrade to expand tree species offerings to meet adaptation and resiliency challenges. Enhance seed collection and storage efforts, seedling production, workforce development, pre- and post-planting practices.	DEC	3 Years	Legislature, NYFOA,SWCD, ESFPA, SAF, NGO's, landowners
Develop an opportunity assessment to identify areas where afforestation and reforestation are likely to succeed. Seek out opportunities for enhancing natural afforestation success, which could be more economical	DEC/SWCD/AGM/SUNY ESF/	3 years	Legislature, NYFOA,SWCD, ESFPA, SAF, TNC, NGO's
Expand or create new, free tree seedling programs such as Buffer in a Bag programs to assist landowner with smaller project areas. Explore partnerships with local governments and regional organizations to scale up programs.	DEC/SWCD	2 years	Legislature, NYFOA, ESFPA, SAF, NGO's

Mitigation strategy – Initiative #2: Afforestation/Reforestation: Components

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** (*Entities that need to be engaged)*
Work with public and private partners on reforestation efforts in ROW areas of the state. Focus on tree and shrub species compatible with power transmission and distribution right of way's, roadside areas, pipelines, railroads, etc. Public outreach for right tree, right place is needed.	DEC, NYPA	1-2 years	NYPA, DOT, Municipalities, ISA (UAA), Industry
Tree Planting Equipment Loan Program to allow landowners and operators access to specialized equipment for small- and large-scale tree planting projects.	SWCD/DEC	1-2 years	Legislature, SWCD, NYFOA, ESFPA, SAF, NGO's
Enhance agency and partner capacity to deliver technical assistance and education programs to landowners. Assist with planting plans, site and species selection. Promote tree planting programs. Increase partner cooperation to meet requests, ensure minimal overlap of services, capture accomplishments and coordinate efforts.	DEC/CCE/SWCD/AGM/ NGO	1 year	Legislature, NYFOA, ESFPA, SAF, NGO's
Investment in seeding and seeding technology to fill in smaller forest gaps where needed. Drone, robotic technology to distribute seeds in areas regeneration needs to be supplemented after a treatment.	DEC	1-2 years	Legislature, NYFOA,SWCD, ESFPA, SAF, NGO's

Mitigation strategy – Initiative #2: Afforestation/Reforestation: Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Strategy will benefit rural, economically disadvantaged communities, including those in EJ areas, by improving the forest-based economy and increasing job opportunities. Provides valuable job experience and training in tree planting and forestry sector through volunteer opportunities, internship and full and part time jobs in rural areas
Health and co-benefits	Numerous studies in the U.S. and around the world are exploring the health benefits of spending time outside in nature, green spaces, and, specifically, forests. Co-benefits to this strategy include avoided agricultural conversion, supporting forest and forestry sector jobs in rural communities, improved forest ecosystem resiliency and soil health, improved forest productivity, enhancing wildlife habitat, protecting water quality, and maintaining rural character.
Just transition: businesses and industries, workers	Mitigation strategy would expand the opportunities available to forestry-based businesses in rural areas of New York; by increasing the demand for forestry services including natural resources professionals as well as certified herbicide applicators, tree planters and forestry equipment operators. Increased job opportunities from expanded public and private nursery capacity.
Other	

Mitigation strategy – Initiative #3: Urban Forestry: Overview

Description:	Increase and maintain tree cover in urban and developed areas to reduce energy use and corresponding GHG emissions through the shading and cooling effect of trees. Increase carbon sequestration through tree establishment and extending the life of urban trees through improved maintenance.		
Action type:	Emission Reduction and Carbon Sequestration		
GHG reduction by 2030:	Medium	**GHG reduction by 2050:**	Medium
Cost and funding considerations:	$$. Increasing grant funding to communities and expanding to individual landowners. Higher cost of establishing urban trees vs. planting trees in fields. Increased staffing resources for program delivery.		
Ease of implementation:	Medium. Sustained tree maintenance after establishment in harsher environments. Most urban and community trees are privately owned		
Example case studies:			

Risks / Barriers to success	Possible mitigants
• Requires staff to manage additional workload • Sufficient availability of trained individuals to preform tree work Sufficient availability of resources/ equipment to preform tree work. • Availability of suitable growing stock to plant • Ensuring survival of trees planted. • Most urban and community trees are privately owned	• Utilizing third party project/ grant managers (not for profits) to handle multiple projects on a regional level • Work with professional organizations (ISA, TCIA, for profit training groups) to develop training programs that can be rolled out statewide • Develop guidance and work with other agencies/ municipalities to establish shared resources such as equipment caches

Mitigation strategy – Initiative #3:
Urban Forestry: Components

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Increase funding levels of Urban and Community Forestry Grants to assist local municipalities in the management of the urban forest which includes planning, planting and maintenance of trees, Provide funding opportunities for private individuals to establish and maintain privately owned trees.	DEC	1-2 years	Local communities, arborists
Develop guidance and provide support to local communities to establish or expand youth and young adult conservation corps that employ and train disadvantaged youth and provide a source of skilled labor for increasing, maintaining and improving the management of the urban forest	DEC, SWCD,	1-2 years	NY Society of Arboriculture, local governments, non-profit organizations
Develop an opportunity assessment to focus tree establishment and maintenance efforts within urban areas and communities where the most climate, societal, and public health benefits are likely to be achieved.	SUNY ESF, SWCD, DEC, CCE	1-2 years	Legislature, NYFOA,SWCD, ESFPA, SAF, NGO's
Develop guidance and provide support and funding to local communities for planning and implementing planting and maintenance projects that help communities adapt to climate change. This may include sharing resources (equipment, staff, bulk ordering, etc.). This will help communities maintain critical ecosystem services like flood mitigation, clean air, clean water, reduced sediment and nutrient runoff, reduced energy use, shade and improved human health	DEC, Cornell CALS/SUNY ESF	1 year	DOS, ESD, nonprofit organizations, local governments, USDA

Mitigation strategy – Initiative #3:
Urban Forestry: Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Urban communities in EJ areas will benefit from increased tree canopy and open spaces through increased public health benefits, property values, reduced energy costs, and recreational opportunities. A community engaged in urban forestry activities improves the overall quality of life.
Health and co-benefits	Numerous studies in the U.S. and around the world have shown and continue to explore the mental, physical and societal health benefits of spending time outside in nature, green spaces, and —specifically— forests. Significant co-benefits to this strategy include urban forests more resilient to the negative impacts of climate change; Overall improved public health, mitigation of heat island effects, and providing public recreational opportunities
Just transition: businesses and industries, workers	Provides increased volunteer and job opportunities to local communities. Services for arborists, tree service and utility line workers could increase based on increased tree maintenance activities. This strategy will create more livable communities throughout New York.
Other	

Enabling strategy summary – Forest Management

Initiative #	Description	Action type	Ease of implementation	Cost
1.	Expand funding for peer reviewed climate, forest carbon and applied forest management research	Scientific Research	Medium	$-$$
2.	Develop and support workforce development and training programs for forest sector workers to enable an increase demand in forestry services to be met. Incorporate forest carbon and forest carbon management into training programs and forestry curriculums at the high school (e.g., BOCES) and college level.	Training, Implementation	Medium	$
3.	Facilitate the development of a forest-based culture and economy through state-of-the-art outreach, education and marketing techniques to inform the public and policy makers about forest and forest carbon issues	Outreach and Education	Hard	$-SS

Enabling initiative – Initiative #1: Climate and Forest Carbon Research: Overview

Description:	Expand funding for peer reviewed climate, forest carbon, and applied forest management research
Action type:	Research
Cost and funding considerations:	$-$$. Provide funding for researchers, facilities, assistants and equipment needed to sustain a robust forest carbon research effort over time.
Ease of implementation:	Medium. Sustaining funding over time and during difficult economic times.
Example case studies:	

Risks / Barriers to success	Possible mitigants
1. Sustaining funding for long term forest research 2. Biased research to further a particular agenda 3. Public and policy-makers education in forestry and climate issues	1. Identifying long term public and private funding sources, such as forest industry, private foundations, and state budget 2. Published peer reviewed research as a measure of success 3. Creating new ways to disseminate or demonstrate results

Enabling initiative – Initiative #1: Climate and Forest Carbon Research: Components

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Support research needs of improved forestry management mitigation strategies. Focus on peer reviewed forestry and forest carbon research in New York State Forests, such as improving forest resilience and vigor, regeneration and forest soil carbon.	Cornell CALS/SUNY ESF, DEC	1-2 years	AGM. CCE, WPDC NYFOA, ESFPA, SAF, USDA, TNC/ENGOs
Develop a suite of forestry practices designed to improve forest carbon sequestration in New York forests. Practices would be deployed across state funded forestry programs to achieve consistency.	Cornell CALS/SUNY ESF, DEC	1-2 years	CCE,NYFOA, ESFPA, SAF, USDA, WPDC, TNC/ENGOs
Develop efficient, cost effective monitoring and verification systems for accurately measuring forest carbon to evaluate practices and programs over time.	Cornell CALS/SUNY ESF, DEC	1-2 years	CCE,NYFOA, ESFPA, SAF, USDA, WPDC, TNC/ENGOs
Research using science-based decision systems that enables the leveraging of climate change investments to make more efficient and cost-effective decisions on forest-based climate change initiatives.	Cornell CALS/SUNY ESF, DEC	1-2 years	CCE,NYFOA, ESFPA, SAF, USDA, WPDC, TNC/ENGOs

Enabling initiative – Initiative #1: Climate and Forest Carbon Research: Components

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Research on the most cost-effective methods of using trees and short rotation woody corps (e.g., shrub willow, miscanthus) to sequester carbon on marginal lands.	Cornell CALS/SUNY ESF, DEC, AGM	1-2 years	CCE,NYFOA, ESFPA, SAF, USDA, SWCD, TNC/ENGOs
Increase urban forestry and forest carbon research to maximize the carbon and other benefits of establishing and maintaining urban forests. Focus on	Cornell CALS/SUNY ESF, DEC	1-2 years	CCE,NYFOA, ESFPA, SAF, USDA, TNC/ENGOs
Fund research into long term new and emerging Natural and Working Lands solutions to meet our 2050 goals.	Cornell CALS/SUNY ESF, DEC, AGM	1-2 years	CCE, NYFOA, ESFPA, SAF, USDA, TNC/ENGOs
Increase research into emerging forest products and forest product markets as it relates to bioeconomy and harvested wood product initiatives	Cornell CALS/SUNY ESF, DEC, WPDC	1-2 years	CCE, NYFOA, ESFPA, TNC/ENGOs

Enabling initiative – Initiative #1: Climate and Forest Carbon Research: Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Provide research employment and volunteer opportunities for students from disadvantaged communities. Demonstration sites or projects could be in EJ areas for urban forestry projects.
Health and other co-benefits	Improving sustainable forestry practices lead to healthier, more productive forests. Research universities and institutions are local economic engines that support the local communities they are located in. They also often include educational programing and events for the general public.
Just transition: businesses and industries, workers	May provide increased job opportunities based on the new products or methods developed through research efforts. Forest sector workers may find new types of positions.
Other	

Enabling initiative – Initiative #2: Workforce Development: Overview

Description:	Develop and support workforce development and training programs for forest sector workers meet an increase demand in forestry services. Incorporate forest carbon and forest carbon management into training programs and forestry curriculums at the high school (e.g., BOCES) and college level.
Action type:	Training and Education
Cost and funding considerations:	$. Private/Public funding partnership opportunity. Increase funding to Wood Products Development Council, forestry colleges, BOCES. Some federal funding may be available.
Ease of implementation:	Medium. Existing programs are in place that could be scaled up and expanded. Some additional areas of need may need to be identified.
Example case studies:	

Risks / Barriers to success	Possible mitigants
1. Liability insurance at facilities 2. Lower paying, more dangerous jobs 3. Cost of training and education to the worker, student or employer 4. Long term success of moving trainees/students into careers	1.Using state, federal or PPP funding to cover training and education costs to eliminate barriers for employers and individuals 2. Improve on safety training within programs 3. Provide state support to bolster programs 4. Evaluate how many student/trainees go into and remain in forestry careers

Enabling initiative – Initiative #2: Workforce Development: Components

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** (*Entities that need to be engaged)*
Improve Cooperating Consulting Forest Policy, CP-36: Require continuing education in forest carbon or forest carbon management. Improve the rigor and accountability of the program	DEC	1 Year	SAF, NYFOA, ACF, SUNY ESF
Provide funding for climate change, forest carbon management, and silvicultural training for forestry and natural resources professionals in the public and private sector.	DEC	Ongoing	SWCD, SAF, ESFPA, CCE, SUNY ESF
Forest Carbon Certification Program: Qualified participants would receive a certification credential that allows them to work under state funding forestry and forest carbon programs.	DEC	1 Year	SAF, ACF, ESFPA, SUNY ESF
Lower the initial fee or provide cost share dollars for forestry workers to obtain their NYS Pesticide Applicator's license	DEC or WPDC	1-2 years	CCE, SAF, ACF, ESFPA
Support and bolster existing state, NGO, or industry urban forestry and utility forestry training programs. Integrate forest carbon and forest carbon management into programs	DEC	1-2 years	ISA, Releaf, SUNY ESF, Public Utilities, Industry
Provide support for existing training apprenticeship programs for careers in forestry and forest product across the entire supply chain from the woods to the mill. Incorporate forest carbon and forest carbon management into training programs and forestry curriculums at the high school (e.g., BOCES) and college level.	Wood Products Development Council	1 Year	Paul Smiths College, SUNY ESF, BOCES, Workforce Development Institute (WDI)
Bolster state support for Trained Logger Certification to develop and implement new training modules around improved forestry practices including forest carbon best management practices (BMP's) designed to increase carbon sequestration(e.g. reduced soil carbon loss through improved harvesting techniques).	DEC	1-2 years	TLC, ESFPA, SUNY ESF

Enabling initiative – Initiative #2: Workforce Development: Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Increased job opportunities in rural economically disadvantaged communities. Initiative supports local workers and economy to remain in local communities and NY state by providing the skills necessary to succeed. Keeps local forest industry and manufacturing knowledge intact to position itself to take advantage of new, emerging markets.
Health and other co-benefits	Initiative increases logger safety through training and through increased availability of newer, safer, modern equipment. A better trained forest sector workforce will improve implementation of forestry and climate strategies. Co benefit also include improved water quality, forest productivity and increased public confidence in foresters and loggers.
Just transition: businesses and industries, workers	Maintaining employment in natural resource sectors and related industries. Prevents displacement of workers and industries.
Other	

Enabling initiative – Enabling initiative – Initiative #3: Outreach and Education: Overview

Description:	Facilitate the development of a forest-based culture and economy through state-of-the-art outreach, education and marketing techniques to inform the public and policy makers about forest and forest carbon issues
Action type:	Education and Implementation
Cost and funding considerations:	$ - $$. The cost of sustained state-of-the-art marketing campaigns, social and traditional media, training, and increase in trained outreach staff.
Ease of implementation:	Medium. Behavior change takes time and requires research-based strategies. Behavior change strategies have been successfully implemented for an array of campaigns
Example case studies:	Wisconsin DNR, TELE

Risks / Barriers to success	Possible mitigants
1.Technical concepts and language 2.Misinformation and opposing public perceptions 3.Potential increased costs to consumers associated with bioeconomy products 4. Proper technical guidance on tree establishment/maintenance for municipalities, tree company's, utilities and general public	1.Stewardship and Cooperating Forester Outreach Training 2.Happy Little Tree Marketing Campaign 3.Bio-Economy Promotion 4. Increase urban forestry outreach efforts

Enabling initiative – Initiative #3: Outreach and Education: Components of the strategy

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** (*Entities that need to be engaged)*
Stewardship and Cooperating Forester Outreach Training: Provide public and private foresters with training, technical assistance, and resources on landowner engagement and climate change.	Cornell CALS/SUNY ESF, DEC	1 year	SWCD, NYFOA, ESFPA, MFO/CCE, TNC/ENGOs
Bio-Economy Promotion: Engage social media influencers and wood product manufactures to promote NYS wood products as trendy, local, and sustainable. This includes supporting and promoting traditional wood products, emerging markets and urban wood utilization	Wood Products Development Council, SUNY ESF	2 years	DEC, AGM, ESFPA
Build public acceptance for forest management and increase the adoption of climate focused private forest management. Communicate clear and simple messages that connect forestry and management to the things people value (clean air, water, recreation, etc.).(e.g Happy Little Trees Marketing Campaign)	Cornell CALS/SUNY ESF, DEC	2 years	MFO/CCE, NYFOA, TNC ENGOs
City and Municipality Engagement: Provide outreach messaging toolkits to urban foresters, city planners, and local officials. Toolkits will focus on the climate and other co-benefits of urban forests, private forest management, and local wood products.	DEC	1 year	Municipalities, SUNY ESF

Enabling initiative – Initiative #3: Outreach and Education: Components of the strategy

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Bolster urban forestry and natural resource education and outreach, especially in underserved communities. Residents in underserved communities are often skeptical of government led improvement projects. Identify and work with local partners.	DEC	1-2 Years	Local government, no nprofit organizations, SUNY ESF
Increase the promotion of urban forestry and tree care through TreeLine USA for utilities, TreeCity USA for communities and Tree Campus for college campuses. Support increased ReLeaf efforts in communities across the state.	DEC	1-2 Years	ReLeaf, Arbor Day Foundation, Municipalities, Private and Public Universities, Public Utilities, Industry, SUNY ESF

Enabling initiative – Initiative #3: Outreach and Education: Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Promotion of a bio-based, forest economy is likely to indirectly support the economic wellbeing of rural New Yorkers and may provide opportunities to low-income communities in those areas.
Health and other co-benefits	There is research to suggest that the use of wood products in the built environment has benefits for human health. One such study can be found here.
Just transition: businesses and industries, workers	Training foresters in better communication practices is likely to enhance the skillsets of natural resource professionals. Outreach tools for municipalities and natural resource professionals will serve to enhance landowner engagement and can indirectly expand opportunities for the forest industry.
Other	Planned communication strategies for natural resource professionals is likely to improve outcomes for private landowners. Private landowners will benefit from a better trained workforce and a suite of outreach tools that provide them with a better understanding of the benefits and risks of forest management.

Enabling strategy summary - Bioeconomy

Initiative #	Description	Action type	Ease of implementation	Cost
1	Expand Markets for Sustainably Harvested Durable Wood Products	Market development, Research	Medium	$$
2	Sustainable biomass feedstock action plan for 2050 hard-to-decarbonize products	Research and Planning	Medium	$
3	Increasing market access for NY low-carbon products	Market development; Research	Hard	$$
4	Financial and Technical Assistance for Low-Carbon Product Development	Technical support, financial incentives	Easy/Medium	$$
5	Bio-based Products Research Development & Demonstration Overview	Research initiative, pilots	Medium	$
6	Net Negative Carbon Dioxide Removal	Research and policy development	Hard	$$

To learn more about the concept of a bioeconomy please see this document by SUNY ESF

Enabling initiative – Expand Markets for Sustainably Harvested Durable Wood Products

Description:	Advance the use of high value timber for long lasting products while advancing forest health and forest carbon sequestration. Displace GHG-intensive building materials (steel, concrete) with durable wood products (carbon sequestered in cross-laminate timber, hard wood floors) that reduces the net building and infrastructure GHG and provide long duration carbon storage
Action type:	Market development, Research
Cost and funding considerations:	$$ ($25M - $100M)
Ease of implementation:	Medium;
Example case studies:	other states like Maine and Oregon have embraced mass timber, Canada too

Risks / Barriers to success	Possible mitigants
• Current building codes limit the area (square footage), height, and number of floors that be built with mass timber • Cost of construction compared to other methods • No plants currently operate in NYS, meaning construction material would need to arrive ready to use, or a plant would need to be established to process materials • Limited softwood supply for mass timber in NYS means raw material would likely need to be imported • Lifecycle benefits uncertainty for some use cases • Architects and builders do not have as much experience with mass timber and other low carbon bio-based building products	• Accelerate the code revision cycle and adopt the 2021 International Building Code • Incentivize the use of mass timber construction which has long duration carbon sequestration benefits and provides a substitute for high carbon materials (e.g., concrete) • Expand the current efforts of SUNY ESF, to have mass timber dormitories on SUNY campuses • Use mass timber construction in the new DEC Environmental Stewardship building at the Great NYS Fair • Sponsor pilot construction and retrofit efforts to educate builders alongside lifecycle analysis and economic quantification to more clearly demonstrate benefits

Enabling initiative – Expand Markets for Sustainably Harvested Durable Wood Products

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Advance building code changes to adopt the International Code Council 2021 International Building Code	DOS, NYC DOB,	2-3 years	NYSERDA, USGBC, SUNY ESF
Enhance NYS supply chain for harvested wood products; fund innovation to develop mass timber applications using northern hardwoods	SUNY ESF/Cornell CALS, NYSERDA,	5-10 years	ESFPA,WPDC, DEC; ESD, AGM
Revise state procurement specifications that limit the eligibility of wood products that meet the technical performance standards	GreenNY, OGS, DEC, DASNY	2-3 years	SUNY, DOCC, OMH, HCR, NYSERDA, SUNY ESF, WPDC
Remove barriers and create incentives for using wood for infrastructure applications, including bridges, sound barriers, transportation hubs, utility poles, marine and foundation pilings, retaining walls, docks, and piers	DOT, PANYNJ, DEC, EFC	5-10 years	ASCE, AIA, SUNY ESF, RIT P2I

Enabling initiative – Expand Markets for Sustainably Harvested Durable Wood Products

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Outreach and education to construction industry and public on mass timber construction and harvested wood products (fire safety, high-rise applications) Promoting carbon sequestering materials that are substitutes for energy efficiency materials that are fossil fuel based (e.g., hemp insulation replacing foams; research potential on uses for residues from hemp product creation)	SUNY ESF Cornell CALS	1 year	Industry partners, AIA, USGBC, DEC, USCA, ESFPA, WPDC, AGM, HCR, DASNY, RIT P2I
Set standards and specifications for a minimum portion of harvested wood products, such as mass timber or wood flooring, in new construction in certain state funded/supported buildings and infrastructure projects when NY supply chain can cost effectively meet the demand	GreenNY, OGS,DEC, DASNY,	3-5 years	DEC, HCR, SUNY, DOCCs,
Support R&D, demonstration, and technology transfer of wood utilization and wood innovations to scale the use and climate benefits of wood in the built environment	SUNY ESF/Cornell CALS, NYSERDA, AGM, DEC	1-5 years	ESFPA, WPDC, Industry Partners, USCA

Enabling initiative – Expand Markets for Sustainably Harvested Durable Wood Products

Anticipated Benefits and Impacts	
Disadvantaged communities	Promote the value of building with wood in affordable housing to save time and money, provide safe and healthy housing, stimulate jobs, reduce embodied carbon emissions, and enhance carbon storage. The use of clean, low carbon products that have low off-gassing and toxicity will be another benefit to disadvantaged communities
Health and co-benefits	Sustainable harvest practices and improved utilization of high grade wood provides an economic driver for conservation of natural and working lands, particularly when customers want verified low carbon products. Ecosystem conservation will also translate to benefits for human health, water quality and air quality. Improve quality of living for tenants and others which impacts physical and mental health. Bio-based products will also often have a safer profile when installed and from cradle to end of life. Bio-based products also have end-of-life opportunities, in a circular economy landfill wastes are reduced. Modular application of mass timber drives cost efficiencies for construction projects by shortening the urban installation time which also reduces site emissions/nuisances
Just transition: businesses and industries, workers	New York's forests and wood products industries are currently directly responsible for nearly 40,000 well-paying jobs and more than $13 billion of economic output and are indirectly responsible for another 53,000 jobs and nearly $10 billion of economic activity. Generates manufacturing and construction jobs. Creates new market for existing secondary wood products industries such as flooring, millwork and molding for interior design. mass timber has the potential to be designed and manufactured in modular capacity in rural locations, creating rural jobs with safer and more efficient conditions
Other	Supports sustainable management of NYS forests which maintains or increases forest carbon stocks, while producing an annual sustained yield of bio-based feedstocks from the forest. COVID-19 pandemic has driven many wood prices high due to increased demand, need to evaluate near term effect on costs/ timeframe of implementing this strategy

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Enabling initiative – Sustainable biomass feedstock action plan for 2050 hard-to-decarbonize products

Description:	This plan will identify feedstock volumes and production methods that utilize NYS biomass resources in a sustainable, sequestration maximizing manner to create replacements for hard to decarbonize fuels while considering other uses for these feedstocks (see recommendation on low-carbon product development). Fuel derived from biomass will likely have a limited but strategic role in New York's 2030 and 2050 needs
Action type:	Research and Plan development
Cost and funding considerations:	$, <$2M total cost
Ease of implementation:	Medium. A comprehensive plan is a significant undertaking with many elements that would require coordination and may be challenging.
Example case studies:	

Risks / Barriers to success	Possible mitigants
• Competition for finite land area to grow a variety of products (food, feed, fiber, fuel) • The benefits, environmental and social impacts, and limitations are highly dependent on the specific combination of the source of energy, management, logistics, spatial and temporal scales, conversion technologies, co-products, end-use efficiency, environmental and social externalities, and the baseline to which an energy pathway is compared • Reduced carbon availability for recycling into soils, impacts and nutrient management • Requires comprehensive look at role of other biofuels as well as other uses for the biomass inputs	• Focus on wastes and residues as feedstocks, anticipated 2050 fuels needed should frame 2030 feedstock development and associated infrastructure. • Apply criteria to assess the energy, environmental, and social benefits, impacts, and limitations of all energy pathways (e.g., biomass, solar, wind, fossil etc.) and to select pathways with highest and best use of our limited natural resources with low risks of undesirable environmental and social impacts • Incentivize carbon storage in soil through amendments like biochar • Focus on closed-loop processes where possible and in-state feedstock development to meet in-state demand. • Matching the conversion technology to the fuel source and to the products needed (i.e., jet fuel, chemicals, etc) is essential to achieve the maximum economic returns and long-term performance from a bioenergy system.

