August 7, 2020

VIA ELECTRONIC DELIVERY

Honorable Michelle Phillips
Secretary
State of New York Public Service Commission
Three Empire State Plaza
Albany, NY 12223-1350

Re: Case #20-G-0131 - Proceeding on Motion of the Commission in Regard to Gas Planning Procedures

Dear Secretary Phillips:

Please find attached for filing comments by Renewable Heat Now in anticipation of the forthcoming Staff White Paper in the above referenced proceeding.

Sincerely,

/s/
Jessica Azulay
Executive Director
Alliance for a Green Economy
Filing on Behalf of the Renewable Heat Now Campaign

Case 20-G-0131
Proceeding on Motion of the Commission in Regard to Gas Planning Procedures

COMMENTS BY RENEWABLE HEAT NOW
REGARDING THE FORTHCOMING STAFF WHITE PAPER

Introduction

Renewable Heat Now is a campaign organized by Acadia Center, Alliance for a Green Economy, Binghamton Regional Sustainability Coalition, Earthjustice, Food and Water Action, Fossil Free Tompkins, Frack Action, HeatSmart Tompkins, Mothers Out Front, New Yorkers for Clean Power, NY-GEO, NYPIRG, Pace Energy and Climate Center, Rochester People's Climate Coalition, and Sane Energy Project.

We work together to educate the public about renewable heating options and the importance of transitioning away from fossil fuels in the heating sector. We advocate for policies to enable widespread and equitable adoption of renewable thermal technologies. The members of

Renewable Heat Now have been at the forefront of building beneficial electrification and we bring a multifaceted perspective to this proceeding. Our members have introduced the construct of non-pipe alternatives; developed the HeatSmart program that has subsequently been adopted by NYSERDA and implemented across the state; and convened the State's leading conference on heat-pump technologies, bringing together leading heat-pump engineers from across the globe, as well as architects, utilities, and State officials to learn about state-of-the-art developments in the field. We have participated in policy proceedings and rate cases, successfully advancing a range of programmatic initiatives to promote heat pump adoption and reduce reliance on oil, propane and methane gas. Many of our members are active in their communities helping to implement weatherization, energy efficiency and heat pump programs - so we are aware of the real world challenges and opportunities, and several of us reside in areas impacted by gas moratoria, and have engaged directly with elected officials, business owners, realtors, developers and residents who have been impacted by gas constraints. We have been thinking about and actively working to find solutions for reducing gas use for years.

We appreciate the New York Public Service Commission ("Commission") for opening this much-needed proceeding, and we look forward to lending our considerable experience in many different aspects of the the transition to renewable thermal energy to help get New York on track toward meeting the ambitious 2030 greenhouse gas reduction targets mandated by the Climate Leadership and Community Protection Act ("CLCPA").

We hope this proceeding will provide much needed direction to regulatory staff, utilities, and stakeholders around expectations for gas utility planning. In recent rate cases and investigative proceedings, regulators, utilities, and stakeholders have been struggling to accommodate different and sometimes contradictory policy objectives defined by law, regulation, and precedent. In the absence of clear direction from the Commission, disorder has ensued. Utilities have continued to pursue business as usual, even while facing increasing resistance and protests in regulatory and administrative processes, in Commission meetings, and in the streets where they are attempting to build pipelines.

What does it mean to "modernize" gas system planning and align it with state policy?

The PSC order asks that we consider how to modernize gas system planning. The passage of the Climate Leadership and Community Protection Act last year solidified the requirement for the Commission to align its actions with state climate targets. As defined in that law, these targets are 40% greenhouse gas reductions from 1990 levels by 2030 and 85% reductions by 2050. Further, according to CLCPA, these measures must be based on the global warming potential of methane over a 20-year timeframe and must consider out-of-state methane leakage that occurs from the wellhead to the final destination.

While we realize the CLCPA is not the only law or policy that the Commission must align with, climate and environmental concerns must now be central to gas system planning because the sole purpose of utility gas systems is to deliver methane gas to customers. Methane gas is a potent global warming agent that must now be dramatically reduced and eventually eliminated.

It's critical to recognize that "modernizing" the gas system in the context of strict and legally binding climate targets ultimately means dismantling it. We need to dismantle the laws that require utilities to provide gas service, and we must find ways to deliver universal access to other thermal energy services. We need to dismantle the subsidies for providing gas service to new buildings, and instead support heat pumps and their attendant loop fields and - where appropriate - district systems. We need to shake-up our thinking and business as usual -- instead of replacing leak prone gas pipes with newer gas pipes, we need to deploy renewable thermal energy on an entire neighborhood scale with an orderly plan for decommissioning the incumbent gas system. We need to make a plan for managed decapitalization so that we are not left with stranded assets. And we must get away from the concept of "Non Pipe Alternatives" that references pipelines as the default solution and heat pumps as the alternative to be considered only when cost-effective. We must transition to a reality where heat-pumps and other renewable solutions for building heating are the norm.

The large-scale transition of our heating and cooking services from fossil fuels to renewable energy will require cooperation on a scale not seen in our lifetimes between regulators, state agencies and authorities, utilities, other businesses, customers, and civil society. The cooperation will not be possible without a successful outcome from this gas planning proceeding. Further, in that this must be a coordinated effort, our comments below identify not only actions for the utilities to undertake, but also actions that we urge state agencies to commit to as well to achieve successful outcomes.

The technologies for renewable and efficient thermal energy already exist, and innovation to improve and link them into shared district heating networks is ongoing. But to replace the current system with these and other emerging technologies is an enormous task. We will not succeed without a comprehensive plan developed to meet clear goals and timelines. We also must commit to transparency, accountability, affordability, economic and racial equity, and attention to the needs of labor. These principles must be central to this proceeding and the planning processes that result from it.

Summary of Recommendations for the Forthcoming Staff White Paper

In the interest of contributing to this proceeding, we offer the following recommendations to the Staff to consider while preparing the White Paper.

1. The Commission must set clear emissions reduction goals for utilities to achieve. This is one of the most important Commission actions that must be taken. Without clear goals,

an orderly planning process cannot and will not ensue. Section 1 below outlines annual emissions reduction targets from the heating sector that will be necessary to achieve the state's climate goals. These goals are supported by the attached comprehensive multi-sector analysis of New York's legally mandated greenhouse gas reduction targets analysis from Jerry Acton, Senior Fellow at Physicians, Scientists, and Engineers for Healthy Energy (Exhibit A).

2. The Commission must design a gas process around the principles of transparency, affordability, equity, public collaboration, just transition for workers, and accountability. In Section 2 of this document, we outline these principles.