Enabling initiative – Sustainable biomass feedstock action plan for 2050 hard-to-decarbonize products

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Establish rigorous energy, greenhouse gas, and environmental sustainability guidelines and metrics	DEC, NYSERDA, AGM	2-3 years	SUNY, TNC/ENGOs, SUNY ESF/Cornell CALS, USEPA, RIT P2I
Identify bioenergy pathways with high lifecycle energy efficiency and high emissions reductions (from land-harvest, conversion, and delivery to the end user) that replace fossil fuels and complement next generation energy delivery systems	NYSERDA, SUNY ESF/Cornell CALS	2-3 years	SUNY, USDOE, national labs (ARGONNE), toxicology experts/risk assessment
Identify 2050 hard to decarbonize fuel needs (e.g., high quality distillate jet fuels) and incentivize appropriate bioenergy development (feedstock supply chain, conversion systems, and end use markets) to meet these needs.	SUNY ESF/Cornell CALS, NYSERDA/DPS	2-3 years	Utilities, USDOE, Industry, PANYNJ, CAAFI

Enabling initiative – Sustainable biomass feedstock action plan for 2050 hard-to-decarbonize products

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Prioritize use of feedstocks that are residues from existing agricultural, forest, and waste systems. (through preferential pricing in product development proposal)	NYSERDA, DEC, SUNY ESF, Cornell CALS	2-3 years	CCE, SWCD, ESFPA, WPDC, AGM, NYCDEP, RIT P2I, (other waste stakeholders)
Activate former agricultural and underused lands (including former industrial lands) for more productive uses, one of which could be purpose-grown biomass	AGM, DEC	3-5 years	SUNY ESF/Cornell CALS, CCE, SWCD, Forest Connect, TNC/ENGOs, Hunting stakeholders (deer management)
Develop energy systems that can best support a net-zero carbon economy in NY. NYSERDA and the Green Bank to develop programs that leverage private capital to invest in conversion technology for bio-based feedstock into bio-based products	NYSERDA, DPS	Ongoing	Utilities, CAAFI, USDA, USDOE, Industry, SUNY ESF/Cornell CALS

Enabling initiative – Sustainable biomass feedstock action plan for 2050 hard-to-decarbonize products

Anticipated Benefits and Impacts	
Disadvantaged communities	Interim fuels and infrastructure systems ensure near-term affordable energy alternatives to traditional fossil fuel systems (e.g., boilers) or promote affordable bio-electricity further encouraging the transition to electrification in both rural and urban areas
Health and co-benefits	Increases forest area under active professional management, increases forest management for maximum sequestration. Keeps our forests as forests, avoids conversion of forests to other land uses, and enables private forest owners to invest in management that not only maintains but scales carbon sequestration, clean water and wildlife habitat. Combustion of biomass could lead to increased air emissions and impacts to public health; any consideration of combustion must address this issue
Just transition: businesses and industries, workers	Develops markets for low grade wood products, increasing value to rural industries. Create new opportunities in rural areas (e.g., agricultural/forestry jobs, biomaterial processing jobs, and infrastructure development and maintenance). New York's forests and wood products industries are currently directly responsible for nearly 40,000 well-paying jobs and more than $13 billion of economic output and are indirectly responsible for another 53,000 jobs and nearly $10 billion of economic activity. Strengthen our existing bioeconomy for the future and to ensure a supply chain of feedstock and, workers and innovation to unleash new biobased products.
Other	Supports sustainable management of NYS forests and ag lands which maintains or increases carbon stocks, while producing an annual sustained yield of bio-based feedstocks.

Enabling initiative – Increasing market access for NY low-carbon products

Description:	Enhancing carbon sequestration, greenhouse gas mitigation, and economic development opportunities by reducing barriers and creating competitive advantage for NY produced low carbon products
Action type:	Market development; Research & Development
Cost and funding considerations:	$$ ($25M - $100M) Low carbon products available in the near-term have comparable cost characteristics to fossil fuel based products after accounting for positive externalities but lack production capacity in Northeast U.S. Public-private partnerships would support initial technology deployment.
Ease of implementation:	Hard for implementation due to policy novelty and lack of NYS-specific carbon intensity calculations for many fossil fuel based products. Moderate for post-implementation under model in which producers of fossil fuel based and bio-based products provide lifecycle data that are reviewed and certified by DEC.
Example case studies:	USDA Biopreferred® program; Dutch Ministry of Infrastructure and the Environment tenders

Risks / Barriers to success	Possible mitigants
• Measurement and verification of carbon content is complex and if not done properly can erode market confidence • Lifecycle data availability for covered fossil fuel based products • Deployment of low carbon substitutes to fossil fuel based products • Interim maintenance of existing low carbon supply chains • Permitting timeframes and lack of technology awareness	• Look to leverage existing certification standards • Confidential producer analysis of covered fossil fuel based products • Combine with low carbon preferential procurement policies • Base product coverage on TRL of low carbon substitutes • Leverage in-state academic/industry expertise on low carbon products & conduct needed research to increase certainty in verification, leading to low carbon product standards

Enabling initiative – Increasing market access for NY low-carbon products

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** *(Entities that need to be engaged)*
Begin tracking and reporting on this market to spot emerging trends, innovative applications, external market opportunities, growth opportunities to guide the development	ESD, NYSERDA	1 year	Business Council, AGM, REDCs, trade groups
Spur innovation through lead by example in low carbon procurement requirements for state government (e.g. bio-based products, low carbon concrete)	GreenNY, OGS, DEC, DASNY	2-3 years	SUNY, DEC, NYSERDA, PANYNJ
Commence a technology readiness level analysis of low carbon substitutes for fossil fuel based products and fuels; Identify the high value products from bio-based processing of New York grown feedstocks and invest in production facilities	NYSERDA, SUNY ESF	1-3 years	DEC, ESD, Industry, SUNY, OEMs,
Strategic use of incentives to drive scale-up of high-demand products when the low carbon alternative is not yet cost competitive with the fossil fuel based option	NYSERDA, AGM, DEC	3-5 years	Industry, DEC, NYSERDA, ESD

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Enabling initiative – Increasing market access for NY low-carbon products

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** *(Entities that need to be engaged)*
Develop standards and guidelines for defining a low carbon product, including ensuring sustainable feedstock production (biomass action plan)	GreenNY, DEC, NYSERDA, AGM	2 years	Industry, SUNY,
Expand access to low interest loans or grants for existing NYS businesses to develop new low carbon products lines by educating local banks on emerging bio-technologies and offering NYGB loan guarantees	DFS, NYGB, ESD	2-3 years	NYFB, technology incubators, IDAs, SUNY, Small Business Administration, USDA Rural development, financing partners, Urban Green Council
Create a low-carbon products portal to facilitate connecting NYS producers to corporations and other buyers that have made GHG emission reduction commitments, expand the NY Grown program to cover more products and adding a low-carbon aspect to this program	AGM, RIT P2I	2 years	Industry, Urban Green Council, SUNY ESF/Cornell CALS, NYSERDA, trade groups, producers, SWCD

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Enabling initiative – Increasing market access for NY low-carbon products

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Expand production of high-value agroforestry products that contribute to maintaining healthy forests (sap/syrup production, nuts, mushroom cultivation, and ginseng production)	AGM	2 years	SWCD, NYFB, CCE
Enhance the public's understanding of the bioeconomy and its role in implementing the CLCPA	AGM, SUNY ESF	Ongoing	NYSAF, social scientists, industry, REDCs
Develop low carbon fuel strategies for hard to electrify applications	DEC, NYSERDA	2 years	Industry, Utilities, Aviation stakeholders
Consumer and business-to-business education on bio-based products and low carbon products, build buyer confidence	RIT P2I (?)	1 year	trade groups, OEMs

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Enabling initiative – Increasing market access for NY low-carbon products

Anticipated Benefits and Impacts	
Disadvantaged communities	Transitioning industrial emitters located primarily in disadvantaged communities to low carbon fuels could decrease co-pollutant emissions (Knothe, Yin et al., Yang et al.)
Health and other co-benefits	In the transition to electrification and for applications that are difficult to electrify, low carbon fuels can have reduced co-pollutant emissions as compared to fossil fuel emissions at industrial emitters, leading to health benefits. Many low carbon product feedstocks (e.g., willow) provide ecosystems and bioremediation services during growth.
Just transition: businesses and industries, workers	20,000 new jobs are potentially expected in the low carbon products sector in NYS. Low carbon processing is an enabling technology for the broader transition to a decarbonized economy. Significant opportunities exist for worker training, especially within disadvantaged and rural communities, including partnering with local labor unions and community colleges. Investment in market development would provide the market certainty needed to deploy a thriving low carbon processing sector within NYS while minimizing opportunities for carbon leakage.
Other	The amount of material going to landfill will decrease. Building materials that sequester carbon will have additional market value; this may help drive down the costs of sequestration policies. There will be less uncertainty in the long-term market for initial producers of low carbon products.

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Enabling initiative – Financial and Technical Assistance for Low-Carbon Product Development

Description:	Provide financial and technical assistance to grow a bioprocessing industry in New York that utilizes low-grade wood and other biomass residuals to create bio-based substitutes for fossil fuel based products
Action type:	Engineering support, supply chain development, financial incentives, legislative action
Cost and funding considerations:	$$ ($25M - $100M) Costs to support existing supply chains can be through public-private partnerships, agency funding, and/or federal grants and support.
Ease of implementation:	Easy due to current availability of both decarbonization technology and existing supply chains. Work with SUNY campuses and industry to identify qualifying near-term decarbonization investments.
Example case studies:	EPA Green Suppliers Network; Södra pulp mill biomethanol production facility

Risks / Barriers to success	Possible mitigants
1. Owners of existing supply chains lack capital/margins to make near-term decarbonization capacity investments 2. Owners of existing supply chains lack technical expertise to make near-term decarbonization capacity upgrades 3. Rural labor is limited, competitive for workers could hurt existing businesses 4. Incentives to attract new businesses could put existing businesses at a competitive disadvantage	1. Provision of financial incentives to qualifying near-term decarbonization capacity investments 2. Provision of regulatory and technical support to qualifying near-term decarbonization investments. 3. Policies need to focus on attracting new workers into rural areas to meet labor needs 4. Policies should also encompass new product offerings or diversification of existing businesses

Enabling initiative – Financial and Technical Assistance for Low-Carbon Product Development

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Development of criteria for qualifying near-term bioprocessing capacity investments.	NYSERDA, industry leaders	6-12 months	DEC, ESD, SUNY ESF, SWCD
Financial and technical initiatives to identify and promote the high value outputs from New York bioprocessing inputs	NYSERDA, DTF, ESD	Ongoing	DEC, REDCs, legislature
Define sustainable feedstock production for bio-based processing to determine feedstock volume and practices that maximize sequestration, part of biomass action plan	NYSERDA, DEC, AGM, SUNY ESF, Cornell CALS	2 years	SWCD
Create an economic development initiative focused on attracting bioprocessing/bio-based product businesses to NYS	ESD	2 years	SUNY ESF, REDCs, IDAs, industry leaders, SWCD
Preferential pricing for in-state low grade feedstocks that maximize carbon sequestration (organic waste streams, wood residues, marginal land)	DEC, AGM	2-3 years	Legislature, local governments, SWCD
NYSERDA and the Green Bank to develop programs that leverage private capital to invest in conversion technology for bio-based feedstock into bio-based products	NYSERDA, NYGB	Ongoing	ESD, IDAs

Enabling initiative – Financial and Technical Assistance for Low-Carbon Product Development

Anticipated Benefits and Impacts	
Disadvantaged communities	Potential for reinvigoration of idled rural production sites such as sawmills, create projects at existing NYS infrastructure that is able to support future deep decarbonization projects following the deployment of next-generation technology. Bioprocessing facilities should not be sited in disadvantaged communities unless the community is seeking the project
Health and co-benefits	Substantial health benefits are expected from reduced fossil fuel combustion emissions by emitters that interact with existing supply chains. Bio-based products will also often have a safer profile when installed and from cradle to end of life. Bio-based products also have end-of-life opportunities, in a circular economy landfill wastes are reduced
Just transition: businesses and industries, workers	New York's forests and wood products industries are currently directly responsible for nearly 40,000 well-paying jobs and more than $13 billion of economic output and are indirectly responsible for another 53,000 jobs and nearly $10 billion of economic activity. Significant opportunities exist for worker training, especially within disadvantaged and rural communities, including partnering with local labor unions and community colleges. Near-term decarbonization of existing supply chains is an enabling technology for the broader transition to a decarbonized economy via the maintenance of those supply chains. Supply chain retention is an important factor in carbon leakage prevention.
Other	Reduced landfilling, increased value proposition for building materials via carbon sequestration potential, reduced uncertainty in long-term market for initial producers of low carbon products, correction of market failure caused by lack of externality internalization. Supports sustainable management of NYS forests which maintains or increases forest carbon stocks, while producing an annual sustained yield of bio-based feedstocks from the forest.

Enabling initiative – Bio-based Products Research Development & Demonstration Overview

Description:	Develop a demonstration and pilot project portfolio to drive investment in the areas of biobased low-carbon fuels, products, and related sequestration that considers intersection of industrial/manufacturing, agriculture, transportation, and power generation sectors. Fund Innovation challenges and select projects that can scale beyond business as usual
Action type:	Research initiative, Project demonstration/pilot
Cost and funding considerations:	$, $1 million required for initial roadmap analysis with additional funding research and early-stage pilots to be determined pending the outcome of the analysis.
Ease of implementation:	Medium
Example case studies:	CA Energy Commission Autothermal Pyrolysis Demonstration; Cornell University's Leland Pyrolysis Kiln Demonstration

Risks / Barriers to success	Possible mitigants
1. A poorly defined scope for RD&D could direct limited funds towards low performing technologies creating a lost opportunity for innovation. 2. Decarbonization efficiency will need to be quantified via a metric such as carbon abatement cost to enable comparison of low carbon pathways with net sequestration pathways.	1. Utilize expert elicitation to determine appropriate research scope. 2. Utilize in-state expertise on lifecycle assessment and techno-economic analysis to establish best practices on decarbonization efficiency quantification.

Enabling initiative – Bio-based Products Research Development & Demonstration Overview

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Development of research agenda scope	NYSERDA, SUNY ESF/Cornell CALS	<1 year	DEC, SUNY
Develop solicitation to perform research and identify promising pilot/demonstration projects	NYSERDA	1-2 years	NYCDOB, DEC, AGM, SWCD, ESD, National labs,
Fund research and pilot/demonstration projects	NYSERDA	Ongoing	ESD, NYPA, DEC, USDA, USDOE, private investors, philanthropy

Enabling initiative – Bio-based Products Research Development & Demonstration Overview

Anticipated Benefits and Impacts	
Disadvantaged communities	Research must take account of potential impacts to economic development, ecosystem services, and human health in disadvantaged communities in which pilot projects would be located.
Health and other co-benefits	Research must quantify criteria pollutant emissions, ecosystem services, and bioremediation potential of deep decarbonization and net sequestration pathways analyzed under roadmap. This will enable pathways that contribute to improvements in these areas to be considered for pilot funding.
Just transition: businesses and industries, workers	The roadmap will identify the economic growth potential of the pathways considered in the form of market size, jobs growth across the supply chain, and workforce development requirements/opportunities.
Other	

Enabling initiative – Net Negative Carbon Dioxide Removal (CDR)

Description:	Advance deployment of natural CDR pathways that serve to create a negative emissions profile for bioeconomy products and other economic sectors. (long duration carbon storage beyond net zero)
Action type:	Research and policy development
Cost and funding considerations:	$$ ($25M - $100M), Currently available CDR technologies require financial incentive in range of DEC's value of carbon to be economically feasible. Many CDR strategies provide co-benefits (e.g., ecosystem remediation) that offset costs elsewhere.
Ease of implementation:	Medium, many applications are in the RD&D stage, near-commercial applications seek market value for the negative emissions values, research is needed to expand future pathways. Moderate for post-implementation as best practices are deployed.
Example case studies:	CA Energy Commission Autothermal Pyrolysis Demonstration; Cornell University's Leland Pyrolysis Kiln Demonstration; U.S. 45Q tax credit, enhanced weathering, enhanced photosynthesis

Risks / Barriers to success	Possible mitigants
1. Verification and confidence in CDR technologies whose results go beyond net zero and achieve enduring negative GHG emissions 2. Deployment of CDR projects, costs, land-use trade-offs 3. Many emerging technologies will need to advance to commercialization	1. Regular CDR certification and monitoring 2. Provide long-term incentive value 3. Invest in research to establish standards for lifecycle benefits to prioritize investments in the most impactful strategies

Enabling initiative – Net negative Carbon Dioxide Removal (CDR)

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** *(Entities that need to be engaged)*
Set clear goals and standards regarding the need for net negative removal, evaluate solutions viable today and monitor solutions that could be viable in the future	NYSERDA, DEC	2 years	Legislature, Cornell CALS, SUNY ESF
Identification of verifiable and maintainable CDR technologies and pathways	NYSERDA, SUNY ESF	2-3 years	DEC, industry partners, IBI, National labs (LLNL, Argonne)
Develop RD&D agenda and priorities, Initial work to focus on nature-based CDR pathways while examining the role of technology-based pathways in the future	NYSERDA, DEC, SUNY ESF, Cornell CALS	1 year	SUNY, AGM
Fund demonstration projects	NYSERDA	3-5 years	ESD, NYPA, DEC, USDA, USDOE, private investors, philanthropies

Enabling initiative – Net negative Carbon Dioxide Removal (CDR)

Anticipated Benefits and Impacts	
Disadvantaged communities	Many CDR technologies provide associated positive externalities (e.g., ecosystem services, improved air quality, reduced agricultural pollution) and would benefit communities that have disproportionately experienced harm from negative externalities of current energy mix.
Health and co-benefits	Many CDR feedstocks (e.g., agricultural waste, dedicated energy crops) provide ecosystem and bioremediation services during growth. CDR technology biochar shows promise for urban organics management, or as a replacement for fly ash in concrete. Net negative CDR can provide permanent storage of atmospheric carbon
Just transition: businesses and industries, workers	Significant opportunities exist for CDR project worker training, especially within disadvantaged and rural communities, including partnering with local labor unions and community colleges. Many CDR pathways are enabling technologies for the broader transition to a decarbonized economy.
Other	Correction of market failure caused by lack of externality internalization.

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Carbon Farm Study

Jurisdiction:	*Cornell University, NYS Department of Agriculture and Markets*
Context:	*New York Agriculture and Climate Change: Key Opportunities for Mitigation, Resilience, and Adaptation completed in 2020, ranks the most promising GHG mitigating strategies for agriculture in NYS based on co-benefits, measurability, achievability, ease of implementation, and time scale per the Carbon Farming Act (A3281). Note, this study also provides many additional case-studies and references critical to the development of Agriculture and Forestry Advisory Panel recommendations.*
Description of action(s):	*Five practices were selected for priority implementation because they are the most cos-effective and permanent opportunities using currently available technologies and realistic verification methods. Analysis offered provided baseline for the mitigation strategies for meeting the agricultural goals under the Agriculture and Forestry Advisory Panel of the CAC.*
Type of action(s):	*Research paper; Voluntary incentive-based opportunities*
Impact:	*14 mmt of GHG reduction opportunities available through alternative manure management, precision feed, forage, and herd management, soil health, crop fertilizer nutrient management, agroforestry practices, and afforestation of idle or underutilized agricultural land. Co-benefits that may apply to practices include soil health, community relations, adaptation to climate change, profitability, air quality, water quality, biodiversity, and energy production potential.*
Cost and bearer of cost:	*Environmental Protection Fund (EPF) Climate Resilient Farming SFY 2017-2018 budget*
Ease of implementation:	*Moderate; this is current research for NY agriculture is guiding the development of recommendations from the Agriculture and Forestry Advisory Panel*

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US Climate Alliance (USCA) Toolkit

Jurisdiction:	*US Climate Alliance (USCA), American Farmland Trust (AFT), Coalition on Agricultural Greenhouse Gases (C-AGG)*
Context:	*The agriculture policy toolkit released in August 2020, provides USCA states a reference for climate and ag policy in the US developed in support of Natural and Working Lands (NWL) initiatives. It focuses on programs and policies driving adoption of agriculture pathways that reduce GHG emissions and increase carbon sequestration.*
Description of action(s):	Agriculture can be a solution to climate change and sharing highlights and recommendations of state agricultural policies and programs with climate benefits including case studies of effective and innovative state polices and programs.
Type of action(s):	Case Study and Toolkit; Voluntary incentive-based opportunities
Impact:	*Agriculture plays an important role in the economies of USCA states. Climate change negatively affects agriculture overall and agriculture is a net emitter of greenhouse gases. Agriculture can be an important climate mitigation solution.*
Cost and bearer of cost:	Varied examples of public and private funding
Ease of implementation:	Moderate; Lessons learned from several policies and programs highlighted can be integrated into recommendations being put forward.