3. We must stop the growth of gas use and gas infrastructure expansions. Utilities are still investing money and charging ratepayers to expand their gas delivery networks in New York. This is contributing to an increase in gas used for heating and cooking. Section 3 of this document outlines topics to end gas expansion in New York.

4. The gas utility system as it stands today is designed and built to deliver methane gas. We must replace that gas with renewable thermal energy sources, and we will likely need a different delivery system to provide that. Section 4 outlines topics to begin a managed, affordable process to phase out the gas system by 2050.

5. The Commission will need to work closely with the Climate Action Council, other agencies, and with the State Legislature to reconcile competing policies and laws and enable the needed transition. Section 5 identifies areas where collaboration with other government agencies is necessary.

6. The gas system transition will be supported by good information and analysis. Section 6 of this document lists studies we recommend begin now to inform the transition.

1. Goals for the Transition

Any serious planning process must start with clear goals and objectives. If we do not have a clear understanding of what we are planning for, we cannot hope to develop a workable plan to get us anywhere. It is absolutely critical that during this gas planning proceeding the Commission develop and articulate clear goals for gas utilities, utility customers, and other market actors and influencers to guide their planning. The Order instituting this proceeding included some preliminary objectives, such as avoiding the kind of unplanned moratoria that have been experienced by customers in various parts of New York, avoiding costly infrastructure investments, and aligning gas planning with the Climate Leadership and Community Protection Act. These objectives are important, but they are potentially conflicting

and they are not specific enough to drive the rapid decarbonization of the building sector that is needed to meet New York's legally mandated greenhouse gas emissions targets.

Therefore, we urge the Commission to set out a clear vision for gas utilities for the period between now and 2030, when New York must have reduced its greenhouse gas emissions by 40% from 1990 levels. In our view, this requires gas, propane and oil reduction targets for the year 2030 as well as annual benchmarks for the utilities to meet. In addition, DPS needs to designate which entities - gas or electric utilities or other - will be responsible for shouldering expenses and meeting the targets. This kind of framework, with clear responsibility, overarching goals, and annual benchmarks would be similar to what the Commission has developed for electric utilities for meeting the 2030 renewable energy targets. Clear, specific goals will create certainty for utilities, catalyze the renewable thermal energy market, and ensure the various pieces of New York's energy transition are working together.

Renewable Heat Now has been working with Complex Systems Architect Jerry Acton, Senior Fellow at Physicians Scientists and Engineers (PSE) Healthy Energy and member of The GreyEdge Group, to develop a proposal for 2030 greenhouse gas reduction goals and corresponding annual reduction benchmarks that the Commission can use for this gas planning proceeding.[1] The proposed goals for the heating sector are part of a more comprehensive analysis of the greenhouse gas reductions necessary to meet the legally mandated targets set forth by the CLCPA. The analysis demonstrates the interplay between greenhouse gas reductions in heating and transportation with beneficial electrification and renewable electricity. Unlike the *Pathways to Deep Decarbonization in New York* report recently presented to the Climate Action Council, Mr. Acton's analysis takes into account all of New York's legally mandated climate goals including the new mandates for lifecycle methane accounting. The analysis shows that when methane is properly accounted for according to the terms set forth in the CLCPA, the heating sector is the largest contributor to greenhouse gasses in New York State and will be one of the most challenging to decarbonize at the pace necessary to meet the goals.

Based on Mr. Acton's analysis, we offer the following 2030 goals for greenhouse gas reductions from both the gas sector ("natural gas" in the table below) and the delivered fuels sector ("petroleum" in the table below). These two areas are separated out in recognition that different entities may be responsible for reducing greenhouse gasses in each sector. Further, annual benchmarks are provided to show a possible ramp up over time in anticipation of an accelerating pace of change. We note that the ramp is extremely steep due to the very short time between now and 2030.

[1] The numbers provided in this document and the attached Exhibit A are preliminary in nature. We look forward to working with Mr. Acton and other parties in this and other proceedings to expand this work.

Proposed Heating Sector Greenhouse Gas Reduction Targets
in Million Metric Tons (mmT)

	2019 Starting Level	Target Reductions by 2030	Benchmark Reductions per Year 2020-2030 (mmT)											2030 Target Level
			2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
Petroleum[2] CO2	14.5	6.3	0.1	0.2	0.3	0.4	0.5	0.7	0.7	0.8	0.8	0.9	0.9	8.2
Natural Gas CO2	45.1	6.9	0.0	0.0	0.1	0.2	0.4	0.6	0.7	0.9	1.1	1.3	1.5	38.2
Methane Leakage CO2e	41.5	6.3	0.0	0.0	0.1	0.2	0.3	0.5	0.7	0.8	1.0	1.2	1.4	35.2
Total CO2	60.9	13.4	0.1	0.3	0.5	0.7	0.9	1.3	1.5	1.7	2.0	2.2	2.5	47.5
Total GHG	102.4	19.7	0.2	0.3	0.6	0.9	1.2	1.8	2.1	2.5	3.0	3.4	3.9	82.7

We have attached Mr. Acton's full preliminary analysis to this comment (Exhibit A), and we offer to make Mr. Acton available to DPS Staff and other parties to this proceeding for questions and discussion.

2. Principles for transition

The process for future gas system planning should follow some fundamental principles to keep it on track and ensure that it serves the public interest. The Commission should ensure that the process is built around these principles:

a. **Transparency** - Recent experience with gas utility moratoria has illustrated the importance of transparency in gas planning. Utilities should be required to create and publish multi-year forward looking plans to meet their customers' needs for thermal energy. Any changes, including potential pending gas moratoria, should be communicated well in advance so that an open and transparent process can be followed

[2] Petroleum includes all delivered fuels for the heating sector such as oil, propane kerosene, etc.

for evaluation and consideration of alternatives. Decision-making process and timelines should also be made clear. We cannot affect a transition in thermal energy delivery on the scale necessary without a clear plan, open communication, and a transparent process for public engagement and decision-making.

b. **Affordability** - The current gas system is not affordable for hundreds of thousands of New Yorkers. The rising costs of this system cause excruciating hardship for low-income families and individuals, who suffer under the threat of being cut off from essential heating services, who are forced to choose among heat, food, rent/mortgage or other essential needs, and whose lives are sometimes sent into disarray by utility shut offs. Loss of utility service is a leading cause of homelessness and of children being removed from their homes by social services.[3] This situation is neither reasonable or just. As we plan for the future, we must make a commitment to end this harm. The commitment will require new thinking about what is just and what is reasonable, and will require the Commission, the utilities, and stakeholders to deeply examine and change how costs for service are distributed and how alternatives to gas are funded and made available.