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Cornell Characterization of Soil Health in NYS

Jurisdiction:	*Cornell College of Agriculture and Life Sciences (CALS), Cornell Soil Health Laboratory, NY Soil Health Working Group*
Context:	*Soil health concepts, practices, and testing have generated a growing awareness of soil's central role and highlights that sustainable soil management requires an understanding of biological, physical, and chemical processes and that management can significantly degrade or improve the quality of the soil. The NYS Soil health dataset was compiled from 1,456 soil samples collected from 2014 to 2018.*
Description of action(s):	Soil health in New York is affected by both soil type and cropping system differences that relate to carbon cycling and soil disturbances. Metrics for quality standards and goals are common for many natural resources (air, water, etc.) soil health goals can help farmers calibrate their management and target policy efforts.
Type of action(s):	Soil health standards for improved soil health and carbon sequestration
Impact:	*Building soil organic carbon offers an opportunity for carbon storage for negative emissions on-farm. Carbon sequestration and soil health improvements are aligned for a win-win of on-farm and statewide GHG reduction goals.*
Cost and bearer of cost:	Soil health testing is paid for by the farm and can be supported by state cost-share programs.
Ease of implementation:	Easy; this is current research for NY soil health that can be used to develop a soil health standard for NYS.

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Payment for Ecosystem Services for Vermont

Jurisdiction:	*University of Vermont, State of Vermont*
Context:	*Payment for Ecosystem Services (PES) when aligned with water quality goals has the potential to protect water quality while aiding the struggling agricultural economy. University of Vermont Gund Institute's white paper issued September 2019 highlights that to support economic viability for farmers with a PES program that is voluntary, flexible, and equitable will incentivize innovative and sustainable agricultural land management that provides multiple ecosystem services (for nutrient and/or GHG reductions).*
Description of action(s):	Voluntary financial incentive program compensating farmers for performance gains that provide multiple ecosystem services.
Type of action(s):	*Research paper on voluntary incentive-based program to increase efforts to reduce phosphorus entering Lake Champlain in order to meet the Total Maximum Daily Load (TMDL) set by the state.*
Impact:	*A PES program that is performance-based would quantify ecosystem service provisioning from farms and reward farmers for their measured contributions to public goods. Programs that incentivize performance reward farmers based on quantifiable outcome but have historically been too expensive and burdensome to monitor and verify. Advances in measurement and modeling tools have created an opportunity for performance-based payment programs.*
Cost and bearer of cost:	Setting the right rates enables the desired level of farmer participation and ecosystem service outcomes. The rate per unit will have to be calculated. Public and private funding sources.
Ease of implementation:	Moderate; examples of program logistics exist but the rate per unit offered and quantification verification may take time to research and set standards for.

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WAC Nutrient Management Credit Program

Jurisdiction:	*NYC Watershed, Watershed Agricultural Council (WAC) , NYC Department of Environmental Protection (NYC DEP)*
Context:	*The Watershed Agricultural Council (WAC) created the Nutrient Management Credit Program (NMC) in early 2000's to provide financial incentive to offset some of the added costs associated with properly implementing a farms Nutrient Management Plan. Program participants receive $10/acre plus an animal unit rate for following and monitoring their Nutrient Management Plan.*
Description of action(s):	Voluntary financial incentive program including technical assistance provided to participating farms
Type of action(s):	*Voluntary incentive-based program; created as part of NYC watershed filtration avoidance plan*
Impact:	*140 farms participate reducing phosphorus in the watershed. On average each farm participating receives $3,900 credit towards eligible expenses relating to nutrient management. The reduction of phosphorus has improved water quality in the NYC watershed and has aided in meeting the filtration avoidance plan. Technical assistance necessary for plan implementation supports jobs for agricultural planning and on-farm management. This model could be implemented to track and incentivize GHG emissions reductions on-farm as well as other types of Ecosystem Services.*
Cost and bearer of cost:	Costs are covered through NYC DEP. Annual cost of program in 2020 was ~$560,000.
Ease of implementation:	Moderate technical assistance is important for accurate planning and implementation and oversight of record keeping.

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Silvopasture Examples in New York

Jurisdiction:	Cornell University, Cornell Cooperative Extension (CCE) of Schuyler County and the SCNY Ag Team, Case study location: Angus Glen Farms, LLC Watkins Glen, NY
Context:	Silvopasture is a land management system that sustainably integrates trees, livestock and forage. When properly implemented, silvopasture may increase carbon sequestration through increasing the number and growth rate of trees, increasing the longevity of trees, growing trees for long-lived products, increasing soil carbon, and reducing the clearing of forest for pasture. Case studies of Angus Glen Farms from 2015 to date provide examples of woodlot Silvopasture and plantation Silvopasture management.
Description of action(s):	Silvopasture is utilized in most other regions of the world but has not been widely adopted in the Northeast. Although successful examples of silvopasture exist in NY, increased awareness and support would improve the rate and scale of adoption.
Type of action(s):	Land use and land management
Impact:	Estimated potential in NYS: 2 million acres – defined as development of silvopastures on existing woodlands that can be profitably and sustainably managed. This acreage would increase significantly if new and expanded grazing operations create opportunities to feasibly incorporate small and fragmented parcels that may not be profitable in isolation. Additional benefits include enhanced food security, local jobs and rural economic development.
Cost and bearer of cost:	Net Present Value (NPV, 5% discount rate) of silvopasture is $1,200/acre vs. $600 for timber only vs. $60 for hay only. Additional benefits not factored in to the NPV calculation include increased animal performance, reduced vegetation (invasive species) management costs, and a locally-grown source of grass-fed meat and fence posts (reduced transportation costs).
Ease of implementation:	Moderate; technical assistance and outreach is important for implementation.

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Silvopasture Examples in New York

NRCS Carbon Planning Guidance

Jurisdiction:	*USDA Natural Resource Conservation Service (NRCS)*
Context:	*A carbon plan is a whole-farm conservation plan that when implemented will enhance soil health, increase carbon sequestration, and reduce GHG emissions. Planning guidance from NRCS from 2018 provide a pathway for developing carbon plans.*
Description of action(s):	*The planner and farmer develop a plan to identify carbon sequestration and GHG mitigation potential.*
Type of action(s):	Voluntary plan to address on-farm resource concerns with a focus on opportunities for carbon sequestration and GHG reduction.
Impact:	*Site-specific conservation practice systems implemented with known and/or quantifiable greenhouse gas benefit.*
Cost and bearer of cost:	Cost-share assistance is needed and technical assistance for plan development. Public and private funding could be used.
Ease of implementation:	Moderate; planning templates and tools need to be customized to New York. Planning infrastructure exists and a Carbon Planning element can be added.

Cornell Nutrient Management Spear Program Whole Farm Nutrient Mass Balance Assessment

Jurisdiction:	*Cornell College of Agriculture and Life Sciences (CALS), Nutrient Management Spear Program* http://nmsp.cals.cornell.edu/NYOnFarmResearchPartnership/MassBalances.html
Context:	*Farm Nutrient Mass Balances (NMB) help farmers and their advisors find ways to increase nutrient use efficiency on farms and, thereby, decrease nutrient imports and reduce loadings to watersheds. Balances provide a useful and achievable metric for assessing nutrient loadings and potential losses on farms, include N20, as losses could be significantly reduced if fewer nutrients were imported onto the farm in the first place. [from http://nmsp.cals.cornell.edu/NYOnFarmResearchPartnership/MassBalances.html].*
Description of action(s):	*The NMB of a farm is the difference between the amounts of nitrogen (N), phosphorus (P), and potassium (K) imported as feed, fertilizer, animals, and bedding, and nutrients exported via milk, animals, crops, and manure. With the development of feasible farm nutrient mass balance guidelines, farmers and advisors are better able to identify farm-specific opportunities to reduce nutrient loadings. This collaborative approach among farmers and advisors providing confidential, farm-specific summaries for benchmarking by farmers and anonymized statewide summaries offers an example for the benchmarking and monitoring enabling initiative prioritized in the Panel recommendations.*
Type of action(s):	*Extension program; Voluntary, incentive-based opportunities.*
Impact:	*Work with hundreds of farms in NYS has shown reductions of between 29%-41% in nitrogen balances over the last decade (https://doi.org/10.3168/jds.2015-9776).*
Cost and bearer of cost:	*Long-term funding for NMB program staff; for field staff from Cornell Cooperative Extension, Soil and Water Conservation Districts, and AEM Planners; and as incentives for farmer participants.*
Ease of implementation:	Moderate; MNB work has been underway for over two decades, but more funding, technical assistance and outreach is important for expanded implementation.

USDA BioPreferred procurement program

Jurisdiction:	*U.S. Department of Agriculture, United States*
Context:	*Created in 2002 and expanded in 2018 by Congress, the BioPreferred Program's purpose is to increase the purchased of biobased products. It uses a mandatory purchasing requirement for federal agencies/contractors and a voluntary labeling initiative for qualifying products. The Program was created to support U.S. energy security but has since been expanded to also support U.S. environmental security.*
Description of action(s):	Mandatory government procurement program.
Type of action(s):	*Created by legislative act and implemented by executive branch.*
Impact:	*Covers 139 categories (e.g., cleaners, carpet, lubricants, paint, etc.) of biobased products that displace fossil products. Estimated to support 4.2 million domestic jobs (direct, indirect, and induced) and contribute $393 billion to U.S. economy ($127 billion direct sales and $266 billion spillover sales). Jobs growth has been concentrated in rural/lower-income areas. Covered biobased products are estimated to displace 300 million gallons of annual U.S. petroleum consumption, which is equivalent to removing 200,000 cars from the roads.*
Cost and bearer of cost:	Costs are borne by federal government agencies.
Ease of implementation:	Moderate to implement (need to establish biobased product criteria) and easy to maintain.

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Dutch Ministry of Infrastructure and the Environment (RWS) tenders

Jurisdiction:	*Rijkswaterstaat (Dutch Ministry of Infrastructure and the Environment), Netherlands*
Context:	*Created by the Netherlands House of Commons, the RWS tenders purpose is to encourage the minimization of environmental impacts related to infrastructure building. It required that green criteria be included in all RWS tenders by 2015.*
Description of action(s):	RWS tenders require two sustainability criteria, one on energy savings, efficient use of materials, and use of renewable energy; and a second on the environmental impacts of the use of materials specified in a contract.
Type of action(s):	*Created by legislative act and implemented by the executive branch.*
Impact:	*Incentivizes bidders that can prove via life cycle assessment ("CO2 performance ladder") that their operations lead to significant CO2 operations. Utilizes sustainable construction logistics and "Social Return on Investment" to quantify full impacts across the supply chain. Employs DuboCalc software to calculate the full environmental effects of a material, building, or method as an environmental cost indicator that utilizes life cycle environmental impacts in 11 areas.*
Cost and bearer of cost:	Costs are borne by national government agencies.
Ease of implementation:	Moderate to implement (need to establish sustainability criteria and calculators) and easy to maintain.

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EPA Green Suppliers Network

Jurisdiction:	*Washington D.C.; U.S. federal government*
Context:	*Created by U.S. EPA in collaboration with U.S. Department of Commerce National Institute of Standards and Technology's Manufacturing Partnership in order to help small-, medium-, and large-sized manufacturers stay competitive and profitable while reducing their impact on the environment.*
Description of action(s):	The U.S. EPA's Green Suppliers Network works with manufacturers to engage their suppliers in low-cost technical reviews to identify strategies for improving process lines, using materials more efficiently, and reducing waste. Technical assistance is provided on the measurement and improvement of energy efficiency and GHG emissions across the supply chain.
Type of action(s):	*Executive*
Impact:	*Participating manufacturers and their suppliers have been able to quantify the environmental impacts of their supply chains and improve their profitability while minimizing energy losses, pollution, and GHG emissions. Participants further report improvements to their sustainability commitments, risk mitigation efforts, and ability to meet customer demand for greener products.*
Cost and bearer of cost:	Cost not available; cost of technical assistance borne by EPA; cost of implementing improvements borne by participating manufacturers and their suppliers.
Ease of implementation:	Moderate due to need to establish network, although implementation ease has increased as major retailers have adopted their own supply chain sustainability metrics.

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Södra pulp mill biomethanol production facility

Jurisdiction:	*Project Location: Mönsterås, Sweden; Entity: Södra pulp mill*
Context:	*Announced in 2017 and operational in 2020. Biomethanol production facility constructed on-site at existing pulp mill to increase energy efficiency and contribute to circular economy. Biomethanol is sold to Danish biodiesel producer Emmelev A/S as input that displaces natural gas consumption. Resulting biodiesel is incentivized as part of Denmark's transportation decarbonization targets.*
Description of action(s):	Installation of biomethanol production capacity that utilizes forestry waste generated at an existing pulp mill.
Type of action(s):	*Commercial low-carbon product investment in response to national decarbonization policy and the European Union's Renewable Energy Directive 2.*
Impact:	*The use of biomethanol to produce biodiesel results in a biodiesel that is 100% renewable and achieves a lower carbon intensity than biodiesel that does not utilize biomethanol as an input. Increases the economic sustainability of Sweden's existing low-carbon feedstock supply chain and creates additional jobs at an existing pulp mill. Produces 5,000 tons of biomethanol annually.*
Cost and bearer of cost:	Cost not available; cost borne by Södra pulp mill.
Ease of implementation:	Moderate due to novelty of biomethanol production capacity integrated with existing low-carbon feedstock supply chain.

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Cornell University's Leland Pyrolysis Kiln Demonstration

Jurisdiction:	*Project Location: Ithaca, NY; Entity: Cornell University*
Context:	*Began operations in 2018 for the purpose of converting waste and sustainable biomass to biochar (sequestered CO2). Funded through a philanthropic gift to Cornell's Atkinson Center for a Sustainable Future. Designed to achieve commercially representative operations of biogenic carbon sequestration in NYS.*
Description of action(s):	Construction and operation of pyrolysis kiln that processes 50 kg/hr of organic feedstock at temperatures of up to 600°C. The kiln yields 15-20 kg/hr biochar and is capable of utilizing a wide range of feedstocks, including ag waste, woody biomass, animal waste (manure, poultry litter), etc.
Type of action(s):	*R&D*
Impact:	*Biochar produced by the kiln achieves stable sequestration of the feedstock's biogenic carbon content, resulting in a net-negative GHG emissions pathway. The use of high temperatures neutralizes any pathogens contained in the feedstock (e.g., dairy manure). In addition to carbon sequestration, biochar has been found to increase crop yields, reduce nutrient run-off, and achieve other ecosystem services/bioremediation benefits in some applications.*
Cost and bearer of cost:	Funded through a $5 million gift from philanthropist Yossie Hollander.
Ease of implementation:	Easy due to availability of equipment for demonstration-scale facility.

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Cornell University's Leland Pyrolysis Kiln Demonstration

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California Energy Commission Autothermal Pyrolysis Demonstration

Jurisdiction:	*Project Location: El Dorado Hills, CA; Government: State of California*
Context:	*In 2017, the California Energy Commission (CEC) solicited proposals for projects to demonstrate production of bio-oil that was suitable for upgrading to fungible low carbon fuels. The project team of Lawrence Livermore National Laboratory (LLNL), Iowa State University (ISU), Frontline Bioenergy (FBE), and Sierra Pacific Industries (SPI) received an award.*
Description of action(s):	*The project team is designing, constructing, and fabricating a modular, autothermal pyrolysis system to convert 50-ton-per-day of wood waste into bio-oil suitable for upgrading into low carbon "drop-in" hydrocarbon transportation fuel. Deliverables of the project include 50,000 gallons of bio-oil, technical demonstration of the hydroprocessing of the bio-oil into transportation fuel, and an economic and life cycle analysis of the overall process.*
Type of action(s):	*R&D*
Impact:	*The project supports California goals of reducing greenhouse gas emissions; expanding the supply of alternative fuels; and expanding the capacity of forests to remove CO_2 from the atmosphere.*
Cost and bearer of cost:	*Total project cost: $7.397 million. Bearer of cost: CEC ($5.7 million); FBE ($0.72 million); ISU ($0.305 million); LLNL ($0.291 million); SPI ($0.38 million).*
Ease of implementation:	*Easy due to leveraging of existing technological pathways and use of modular equipment.*

California Energy Commission Autothermal Pyrolysis Demonstration

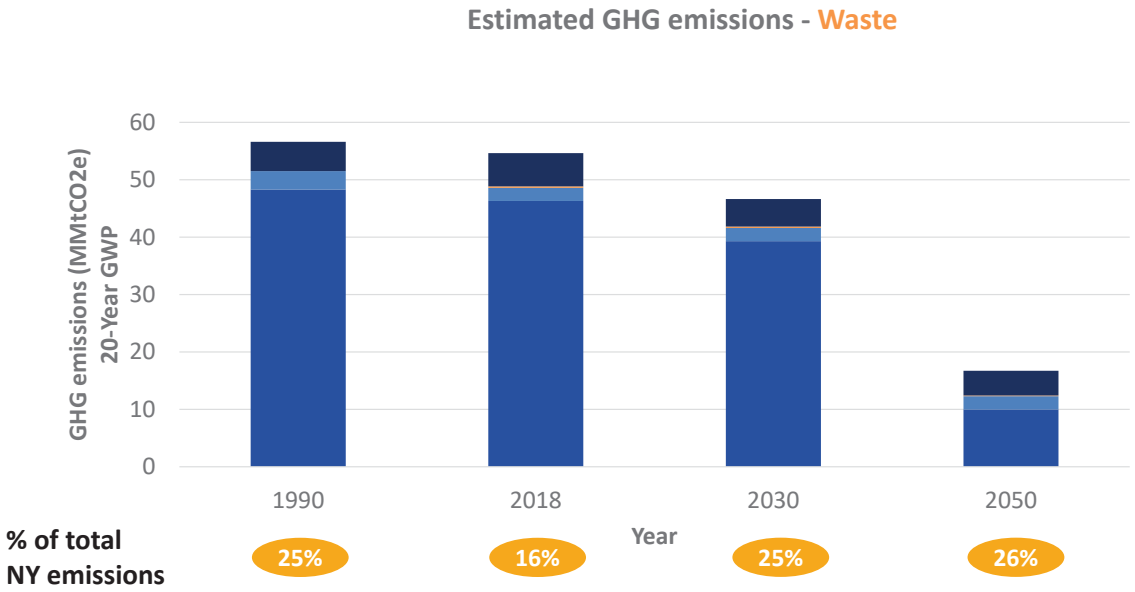
Waste Advisory Panel

Recommendations

April 5, 2021

NEW YORK STATE OF OPPORTUNITY. | Climate Action Council

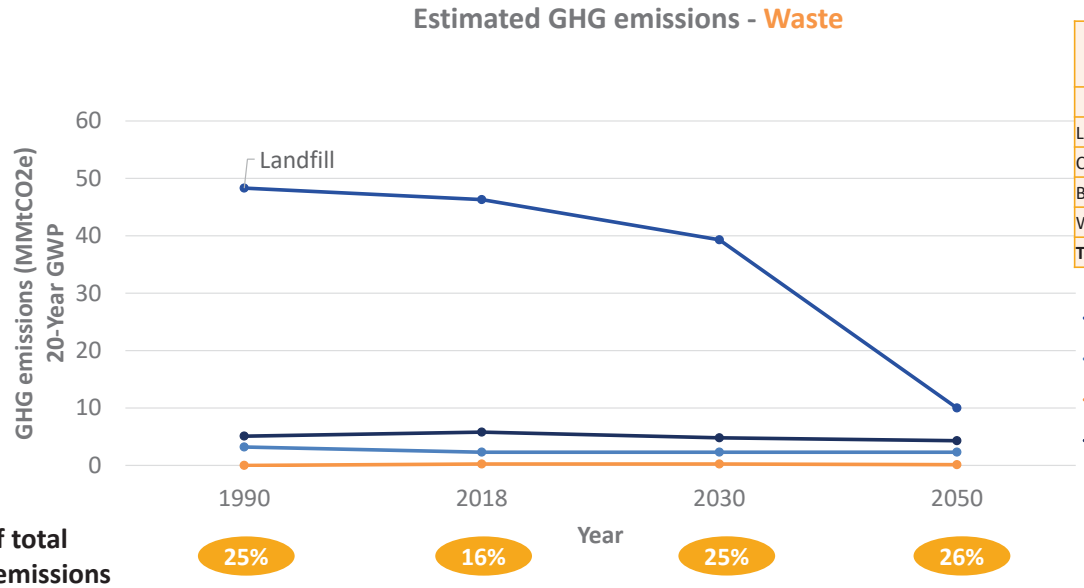
Aggregate GHG emissions impact of Waste panel recommendations



Reductions require aggressive initiatives to divert organics from landfills and reduce methane leaks.

2018 emissions data are preliminary draft

Aggregate GHG emissions impact of Waste panel recommendations



Total reductions in GHG emissions from 1990		
	2030	2050
Landfill	18.6%	79.3%
Combustion	28.1%	28.1%
Biological	(increase)	(increase)
Wastewater	5.9%	15.7%
Total all sectors	17.6%	70.5%

% of total NY emissions

25% 16% 25% 26%

2018 emissions data are preliminary draft

Actions needed to achieve GHG emissions reductions

> Landfills
  - Achieving the aggressive goals of *Beyond Waste*, the New York State Solid Waste Management Plan (e.g., 90% paper recycling and 65% food waste diversion by 2030)
  - Delay in achieving GHG emissions reductions due to typical slow rate of degradation of waste placed in landfills

> Combustion
  - No reduction projected from 2018-2050 because existing combustor facilities will be needed to handle MSW remaining after reduction, reuse, and recycling strategies

> Biological (composting, regional anaerobic digesters)
  - 50% of current leaks eliminated by 2030; 75% by 2050

> Wastewater
  - 50% of current anaerobic digester leaks eliminated by 2030; 75% by 2050
  - 1/3 of fugitive emissions from WRRFs eliminated by 2030; 2/3 by 2050
  - 1% increase in municipal sewer system utilization (conversion from septic) by 2030; 2% by 2050

Mitigation strategy summary

Initiative #	Description	Action type	Emissions impact	Ease of implementation	Cost
1	Reduce methane and carbon dioxide emissions by reducing the combustion and landfilling of organics and other methane/GHG producing wastes.	Legislative; Regulatory; Financial	High	Easy	$$
2	Reduce methane and carbon dioxide emissions from waste disposal facilities by enacting broad Extended Producer Responsibility (EPR)/Product Stewardship requirements to cover the recycling of packaging and printed paper, carpet, tires, textiles, solar panels, wind turbines, all batteries, appliances (especially those containing refrigerants), mattresses, and other methane generating wastes.	Legislative	High	Easy to Medium	$$
3	Identify and reduce fugitive emissions of methane from landfills and anaerobic digesters through baseline measurement, increased monitoring, and engineering and regulatory programs to reduce leaks.	Regulatory	High	Easy to Medium	$

Mitigation strategy summary

Initiative #	Description	Action type	Emissions impact	Ease of implementation	Cost
4	Reduce methane and carbon dioxide emissions from landfills and combustors by supporting domestic recycling facilities and markets for recovered resources, including compost, digestate, and recycled aggregate/building deconstruction materials.	Legislative; Financial	Medium	Easy to Medium	$ - $$
5	Recognizing that some waste generation is unavoidable, determine limited and strategic best uses for energy produced from biogas/RNG derived from organic waste. Assess use in the waste transportation sector, electric co-location or cogeneration opportunities for energy/heat intensive industries and hard to electrify users. Utilize market value of the energy to support organics diversion and waste reduction initiatives. Align energy price analysis with funding needs for build-out of organics recycling infrastructure.	Legislative; Financial	Medium to High	Medium	$$

Mitigation strategy summary

Initiative #	Description	Action type	Emissions impact	Ease of implementation	Cost
6	Reduce methane and carbon dioxide emissions from waste disposal facilities by supporting robust waste reduction, reuse, and recycling initiatives.	Legislative; Financial	Medium	Easy	$
7	Transform Wastewater Treatment Plants from waste disposal priority to Water Resource Recovery Facilities (WRRFs) that emphasize capture of beneficial products.	Financial	High	Medium	$$
8	Measure and reduce fugitive emissions from WRRFs, septic and sewer systems. Where density and local conditions allow, eliminate septic tanks and convert to municipal sewer system collections or advanced onsite treatments.	Legislative; Regulatory; Financial	High	Easy to Medium	$$
9	Reduce GHG emissions associated with end-of-life management of appliances that contain High-Global Warming Potential refrigerants. Benefits are highest in the near-term while these refrigerants are still in widespread usage.	Legislative; Regulatory	Medium to High	Easy	$

Mitigation strategy – Initiative #1: Organic Waste Reduction and Recycling

Description:	Reduce methane and carbon dioxide emissions by reducing the combustion and landfilling of organics and other methane/GHG producing wastes.		
Action type:	Legislative; Regulatory; Financial		
GHG reduction by 2030:	High	**GHG reduction by 2050:**	High
Cost and funding considerations:	$$; Cost are associated with the development of infrastructure for additional food donation, increased food scraps recycling, and organics handling. However, costs are shifted from waste disposal.		
Ease of implementation:	Easy; The technologies exist, the challenges are financial (e.g., investment & end markets), behavioral, and logistical (e.g., siting, etc.).		
Example case studies:			

Risks / Barriers to success	Possible mitigants
• The relatively low cost of landfilling make alternatives less attractive • Capacity and economically viable markets must exist for compost, biogas, digestate, and other organics products. • Requires significant and broad-based behavior change. • May create impacts in transportation and handling. • Presence of co-pollutants including emerging contaminants.	• As more organics recycling facilities and collection systems are established the cost should become more competitive. • Successful food scraps recycling systems already exist and can be replicated. • Low carbon approaches to collection and transportation. • Reliable end markets / market outlets. • Tip fee surcharge important to establishing funding sources.

Mitigation strategy – Organic Waste Reduction and Recycling

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Expand and Amend existing Food Donation and Food Scraps Recycling Law to include smaller food scraps generators, eliminate or increase mileage limit for organics recycling facilities and eliminate the financial hardship exemption.	Legislative	1-2 years increase requirements of existing law	DEC, food generators, DOH, DAM, donation organizations, SWMFs
Phase in organics source separation requirements and eventual ban on the combustion and landfilling of food scraps, food processing wastes, and other high-strength and organic wastes.	DEC	5-10 years phase in source separation and full ban	"
Require a surcharge (fee per ton) on all waste landfilled or combusted in New York State and all waste generated in New York State being sent for landfilling or combustion out-of-state to provide financial support for reduction, reuse, and recycling projects.	Legislative	1-2 years	DEC, solid waste management facilities (SWMFs), municipalities
Provide financial assistance for emergency food relief organizations and organics recycling facility infrastructure. Encourage partnerships between retailers and donation organizations for food and other household products.	DEC	1 year	SWMFs, food recovery organizations

Mitigation strategy – Organic Waste Reduction and Recycling

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Financial assistance to expand food scraps drop-off and local-scale processing opportunities (e.g., farmers markets, community gardens, transfer facilities, etc.). Financial assistance for local, non-profit, and small-scale organics collection and processing systems.	DEC; DAM	1-2 years	Municipalities, small-scale solid waste management facilities (SWMFs) and transporters, farmers
Financial assistance, education, and outreach to schools for food waste reduction, food donation, and on-site food scraps recycling programs.	DEC; NYSED	2-3 years	NYSED, municipalities, schools
Provide incentive for public-private partnership for organics recycling facility development.	DEC; ESD	2-3 years	Municipalities, SWMFs
Encourage co-location of solid waste infrastructure investments and operation by simplifying regulatory requirements and incorporate into local planning.	DEC; Legislative	1-3 years	SWMFs

Mitigation strategy – Organic Waste Reduction and Recycling

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Require local solid waste management planning units to emphasize food scraps recovery programs.	DEC	1 year	Municipalities, local solid waste planning units
Food waste reduction education and outreach to businesses and residents. Evaluate and define food labelling and portion practices (including "best by dates", meal planning, etc.) to reduce waste. Implement "best by" food label standardization.	Legislative; DEC	1-2 years	Residents, businesses, solid waste management facilities, retailers, manufacturers
Support reducing food waste in stores via enhanced demand planning systems (digital), minimized in-store inventory, dynamic pricing near expiry, and reduced portion size of food sales. Program to be coupled with education materials in stores and GHG smart shopping tips.	DEC	1-3 years	Retail, groceries, digital inventory apps

Mitigation strategy – Organic Waste Reduction and Recycling

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Evaluate the co-location of food donation and compost sites for streamlined waste diversion. Support installation of renewable energy projects (solar, wind, battery) to power refrigeration at donation sites for produce and perishable goods.	Legislative	1-5 years	Food donation organizations, businesses, municipalities
Expand successful models for organics collection programs inclusive of multi-family buildings and public housing (e.g., NYCHA, etc.).	DEC; housing authorities	1-3 years	Municipalities
Fund digital platforms for donation logistics and operation including efficient transportation route planning, food safety monitoring, reusable storage solutions where feasible, etc.	Legislative	1-5 years	Food donation organizations, businesses, municipalities

Mitigation strategy – Organic Waste Reduction and Recycling

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Require thoughtful food waste reduction and education strategies in school meals. Consider GHG impacts in purchasing of products selected for consumption. Enhance compost and waste diversion education standards in schools for early habit adoption.	Legislative; NYSED	1-5 years	Municipalities, schools
Support technology-enabled waste tracking in restaurants.	DEC	1-3 years	DEC, restaurants
Land use and procurement for non-profit, small-scale composters: Require that composting is explicitly allowed, and encouraged, on municipal park lands.	Legislative; DEC	1-3 years	Parks
Increase the ability to distribute organic amendments locally: Establish local compost receiving partners with food growers, street tree, stormwater resiliency projects, individuals, etc.	DEC	1-3 years	Municipalities, solid waste management facilities

Mitigation strategy – Organic Waste Reduction and Recycling

Anticipated Benefits and Impacts	
Disadvantaged communities	Solid waste combustion and landfill facilities may be located in EJ and disadvantaged communities. Food waste in these facilities leads to odors that significantly impact quality of life for those communities and potential health impacts. Removing food waste will reduce truck traffic to the landfill and odors.
Health and co-benefits	Odors from landfills and transfer facilities have an impact on neighboring communities, and exposure to odors could result in health impacts. Reducing these odors will improve air quality and may reduce health impacts in these communities.
Just transition: businesses and industries, workers	Increasing food donation will assist those in need and increasing food waste recycling will increase job opportunities, including local jobs for recycling facilities located close to the source.
Other	The technologies are readily available if the requirements, financing, and end markets are available.

Mitigation strategy – Initiative #2: Extended Producer Responsibility/Product Stewardship

Description:	Reduce methane and carbon dioxide emissions from waste disposal facilities by enacting broad Extended Producer Responsibility (EPR)/Product Stewardship requirements to cover the recycling of packaging and printed paper, carpet, tires, textiles, solar panels, wind turbines, all batteries, appliances (especially those containing refrigerants), mattresses, and other methane generating wastes.		
Action type:	Legislative		
GHG reduction by 2030:	High	**GHG reduction by 2050:**	High
Cost and funding considerations:	$$; Funding will be provided by the product manufacturers.		
Ease of implementation:	Easy to Medium		
Example case studies:	Successful current beverage container, electronic waste, thermostat, and battery programs in New York State.		

Risks / Barriers to success	**Possible mitigants**
• May require the development of infrastructure to collect and recycle. • Manufacturers are located across the globe. • Certain industries may oppose taking responsibility or will cite successful recycling models already in place (e.g., paper and packaging manufacturers).	• Successful programs in New York State and elsewhere already exist using this model.

Mitigation strategy – Extended Producer Responsibility/Product Stewardship

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Legislation to create a framework for extended producer responsibility/product stewardship, or individual legislation targeting products with the greatest greenhouse gas impact (e.g., packaging and printed paper, carpet, tires, textiles, solar panels, wind turbines, all batteries, appliances (especially those containing refrigerants), mattresses, etc.)	Legislative	1-5 years	DEC, product manufacturers

Mitigation strategy – Extended Producer Responsibility/Product Stewardship

Anticipated Benefits and Impacts	
Disadvantaged communities	Reduction in landfilling will also reduce the need for transfer facilities and will reduce truck traffic that can impact EJ and disadvantaged communities. These facilities can significantly impact quality of life for those communities and potential health impacts.
Health and co-benefits	Reduction in truck traffic and transfer facilities can reduce emissions and will improve air quality in these communities. Reduction in illegal dumping by providing convenient methods of recycling.
Just transition: businesses and industries, workers	Requiring manufacturers to establish collection systems for recycling will lead to local jobs associated with those collection systems.
Other	Requiring manufacturers to take responsibility for materials management leads to product designs that have less waste at the end of their useful life. Solar panels and large-scale batteries are more of a concern for end-of-life management of renewable energy technologies that are expected to grow exponentially under the CLCPA. Currently no widely available options exist for end-of-life management of these items.

Mitigation strategy – Initiative #3: Reduce fugitive emissions

Description:	Identify and reduce fugitive emissions of methane from landfills and anaerobic digesters through baseline measurement, increased monitoring, and engineering and regulatory programs to reduce leaks.		
Action type:	Regulatory		
GHG reduction by 2030:	High	**GHG reduction by 2050:**	High
Cost and funding considerations:	$		
Ease of implementation:	Easy to Medium		
Example case studies:	California Methane Study (“Super-Emitter Study”)		

Risks / Barriers to success	Possible mitigants
• Current monitoring of fugitive emissions from landfills and ADs are not robust and full emissions data are lacking. • Fugitive emission levels likely vary significantly among individual facilities (e.g., California Super-Emitter Study).	• Monitoring technologies continue to improve. • Total number of landfill facilities anticipated to drop over time as facilities close or are repurposed for organics processing. • Existing financial limitations of the facilities and municipalities.

Mitigation strategy – Reduce fugitive emissions

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Incorporate improved monitoring technologies (e.g., drones) into facility operations and existing monitoring programs.	DEC	1-5 years	Solid waste management facilities
Implement best practices for further emissions reduction. • Landfill examples: enhanced landfill covers to increase oxidation of methane, specialty landfill gas collectors for difficult to access areas, dewatering to increase collection. • AD examples: improve maintenance on methane collection systems.	DEC	1-5 years	Solid waste management facilities
DEC regulation changes for landfills to require installation of landfill gas collection systems sooner after waste placement; expansion of monitoring requirements for fugitive emissions beyond existing criteria.	DEC	1-3 years	Solid waste management facilities

Mitigation strategy – Reduce fugitive emissions

Anticipated Benefits and Impacts	
Disadvantaged communities	Landfills may be located in EJ and disadvantaged communities. Increased methane collection rates reduce the potential for odors or impacts from emissions.
Health and co-benefits	Emissions lead to odors and potential health impacts which have a significant impact on neighboring communities. Reducing these leaks will improve air quality and may reduce health impacts in these communities.
Just transition: businesses and industries, workers	Projects produce energy, jobs, co-located facilities, and opportunities for partnerships with industries needing energy and/or heat.
Other	Fugitive emissions data will focus regulatory and industry resources at the specific facilities or areas where the greatest improvements can be made.

Mitigation strategy – Initiative #4: Recycling markets

Description:	Reduce methane and carbon dioxide emissions from landfills and combustors by supporting domestic recycling facilities and markets for recovered resources, including compost, digestate, and recycled aggregate/building deconstruction materials.		
Action type:	Legislative; Regulatory; Financial		
GHG reduction by 2030:	Medium	**GHG reduction by 2050:**	Medium
Cost and funding considerations:	$ - $$		
Ease of implementation:	Easy to Medium		
Example case studies:	Onondaga Resource Recovery Agency's solid waste management facilities have public-private partnerships; existing OGS green procurement rules; ESD has previously assisted with funding recycling markets (e.g., glass, tires, etc.)		

Risks / Barriers to success	Possible mitigants
• Commodities markets are global and subject to severe capacity and price fluctuations. • Markets may exist but the price paid is not enough to sustain the cost of material collection and processing.	• Growth in domestic markets will reduce volatility in market pricing. • Domestic market pricing can be increased by subsidies, source separation requirements and other means.

Mitigation strategy – Recycling markets

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Require a surcharge (fee per ton) on all waste landfilled or combusted in New York State and all waste generated in New York State being sent for landfilling or combustion out-of-state to provide financial support for reduction, reuse, and recycling projects.	Legislative	1-2 years	DEC, solid waste management facilities, municipalities
Financial assistance to develop recycling markets.	Legislative	1-4 years	DEC, solid waste management facilities, municipalities
Financial assistance to research and increase the capture and use of building deconstruction materials and recovered aggregate for a variety of applications. Change government requirements (e.g., procurement standards, bid specifications, etc.) to include recycled or reused deconstruction materials.	DEC	1-4 years	DOT, solid waste management facilities, municipalities

Mitigation strategy – Recycling markets

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Provide incentive for public-private partnership for recycling facility development.	DEC	2-3 years	DEC, municipalities, solid waste management facilities
Legislation to require a minimum level of recycled content in certain products and packaging to support end markets.	Legislative	2-5 years	DEC, product manufacturers
Legislation and green procurement programs to require the use of recyclables (compost, construction aggregate, etc.) by State and local entities and those contracting with the government.	OGS; DEC	1-3 years	State agencies

Mitigation strategy – Recycling markets

Anticipated Benefits and Impacts	
Disadvantaged communities	Developing local markets supports the businesses that provide job opportunities and reduce pollution in disadvantaged communities (see other recommendations).
Health and co-benefits	Building local markets for materials reduces long distance truck traffic and associated health effects.
Just transition: businesses and industries, workers	Market development is critical to support the potential jobs in recycling and composting and will help support a just transition.
Other	

Mitigation strategy – Initiative #5: Biogas Use

Description:	Recognizing that some waste generation is unavoidable, determine limited and strategic best uses for energy produced from biogas/RNG derived from organic waste. Assess use in the waste transportation sector, electric co-location or cogeneration opportunities for energy/heat intensive industries and hard to electrify users. Utilize market value of the energy to support organics diversion and waste reduction initiatives. Align energy price analysis with funding needs for build-out of organics recycling infrastructure.		
Action type:	Legislative; Financial		
GHG reduction by 2030:	Medium	**GHG reduction by 2050:**	High
Cost and funding considerations:	$$; Stable, enhanced energy revenue will attract investment to aggressively manage methane in existing disposal facilities and existing and new organics recycling facilities.		
Ease of implementation:	Medium		
Example case studies:	CA Biomat (Bioenergy Feed-in Tariff Program – SB1122)		

Risks / Barriers to success	Possible mitigants
• Redirection of organics in MSW stream to new and existing digesters and compost facilities will require quantification of feedstock and facility capacity and locations. • Ability to attract enough fuel approximate to facilities/guarantee fuel availability. • Perception that new transmission infrastructure will be needed for biogas use.	• Alternative revenues at organics recycling facilities will allow lower tip fees to attract NY organics at competitive levels. • Identify solutions to collection/feedstock/capacity issues and establish template for accelerated construction of organics recycling facilities 2030-2050. • No significant new transmission infrastructure would be allowed to support additional biogas.

Mitigation strategy – Biogas Use

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Identify energy pricing model and conduct market-based study for waste-generated biogas. Provide funding mechanism to support organics recycling infrastructure.	NYSERDA; PSC; Utilities	2-5 years	Solid waste management facilities, utilities, municipalities, business community
Evaluate strategic and local uses of generated fuels, electricity, or other energy produced from biogas/RNG for essential needs during transition to electrification and other low-emissions energy sources. Stress fuel uses in the waste transportation sector, electric co-location or cogeneration opportunities for energy/heat intensive industries, and hard to electrify users. Example: resilient microgrid capacity.	NYSERDA; PSC; Utilities	2-5 years	Solid waste management facilities, utilities, municipalities, business community

Mitigation strategy – Biogas Use

Anticipated Benefits and Impacts	
Disadvantaged communities	Reduction and control of methane and other gases by the creation of new organics recycling infrastructure will reduce the potential impact on disadvantaged communities where disposal facilities are located.
Health and co-benefits	Specific infrastructure improvements will also provide enforceable emission controls of other pollutants to improve local air quality.
Just transition: businesses and industries, workers	Jobs will follow the construction and operation of new facilities. Organics management has potential to develop into a national industry of its own.
Other	Organics recycling facilities need a revenue source other than gate fees.

Mitigation strategy – Initiative #6: Waste reduction, reuse, and recycling

Description:	Reduce methane and carbon dioxide emissions from waste disposal facilities by supporting robust waste reduction, reuse, and recycling initiatives.		
Action type:	Legislative; Financial		
GHG reduction by 2030:	Medium	**GHG reduction by 2050:**	Medium
Cost and funding considerations:	$; The cost is very low compared to other solid waste initiatives. Reuse centers also assist those in need as a low or no cost source for household goods, etc. Repair cafes assist people in maintaining their household goods.		
Ease of implementation:	Easy		
Example case studies:			

Risks / Barriers to success	Possible mitigants
• Having sufficient funding to establish and operate. • A Business Plan and administrator for a broader statewide networking/franchising system is challenging.	• A consistent and sufficient funding source will lead to greater success. • Energized grass roots volunteer, non-profit, and faith-based organizations already exist to implement.

Mitigation strategy – Waste reduction, reuse, and recycling

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Require a surcharge (fee per ton) on all waste landfilled or combusted in New York State and all waste generated in New York State being sent for landfilling or combustion out-of-state to provide financial support for reduction, reuse, and recycling projects.	Legislative	1-2 years	DEC, solid waste management facilities, municipalities
Financial assistance to support waste reduction and reuse education and program implementation.	DEC	1-3 years	Municipalities, schools
Financial support for local reuse centers, materials exchanges/sharing hubs, certain repair shops, and innovative businesses incorporating recovered or waste reducing materials and technologies. (There is a big need to move beyond volunteer-run only operations.)	DEC	1-3 years	Municipalities, non-profit charities
Legislation to require "By Request Only" policies for single-use (e.g., cutlery, straws, etc.) products at businesses.	Legislative; DEC	1-2 years	Municipalities, businesses

Mitigation strategy – Waste reduction, reuse, and recycling

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Support innovative zero-waste product development and business projects.	Legislative	1-3 years	Businesses
Require textile origination/conditions of manufacture labeling and reduced sales of textiles; reduce import of GHG intensive and polluting textiles into NYS; optimize and reduce retail stocking; consumer-facing labeling on clothes and in stores; standardize eco-friendly clothing certification based on GHGs and pollutants.	DEC	2-5 years	Clothing retailers/industry
Support and expand successful recyclables collection programs inclusive of multi-family buildings and public housing (e.g., NYCHA, etc.). Use best available save as you throw programs, with consumer education in buildings.	DEC; housing authorities	1-3 years	Municipalities

Mitigation strategy – Waste reduction, reuse, and recycling

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Require reusable/refillable options for consumer goods in retail stores. Support the reduction and eventual elimination of single-use packaged items for use in stores. Implement deposit container programs where feasible. Require the sale of reusable diapers and feminine hygiene products in stores that choose to sell their disposable counterparts. Expand this to all personal care products, including toothpaste, soap, shampoo, etc.	Legislative	5 years	Businesses
Support digital demand software/technologies to monitor and reduce over-production across all sectors with comprehensive, measurable, and equitable regulation and inspection, inclusive of food, livestock & pets, home goods, hygiene and health products, restaurant goods, textiles, and all other consumer goods.	Legislative	1-4 years	Retailers, Manufacturers

Mitigation strategy – Waste reduction, reuse, and recycling

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Fund infrastructure development (i.e., eco-hubs) to increase access to reuse and recycling opportunities for multi-family housing and campuses (e.g., NYCHA, business parks, etc.). Facilities consist of Reverse Vending Machines (RVM), inclusive of MGP, e-waste, textile, organics, reuse programs, and non-traditional recyclable items.	DEC; ESD; HCR	3-5 years	NYCHA, housing authorities, municipalities
Implement new and expand existing statewide campaigns for reduction, reuse, and recycling (e.g., tv, hulu, spotify, radio and podcasts, billboards, subways, social media, other forms of media).	DEC	2-3 years	NYSAR3, media companies, SUNY ESF
Support peer-to-peer education and outreach campaigns in underperforming and BIPOC communities around reduction, reuse, and recycling.	DEC	1-3 years	EJ communities, municipalities, schools

Mitigation strategy – Waste reduction, reuse, and recycling

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Support coordination between local and regional municipalities to enhance regional recycling initiatives. Provide funding to hire local enforcement officers for municipal recycling programs. Encourage cross-jurisdiction and multi-planning unit collaboration on these efforts (e.g., Hudson Valley Regional Council Materials Management Committee).	Legislative; DEC	1-3 years	Municipalities, planning units
Require government procurement standards for low GHG-emitting products (e.g., textiles, paper, packaged products, etc.).	OGS; DEC	1-3 years	State agencies
Evaluate the feasibility of requiring universal restaurant reusables (unbranded) which can be used across establishments, with a deposit for use and drop off locations.	DEC	1-3 years	Restaurants

Mitigation strategy – Waste reduction, reuse, and recycling

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Support workforce development, job training and trades skills in repair, refurbishment, remanufacturing, recycling, and innovative materials reuse. (Example case study: NY Youth Works @ DOL)	ESD; NYSERDA; DOL	1-3 years	DEC, businesses, non-profit charities, municipalities
Evaluate the feasibility of requiring reusable shipping containers and padding to replace packaging material from online retailers.	Legislative	1-3 years	DEC, online retailers

Mitigation strategy – Waste reduction, reuse, and recycling

Anticipated Benefits and Impacts	
Disadvantaged communities	Education on waste reduction can have a positive financial impact on EJ and disadvantages communities. Local reuse centers can be a source for free or low-cost household items. Repair cafes help individuals keep their household items working, reducing the need to purchase new appliances, etc. Reuse centers and sharing platforms offer free or low-cost household items to those who cannot afford to buy new or have the space to own. Reduces waste, builds equity, and reduces the need to buy new.
Health and co-benefits	Less materials produced leads to less pollution and waste from product manufacturing.
Just transition: businesses and industries, workers	Job training workshops and education will benefit people looking for work in disadvantaged communities. Repair shops can be a source of local employment. Funding/moving away from volunteer-run organizations and employing people to run reuse centers, etc. will improve local employment.
Other	Many examples of successful programs exist.