c. **Equity** - As we plan the next generation of thermal energy infrastructure in New York and plan for the phase out of today's utility gas distribution system, we must do so with racial and economic equity at the core of the plan. Considerations of who is negatively or positively impacted by decisions and who is included in the development and benefits of the new system must be explicit and ever present in the process. The Climate Leadership and Community Protection Act, signed into law last year, requires agencies to consider the impact of decisions on environmental justice and low-income communities, and it sets a goal of distributing the benefits of the renewable energy transition more equitably. This cannot be an afterthought. It must be the core of system design.

d. **Process for public collaboration** - The transition away from fossil fuel use in buildings is going to require the participation, creativity, cooperation, and dedication of residents, workers, local governments, community organizations, companies of all kinds, utilities, and regulators. A top-down or utility-centric approach is unlikely to work because the transition will happen in our streets and in our homes, requiring the consent and cooperation of customers and community planners. The Commission should develop a public engagement process that sets clear goals and timelines for the transition and then enables and facilitates multi-stakeholder collaborative planning for how to realize that transition in communities all over New York. We realize this is a tall order and different from current Commission or utility practice, but, good process requires real resources and tools. The Commission and the utilities should invest in facilitators and tools to enable collaborative planning.

[3] Energy Efficiency for All Fact Sheet "Reducing Energy Burden" https://assets.ctfassets.net/ntcn17ss1ow9/7JPAB12O4ZLFeDoVcR2jeU/bf80310e1583d9ef58a45670ffea85c6/EEFA_Reducing_FS_02.pdf

e. **Just Transition for Workers -** Workers in today's heating sector, including gas utility workers and HVAC workforce, must be cared for as we transition their industries to new infrastructure and new technologies. The planning process addressed by this proceeding should include the robust participation of the labor force and should attend to the training, transition, and employment needs of these potentially impacted workers. Additionally, the new workforce needed for renewable thermal energy systems is likely to be much greater than the current utility and HVAC workforce can handle. Therefore, as new workers are recruited into this sector, the Commission and other state agencies must plan for equitable opportunity and access to jobs by communities and populations that currently experience employment and education discrimination.

f. **Accountability** - The new gas planning process should include strong mechanisms for accountability for meeting the goals set out by the proceeding. Key to accountability is identifying who is responsible for what and setting strict reporting requirements and consequences for failing to meet standards or targets. In the case of utility accountability, financial penalties or alternative compliance mechanisms are appropriate to motivate utilities to stay on target and ensure that funding is available to meet targets and that ratepayers are compensated for the harm that results from utility inaction.

g. **Comprehensive Planning including electrification impacts** - In addition to gas planning, utilities must take up comprehensive planning on the electric side to ensure we understand the impacts of environmentally beneficial electrification and have an electric system that can effectively provide the renewable electricity necessary to power thermal and transportation needs. These two systems cannot be siloed, but need to be planned together in a comprehensive manner.

Topics for Discussion in the Forthcoming Staff White Paper

Below we list topics we encourage the staff White Paper to address related to preventing a net increase in gas use, and subsequently, reducing gas use. We note that stopping gas expansion must be undertaken as soon as possible; we cannot afford to continue gas expansion if we are to reach the ambitious and necessary greenhouse gas reduction goals in the heating sector. We note too that stopping expansion is insufficient to reach the greenhouse gas reduction goals and so in the subsequent section we address topics related to a managed transition off of gas in the heating sector.

3. Ending Gas Expansion

“If you find yourself in a hole, stop digging.” So said Will Rogers and subsequently, Karl Rabago when advising the Commission on gas policy at the Westchester public hearing on the ConEd moratorium. Indeed, preventing a net increase in gas use is the essential first step in meeting the goals of the CLCPA.

1. Zero net gas strategy - We applaud the commitment to no net new gas sales that the utilities NYSEG and RG&E have made in agreement with parties in their rate cases, and urge the Staff to incorporate key elements of the Joint Proposal filed in that case into its White Paper. Further, we note that Pace Climate and Energy Center has developed an in-depth policy paper on Zero Net Gas Strategy that we hope the Staff will incorporate into the White Paper.

2. Equity considerations - As a zero net gas strategy is pursued, it is critical to prioritize affordability of energy for those who can least afford their bills now. The White Paper should lay out expectations and requirements for utilities to meet both climate, affordability, and environmental justice goals of the state. Additionally, for each new gas system investment proposed (including pipelines, trucking, compressors, etc), utilities should be required to do an environmental justice analysis to ensure compliance with the CLCPA.

3. Early interventions with information for developers and architects - The White Paper should consider protocols to reach developers/architects early, before costly plans have been developed (See Tompkins County’s Business Energy Advisor Program as a successful example.)

4. End marketing of gas - The White Paper should address rules about whether or how utilities should be allowed to market gas in the future. See the NYSEG/RG&E Joint Proposal for an example of gas utilities agreeing to end their gas marketing practices.

5. End incentives for gas expansion - The White Paper should address the current utility practice of incentivizing oil-to-gas conversions, utility neighborhood expansion programs, and other processes that utilities use to expand their customer base.

6. Oil-to-heat-pump conversions - To date, the primary state strategy for reducing oil and propane use for heating in New York has been to encourage conversion to methane gas. Even though it’s not necessarily the focus of a “gas planning” proceeding, the White Paper should address how to move customers off of oil. We suggest requiring electric utilities to meet specified oil-to-heat-pump conversions on an annual basis.

7. Enable current and potential gas customers to make rational, well-informed choices and plans by developing a strategy for communicating to them the likelihood that gas service may be curtailed or eliminated prior to 2050 and that accelerated cost recovery for fixed assets may require a significant increase in gas delivery charges.

8. Allow preferential reallocation in gas constrained areas. Preferential reallocation is the idea that within a gas constrained area, as gas is "liberated" via energy efficiency and heat pump conversion – and once system pressure reaches an acceptable level to where catastrophic pressure drops are no longer a concern -- gas should be preferentially reallocated to essential industrial process needs to enable continued economic development – rather than allocating the gas to customers in the queue on a first-come first-serve basis. Indeed, liberated gas should only be available for essential industrial process needs. Any other thermal needs should be addressed with electric/renewable solutions.