Mitigation strategy – Initiative #7: WRRF Conversion

Description:	Transform Wastewater Treatment Plants from waste disposal priority to Water Resource Recovery Facilities (WRRFs) that emphasize capture of beneficial products		
Action type:	Financial		
GHG reduction by 2030:	High	**GHG reduction by 2050:**	High
Cost and funding considerations:	$$; WRRFs are a key component of the circular economy and present tremendous opportunities for reducing GHG emissions; however, their funding is tied to water and sewer rates, is generally constrained, and is largely dedicated to water quality projects. Additional funding streams will be necessary to unlock the GHG reduction potential of wastewater and its associated infrastructure.		
Ease of implementation:	Medium		
Example case studies:			

Risks / Barriers to success	Possible mitigants
• Difficult to self-fund projects due to water quality priorities and water/sewer rate affordability considerations. • Capital investments needed to maintain state-of-good-repair in addition to new resource recovery approaches. • Market conditions and regulations favor landfilling biosolids/digestate over beneficial reuse. • Evaluate extent and impact of co-pollutants such as emerging contaminants.	• Bioproducts resulting from resource recovery can be valuable if markets are aligned with GHG reduction priorities. • Incentivizing biogas production and utilization can offset costly infrastructure upgrades. • Current infrastructure has existing capacity to digest difficult-to-compost organics. • Many municipalities are working towards this goal and would benefit from additional State-level support.

Mitigation strategy – WRRF Conversion

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Support beneficial use of biosolids: Current market conditions often result in municipalities landfilling treated biosolids, losing the finite resources to landfills. Rising landfilling prices may push some municipalities to beneficially reuse naturally, but others that have agreements with local landfills and will require additional incentives to transition to beneficial reuse. Emerging technologies may make nitrogen, phosphorus and other nutrient separation and recovery economically feasible.	Local utilities; Municipalities	2-10 years	DEC; landowners and farmers; agriculture sector
Support beneficial use of renewable biogas, recognizing that water treatment process waste generation is unavoidable**:** Existing treatment plants have high thermal demands to operate digesters used to stabilize sludge. Boilers and engines on site are often able to replace natural gas with a WRRF's own digester gas. Some facilities may be well situated to provide local communities and co-located facilities with limited but strategic quantities of RNG.	Local utilities; Municipalities	2-10 years	DEC; engineering consultants; energy utilities

Mitigation strategy – WRRF Conversion

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Operate co-digestion programs with existing capacity: Anaerobic digesters with existing capacity should accept difficult-to-compost organics such as post-consumer food waste and FOG (Fats, Oils and Grease). Diverting additional organic wastes to WRRFs will require increased pre-processing and depackaging capacity throughout the state – either on- or off-site. Thickening improvements at WRRFs are low-capital investments that can increase capacity to operate co-digestion programs.	Local utilities	2 – 10 years	Local organics processors, haulers and microhaulers, DEC, waste preprocessing facilities

Mitigation strategy – WRRF Conversion

Anticipated Benefits and Impacts	
Disadvantaged communities	Reduced volume of biosolids sent to landfills will reduce methane, odors (particularly a concern where landfills that serve NY communities abut EJ communities); beneficial use of biogas can help grid-constrained areas by reducing utility demand or by exporting power or RNG, as well as sending RNG to difficult-to-electrify local buildings or businesses. This transformation will require investments in infrastructure that will be difficult to self-fund because of concerns with keeping water and sewer rates affordable.
Health and co-benefits	Beneficial reuse of biosolids has potential to offset synthetic, GHG intensive fertilizers, re-green space (tree plantings), and restore disturbed land.
Just transition: businesses and industries, workers	WRRFs will function as job creation hubs in the circular economy. Capturing non-renewable resources contained in wastewater (e.g., nitrogen, phosphorous) from treatment processes will require workforce training and permanent job creation. This will range from technical positions at the facility to distributed roles in communities to manage the resource streams made available.
Other	Nutrient recovery has the potential to offset large quantities of fossil fuel consumption if it replaces fertilizers containing atmospheric nitrogen (an energy intensive process) that takes place outside of NYS and is therefore not contained in the state inventory but contributes to climate change.

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Mitigation strategy – Initiative #8: Fugitive emissions from WRRFs

Description:	Measure and reduce fugitive emissions from WRRFs, septic and sewer systems. Where density and local conditions allow, eliminate septic tanks and convert to municipal sewer system collections or advanced onsite treatments.		
Action type:	Legislative; Regulatory; Financial		
GHG reduction by 2030:	High	**GHG reduction by 2050:**	High
Cost and funding considerations:	$$. Larger municipal utilities may be able to absorb some costs, but medium and smaller municipalities do not have the funding to accomplish without state funding. Sewering costs will vary based on availability of a local WRRF and local soil conditions, among other factors. Funding will be critical to address wastewater GHG emissions; DEC regulations may need to be revised to require monitoring and remediation.		
Ease of implementation:	Easy to Medium, depending on emission source, funding available and monitoring capabilities.		
Example case studies:			

Risks / Barriers to success	Possible mitigants
• Monitoring of emissions can be difficult without proper equipment and training. • Difficult to quantify and address sewer emissions. • Nitrous oxide emissions profile of WRRFs is significant but poorly quantified. • Sewer conversions require proximity to a WRRF, and requires responsible entity, referendum, debt obligation, and high up front costs. • Private Property / Easement Access	• Some larger municipalities are already implementing these techniques and can provide guidance to others. • Abating methane fugitive emissions is primarily a financial issue not a technical feasibility issue. • Some communities have high septic costs because of soil conditions and may be willing to transition. • State funding could be repurposed to support this water quality and methane emission reduction improvements such as sewering.

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Mitigation strategy – Fugitive emissions from WRRFs

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Capture and beneficially reuse fugitive biogas: Repair and consistently operate WRRF flares, boilers, engines, or other equipment on-site in order to prevent fugitive methane emissions. Evaluate captured biogas potential to identify strategic beneficial uses before flaring excess capacity.	Local utilities; Municipalities	6 months – 10 years	DEC, NYSERDA, EFC
Rulemaking and monitoring: Wastewater infrastructure was not always designed to mitigate GHG emissions and may require additional emissions monitoring rulemaking and oversight to implement. financial and procurement assistance to wastewater system operators is needed as well as job training to help stakeholders meet new air emission standards.	DEC; EFC; NYSERDA	1 – 2 years	Municipalities, local utilities

Mitigation strategy – Fugitive emissions from WRRFs

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Perform emissions monitoring and updated at WRRFs and septic systems.	DEC	6 months – 5 years	Local municipalities
Ensure proper maintenance of septic systems at the municipal level. Municipalities could establish a funding mechanism (paid for by homeowners) to allow contractual services for routine maintenance on septic systems (potentially legislation).	Municipalities	3 – 5 years	Home-owners, Septic system maintenance companies
Repurpose septic sewer assistance programs: Existing programs could be extended to include sewer hookups to defray high up-front costs of sewering.	EFC	1-5 years	NYSCDBG, NYSDOH, NYSDEC, NYSEFC, USDA-RD

Mitigation strategy – Fugitive emissions from WRRFs

Anticipated Benefits and Impacts	
Disadvantaged communities	Wastewater treatment plants are sometimes located in EJ and disadvantaged communities. Energy self-sufficiency at WRRFs can allow utilities to distribute finite renewable energy resources to other community needs.
Health and co-benefits	Emissions from wastewater treatment plants lead to odors and potential health impacts which have a significant impact on neighboring communities. Reducing these leaks will improve air quality in these communities. Proper maintenance of septic systems and septic conversions will improve surface and ground water quality.
Just transition: businesses and industries, workers	Local engineering, construction, and operation employment will be positively impacted by improving operations at these treatment facilities. These treatment plants are located throughout New York State, in large and small communities, providing widespread local employment opportunities.
Other	Reducing leaks will increase the amount of methane that is captured and can be used to generate renewable energy for use at the treatment plant and locally.

Mitigation strategy – Initiative #9: Refrigerant Diversion

Description:	Reduce GHG emissions associated with end-of-life management of appliances that contain High-Global Warming Potential refrigerants. Benefits are highest in the near-term while these refrigerants are still in widespread usage.		
Action type:	Legislative; Regulatory		
GHG reduction by 2030:	High	**GHG reduction by 2050:**	Medium
Cost and funding considerations:	$		
Ease of implementation:	Easy		
Example case studies:	EIA 100 Billion Ton Climate Problem (UK), EPA Part 608 implementation		

Risks / Barriers to success	Possible mitigants
• Wide range of manufacturers, products, and types of use of refrigerants. • Enforcement challenging due to the large number of end-of-life facilities. • Current lack of disposal data on these appliances.	• Many alternative refrigerants are being produced, but end-of-life management of existing appliances still remains important.

Mitigation strategy – Refrigerant Diversion

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** (*Entities that need to be engaged)*
Require reclamation or destruction of refrigerants from appliances at end of life and institute requirements for verification and reporting.	DEC	1-5 years	Appliance manufacturers and producers, solid waste management facilities, auto repair
Imposing a ban on sale of virgin high-global warming potential (GWP) refrigerants for servicing with an exception for reclaimed refrigerants.	DEC	1-5 years	Appliance manufacturers and servicers
Extended Producer Responsibility program (see Initiative #2)	Legislative	1-5 years	
Create registry and reporting requirements (to track sales, stockpiles, and leaks) for large refrigeration and HVAC systems and refrigerant wholesalers and distributors.	Legislative; DEC	1-5 years	Appliance manufacturers and servicers, users such as supermarkets

Mitigation strategy – Refrigerant Diversion

Anticipated Benefits and Impacts	
Disadvantaged communities	HVAC and refrigeration equipment is important for human safety and resilience to climate change. Those who are most vulnerable may also be most affected transformations in this industry, including short-term price impacts driven by state and federal policy. Addressing leakage and disposal could mitigate costs.
Health and co-benefits	Proper management of refrigerant-containing appliances will decrease overall pollution from disposal of this material.
Just transition: businesses and industries, workers	Could lead to additional jobs related to service, recovery, and destruction of refrigerants from end-of-life appliances.
Other	These management techniques should be coupled with continued alternative refrigerant (replacement) research and production.

Enabling strategy summary

Description	Action type	Ease of implementation	Cost
Continue to research and obtain more accurate data on climate impacts from solid waste	Financial	Easy	$
Green, equitable jobs and workforce development. Institute coordination around workforce recruitment and employment frameworks. Develop strategies that result in a living wage green-collar labor system for residents and communities that are economically disadvantaged. Sustainable funding for environmental justice, resident-led initiatives with proven, shovel-ready (local and regional) solutions that reduce and divert recyclables and organics with a focus on multi-family buildings, disadvantaged, BIPOC, and underperforming communities.	Financial	Easy	$

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Enabling initiative: Research

Description:	Continue to research and obtain more accurate data on climate impacts from solid waste
Action type:	Financial
Cost and funding considerations:	$; Costs associated with contracts with academic and consulting entities to perform research/pilot studies
Ease of implementation:	Easy
Example case studies:	

Risks / Barriers to success	Possible mitigants
• Obtaining and contracting in a timely manner • Applying research to existing mitigation strategies • Obtaining research results in time to implement to meet State climate goals • Limitations in available expertise in areas needed	• Contracting procedures already well understood • Some research already occurring on these topics • Timing to complete research should not be extensive

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Enabling initiative: Research

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Better understanding of potential co-pollutants from solid waste management and recycling facilities, including emerging contaminants.	DEC	1-3 years	Solid waste management facilities (SWMFs), academics, consultants
Development of lifecycle analysis model and solid waste management decision making tool.	DEC	1-3 years	SWMFs, academics, consultants
Research end of life management for difficult to manage materials (e.g., refrigerants, green energy infrastructure like solar panels, etc.).	DEC	1-3 years	NYSERDA, SWMFs, academics, consultants
Comprehensive landfill gas and water resource recovery facility emissions research study to evaluate emissions monitoring techniques, quantify fugitive emissions, and to evaluate most appropriate uses for the gas during transition to statewide electrification.	DEC	1-3 years	Landfills, academics, consultants, utilities
Market study of quantity and characteristics of organics (food waste, biosolids, other high strength waste) produced in state as well as possible end uses (agriculture, mine reclamation, roadside soil amendments and erosion control, etc.)	DEC	1-3 years	DAM, DOT, academics, consultants, SWMFs

Enabling initiative: Research

Anticipated Benefits and Impacts	
Disadvantaged communities	Better research on co-pollutants and other impacts from solid waste management facilities (SWMFs) that may be located in EJ communities and means to potentially mitigate issues affecting these communities.
Health and other co-benefits	Research on co-pollutants can help inform ways to eliminate health issues related to water and air pollution. Market research and development will assist SWMFs in effectively distributing product.
Just transition: businesses and industries, workers	Research projects lead to additional employment in engineering consultant firms and academic institutions.
Other	Emerging waste streams from clean energy efforts have not been previously studied or handled. Further research will help inform end-of-life management for these new wastes.

Enabling initiative: Green jobs

Description:	Green, equitable jobs and workforce development. Institute coordination around workforce recruitment and employment frameworks. Develop strategies that result in a living wage green-collar labor system for residents and communities that are economically disadvantaged. Sustainable funding for environmental justice, resident-led initiatives with proven, shovel-ready (local and regional) solutions that reduce and divert recyclables and organics with a focus on multi-family buildings, disadvantaged, BIPOC, and underperforming communities.
Action type:	Financial
Cost and funding considerations:	$
Ease of implementation:	Medium
Example case studies:	Inner City Green Team (NYC)

Risks / Barriers to success	Possible mitigants
	• See above recommendation about public/private funding mechanism for green jobs in waste • Thoughtfully easing restrictions for entrepreneurs in city and state agencies

Enabling initiative: Green jobs

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders (***Entities that need to be engaged)*
Institute a job program aimed at recruiting recycling and sustainability champions and residents from multi-family buildings, disadvantaged communities, BIPOC, and underperforming communities.	DOL; Municipalities	1-3 years	Municipalities, workforce
Strengthen partnerships with local workforce development and staffing programs.	DOL; DSNY; NYCHA; upstate municipalities	1-3 years	Municipalities, workforce
Ensure funding consistent for program success.	DOL	1-3 years	Municipalities, workforce

Enabling initiative: Green jobs

Anticipated Benefits and Impacts	
Disadvantaged communities	Reduces economic disadvantages faced by such communities through creation of empowering workforce and job program co-led by people in community.
Health and other co-benefits	Creates heightened sense of community and solid waste management awareness.
Just transition: businesses and industries, workers	Strengthen partnerships with identified workforce development and staffing programs, which aims to attain job skills and better prepare working age residents for jobs that will increase earning and employment outcomes. Creates the model for economic opportunity and sustainable green-collar jobs with a living wage that improves quality of life.
Other	Empowers residents to take green action, and increase pride where they live.

Additional panel perspectives summary

Initiative	Summary of views
1; 7	Route at least 90% of organic waste to composting sites and facilities within 1-5 miles in cities, and 10 miles in less dense areas; Limited support for food waste routed as co-digestate to existing wastewater treatment facilities, up to 10% of organic waste stream, for local clean energy.
5	Encourage increased methane collection from landfills through an off-take or procurement program that compensates generators for reducing methane by combustion.
5	Off-take or procurement program for each kilo-watt hour (kWh) generated or thousand cubic feet (MCF) of pipeline gas produced; minimum price paid for compost products used in publicly funded projects.
N/A	Decommission NYS incinerators and end contracts out of state by 2030. Do not permit any subsidies, nor permit new incinerators, or incineration/burning by other names (inc. pyrolysis, gasification).
N/A	Establish polluter funded union jobs for cleanup and monitoring of natural and built environment (waterways and oceans, sewage, soils, air) to help all communities meet at least minimum legal environmental standards by 2035. Inclusive of but not limited to: fossil fuel companies, incinerators, plastic producers, single-use product producers, etc.

Additional panel perspectives summary (cont.)

Initiative	Summary of views
N/A	Improve the Management of Combined Sewer Overflows (CSOs) to prevent continued contamination during rain and storm events with comprehensive green and grey infrastructure. The NYS Department of Environmental Conservation (DEC) should require stronger application of green infrastructure strategies and nature-based solutions to increase the CSO capture rate. DEC should also better monitor compliance and require green infrastructure intervention in Municipal Separate Storm Sewer System (MS4) and direct drainage areas to decrease risk of pollutants reaching our waterways. Public investments in addressing CSOs should be coupled with strong maintenance strategies that support the local workforce goals, as well as public input and community awareness. Additionally, a strong CSO policy should incorporate resilient safe disposal and control of floatable and settleable trash and debris, alongside an improved street disposal and recycling plan.

Land Use and Local Government Advisory Panel

Recommended Strategies

May 3, 2021

NEW YORK STATE OF OPPORTUNITY. Climate Action Council

Panel Members

Sarah Crowell, Chair
Director, Office of Planning, Devt, & Community Infrastructure: DOS

Mark Lowery
Assistant Director, Office of Climate Change: DEC

Supported by a Multi-Agency Staff Working Group

Jessica Bacher
Managing Director: Pace University School of Law Land Use Law Center

Jayme Breschard-Thomann
Senior Project Manager: Bergmann PC

Kevin Law
Former President & CEO: Long Island Association

Katie Malinowski
Executive Director: NYS Tug Hill Commission

Ed Marx
Former Commissioner of Planning: Tompkins County

Kathy Moser
Senior Vice President: Open Space Institute

Priya Mulgaonkar
Project Manager: Hester Street Collaborative; formerly NYCEJA

Gita Nandan
Board Chair: RETI (Resilience, Education, Training and Innovation) Center

Juan Camilo Osorio
Assistant Professor: Pratt Institute School of Architecture

Eric Walker
Climate and Clean Energy Strategist

Local and Regional Governance in NYS

> New York's local governments wield significant influence through their legal authorities, relationship with their community members, and oversight of their own municipal assets and facilities. Municipalities of New York include:
  - **62 Cities**
  - **932 Towns**
  - **Over 551 Villages**
  - **~ 7,000 Special Districts**

> Local governments are critical partners to the State in providing the right planning, regulatory, financial and information-driven environment for these changes

> Regional and county-level organizations such as County IDAs, MPOs, and Regional Planning Boards and Regional Economic Development Councils do important land use planning that guides, frames, and informs local zoning
  - **62 Counties**
  - **14 Metropolitan Planning Organizations**
  - **9 Regional Planning Boards**
  - **10 Regional Economic Development Councils**

Regional Planning Boards

Land Use and Local Government Goals

Local government provides the scaffolding/framework to facilitate the recommendations of many other panels. The LULGAP approached their recommendations with the following goals in mind:

- Support local and regional initiatives to **promote efficient land use/smart growth**
- **Maximize carbon sequestration potential** of both developed and undeveloped lands
- **Build capacity at the regional level** and streamline/enhance support to municipalities
- **Increase energy efficiency** in new development and promote energy efficiency retrofits
- **Accelerate responsible development and adoption of clean energy sources**
- **Reduce emissions** associated with municipal operations, buildings, facilities, and fleets
- **Commitments to environmental justice, disadvantaged communities, and a just transition**

Recommendation Development Process

Land Use and Local Government Advisory Panel

Process

Themes and Priorities

Identification and consolidation of themes and priorities for each subgroup.

Strategy Development

Translating themes into simple and actionable strategies for further review. Simple feasibility assessment, evaluation and feedback, and cross-panel communication.

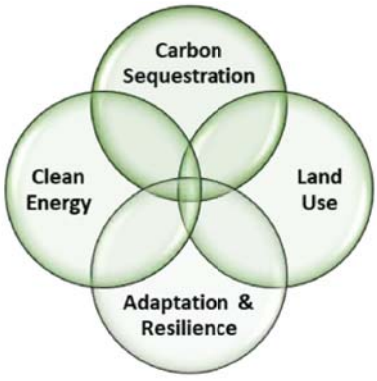
Recommendation Development

Translating Strategies into achievable recommendations for detailed review. Detailed feasibility and mitigation assessment, research, and cross-panel review.

Recommendation Feedback and Integration Analysis

Recommendations undergo further review and evaluation by LULGAP, receive cross-panel feedback and are readied for integration analysis by the CAC.

Subgroups



Public and Stakeholder Input Process

Panel Meetings: The Land Use and Local Government Advisory Panel has held eight full Panel meetings that were open to the public; all meeting presentations and notes have been posted to climate.ny.gov.

Local Government Officials Roundtable: Local government input was received during two roundtable discussions (December 2020 and March 2021) and six small-group conversations with representatives from municipalities from across the state (November 2020). Over 30 local officials participated – distribution is illustrated on the following slide.

Stakeholder Survey: A survey was created by the panel, shared with panel member networks and other local government groups. The survey was open from December 1, 2020 to January 4, 2021 and 38 responses were received

Public Input: Input from the public received during a virtual forum in December 2020, during advisory panel meetings through the "chat" function, and by email to a dedicated email account (LULG@dos.ny.gov)

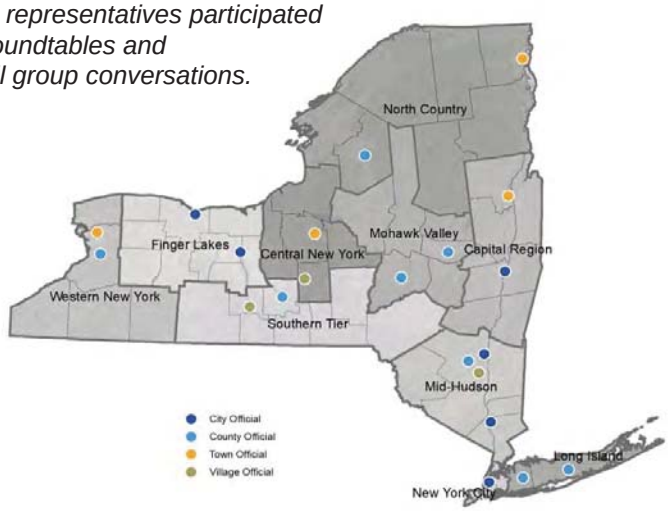
Climate Action Council Engagement: Input from the CAC received in November 2020.

Cross Panel Coordination: Regular collaboration with Transportation, Ag & Forestry, Energy Efficiency & Housing, Power Generation and Waste Advisory Panels, as well as the Climate Justice and Just Transition Working Groups.

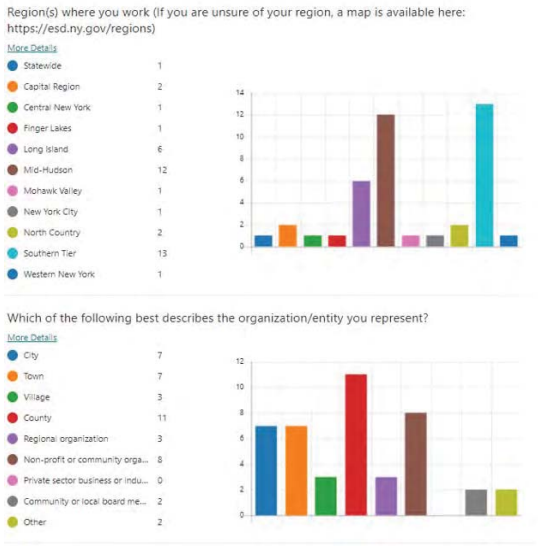
Local Engagement

Local Government Officials Representation

Over 30 representatives participated in two roundtables and six small group conversations.



Stakeholder Survey Representation



Glossary

Blue Carbon: carbon captured by ocean and coastal ecosystems.

Brownfield Opportunity Area: a planning and development program that transforms brownfields from liabilities to community assets that generate and support new businesses, jobs, and revenues for local economies, as well as providing new housing, commercial activity and public amenities.

Community Choice Aggregation: Community Choice Aggregation (CCA) allows local governments to choose where the energy comes from for their community. CCA is a municipal energy procurement model that replaces the utility as the default supplier of electricity for virtually all homes and small businesses within the jurisdiction.

Community Distributed Generation (CDG): Community distributed generation (CDG) allows an electrical production facility up to 5kW, such as a solar farm project, to share benefits through a subscription with residential and business participants who otherwise are not able to participate in solar benefits.

NY Stretch Energy Code: NYStretch Energy Code was developed by NYSERDA as a statewide model code for New York jurisdictions to use to meet their energy and climate goals by accelerating the savings obtained through their local building energy codes.

ICLEI: Local Governments for Sustainability (or simply ICLEI) is an international non-governmental organization that promotes sustainable development.

Property Assessed Clean Energy (PACE) financing: A program adopted by an eligible local government that allows property owners to pay back the cost of clean energy upgrades to their commercial or non-profit property over time and is secured through a benefit assessment lien on the improved property.

Smart Growth: sustainable, equitable planning and development that integrates the 3 Es—Equity, Economy and Environment. Smart Growth is based on several community design principles, including compact, mixed-use, mixed-income development in municipal centers; walkable, bikable and transit-accessible streetscapes; a variety of housing types, sizes and prices; safe, accessible public places; and strategically preserved open space and natural resources for outdoor recreation, healthy ecosystem and water functions and working lands, such as farms and forests.

Transit Oriented Development: smart growth development that is concentrated within a half-mile radius of rail or bus transit.

Land Use

NEW YORK STATE OF OPPORTUNITY. Climate Action Council

Land Use - Enabling strategy summary

Initiative #	Description	Action type	Ease of implementation	Cost
LU-1	Guide future growth, redevelopment, and conservation at the multi-municipal scale through regional planning. Facilitate and support collaborative multi-municipal smart growth comprehensive planning at the county and regional scales to inform and guide land use decisions, including designation of priority development areas and priority conservation areas	Programmatic and legislative	Medium	$$

Land Use - Enabling strategy summary

Initiative #	Description	Action type	Ease of implementation	Cost
LU-2	Empower Local Government to Achieve Smart Growth Planning and Development. Provide direct planning and zoning assistance to local communities. Promote municipal implementation of mitigation strategies through enhanced technical assistance, increased support for local adoption of zoning and land use regulations consistent with smart growth principles, and local policies that support sustainable, equitable development and the accelerated expansion of local clean energy through a streamlined “Plan-to-Zone” initiative	Programmatic and technical assistance	Easy	$$

Land Use - Enabling strategy summary

Initiative #	Description	Action type	Ease of implementation	Cost
LU-3	Enhance Resources to Enable Equitable Smart Growth. Provide local government with the necessary tools and resources to guide, enable and inform the process of achieving equitable smart growth projects such as TOD, mixed-income/affordable housing, downtown, village and hamlet centers, and infill development.	Programmatic and regulatory	Hard	$
LU-4	Align state funding priorities. Prioritize smart growth, equity, and sustainability in all relevant state funding, including new infrastructure spending	Programmatic and regulatory	Medium	$
LU-5	Accelerate Transit Oriented Development. Accelerate mixed-use, mixed-income transit-oriented development around key transit hubs served by rail and bus.	Programmatic/ Legislative	Medium	$$

Enabling strategy - LU-1: Guide Future Growth Overview

Description:	**Guide future growth, redevelopment, and conservation at the regional scale through regional planning.** Facilitate and support collaborative smart growth comprehensive planning at the county and regional scales to inform and guide land use decisions, including designation of priority development areas and priority conservation areas
Action type:	Programmatic and legislative
Cost and funding considerations:	$$ - requires some new resources for successful implementation, State and local funds and sources.
Ease of implementation:	Easy – Builds on/expands existing county and regional planning efforts
Example case studies:	Tompkins County; Genesee County; Cleaner Greener Regional Sustainability Plans

Risks / Barriers to success	Possible mitigants
Long-term viability and stability of programs and funding sources are necessary for continued progress. In addition, existing power for comprehensive planning and zoning rests overwhelmingly with cities, towns, and villages individually. While the General Municipal Law provides for a role for counties in certain instances, the application is quite limited.	Require that counties and regional planning councils consult with municipalities, and allow larger municipalities to handle on their own, in consultation with counties. Ensure that regular funding is available to counties and regional entities to undertake planning in cooperation with municipalities.

Enabling strategy – LU-1: Guide Future Growth
Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Align State funding selection criteria with the priorities and principles contained in the Cleaner, Greener Communities Regional Sustainability Plans, to the extent practicable	DOS, NYSERDA	2 years	REDCs, DOS, multiple state agencies
Identify opportunities to increase coordination with REDCs and alignment of REDC Regional Strategic Plans with sustainability/smart growth/equity principles	REDCs	ongoing	ESD, DOS, NYSERDA other state agencies
Expand DOS Countywide Resiliency Planning grants to incentivize county-wide smart growth comprehensive plans that adhere to clear State goals and outcomes. Include health impact assessments where feasible and relevant, particularly in disadvantaged communities that have experienced health disparities	DOS	2 years	Regional entities and local governments

Enabling strategy – LU-1: Guide Future Growth
Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Develop criteria and incentives for regional entities and counties to identify priority development areas (including areas appropriate for clean energy siting) and priority conservation areas in consultation with local jurisdictions and communities. **Priority Development Areas** may include Brownfield Opportunity Areas, downtowns, central businesses districts, municipal centers, hamlets, former industrial districts, infill projects in developed areas, obsolete fossil fuel-based power plants, re-development/adaptive re-use of existing buildings, TOD/Equitable TOD, disadvantaged communities (as defined by the Climate Justice Working Group), dead/dying malls and vacant property clusters designated by land banks, among others; **Priority Conservation Areas** may include wetlands, riparian areas, forests, agricultural lands and other natural areas and working lands that preserve and restore vital habitats, landscape connectivity, biodiversity, natural water movement, local food security and passive recreation, among others.	DOS, DEC	2 years	Multiple state agencies, regional entities, counties, municipalities, CBOs

Enabling strategy – LU-1: Guide Future Growth
Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Extend eligibility for smart growth-related planning and implementation grants to regional planning councils and, where appropriate, qualified community-based organizations.	DOS/DEC	2 years	
Evaluate opportunities through the use and potential expansion of General Municipal Law Section 239 County Review to further empower counties to implement shared regional smart growth priorities throughout metropolitan and micropolitan statistical areas in municipal planning, zoning and subdivision proposals	DOS	1-3 years	Counties and local governments
Work with the Industrial Development Agencies in each region to proliferate tax incentive policies in their Uniform Tax Exemption policies to incentivize infill and downtown redevelopment	DOS	5-10 years	IDAs

Enabling strategy – LU-1: Guide Future Growth
Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Expanding access to public transportation through Transit-Oriented Development (TOD) will have positive impacts for lower-income households and disadvantaged communities by addressing the spatial mismatches • **Establish brownfields/BOAs and disadvantaged communities (as defined by the CJWG and CAC) as Priority Growth Areas** to bring planning/zoning resources and smart, sustainable, equitable projects to these communities. • **Emphasize mixed-income/affordable housing in the smart growth formula** to de-concentrate poverty and address displacement and gentrification. • **Smart Growth planning may also open the door to shared equity/ownership opportunities**—e.g., community land trusts, deed-restricted ownership, owner-/community-operated businesses—which build community wealth, increase homeownership, address displacement/gentrification and reduce the concentration of poverty in disadvantaged communities.
Health and other co-benefits	Any reduction in VMT/transportation-based GHG emissions will improve air quality and help reduce the incidence of disease caused or exacerbated by air pollution, particularly in disadvantaged communities and communities of color. Co-benefits include, but are not limited to: • **Greater physical activity**, which improves physical well-being and reduces chronic disease • **More opportunities for social interaction for** improved mental health • **Enhanced access to health care** facilities that have become more dispersed and distributed • **Access to services** through walkable, bikeable and transit-friendly infrastructure • **Greater access and proximity to fresh, nutritious food**, local food production and distribution • **Accessible to transit** and other public transportation options.
Just transition: businesses and industries, workers	Smart Growth has generated economic development, business attraction and job creation benefits to communities throughout the State. Additionally, smart growth land use patterns attend to the spatial mismatch between jobs and housing, particularly for lower-income households who spend a disproportionate amount of their time and income commuting. "Locations with housing and transportation options, a mix of uses close together, and a high quality of life can improve environmental outcomes while providing economic advantages for businesses…" *- Smart Growth and Economic Success: The Business Case, EPA Office of Sustainable Communities, 2013*

Enabling strategy – LU-2: Empower Local Government to Achieve Smart Growth - Overview

Description:	**Empower Local Government to Achieve Smart Growth Planning and Development.** Provide direct planning and zoning assistance to local communities. Promote municipal implementation of mitigation strategies through enhanced technical assistance, increased support for local adoption of zoning and land use regulation consistent with smart growth principles and local policies that support sustainable, equitable development and the accelerated expansion of local clean energy through a streamlined "Plan-to-Zone" initiative
Action type:	Existing program expansion and investment, new technical assistance tools, state and local policy changes
Cost and funding considerations	$$- Some resources for successful implementation already exist; new state and local government funds will be needed for some components.
Ease of implementation:	Easy – strategy can build off existing New York State programs
Example case studies:	Tug Hill Commission's Mini-Comp Plan Program, Allegany County's Comp Planning School, Tompkins Co. CNY Regional Planning and Development Board's Vision, Tug Hill Commission's Mini-Comp Plan Program, University of Buffalo's Regional Institute's One Region Forward Initiative

Risks / Barriers to success	Possible mitigants
Some may interpret "expedited" or "streamlined" planning/zoning as a curtailment of public input and engagement. Basic or mini/bare-bones comp plans may be viewed as not detailed or thorough enough.	Require that funded comp plans contain robust public input and engagement and meet the threshold legal standard for a comp plan that can be used as the basis for subsequent zoning and other land use ordinances.

Enabling strategy – LU-2: Empower Local Government to Achieve Smart Growth - Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Create or expand smart growth grant programs to assist municipalities in the efficient development of comprehensive plans, district/corridor plans and zoning ordinances, including form-based codes, that adhere to clear State goals and outcomes; include priority considerations for disadvantaged and rural communities with less capacity/staff.	DOS	< 1 year – current pilot program	Regional entities and local governments
Define base criteria for comprehensive plans, including extensive community outreach and engagement, that would comport with case law; ensure that plans adhere to clear State goals and outcomes.	DOS	2 years	Partnering state agency legal staff
Provide centralized necessary baseline data for municipalities to access and use in developing plans, including data on affordability, poverty and public health.	DOS	2-3 years	Partnering state agencies

Enabling strategy – LU-2: Empower Local Government to Achieve Smart Growth - Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Develop model local laws to assist municipalities of various sizes and capacities to implement smart growth plans and zoning ordinances, including model inclusionary zoning ordinances to address gentrification, displacement the concentration of poverty.	DOS/DEC	2-3 years	Local governments, academia, and partnering state agency legal staff
Expand the roles and responsibilities of DOS Smart Growth planning, NYSERDA Clean Energy Communities (CEC) Regional Coordinators and DEC Climate Leadership Regional Coordinators to provide smart growth planning and zoning technical assistance and capacity-building to municipalities, which would include the integration of land use, transportation and housing planning and projects.	DOS/NYSERDA/DEC	1-2 years	Regional entities and local governments
Support community-based planning to inform redevelopment of obsolete power plant sites and brownfields, particularly through NYSERDA's Power Plant Re-use initiative, in furtherance of the principles developed by the CLCPA Just Transition Working Group.	NYSERDA/DOS	1-2 years	Municipalities

Enabling initiative – LU-2: Empower Local Government to Achieve Smart Growth Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Explore opportunities to address displacement, gentrification, the concentration of poverty, segregation, and inequitable access to opportunity by providing assistance and resources for community land trusts, land banks, inclusive zoning that promotes mixed-income, affordable, rental and supportive housing and shared/community-centered ownership models.	DOS and other state agencies	< 1 year	HCR, ESD and other state agencies, Universities, NGOs and local governments

Enabling strategy – LU-2: Empower Local Government to Achieve Smart Growth - Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Provide grant funding to support community-based organizations to develop local land use plans for disadvantaged communities that can inform and guide development to reduce emissions, adapt to climate change, and achieve a just transition. Examples of such plans include UPROSE's Green Resilient Industrial District (GRID), El Puente's Green Light District, THE POINT CDC's South Bronx Community Resiliency Agenda, and PUSH Buffalo's PUSH GREEN / PUSH BLUE	DOS	1 year	Community-based not-for-profits
Evaluate options such as financial and technical incentives to support development of GEISs for local smart growth overlay zoning (preferably in priority development areas such as TODs), including early and comprehensive community engagement. Consider a State established revolving grant fund to support the GEISs, with a pay-back by the developer if they develop projects consistent with the zoning.	DOS	1-3 years	DEC/Regional Entities/Local Gov'ts/Private Developers/IDAs/Environmental Justice Community

Enabling initiative – LU-2: Empower Local Government to Achieve Smart Growth Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Expanding access to public transportation through Transit-Oriented Development (TOD) will have positive impacts for lower-income households and disadvantaged communities by addressing the spatial mismatches between lower-income households and the jobs they commute to. • **Establish brownfields/BOAs and disadvantaged communities (as defined by the CJWG and CAC) as Priority Growth Areas** to bring planning/zoning resources and smart, sustainable, equitable projects to these communities. • **Emphasize mixed-income/affordable housing in the smart growth formula** to de-concentrate poverty and address displacement and gentrification. • **Smart Growth planning may also open the door to shared equity/ownership opportunities**—e.g., community land trusts, deed-restricted ownership, owner-/community-operated businesses—which build community wealth, increase homeownership, address displacement/gentrification and reduce the concentration of poverty in disadvantaged communities. • **New shared equity/ownership opportunities**—e.g., community land trusts, deed-restricted ownership, owner-/community-operated businesses—which build community wealth, increase homeownership, address displacement/gentrification and reduce the concentration of poverty in disadvantaged communities.
Health and other co-benefits	Any reduction in VMT/transportation-based GHG emissions will improve air quality and help reduce the incidence of disease caused or exacerbated by air pollution, particularly in disadvantaged communities and communities of color. Co-benefits include, but are not limited to: • **Greater physical activity**, which improves physical well-being and reduces chronic disease • **More opportunities for social interaction** for improved mental health • **Enhanced access to health care** facilities that have become more dispersed and distributed • **Access to services** through walkable, bikeable and transit-friendly infrastructure • **Greater access and proximity to fresh, nutritious food**, local food production and distribution • **Accessible to transit** and other public transportation options.
Just transition: businesses and industries, workers	Smart Growth has generated economic development, business attraction and job creation benefits to communities throughout the State. Additionally, smart growth land use patterns attend to the spatial mismatch between jobs and housing, particularly for lower-income households who spend a disproportionate amount of their time and income commuting. "Locations with housing and transportation options, a mix of uses close together, and a high quality of life can improve environmental outcomes while providing economic advantages for businesses…" - *Smart Growth and Economic Success: The Business Case, EPA Office of Sustainable Communities, 2013*

Enabling strategy – LU-3: Enable Equitable Smart Growth Projects - Overview

Description:	**Enhance Resources to Enable Equitable Smart Growth Projects** Provide local government with the necessary tools and resources to guide, enable and inform the process of achieving equitable smart growth projects such as TOD, mixed-income/affordable housing, downtown, village and hamlet centers, and infill development.
Action type:	Programmatic and regulatory
Cost and funding considerations:	$ - total cost and most resources for successful implementation are already on hand. State and local government funds and public, private, and other sources
Ease of implementation:	Medium
Example case studies:	New Rochelle Downtown Overlay Zone, Westbury TOD Zone, Cambridge MA Affordable Housing Overlay

Risks / Barriers to success	Possible mitigants
Must address concerns, particularly in distressed, disadvantaged communities, that expediting a development process will deny or decrease opportunities for community input.	Require extensive and early public outreach, education and engagement, possibly through a pre-filing "uber-scoping" requirement as a pre-condition to funding or permitting; develop training materials—including graphics, scenario analyses, maps and other visuals—to assist developers in effective outreach and engagement.

Enabling strategy – LU-3: Enable Equitable Smart Growth Projects - Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Develop a Sustainable Development/Climate Act Resource Guidebook to serve as a resource to assist regional entities, counties, municipalities, developers in navigating, accessing and integrating of state programs relative to sustainable community development and clean energy development. Improve accessibility and ease coordination across programs.	DOS	1-2 years	Granting state agencies
Provide model outreach materials and other tools and guidance to support pre-development community outreach, engagement and education for smart growth projects in order to generate support, awareness and buy-in prior to a developer filing the project with a municipal board. Coordinate with community-based organizations, local government officials, universities and others, as needed.	DEC/DOS/DOT	2-3 years	Regional Entities/Local Gov'ts/Private Developers/IDAs/CBOs/Universities/Environmental Justice Community/Affected State Agencies

Enabling strategy – LU-3: Enable Equitable Smart Growth Projects - Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Include all state funding programs in the annual Consolidated Funding Application to the extent practicable and provide a centralized source of information on all state funding opportunities for municipalities and not-for-profits.	ESD/affected agencies	1 year	Municipalities, not-for-profits
Investigate creating an expedited local review of supportive housing or affordable housing where at least 20% is affordable at 80% AMI or below.	HCR, OTDA, DOS	1-3 years	Local governments
Build on existing state data portals such as NYSERDA's Climate Science Clearinghouse and DOS's GIS Gateway, and DEC EJ mapping to provide a centralized, user-friendly digital repository of data resources useful to regional/county/local planners in the development of smart growth land use plans, zoning codes and projects—including data on affordability and other equity matters, disadvantaged communities, climate change projections and cumulative health impacts. This should be framed as a one-stop-shop to consolidate data and planning tools related to climate change mitigation and adaptation, disaster risk reduction, and regional and local land use planning and clean energy siting.	DOS/NYSERDA	2-3 years	Other state agencies, regional entities and local governments

Enabling strategy – LU-3: Enable Equitable Smart Growth Projects - Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Provide model zoning and site plan review ordinances that accommodate a variety of densities and uses for localities as a baseline. Such an ordinance should also make available siting for supportive housing, group homes, homeless shelters, multi-family housing, accessory dwelling units, and other affordable housing.	DOS, HCR, OTDA	1-2 years	Local governments

Enabling strategy – LU-3:Enable Equitable Smart Growth Projects – Benefits and Impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Expanding access to public transportation through Transit-Oriented Development (TOD) will have positive impacts for lower-income households and disadvantaged communities by addressing the spatial mismatches • **Establish brownfields/BOAs and disadvantaged communities (as defined by the CJWG and CAC) as Priority Growth Areas** to bring planning/zoning resources and smart, sustainable, equitable projects to these communities. • **Emphasize mixed-income/affordable housing in the smart growth formula** to de-concentrate poverty and address displacement and gentrification. • **Smart Growth planning may also open the door to shared equity/ownership opportunities**—e.g., community land trusts, deed-restricted ownership, owner-/community-operated businesses—which build community wealth, increase homeownership, address displacement/gentrification and reduce the concentration of poverty in disadvantaged communities.
Health and other co-benefits	Any reduction in VMT/transportation-based GHG emissions will improve air quality and help reduce the incidence of disease caused or exacerbated by air pollution, particularly in disadvantaged communities and communities of color. Co-benefits include, but are not limited to: • **Greater physical activity**, which improves physical well-being and reduces chronic disease • **More opportunities for social interaction** for improved mental health • **Enhanced access to health care** facilities that have become more dispersed and distributed. • **Access to services** through walkable, bikeable and transit-friendly infrastructure • **Greater access and proximity to fresh, nutritious food**, local food production and distribution • **Accessible to transit** and other public transportation options.
Just transition: businesses and industries, workers	Smart Growth has generated economic development, business attraction and job creation benefits to communities throughout the State. Additionally, smart growth land use patterns attend to the spatial mismatch between jobs and housing, particularly for lower-income households who spend a disproportionate amount of their time and income commuting. "Locations with housing and transportation options, a mix of uses close together, and a high quality of life can improve environmental outcomes while providing economic advantages for businesses…" - *Smart Growth and Economic Success: The Business Case, EPA Office of Sustainable Communities, 2013*

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Enabling strategy – LU-4: State Priorities Overview

Description:	**Align State Funding Priorities** Prioritize smart growth, equity, and sustainability in all relevant state funding, including new infrastructure spending
Action type:	Programmatic and regulatory
Cost and funding considerations	$ - Some additional resources needed, but primarily recommends enhanced prioritization of existing funds.
Ease of implementation:	Medium - Strategy expands and strengthens existing state programs
Example case studies:	Genesee County's Smart Growth Plan/Ordinance; New York State Smart Growth Infrastructure Policy Act

Risks / Barriers to success	Possible mitigants
Could be viewed as Must address concerns, both in well-resourced and distressed, disadvantaged communities, that expediting a development process could potentially decrease opportunities for community input.	Public education for greater understanding of need to target spending; support for local and regional planning that is consistent with smart growth principles.