4. Phasing Out the Gas System

Stopping gas growth is a first step, but we only have 10 years to dramatically reduce fossil fuel use in the heating sector by 40%. Therefore, the White Paper must also outline strategies for reducing gas used for thermal energy. We do not see an alternative to the development of a plan for the managed decapitalization of the gas system in order to meet the goals of the CLCPA. It is critical that in order to preserve reliability and affordability, that this transition is carefully planned and executed. Below we list topics we hope and expect will be addressed in the staff White Paper.

a. Targets - We urge the Staff to propose clear 2030 greenhouse gas reduction goals for their gas systems, annual benchmarks and negative revenue adjustments to ensure compliance. Factors Staff should consider include how to implement reduction targets - statewide or by utility, year-by-year vs moving average, and possible role for t-RECs.
b. Equity - In addition to the greenhouse gas reduction targets, we urge the Staff to address economic and racial equity in both affordable access to energy and the economic benefits that may come from constructing the next generation of thermal energy infrastructure in New York.
c. Energy efficiency - Energy efficiency plays a critical role in meeting all of New York's greenhouse gas reduction goals. The White Paper should discuss how utilities should incorporate energy efficiency in their plans in order to meet gas reduction targets.
d. Industrial strategies - The industrial sector poses unique technical and cost challenges in order to move industrial processes - as opposed to heating and cooling - away from gas or propane usage. NYSERDA should devote more

resources to investigating options that are in use in other areas nationally and internationally, and pursue strategies to make these cost effective. This is a priority for a number of reasons, particularly given its importance to limitations on economic development in the manufacturing sector currently as long as some industries can only locate near existing natural gas service.

e. Managing costs / stranded assets - The White Paper should discuss planning processes, depreciation schedules, and decommissioning timelines that will avoid the construction of any infrastructure that is likely to become a stranded asset. Similarly, the White Paper should incorporate depreciation schedules into planning processes for determining which parts of the system are ripe for retirement and replacement.
f. Leak prone pipe replacement - The White Paper should discuss the current Commission policies for Leak Prone Pipe ("LPP") replacement and consider whether LPP should ever be replaced with new gas infrastructure given the goals of the CLCPA and should put forth a policy to consider LPP as a priority for non-pipe alternatives.
g. Pruning from the edges - The White Paper should consider how a policy would require utilities to begin a managed decapitalization process starting at the edges of their gas distribution system could work.
h. Consider changes to the gas utility revenue model, including shifting the balance from earnings based on capital investments to performance-based incentives.
i. Finally, Staff should consider how to transition away from the "non pipe alternative" construct, that regards pipelines as the default solution and heat pumps as an alternative. We must shift to regarding renewable, electric-based, thermal solutions as the norm.

5. Current policy barriers to transition

We underscore the need for a coordinated effort to support the transition off gas. We recognize that the Commission has no direct ability to alter State statutes, nonetheless there are actions the PSC, NYSERDA and/or utilities can undertake to work around these barriers, or to build the case for why these barriers need to be addressed legislatively. Below we discuss the policy barriers that pose significant impediments to the transition, and steps that can be taken within this proceeding as well as beyond, to address them.

We urge the Staff to discuss these policies in the White Paper and seek regulatory strategies for aligning these policies with climate goals. We also urge the Commission to raise these matters within the Climate Action Council and to seek the needed legislative remedies as quickly as possible.

A. 100-foot subsidy - The 100-foot subsidy provides ratepayer-subsidized gas infrastructure free to building owners and is a strong incentive for the expansion of gas infrastructure investments in New York State. Ultimately, this law will need to be either changed or eliminated to end this fossil fuel subsidy. We urge the Commission to help craft and support needed legislative changes, including attention to how utilities can shift their obligation for customer hookups to cover renewable thermal rather than gas.

   In the interim, there are steps that can be taken within this proceeding to inform the need for legislative change. In the interests of transparency, equity and minimizing infrastructure investments, to best understand the impacts of the 100-foot rule we urge the Commission to immediately begin the process of developing accurate and full accounting of the costs to utility ratepayers of the 100-foot rule subsidy. Having accurate cost numbers is an important first step in evaluating the role of the 100-foot subsidy relative to minimizing infrastructure investments and creating a competitive marketplace for non-fossil fuel heating/cooling/cooking alternatives.

   In addition, Section 230.2 of Title 16 of New York Codes, Rules and Regulations expands the extent of free infrastructure for gas customers past the 100 foot length described in Section 31 of the Public Service Law. Pending removal of the 100 foot subsidy from Section 31 by the Legislature, as part of this proceeding we urge the Commission to pare back regulations that provide free gas infrastructure not strictly required by Section 31.

B. Utilities required to provide gas not thermal energy solutions - Public Service Law is outdated and assumes that electricity and gas are the only services that regulated utilities offer. As we transform our economy to comply with CLCPA, “thermal energy,” rather than gas will be the service that customers across New York need, in order to heat or cool their spaces, heat their water, and cook their food. The Commission should identify how Public Service Law restricts options for customers and for this necessary and mandated transition and should work with elected leaders to make changes to statute to align them with climate law.

C. Develop model building codes to prohibit gas in new construction that municipalities can adopt.

6. Analyses Needed

Natural gas has been touted as a clean, safe, reliable, and affordable fuel. It is in the best interest of the ratepayers that the Public Service Commission examines each of these claims

thoroughly. Access to gas has also been framed as a social and economic justice issue. Further, the PSC should examine the possibility of undue influence of the gas industry on the gas utilities. Without a thorough investigation of these topics (and perhaps others as this list may not be comprehensive), the gas planning process will be significantly flawed. The full scope of the environmental, economic, and social implications of natural gas need to be measured and addressed.

"Clean"

- Analysis of methane leakage from wellhead to flame tip
- Health impacts of ultrafine particulate matter (UFPM) and radon from gas combustion sources
- Health and indoor air impacts of gas cooking

"Safe"

- Pipeline Safety Oversight
- Risk analysis of gas leaks and explosions in gas distribution pipelines

"Reliable"

- Analysis of gas supply in the Marcellus
- Analysis of the financial stability of the gas industry

"Affordable"

- Potential cost of stranded gas assets
- Cost of the 100 foot subsidy for each utility
- Gas price projections
- Analysis of average cost of gas leak monitoring, replacement and repair for each foot of gas infrastructure and comparative analysis of replacement. (See this MA study)
- Analysis of the social cost of methane

Social and Economic Justice

- Analysis of what communities bear the burden (health, safety, and risk to property) of existing and proposed gas infrastructure
- Analysis of what communities will pay for stranded gas assets

Influence

- Investigation of gas utility lobbying of public officials
- Investigation of "astroturfing" by gas utilities
- Investigation into self-dealing between gas suppliers and gas utilities

7. Future of Heat in NY and Role of the Utilities

The future of heating and cooling in New York State depends, like many other industries in transition, upon strong political, regulatory and business leadership. We need the courage to invest in innovative technologies and provide superior heating sources that serve consumers and society's needs better. Individual, local and worldwide health and safety risks, recognized

by residents, legislators, sustainable energy innovators, scientists and even some utilities, mandate that reliance on fossil fuels to address our thermal needs has to end.