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Enabling strategy – LU-4: State Priorities
Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Review and refine the 11 Smart Growth criteria in the State Smart Growth Infrastructure Policy Act to more accurately identify new smart growth-and sprawl-inducing infrastructure projects and to align those criteria more directly with the CLCPA, including an emphasis on equity and affordability. Include definitions of priority development areas and priority conservation areas. Extend applicability of the Act to all state agencies and authorities and all relevant state programs, including planning and design grants (not just infrastructure).	Legislature/DOS	< 1 year	DOT and affected state agencies
Incentivize Smart Growth-inducing infrastructure by providing priority funding for infrastructure projects that score above a certain threshold in Smart Growth review, particularly those in Priority Development Areas; include definitions of Priority Development Areas and Priority Conservation Areas in the State Infrastructure Act.	Granting State Agencies	1-2 years	
Assess as-of-right funding programs to ensure alignment with new objectives to prioritize smart growth and restrict expansion of sprawl inducing infrastructure and develop updated Smart Growth threshold criteria to be considered for use in scoring State infrastructure grant proposals.	DOS/DOT	1-3 years	Affected State Agencies

Enabling strategy – LU-4: State Priorities
Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Provide regular funding for RESTORE NY and DEC's Environmental Restoration Program to ensure dependable availability of support for the restoration of distressed, vacant, abandoned, contaminated and/or brownfield areas	ESD/DEC/DOS	1 year	Municipalities
Expand and enforce the "priority and preference" provision in the BOA statute to include other relevant grants beyond those already identified in statute.	DOS/DEC	2 years	Regional entities and local governments

Enabling strategy – LU-4: State Priorities Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Expanding access to public transportation through Transit-Oriented Development (TOD) will have positive impacts for lower-income households and disadvantaged communities by addressing the spatial mismatches • **Establish brownfields/BOAs and disadvantaged communities (as defined by the CJWG and CAC) as Priority Growth Areas** to bring planning/zoning resources and smart, sustainable, equitable projects to these communities. • **Emphasize mixed-income/affordable housing in the smart growth formula** to de-concentrate poverty and address displacement and gentrification. • **Smart Growth planning may also open the door to shared equity/ownership opportunities**—e.g., community land trusts, deed-restricted ownership, owner-/community-operated businesses—which build community wealth, increase homeownership, address displacement/gentrification and reduce the concentration of poverty in disadvantaged communities.
Health and other co-benefits	Any reduction in VMT/transportation-based GHG emissions will improve air quality and help reduce the incidence of disease caused or exacerbated by air pollution, particularly in disadvantaged communities and communities of color. Co-benefits include, but are not limited to: • **Greater physical activity**, which improves physical well-being and reduces chronic disease • **More opportunities for social interaction** for improved mental health outcomes • **Enhanced access to health care** facilities that have become more dispersed and distributed. • **Access to services** through walkable, bikeable and transit-friendly infrastructure • **Greater access and proximity to fresh, nutritious food**, local food production and distribution • **Accessible to transit** and other public transportation options.
Just transition: businesses and industries, workers	Smart Growth has generated economic development, business attraction and job creation benefits to communities throughout the State. Additionally, smart growth land use patterns attend to the spatial mismatch between jobs and housing, particularly for lower-income households who spend a disproportionate amount of their time and income commuting. "Locations with housing and transportation options, a mix of uses close together, and a high quality of life can improve environmental outcomes while providing economic advantages for businesses…" *- Smart Growth and Economic Success: The Business Case, EPA Office of Sustainable Communities, 2013*

Enabling strategy – LU-5: TOD Overview

Description:	**Facilitate and Accelerate Equitable Transit Oriented Development (TOD).** Accelerate mixed-use, mixed-income transit-oriented development around key transit hubs served by rail and bus.
Action type:	Programmatic/Legislative
Cost and funding considerations:	$$- funding from existing and new grants and tax credits; cost of structure parking more expensive
Ease of implementation:	Easy
Example case studies:	New Rochelle, Westbury, Wyandanch

Risks / Barriers to success	Possible mitigants
Rural communities may feel left out of the equation, given that some don't have population densities to support TOD. Housing in TODs is often expensive and could contribute to displacement/gentrification. In addition, existing authority for comprehensive planning and zoning rests overwhelmingly with cities, towns, and villages individually. While the General Municipal Law provides for a role for counties in certain instances, the application is quite limited.	Upstate transit agencies and communities coordinate to accommodate rural transit needs. Ensure that housing affordability is included in planning, incentives and other support for TOD.

Enabling strategy – LU-5: TOD
Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Support municipal equitable TOD plans and zoning, including form-based codes, through a grant program and guidance and technical assistance (including model local laws); promote equity tools and models, such as community land trusts, land banks, inclusionary zoning and shared/community-centered ownership and equity models, to address displacement, gentrification and the concentration of poverty; and require communities with commuter rail stations to have an adopted TOD plan that meets state criteria in order to be eligible for supportive state TOD resources, with due consideration for smaller rail stations that may not have a full TOD or TOD plan.	DOS/DOT	1 year	Municipal/regional planners, transit entities
Amend the State Smart Growth Public Infrastructure Policy Act to more effectively direct state resources to projects that advance TOD; add a definition of, and criteria for, TOD that includes rail and bus and the particular transit needs of rural areas; extend applicability of the Act to all state agencies and authorities and all relevant state programs, including planning and design grants (not just infrastructure).	Legislature/DOS	1 year	Affected agencies
Explore enhanced subsidies for TOD projects, especially those that include a meaningful threshold level of affordable housing and incorporate tools and measures such as community land trusts, land banks, inclusionary zoning and shared/community-centered ownership models—include the TOD State Housing Goal in HCR's 9% Low-Income Housing Tax Credit program in all relevant state solicitations; consider other opportunities for tax credits for projects in TOD areas that are consistent with an adopted TOD plans and meet state criteria for equity and affordability, such as an additional "bump up" of Brownfield Cleanup Program tax credits in designated BOAs that are also TODs.	DOS/HCR	1 year	Municipalities/affected agencies

Enabling strategy – LU-5: TOD
Components of the strategy

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Fund and support GEISs to streamline the review process in TODs; create a revolving fund for municipalities to undertake GEISs for TOD zoning and projects—if a developer agrees to build according to the TOD zoning and accepts certain community benefits components, such as affordable housing, green infrastructure, green building or public spaces, the developer will pay back into the fund a portion of the cost of the GEIS; consider using TIFs for this purpose.	DOS	1 year	Municipal planners/ transit entities
Explore opportunities to support and incentivize lower municipal parking minimums and/or parking maximums in consideration of decreased household need, given proximity and accessible of transit.	DOS	2 years	Municipalities, MPOs, affected agencies
Facilitate appropriate structured parking to support a desired TOD density—explore opportunities to defray the cost of structured parking in conjunction with TOD development, such as state funding, low-cost financing, and tax credits; develop best practices for design and construction of structured parking that integrates ground-level retail and that is may be retrofitted for other uses should the demand for parking decline in the future.	Transit authorities/state agencies	1 year	Municipalities
Encourage municipalities to notify the relevant transit entity of planning, zoning and projects that will impact transit ridership and parking needs to allow transit agencies an early opportunity to offer input on such potential impacts.	DOS/DOT/DEC/ESD	1 year	MPOs, Municipalities/ transit entities

Enabling strategy – LU-5: TOD
Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Expanding access to public transportation through Transit-Oriented Development (TOD) will have positive impacts for lower-income households and disadvantaged communities by addressing the spatial mismatches between jobs and housing, which often forces lower-income households to spend more time and income on transportation and commuting. Equitable TOD presents an ideal opportunity for affordable, mixed-income housing. Other benefits include: • **The emphasis on mixed-income/affordable housing helps** de-concentrate poverty and avoid or reduce displacement and gentrification. • **Smart Growth development such as TOD may also open the door to shared equity/ownership opportunities**—e.g., community land trusts, deed-restricted ownership, owner-/community-operated businesses—which builds community wealth, increases homeownership, addresses displacement/gentrification and reduce the concentration of poverty in disadvantaged communities.
Health and other co-benefits	TOD is the most energy-efficient form of smart growth in terms of VMT reductions and increased transit use. The reduction in VMT/transportation-based GHG emissions will improve air quality and help reduce the incidence of disease caused or exacerbated by air pollution, particularly in disadvantaged communities and communities of color. Co-benefits include, but are not limited to: • **Greater physical activity** through walkable, bikeable streetscapes and reduced automobile use, which improves physical well-being and reduces chronic disease . • **More opportunities for social interaction** for improved mental health • **Enhanced access to community health care** facilities that have become more dispersed and distributed. • **Access to services** through walkable, bikeable and transit-friendly infrastructure • **Greater access and proximity to fresh, nutritious, local food**, which addresses food deserts, particularly in lower-income neighborhoods. • **Accessibility to transit** and other public transportation options. • **Reduced urban heat island effect**, which disproportionately impacts disadvantaged communities.
Just transition: businesses and industries, workers	TOD has generated economic development, business attraction and job creation benefits to communities throughout the State; greater access to transit will help address the effects of job shifts to a clean energy economy, if planned smartly with job opportunities in mind. As discussed above, for example, TOD addresses the spatial mismatch between jobs and housing, particularly for lower-income households who spend a disproportionate amount of their time and income commuting. "Locations with housing and transportation options, a mix of uses close together, and a high quality of life can improve environmental outcomes while providing economic advantages for businesses…" *- Smart Growth and Economic Success: The Business Case, EPA Office of Sustainable Communities, 2013*

Clean Energy

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Clean Energy - Enabling strategy summary

Initiative #	Description	Action type	Ease of implementation	Cost
CE-1	Develop a statewide dashboard of community greenhouse gas emissions inventories to promote local climate action planning, monitor equity considerations, measure progress, and ensure data consistency at the county/municipality level.	Programmatic	Medium	Low
CE-2	Encourage local governments to demonstrate leadership in energy efficiency by developing model above-minimum energy conservation construction policies or adopting the NY Stretch Energy Code and promoting its adoption, enhanced code enforcement including streamlined permitting, third party inspections, and shared enforcement, and Property Assessed Clean Energy (PACE) financing.	Programmatic	Easy	Low

Clean Energy - Enabling strategy summary

Initiative #	Description	Action type	Ease of implementation	Cost
CE-3	Establish statewide policies that require consistent advancement on building decarbonization by adopting a highly efficient State Energy Code aligned with CLCPA goals as soon as possible, establishing energy benchmarking and performance standards for buildings, and creating innovative public benefit financing mechanisms.	Legislative	Hard	Medium
CE-4	Facilitate clean energy siting through planning support and the development and promotion of model local laws, streamlined permitting, and local development regulations that clearly identify appropriate as-of-right installation opportunities for different clean energy technology types, and clear requirements and reasonable processes for installations that are not as-of-right.	Programmatic	Medium	Medium

Clean Energy - Enabling strategy summary

Initiative #	Description	Action type	Ease of implementation	Cost
CE-5	Connect homes, businesses, and community institutions with clean energy products, services, and job opportunities through Community Choice Aggregation programs, microgrids, district systems, workforce development initiatives, and community-scale campaigns to encourage adoption of new, innovative technologies to generate value and savings for consumers in an equitable manner.	Programmatic	Medium	Low
CE-6	Continue and expand state program opportunities, incentives, technical assistance, and centralized procurement services to motivate local governments and related public entities to improve assets they control with high-impact actions such as LED lighting, energy efficiency upgrades, heat pump projects, methane recovery for energy production from wastewater treatment and landfills, solar on municipal premises, and municipal and school district fleet electrification.	Programmatic	Medium	Medium

Enabling strategy – CE-1: Community Dashboard Overview

Description:	Develop a statewide dashboard of community greenhouse gas emissions inventories to promote local climate action planning, monitor equity considerations, measure progress, and ensure data consistency at the county/municipality level.
Action type:	Programmatic; Regulatory
Cost and funding considerations:	Low
Ease of implementation:	Medium
Example case studies:	Utility Energy Registry (UER); NREL State and Local Planning for Energy (SLOPE) Platform; ICLEI Clear Path

Risks / Barriers to success	Possible mitigants
• Not all required data (i.e. fuel oil, gasoline, and diesel consumption, as well as vehicle miles travelled (VMT) and fuel mix) is currently reported at the county, city, town, and village level. • Dashboard must be easy to use and provide good, actionable information that local government officials, municipal staff, and community stakeholders can use to inform decision-making at the local level.	• Establish aggregated data reporting requirements for suppliers of fuels in a similar way to how the NYS Public Service Commission (PSC) requires electricity and natural gas consumption data reported by utilities (see PSC "Order Adopting the Utility Energy Registry" in CASE 17-M-0315 issued April 20, 2018). • Include data on energy production and clean energy actions. • Explore methods for estimating GHG of transportation at the county, city, town, and village level.

Enabling strategy – CE-1: Community Dashboard Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	• Track progress toward meeting clean energy goals at the community level, including in disadvantaged communities. • Assist in targeting state resources to achieve benefits in disadvantaged communities.
Health and other co-benefits	• Dashboard provides data that can help manage local sources of air pollution.
Just transition: businesses and industries, workers	• Clean energy investments can create jobs and attract businesses establishments while saving energy and money that can be reinvested locally. There are an estimated 164,000 clean energy jobs across New York State including energy efficiency, renewable energy, grid modernization and storage, renewable fuels, and alternative transportation. These jobs are in installation, maintenance and repair, sales and distribution, manufacturing, and professional services.
Other	

Enabling strategy –CE-1: Community Dashboard Components for delivery

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Establish a Community GHG Working Group consisting of state agencies, academic institutions, consultants, and regional and municipal officials. Activities of the group include the following: • Review existing guidance including ICLEI's U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (ICLEI Community Protocol) to identify methods. • Work with state agencies, MPOs, utilities, and other stakeholders to identify and secure New York-specific data needed to complete the emission inventories. • Develop standard GHG inventory reporting formats for regional and local community inventories.	NYSERDA	2 years	MPOs, utilities academic institutions, consultants, state agencies, and regional and municipal officials.
Launch and maintain the dashboard, ensuring it is accessible to all communities	NYSERDA	1 year	Community stakeholders

Enabling strategy – CE-2: Local Policies Overview

Description:	Encourage local governments to demonstrate leadership in energy efficiency by developing model above-minimum energy conservation construction policies or adopting the NY Stretch Energy Code and promoting its adoption, enhanced code enforcement including streamlined permitting, third party inspections, and shared enforcement, and Property Assessed Clean Energy (PACE) financing.
Action type:	Programmatic
Cost and funding considerations:	Low
Ease of implementation:	Easy
Example case studies:	Clean Energy Communities; Climate Smart Communities; NYStretch Energy Code

Risks / Barriers to success	Possible mitigants
• Many local governments, especially small, resource-constrained communities, struggle with tight budgets and limited staff capacity which limits their ability to take local climate actions.	• State programs like Clean Energy Communities and Climate Smart Communities that offer clear guidance, grants, technical assistance, and recognition can motivate communities to take local climate action and demonstrate climate leadership with a focus on equity.

Enabling strategy –CE-2: Local Policies Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	• Programs designed to encourage local climate action should include rules that focus the benefits of clean energy investments in disadvantaged communities.
Health and other co-benefits	• Local climate actions often reduce local sources of air pollution including combustion fuels used for heating and transportation.
Just transition: businesses and industries, workers	• Clean energy investments can create jobs and attract businesses establishments while saving energy and money that can be reinvested locally. There are an estimated 164,000 clean energy jobs across New York State including energy efficiency, renewable energy, grid modernization and storage, renewable fuels, and alternative transportation. These jobs are in installation, maintenance and repair, sales and distribution, manufacturing, and professional services.

Enabling strategy – CE-2: Local Policies
Components for delivery

Components required for delivery *(Brief description of action required)*	**Implementation lead**	**Time to implement**	**Other key stakeholders**
Utilize the Clean Energy Communities and Climate Smart Communities programs to encourage local climate action	NYSERDA; DEC	2 years	Counties, Cities, Towns, and Villages
Continue and expand NYPA Clean Energy Services to reach more communities	NYPA	2 years	Counties, Cities, Towns, and Villages
Expand the Regional Coordinator Network to enhance and strengthen assistance to local governments and related entities across a range of climate actions and increase support to small, resource-constrained, and underserved communities.	NYSERDA; DEC	2 years	Regional Planning Boards

Enabling strategy – CE-3: Statewide Policies
Overview

Description:	Establish statewide policies that require consistent advancement on building decarbonization by adopting a highly efficient State Energy Code aligned with CLCPA goals as soon as possible, establishing energy benchmarking and performance standards for buildings, and creating innovative public benefit financing mechanisms.
Action type:	Legislation
Cost and funding considerations:	Medium
Ease of implementation:	Hard
Example case studies:	New Efficiency: New York report; NYC Local Law 97

Risks / Barriers to success	**Possible mitigants**
• Local governments often have limited capacity to adopt and enforce regulations and are often leery of taking on initiatives that may place them at what they perceive to be a competitive disadvantage to other communities in their region.	• Rather than a patchwork of different rules and opportunities in different communities, adopt statewide policies that apply evenly across the board.

Enabling strategy – CE-3: Statewide Policies
Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	• Regulations may be applied to focus the benefits of clean energy investments in disadvantaged communities.
Health and other co-benefits	• Regulations are designed to reduce local sources of air pollution including combustion fuels used for heating and transportation.
Just transition: businesses and industries, workers	• Clean energy investments can create jobs and attract businesses establishments while saving energy and money that can be reinvested locally. There are an estimated 164,000 clean energy jobs across New York State including energy efficiency, renewable energy, grid modernization and storage, renewable fuels, and alternative transportation. These jobs are in installation, maintenance and repair, sales and distribution, manufacturing, and professional services.
Other	

Enabling strategy –CE-3: Statewide Policies
Components for delivery

Components required for delivery *(Brief description of action required)*	**Implementation lead**	**Time to implement**	**Other key stakeholders**
Establish energy benchmarking and performance standards for buildings through state legislation	Legislature	2 years	AG
Establish targets for the Energy Code to align with CLCPA goals.	Legislature	2 years	
Revise the Energy Law relating to the Energy Code to extend the consideration of a 10-year cost effectiveness period to allow for assessment over a longer time horizon, potentially the equipment lifecycle or be based on secondary or societal effects, such as reductions in carbon emissions.	Legislature	2 years	
Provide funding for administrative costs of code updates incurred by local governments and state agencies, including enforcement, purchase of codes books, guidance documents, and training for stakeholders.	DOS, NYSERDA	2 years	
Consider programs to offer municipal based financing for required decarbonization building improvements based on clean water financing model.	tbd	5 years	

Enabling strategy – CE-4: Planning Support Overview

Description:	Facilitate and promote deployment of clean energy to expand equitable access, maximize local economic benefit and resiliency, and minimize environmental impacts through planning support, provision model local laws, streamlined permitting, and local development regulations that clearly identify appropriate as-of-right installation opportunities for different clean energy technology types, and clear requirements and reasonable processes for installations that are not as-of-right.
Action type:	Programmatic
Cost and funding considerations:	Medium
Ease of implementation:	Medium
Example case studies:	Clean Energy Communities; SolSmart; Scenic Hudson's Solar Mapping Tool

Risks / Barriers to success	Possible mitigants
• Local governments often have limited capacity to anticipate and plan for solar and energy storage development in their communities	• State programs like Clean Energy Communities and Climate Smart Communities that offer clear guidance, grants, technical assistance, and recognition can motivate communities to adopt appropriate siting policies at the local level.

Enabling strategy –CE-4: Planning Support Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	• Regulations may be applied to focus the benefits of clean energy investments in disadvantaged communities.
Health and other co-benefits	• Regulations are designed to reduce local sources of air pollution including combustion fuels used for heating and transportation.
Just transition: businesses and industries, workers	• Clean energy investments can create jobs and attract businesses establishments while saving energy and money that can be reinvested locally. There are an estimated 164,000 clean energy jobs across New York State including energy efficiency, renewable energy, grid modernization and storage, renewable fuels, and alternative transportation. These jobs are in installation, maintenance and repair, sales and distribution, manufacturing, and professional services.

Enabling strategy – CE-4: Planning Support Components for delivery

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Develop and promote model local laws and development regulations.	NYSERDA	<1 year	Community Stakeholders, Solar Industry
Promote adoption of the NYS Solar Permit and other local actions to streamline the permitting process for clean energy technologies including energy storage at a variety of scales.	NYSERDA	<1 year	Code Enforcement Officers
Develop tools and resources including mapping to help municipalities undertake a comprehensive evaluation of the potential for clean energy development in their communities and plan pro-actively for deployment that maximizes local benefit and minimizes impact on lands with high-quality soils and other competing uses.	NYSERDA	2 years	Community Stakeholders, Agriculture and Forestry; Solar Industry; Utilities
Provide technical and financial support to help local governments plan for and review solar projects.	NYSERDA	2 years	Regional Planning Boards

Enabling strategy – CE-5: Community Initiatives Overview

Description:	Connect homes, businesses, and community institutions with clean energy products, services, and job opportunities through Community Choice Aggregation programs, microgrids, district systems, workforce development initiatives, and community-scale campaigns to encourage adoption of new, innovative technologies to generate value and savings for consumers in an equitable manner.
Action type:	Programmatic
Cost and funding considerations:	Low
Ease of implementation:	Medium
Example case studies:	Sustainable Westchester; Solarize; Heatsmart Tompkins

Risks / Barriers to success	Possible mitigants
• Local governments often have limited capacity to adopt and implement complex clean energy policies. • Job training in the clean energy field does not always lead to job placement.	• State programs like Clean Energy Communities and Climate Smart Communities that offer clear guidance, grants, technical assistance, and recognition can motivate communities to adopt appropriate siting policies at the local level. • Workforce Development programs that focus on job placement.

Enabling strategy – CE-5: Community Initiatives Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	• Potential to reduce the energy burden in disadvantaged communities by reducing household energy costs. • Help create jobs and drive investment in disadvantaged communities.
Health and other co-benefits	• Reduce local sources of air pollution including combustion fuels used for heating and transportation.
Just transition: businesses and industries, workers	• Clean energy investments can create jobs and attract businesses establishments while saving energy and money that can be reinvested locally. There are an estimated 164,000 clean energy jobs across New York State including energy efficiency, renewable energy, grid modernization and storage, renewable fuels, and alternative transportation. These jobs are in installation, maintenance and repair, sales and distribution, manufacturing, and professional services.

Enabling strategy – CE-5: Community Initiatives Components for delivery

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Continue to encourage development of Community Choices Aggregation (CCA) programs where communities choose 100% renewable energy as the default supply, and where participants are automatically enrolled in Community Distributed Generation (CDG).	NYSERDA	1 year	Community Stakeholders; CCA Administrators; ESCOs
Enable county governments to authorize and form CCA programs with local opt-out.	DPS	1 year	Local Governments; Community Stakeholders
Promote community-scale campaigns to encourage adoption of new, innovative technologies to generate value and savings for consumers.	NYSERDA	1 year	Community Stakeholders
Expand workforce development programs focused on training and job placement in clean energy and emerging technologies.	NYSERDA	2 years	Unions; Clean Energy Industries
Enable the development of microgrids (municipal, schools and private) and district clean energy systems.	NYSERDA	10 years	Utilities; Campuses

Enabling strategy – CE-6: Local Assets Overview

Description:	Continue and expand state program opportunities, incentives, technical assistance, and centralized procurement services to motivate local governments and related public entities to improve assets they control with high-impact actions such as LED lighting, energy efficiency upgrades, heat pump projects, methane recovery for energy production from wastewater treatment and landfills, solar on municipal premises, and municipal and school district fleet electrification.
Action type:	Programmatic
Cost and funding considerations:	Medium
Ease of implementation:	Medium
Example case studies:	NYPA Clean Energy Solutions; Clean Energy Communities; Climate Smart Communities

Risks / Barriers to success	Possible mitigants
• Local governments often have limited financial resources and capacity to make improvements with the greatest potential impact. • Local government and related public entities could achieve greater savings if they worked through shared services models.	• State programs that offer clear guidance, grants, technical assistance, and recognition can motivate local governments and related public entities to improve the assets they control. • Create opportunities for communities like inter-municipal conference calls, planning institutes, work groups, or aggregations to provide a framework for communities to complete high-impact actions in mutually supportive cohorts.