Enactment of the CLCPA has already sent a market signal that is being heard. Encouragingly, some utilities have developed proposals to take some first steps with non pipeline alternatives, accelerated depreciation, demand reduction, district geothermal heating pilot programs and other innovative ideas. These market innovations, developed by industry in advance of recommendations by the Climate Action Council, should be supported by regulatory decisions and directives, and allowed to advance, provided they also propose a robust means to address the equity and environmental justice dimensions of transition required by the CLCPA.

The renewable heating and cooling market is gaining momentum, but our climate mandates will require these technologies to scale exponentially in coming years. Leveraging existing market position, financial assets, staff expertise, and consumer reach gives utilities the opportunity to propose solutions and their role in the future of heating.

We hope and expect that this gas planning proceeding will not just support and push utilities to make this needed and urgent change, but will require them to meet clearly defined targets in doing so.

Respectfully submitted,

/s/
Jessica Azulay
Executive Director
Alliance for a Green Economy
Filing on Behalf of the Renewable Heat Now Campaign

August 7, 2020

Exhibit A

New York State Reforming the Energy Vision

A Roadmap to Achieving the Climate Leadership and Community Protection Act (CLCPA) Goals

Emissions Reduction Profiles

Jerry Acton

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Analysis by Jerry Acton

Senior Fellow – Physicians, Scientists, and Engineers (PSE) for Healthy Energy
Complex Systems Architect – The GreyEdge Group, LLC
Former Certified Systems Architect – Lockheed Martin Corporation

Jerry has 43 years experience in developing, teaching and applying Best Systems Engineering Practices to address complex systems challenges for a variety of Military, Commercial and Government customers. He is a long time New York resident. Jerry is dedicated to helping remove GHG emissions from our energy systems so that all New York residents can live in a healthy environment using the abundant, in-state, clean energy available from the sun, wind, water, air, and ground.

He spent 5 years conducting a comprehensive analysis of PA natural gas wells production and correlating it to the depth and thickness of Marcellus Shale that spans PA and NY. He demonstrated that there is insignificant economically recoverable natural gas in NY. His work was instrumental in Governor Cuomo's ban on fracking in NY. For the past 6 years, he has focused on quantifying the scope, required pace and inter-dependencies of efforts needed to achieve the CLCPA Energy Transition Goals.

Acknowledgements

I am grateful for the consultation and on-going encouragement, review and feedback from many New York residents and members of numerous organization, in particular:

Renewable Heat NOW, Alliance for a Green Economy (AGREE), Mothers Out Front, NY-Geo

PSE for Healthy Energy: Dr. Anthony Ingraffea, PhD, PE – Senior Fellow
Dr. Elena Krieger, PhD – Director of Research

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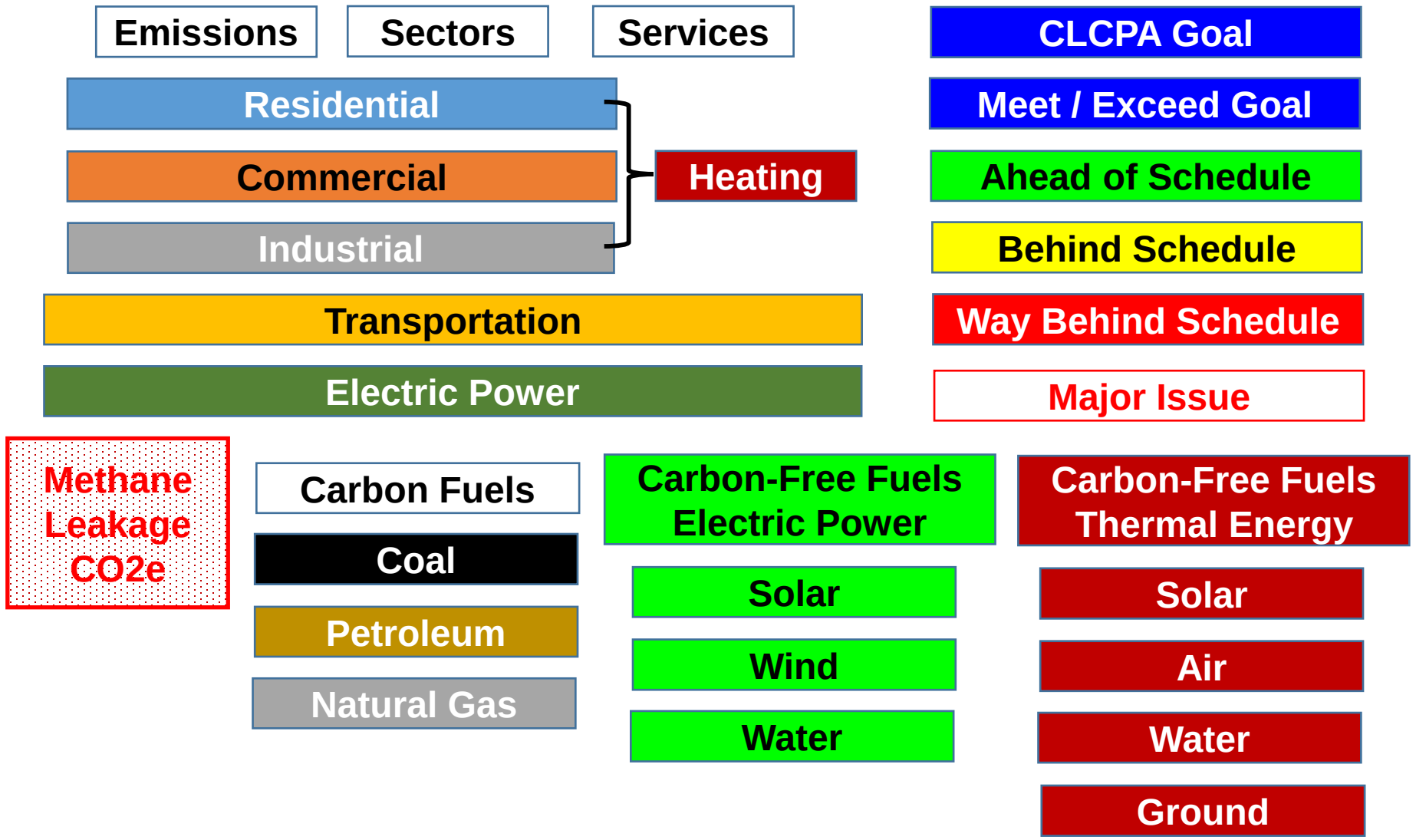
NYS – Emissions Reduction