Enabling strategy – CE-6: Local Assets Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	• Program can be designed to prioritize the improvement of energy consuming assets located in disadvantaged communities
Health and other co-benefits	• Projects may reduce local sources of air pollution including combustion fuels used for heating and transportation.
Just transition: businesses and industries, workers	• Clean energy investments can create jobs and attract businesses establishments while saving energy and money that can be reinvested locally. There are an estimated 164,000 clean energy jobs across New York State including energy efficiency, renewable energy, grid modernization and storage, renewable fuels, and alternative transportation. These jobs are in installation, maintenance and repair, sales and distribution, manufacturing, and professional services.
Other	

Enabling strategy – CE-6: Local Assets
Components for delivery

Components required for delivery	Implementation lead	Time to implement	Other key stakeholders
Provide technical support to help local governments and related public entities develop and implement clean energy projects.	NYSERDA	1 year	Community Stakeholders
Evaluate options to reduce interconnection costs for municipal-owned priority sites.	NYSERDA	2 years	Solar Industry
Prioritize funding for projects that recover methane from wastewater treatment and landfills for energy production.	NYSERDA	5 years	Community Stakeholders
Develop tools and resources to help municipalities procure energy and enable direct purchases of energy by municipalities from the wholesale market.	NYSERDA; DPS	2 years	
Support electrification of municipal and school district fleets while increasing fleet-wide fuel economy.	NYSERDA; DEC	10 years	School Districts
Encourage local governments to track and report the energy use of municipal buildings and facilities (benchmarking).	NYSERDA	2 years	
Increase waste reduction and recycling rates in municipal operations and in the community.	DEC	10 years	Counties

Carbon Sequestration

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Carbon Sequestration - Mitigation strategy summary

Initiative #	Description	Action type	Emissions impact	Ease of implementation	Cost
CS-1	**FRESHWATER WETLANDS** Maintain and enhance the carbon sequestration potential of freshwater, non-tidal wetlands in New York State through protection, restoration, and monitoring.	Legislative and regulatory	Low	Medium	$-$$
CS-2	**BLUE CARBON** Maintain and enhance the carbon sequestration potential of "blue carbon" in New York State, including coastal and estuarine tidal wetlands, submerged aquatic vegetation, and other coastal habitats, through protection, restoration, and monitoring.	Legislative and regulatory	Low	Medium	$-$$

Mitigation strategy – CS-1: Freshwater Wetlands Overview

Description:	Maintain and enhance the carbon sequestration potential of freshwater, non-tidal wetlands in New York State through protection, restoration, and monitoring.		
Action type:	Legislative and regulatory		
GHG reduction by 2030:	Low	**GHG reduction by 2050:**	Low
Cost and funding considerations:	$-$$: agency staff, land acquisition, grants needed		
Ease of implementation:	Medium		
Example case studies:	See *State Wetland Protection: Status, Trends & Model Approaches* (Environmental Law Institute [ELI]); Pennsylvania's Wetlands Net Gain Strategy; NYC DEP's Land Acquisition Program		

Risks / Barriers to success	Possible mitigants
1.) potential opposition to increased regulation 2.) municipal resistance to land protection 3.) insufficient funding and staff 4.) competing interests (e.g., agriculture, renewable energy) 5.) policy differences in permitting agencies 6.) variable landowner interest in selling or easements	1.) stakeholder engagement, outreach, education 2.) reimbursement programs for lost municipal tax revenue 3.) new funding (e.g., environmental bond act) and partnerships 4.) prioritize and increase funding for NYS Open Space Plan acquisitions that support climate strategies 5.) cross-agency and cross-industry communication, coordination

Mitigation strategy – CS-1: Freshwater Wetlands Components of the strategy (p. 1 of 2)

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Improve and expand regulation of all freshwater, non-tidal wetlands and adjacent areas by fundamentally changing New York's statutory system for regulating these wetlands, including shifting wetland maps from regulatory to informational, and establishing jurisdictional boundaries through field delineation. Further improve implementation of the regulatory program by updating state regulations and developing internal and external guidance.	Legislature, DEC	5 years	DOS, APA
Ensure regulatory oversight for wetlands and waterbodies that were removed from federal protection under the 2020 promulgated "Navigable Waters Protection Rule." In addition, explore expanded use of Unusual Local Importance designation to restore oversight to a portion of the wetlands that lost protections under the Rule.	Legislature, DEC	3 to 5 years	DOS, ORES, DPS, OAG

Mitigation strategy – CS-1: Freshwater Wetlands Components of the strategy (p. 2 of 2)

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Develop regional permits (or specific Nationwide Permit 54 regional conditions) with Army Corps of Engineers (ACOE) to incentivize use of natural and nature-based features to enhance resilience and ecosystem benefits.	DOS, DEC, DOT	Unknown (depends in part on ACOE willingness)	ACOE
Increase NYS and other investment in the protection, restoration, and monitoring of freshwater, non-tidal wetlands and adjacent areas, including riparian areas, to maximize carbon sequestration potential (e.g., Environmental Bond Act and Environmental Protection Fund; grants programs like DEC Water Quality Improvement Program and NYS Conservation Partnership Program).	Legislature, DEC, DOS	10 years	OPRHP, conservation NGOs, counties, municipalities, land trusts, SWCDs

Mitigation strategy – CS-1: Freshwater Wetlands Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Improving wetland function provides natural areas for enjoyment, recreation, and education; helps to mitigate flooding risk by moderating storm water; and contributes to clean water through natural filtration. Need to assess potential negative impact of green gentrification.
Health and co-benefits	Healthy wetlands provide services that benefit people: flood mitigation, recreation (e.g., fishing, hunting, wildlife viewing), carbon sequestration, clean water. Exposure to nature provides physical and mental health benefits. Biodiversity is supported and contributes to mosquito control in healthy wetlands.
Just transition: businesses and industries, workers	Benefits include flood mitigation, reduced flood risk to communities and public infrastructure, improved guidance for regulatory compliance. Impacts include regulatory restrictions in wetlands and adjacent areas.
Other	Healthy, resilient fish and wildlife resources; open space for all New Yorkers; increased recreational opportunities in urban and suburban areas.

Mitigation strategy – CS-2: Blue Carbon Overview

Description:	Maintain and enhance the carbon sequestration potential of "blue carbon" in New York State, including coastal and estuarine tidal wetlands, submerged aquatic vegetation, and other coastal habitats, through protection, restoration, and monitoring.		
Action type:	Legislative and regulatory		
GHG reduction by 2030:	Low	**GHG reduction by 2050:**	Low
Cost and funding considerations:	$-$$: agency staff, land acquisition, grants needed		
Ease of implementation:	Medium		
Example case studies:	See *Where the Wetlands Are—And Where They Are Going: Legal and Policy Tools for Facilitating Coastal Ecosystem Migration in Response to Sea Level Rise* and *State Wetland Protection: Status, Trends & Model Approaches* (ELI)		

Risks / Barriers to success	Possible mitigants
1.) potential opposition to increased regulation 2.) municipal resistance to land protection 3.) insufficient funding and staff 4.) competing interests (e.g., waterfront development) 5.) policy differences in permitting agencies 6.) variable landowner interest in selling or easements	1.) stakeholder engagement, outreach, education 2.) reimbursement programs for lost municipal tax revenue 3.) new funding (e.g., environmental bond act) and partnerships 4.) prioritize and increase funding for NYS Open Space Plan acquisitions that support climate strategies 5.) cross-agency and cross-industry communication, coordination

Mitigation strategy – CS-2: Blue Carbon
Components of the strategy (p. 1 of 2)

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Improve and expand regulation of all tidal wetlands and adjacent areas, coastal habitats, and Coastal Erosion Hazard Areas that meet regulatory criteria. Further improve implementation of the regulatory program by developing internal and external guidance, and changes in law and regulation (e.g., review NYCRR Part 661 to consider measures for preventing conversion).	Legislature, DEC	5 years	DOS, APA
Develop regional permits (or specific Nationwide Permit 54 regional conditions) with Army Corps of Engineers (ACOE) to incentivize use of natural and nature-based features to enhance resilience and ecosystem benefits.	DOS, DEC, DOT	Unknown (depends in part on ACOE willingness)	ACOE

Mitigation strategy – CS-2: Blue Carbon
Components of the strategy (p. 2 of 2)

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Increase NYS and other investment in the protection, restoration, and monitoring of tidal wetlands and coastal habitats, including migration pathways and submerged aquatic vegetation (SAV), to maximize carbon sequestration potential (e.g., Environmental Bond Act and Environmental Protection Fund; grants programs like NYS Conservation Partnership Program).	Legislature, DEC, DOS	10 years	OPRHP, conservation NGOs, counties, municipalities, land trusts, SWCDs

Mitigation strategy – CS-2: Blue Carbon
Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Resilient coastal areas have greater protection against property damage in EJ communities from flooding and storm surge. Increased protection of waterfront areas to allow for tidal wetland migration provides public open space and enhanced access to recreation like fishing and wildlife viewing. Need to assess potential negative impact of green gentrification.
Health and co-benefits	Healthy wetlands and coastal habitats provide services that benefit people: flood mitigation, recreation (e.g., fishing, boating, wildlife viewing), carbon sequestration, clean water. Exposure to nature provides physical and mental health benefits. Biodiversity is supported.
Just transition: businesses and industries, workers	Benefits include flood mitigation, reduced flood risk to communities and public infrastructure, improved guidance for regulatory compliance. Impacts include regulatory restrictions along shorelines and coastal habitats.
Other	Healthy, resilient fish and wildlife resources; open space for all New Yorkers; increased recreational opportunities in urban and suburban areas.

Enabling strategy summary:
Mapping, Research, Planning, and Assistance

Initiative #	Description	Action type	Ease of implementation	Cost
CS-3	Maintain and enhance the carbon sequestration potential of natural areas in New York State, including wetlands, coastal habitats, forests, and grasslands through improved mapping (both regulatory and non-regulatory), research, conservation planning guidance, stewardship, and assistance for local governments and landowners.	Mapping, analysis, research, technical assistance, funding	Easy	$

Enabling strategy – CS-3: Mapping, Research, Planning, and Assistance - Overview

Description:	Maintain and enhance the carbon sequestration potential of natural areas in New York State, including wetlands, coastal habitats, forests, and grasslands through improved mapping (both regulatory and non-regulatory), research, conservation planning guidance, stewardship, and assistance for local governments and landowners.
Action type:	Mapping, analysis, research, technical assistance, funding
Cost and funding considerations:	$: staff to provide technical assistance and training; funding for small grants, research, mapping, analysis, development of implementation material and tools, stewardship initiatives
Ease of implementation:	Easy
Example case studies:	*Hudson River Estuary Wildlife and Habitat Conservation Framework*; OSI Climate Resilient Landscape Initiative; NYS Matrix Forests and Linkages; Tompkins County Unique Natural Areas, Conservation Plan and Strategy; LiDAR Enhanced Wetlands Mapping in New York City Watershed; Land Cover Mapping and Modeling Initiatives in Chesapeake Bay Watershed and Delaware River Basin, Object-based Wetland Mapping Approach for Pennsylvania; Hudson River Estuary Program's Conservation and Land Use Team; GulfCorps; Planting Westchester

Risks / Barriers to success	**Possible mitigants**
1.) resistance to mapping of resources for conservation or protection 2.) insufficient uptake and application of planning tools and approaches 3.) variable interests and goals of decision-makers (e.g., landowners, municipalities)	1.) new funding (e.g., environmental bond act) and partnerships 2.) education and outreach 3.) training and technical assistance for key decision-makers and stakeholders

Enabling strategy – CS-3: Mapping, Research, Planning, and Assistance - Components of the strategy (p. 1 of 4)

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Apply the best available technology to **update maps** of wetlands (regulated and unregulated; tidal and non-tidal); shallow water habitats; Significant Coastal Habitats; Coastal Erosion Hazard Areas; and priority forests and natural areas. Ensure all maps and inventories are accurate and publicly available, and schedule recurring updates using the best available technology. Replace Article 24 wetland maps with updated informational Article 24 wetland maps.	DEC	5 years	OPRHP, DOS, conservation NGOs, SWCDs, research partners, other state agencies
Develop **statewide conservation framework** that incorporates current, accurate spatial data on critical ecosystems (terrestrial and aquatic), including priority ecosystem complexes and future needs that address climate adaptation needs (e.g., landscape connectivity, wetland migration pathways, source water areas); and provides basis for prioritizing state funding, tax relief, land acquisition, and technical assistance programs to conserve priority natural areas and promote smart growth. Make publicly accessible and provide outreach and assistance to ensure appropriate and effective use of framework.	DEC	5 years	OPRHP, DOS, conservation NGOs (e.g., OSI), SWCDs, research partners, regional planning commissions, land trusts

Enabling strategy – CS-3: Mapping, Research, Planning, and Assistance - Components of the strategy (p. 2 of 4)

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Assist county and local governments to create **land-use policies, land conservation programs, and smart growth strategies** that prioritize and protect wetlands, forests, grasslands, stream buffers, and other natural areas (e.g., statewide authorization of Community Preservation Act [CPA]; training and support on use of CRRA model local laws, comprehensive planning language, zoning, and other conservation planning approaches; funding for CACs and EMCs; etc.) *	DOS, DEC, Legislature (CPA)	2-10 years	Regional and county planning commissions, counties, municipalities, conservation NGOs, SWCDs
Enhance and create **landowner incentives and other techniques** to conserve and restore tidal and non-tidal wetlands, forests, grasslands, and natural areas and utilize living shoreline and nature-based solutions (e.g., tax abatement programs; tax incentives; land conservation programs; payment for ecosystem services). *	Legislature	5 years	DOS, DEC, counties, municipalities, land trusts, landowners, conservation NGOs
Provide or support technical guidance and incentive programs, based on latest scientific understanding, to **forest landowners** including land trusts and municipalities, to increase carbon sequestration through management and stewardship .*	DEC	3 years	Research partners, land trusts, conservation NGOs, Extension, SWCDs

Note: Agriculture and Forestry is leading on forest carbon recommendations.

Enabling strategy – CS-3: Mapping, Research, Planning, and Assistance - Components of the strategy (p. 3 of 4)

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Fund **research, analysis, and monitoring** to determine carbon storage and sequestration potential of tidal and non-tidal wetlands, SAV, forests, and other priority natural areas, to increase understanding of mitigation opportunities and to establish siting protocols and priorities for conservation and restoration.	DEC, DOS	5-10 years	research partners
Develop **cost-benefit analysis tools** that incorporate the value of carbon for use in planning, environmental assessment, and permitting of conservation and restoration projects.	DEC	1 year	DOS, research partners
Initiate **climate resilient demonstration projects** by working with existing wetland protection, restoration, or NNBF projects to add additional components for maximizing climate resilience and carbon sequestration capacity, developing quantification models and best practices, and monitoring effectiveness.	DEC, DOS	1 year	counties, municipalities

Enabling strategy – CS-3: Mapping, Research, Planning, and Assistance - Components of the strategy (p. 4 of 4)

Components required for delivery *(Brief description of action required)*	**Implementation lead** *(Entity responsible for completing)*	**Time to implement** *(Time required to implement)*	**Other key stakeholders** **(***Entities that need to be engaged)*
Create a **conservation and restoration service corps program** (for early and experienced professionals) and a **youth climate conservation corps** (for unemployed young people ages 18-25) that focuses on ecosystem stewardship, management, and restoration activities to maximize carbon sequestration in natural and developed areas (e.g., tree plantings in lower-income, suburban neighborhoods; wetland restoration; native grassland establishment in municipal parks). (Added benefit to support just transition and "green job" career training.)	DEC, OPRHP	5 years	Many possibilities, e.g., DOS, NOAA, Student Conservation Association, proposed Civilian Climate Corps, AmeriCorps, existing conservation corps programs, counties, municipalities, conservation NGOs, SWCDs

Enabling strategy – CS-3: Mapping, Research, Planning, and Assistance - Benefits and impacts

Anticipated Benefits and Impacts	
Disadvantaged communities	Expanding and improving natural areas provides recreational opportunity; storm water management and reduced flood risk; clean air and water. Technical and funding assistance can enable greater participation in local land use by disadvantaged communities. Need to assess potential negative impact of green gentrification.
Health and other co-benefits	Healthy ecosystems provide services that benefit people: flood mitigation, recreation (e.g., hiking, camping, fishing, hunting, wildlife viewing), carbon sequestration, clean water and air, and mental and physical health benefits. Biodiversity improves resilience to disturbance and can moderate disease and pests like mosquitos and ticks.
Just transition: businesses and industries, workers	Benefits include mitigation of floods and associated property damage; reduced flood risk to communities and public infrastructure; green job career training; improved understanding, guidance, and tools for decision-making; tax incentives for nature-friendly practices.
Other	Healthy, resilient fish, wildlife, and habitat; open space for all New Yorkers; increased recreational opportunities in urban and suburban areas; up-to-date decision-making tools accessible to all.

Appendix: Case Studies

NEW YORK STATE OF OPPORTUNITY. Climate Action Council

Priority Development Area Plans

Jurisdiction:	*Genesee County/Tompkins County*
Context:	*Genesee county sought to preserve its agricultural land and rural character, while also redeveloping and revitalizing in municipal centers and attracting businesses.*
Description of action(s):	*Genesee County designates Smart Growth "Development Areas"—including hamlets, villages, urban centers, industrial centers—and allows water infrastructure extensions only to development in those areas; Tompkins County designated Development and Conservation Focus Areas to inform local land use planning and zoning*
Type of action(s):	*Executive (Genesee/Tompkins County Planning Departments)/Legislative (Tompkins County Legislature)*
Impact:	*Focusing development in walkable, bikable, transit-friendly municipal centers and preserving open space reduces GHG emissions and air pollution from VMT; helps attract businesses and jobs; and sequesters carbon.*
Cost and bearer of cost:	*County; cost of plans and implementation unknown*
Ease of implementation:	*Medium*

Priority Conservation Area Plans

Jurisdiction:	*Municipal/Multi-Municipal; State—Hudson River Estuary Program (HREP).*
Context:	*Municipalities, with support from HREP, sought to direct growth to municipal centers/downtowns and protect priority conservation/biodiversity areas in planning and zoning.*
Description of action(s):	***Red Hook Centers & Greenspaces Plan.*** *The Town incorporated designated centers (development areas) and greenspaces (conservation areas) into its comp plan and zoning ordinance.* ***HREP Pilot Multi-Municipal Conservation Planning Project.*** *HREP helped 3 municipalities—Red Hook (Town/Village) and Tivoli—to apply a Cornell habitat connectivity model to municipal planning. The oilot project resulted in a framework of conservation opportunities and strategies to incorporate the connectivity model into planning, and resulted in the addition of designated priority habitat linkages into the communities' Community Preservation Plan.* ***Town of Wawarsing.*** *Town used biological data on conservation to inform designation of Critical Environmental Areas under SEQRA.*
Type of action(s):	*Executive*
Impact:	*Conservation areas help direct growth into municipal centers, which reduces VMT and contributes to climate adaptation.*
Cost and bearer of cost:	*State/Municipal*
Ease of implementation:	Medium

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Centralized Baseline Planning and Zoning Database

Jurisdiction:	*Region—Boston Metro Area Planning Council; State—CT*
Context:	*Both initiatives seek to provide baseline data to municipalities to assist in their development of comp plans, zoning ordinances and other land use policies, particularly for municipalities that may not have the staff or capacity to hire consultants to gather/access these data.*
Description of action(s):	• ***Boston Metropolitan Area Planning Council (MAPC) Open Data Zoning Atlas:*** *https://zoningatlas.mapc.org/ Centralized database for municipalities* • ***CT Desegregate Connecticut Zoning Database:*** *www.desegregatect.org/atlas Centralized database for municipalities, focusing on equity issues, including equitable TOD.*
Type of action(s):	*Organization*
Impact:	*The databases help municipalities plan for smart, sustainable, equitable development, which reduces VMT, supports public health and promotes equity.*
Cost and bearer of cost:	Sponsoring organization/cost unknown
Ease of implementation:	Hard

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Expedited Comp Plans with Region-/County-Based Technical Support

Jurisdiction:	*Regional—NYS Commission; County—Alleghany County*
Context:	*Tug Hill and Alleghany county seek to proliferate the number of comp plans by providing technical support and capacity-building, rather than one-off grants and efforts.*
Description of action(s):	***Tug Hill Mini-Comp Plan program**—Commission uses circuit riders and existing regional plans and data to inform, jump-start and expedite the development of short municipal comp plans, which can then lead to zoning.* ***Allegany County's Comprehensive Planning School**—with a NYSERDA Cleaner, Greener grant, the county developed and delivered a "Comprehensive Planning School" to four municipalities and then helped them develop and pass individual municipal comp plans.*
Type of action(s):	*Executive (Tug Hill—agency-based; Alleghany—county-based)*
Impact:	*[Please include the resultant GHG emissions impact, economic impact (e.g. jobs, economic growth), local pollution and health impact, impact on disadvantaged communities, and other impacts as relevant]*
Cost and bearer of cost:	Agency/cost unknown
Ease of implementation:	Easy

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TOD Support and Incentives

Jurisdiction:	*Municipal*
Context:	*Municipalities were seeking to expedite, support and incentivize smart growth/TOD.*
Description of action(s):	• ***New Rochelle Downtown/TOD Overlay Zone**—City created several overlay zones covering 279 acres of downtown land that include smart growth design elements as a form-based code—projects that comport with this overlay zoning can receive incentives, such as height/density bonuses; a revolving fund supports GEISs consistent with the zoning, costs to be paid back to the fund by the developer if the project is built; a step-by-step guide was created to help developers to build according to the code.* • ***Westbury TOD Zone:** The Village re-zoned 52 acres of prime land around the Westbury LIRR station, with density bonus incentives for workforce, veterans and senior housing and an expedited review process by the Village Board (re-zoning funded by the DRI).*
Type of action(s):	*Executive*
Impact:	*TOD was recognized as the most energy-efficient form of development in the 2015 State Energy Plan; TOD significantly reduces VMT and offers the greatest opportunities for mixed-income/mixed-use, walkable, bikable and transit-friendly development.*
Cost and bearer of cost:	Municipality/cost unknown
Ease of implementation:	Easy

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IDA Smart Growth Tax Incentives

Jurisdiction:	*Municipal/IDA*
Context:	*IDAs include tax incentives for downtown redevelopment projects in their Unified Tax Exemption Policy.*
Description of action(s):	*Erie County IDA—extended tax incentives to vacant/abandoned properties in downtowns.* *Tompkins IDA—Created the City of Ithaca Community Investment Incentive Tax Abatement program to further incentivize the redevelopment of the city's downtown, increase density and housing availability and affordability promote redevelopment of vacant/abandoned buildings.*
Type of action(s):	*Regulatory/Executive*
Impact:	*Downtown redevelopment reduces VMT, promotes outdoor activity and offers opportunities for affordable, mixed-use/mixed-income development.*
Cost and bearer of cost:	Municipalities/IDAs (through tax abatements)
Ease of implementation:	Easy

Gentrification/Displacement Protections and Community Wealth-Building

Jurisdiction:	*State/Municipal*
Context:	*Gentrification and displacement are risks that must be addressed within the planning and development process, in partnership with grass-roots entities that are well-versed in the impacts and solutions.*
Description of action(s):	***Albany County Land Bank/Community Land Trust Partnership**—land banks redevelop vacant properties and community land trusts build long-term affordability into their ownership model by owning the underlying land; these two entities partnered to reinforce one another's work and create more opportunities for long-term, successive affordability, while allowing for managed equity creation.* ***Kearney Realty Artist/Affordable Housing Mixed-Income Projects**—the developer maximizes public programs, including the DRI, in order to continue as property managers to achieve equity—design is high quality and woven into the surrounding community; projects sponsor/support artists, arts and cultural events; properties are strategically located in transitional neighborhoods in order to de-concentrate poverty, create a mix of incomes and ultimately reduce gentrification.*
Type of action(s):	*Executive*
Impact:	*These entities reduce and avoid displacement and gentrification, increase homeownership for lower-income households, create community wealth through both home-ownership and business-ownership and reduce the concentration of poverty in disadvantaged communities.*
Cost and bearer of cost:	*Municipalities/IDAs (through tax abatements)*
Ease of implementation:	*Easy*