Color Schemes / Conventions



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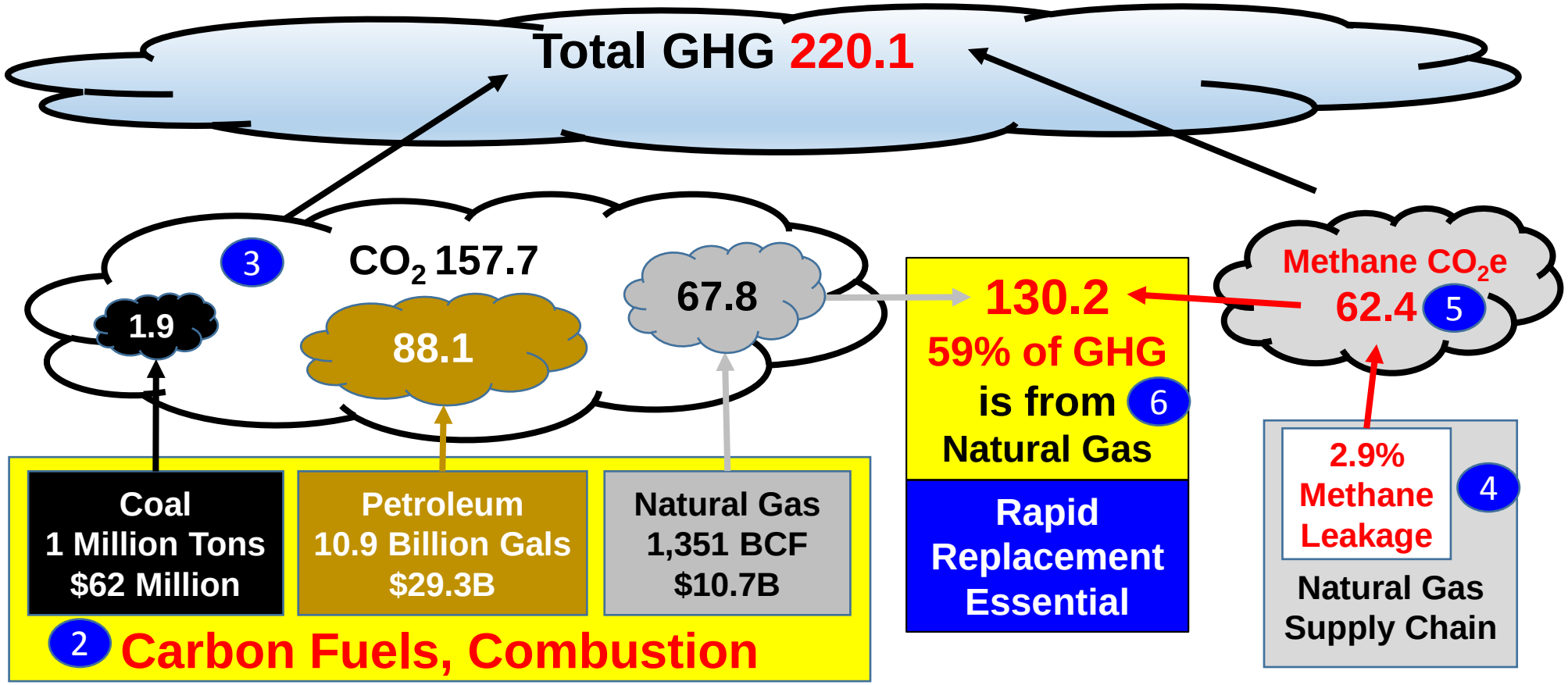
NYS – GHG Emissions Status

Million Metric Tons as of 2017



1 **Carbon Fuel Systems in Buildings, Vehicles, Power Plants**

Primary Contributors to GHG Emissions

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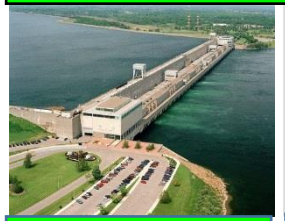
2050 Vision

Free Electric Power Fuels

Free Thermal Energy Fuels

Wind

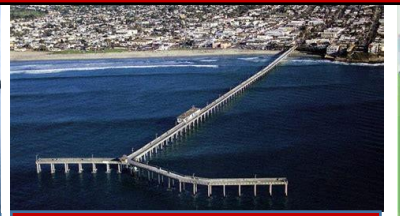
Water



Dams

Rivers

Lakes



Oceans

Municipal & Sewer Water

Carbon Free Electricity Network

Carbon Free Thermal Energy Network

Buildings

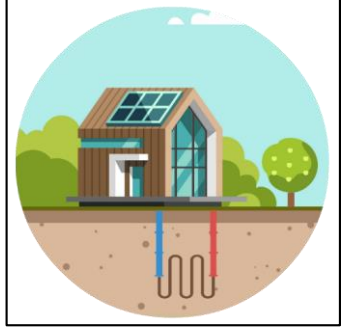
Recycled Wasted Thermal Energy

Air

Solar

Solar

Ground



Imported Fuels Carbon Intensive Emissions Intensive Expensive Energy	→	In-State Fuels Carbon Free Emissions Free Affordable Energy

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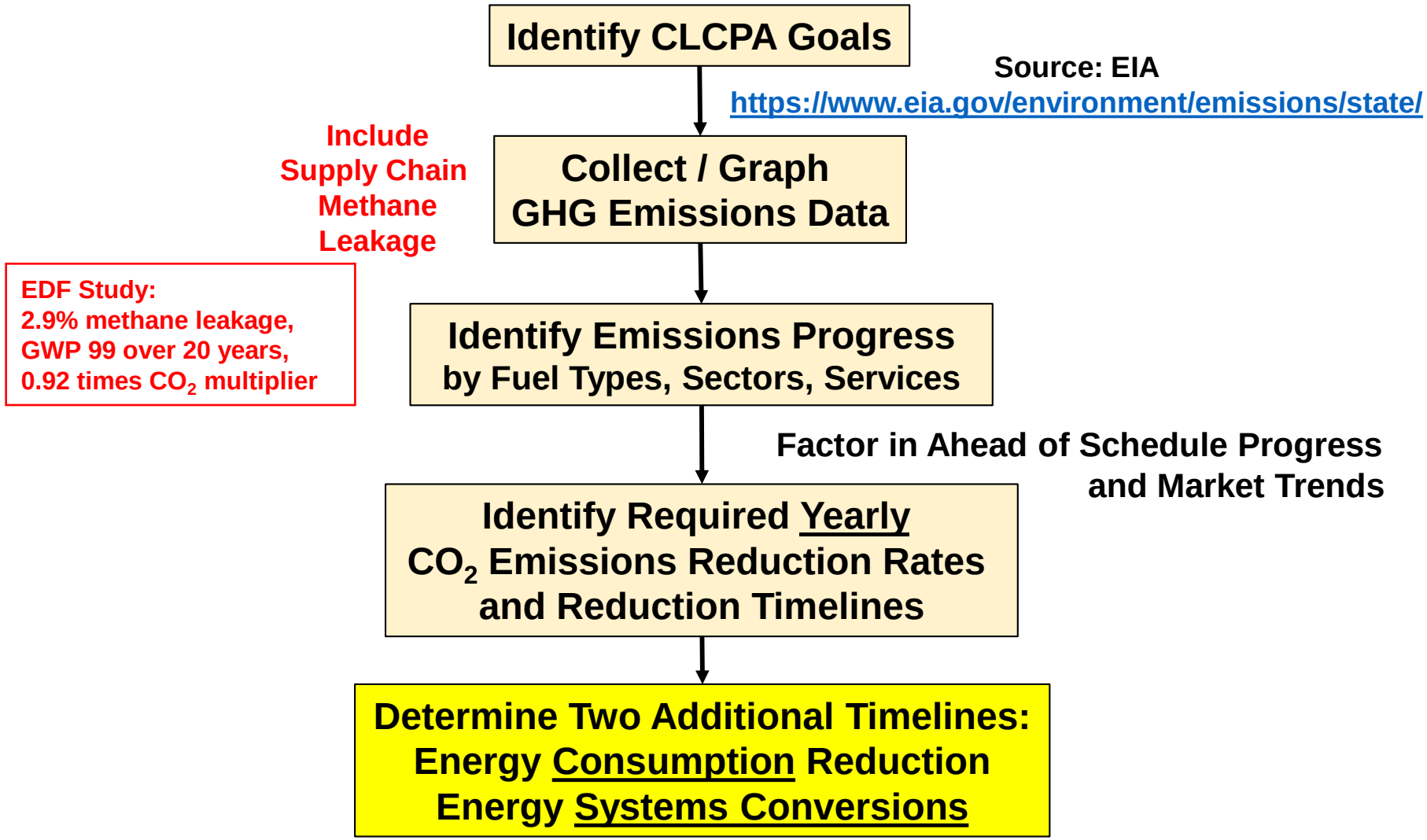
NYS – GHG Emissions Reduction

Methodology



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NYS – Emissions Reduction

Goals / Progress as of 2017

Progress		Goals		
Emissions	1990 - 2017	2030	2040	2050
Electric Power CO_2	-66%	-40%	-100%	
Total CO_2	-24%	-40%		-85%
Total GHG	-12%			

- Electric Power Leads in Emissions Reduction
- Total CO_2 Reduction Slightly Behind Ideal Progress
- Total GHG Reduction Well Behind Ideal Progress

Progress – Million Metric Tons (mmT)			Goals (mmT)		
Emissions	1990	2017	2030	2040	2050
Electric Power CO_2	64.5	22.0	19.3	0.0	
Total CO_2	207.3	157.7	124.4		31.1
2.9% Methane Leakage CO_2e	43.6	62.4			
Total GHG	250.9	220.1	150.5		37.6

Fuel Switching to Natural Gas Has Reduced CO_2, But Methane Leakage Off-Sets Half of the Progress

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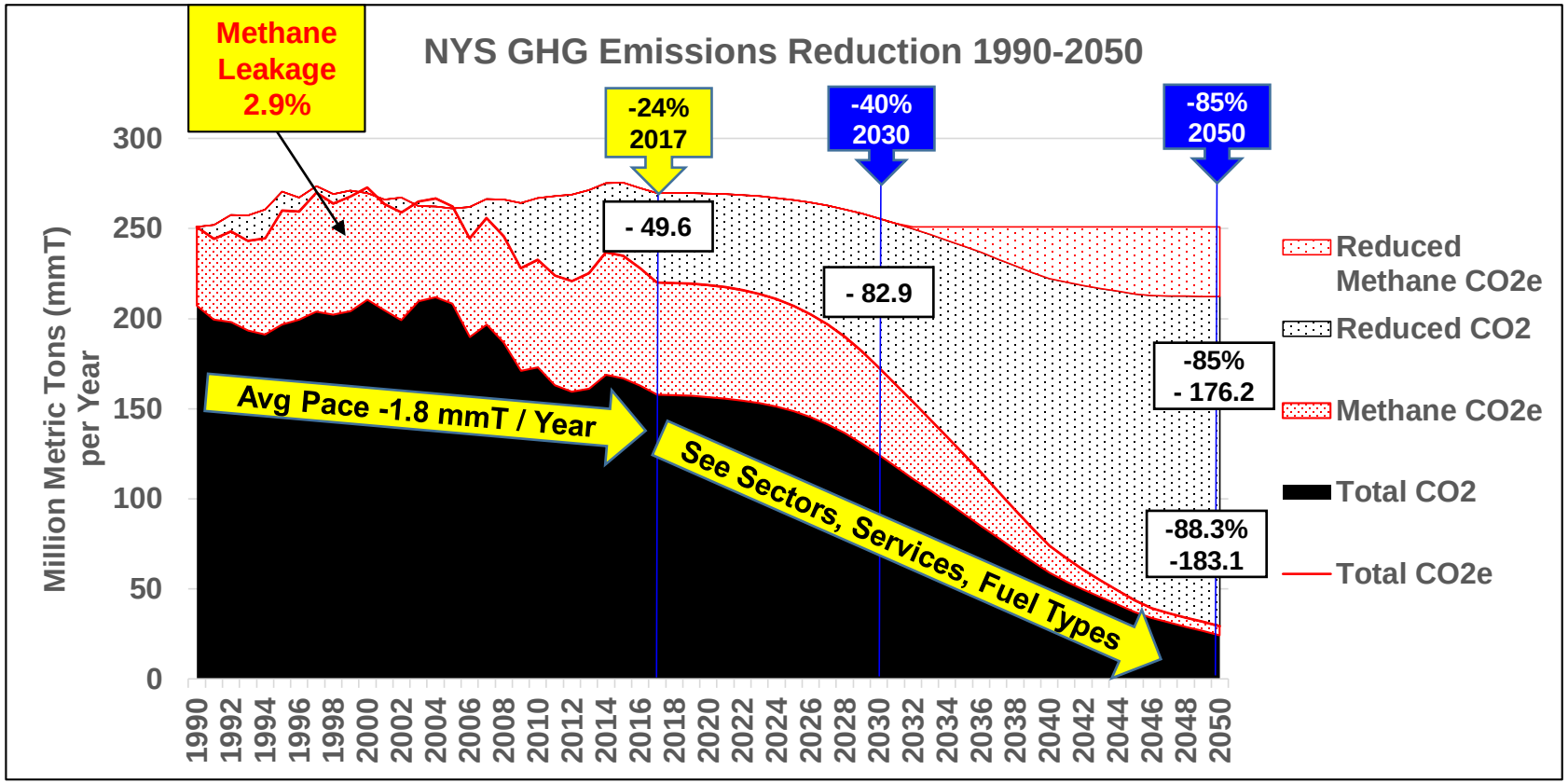
NYS – GHG Emissions Reduction Timeline

2017 Progress & Yearly Targets to Be CLCPA Compliant



Average Pace of <u>Yearly</u> GHG Emissions Reduction Must <u>Increase Significantly</u> to Meet CLCPA Goals

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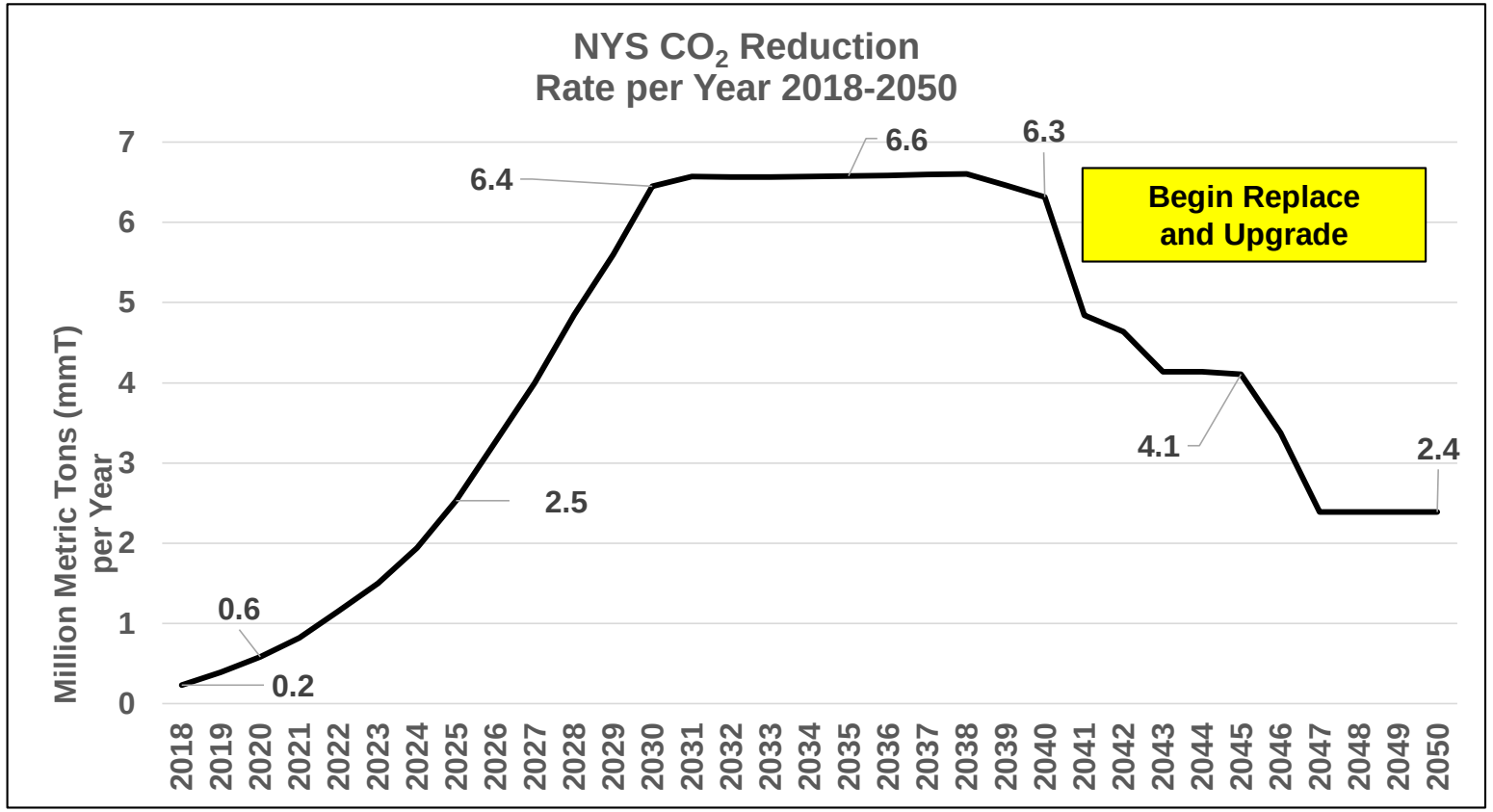
NYS – GHG Emissions Reduction

Yearly CO_2 Reduction Rates to Be CLCPA Compliant



Total <u>Yearly</u> CO_2 Emissions Reduction Rate
Must <u>Increase 10X</u> to Meet 2030 CLCPA Goals

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NYS – Emissions Reduction Summary

Progress as of 2017 / CLCPA Compliant Targets

Progress – Actuals (Million Metric Tons)				Targets (Million Metric Tons)			
Services / Sectors	1990	2017	% Reduction	2030	2040	2050	% Reduction
Heating CO2	79.0	61.0	-22.7%	46.4	11.0	6.3	-92.0%
Residential CO2	33.6	31.3	-6.9%	25.7	4.5	0.0	-100.0%
Commercial CO2	27.2	22.1	-18.7%	13.7	0.0	0.0	-100.0%
Industrial CO2	18.2	7.6	-58.1%	7.0	6.5	6.3	-65.2%
Transportation CO2	63.9	74.7	17.0%	65.1	34.4	17.9	-72.0%
Electric Power CO2	64.5	22.0	-65.9%	13.0	0.0	0.0	-100.0%
Total CO2	207.3	157.7	-23.9%	124.4	45.4	24.2	-88.3%
Total CO2e	250.9	220.1	-12.3%	172.9	54.8	29.3	-88.3%

2030 Goals Are The Most Challenging By Far
But Enable Faster Progress Toward 2050 Goal

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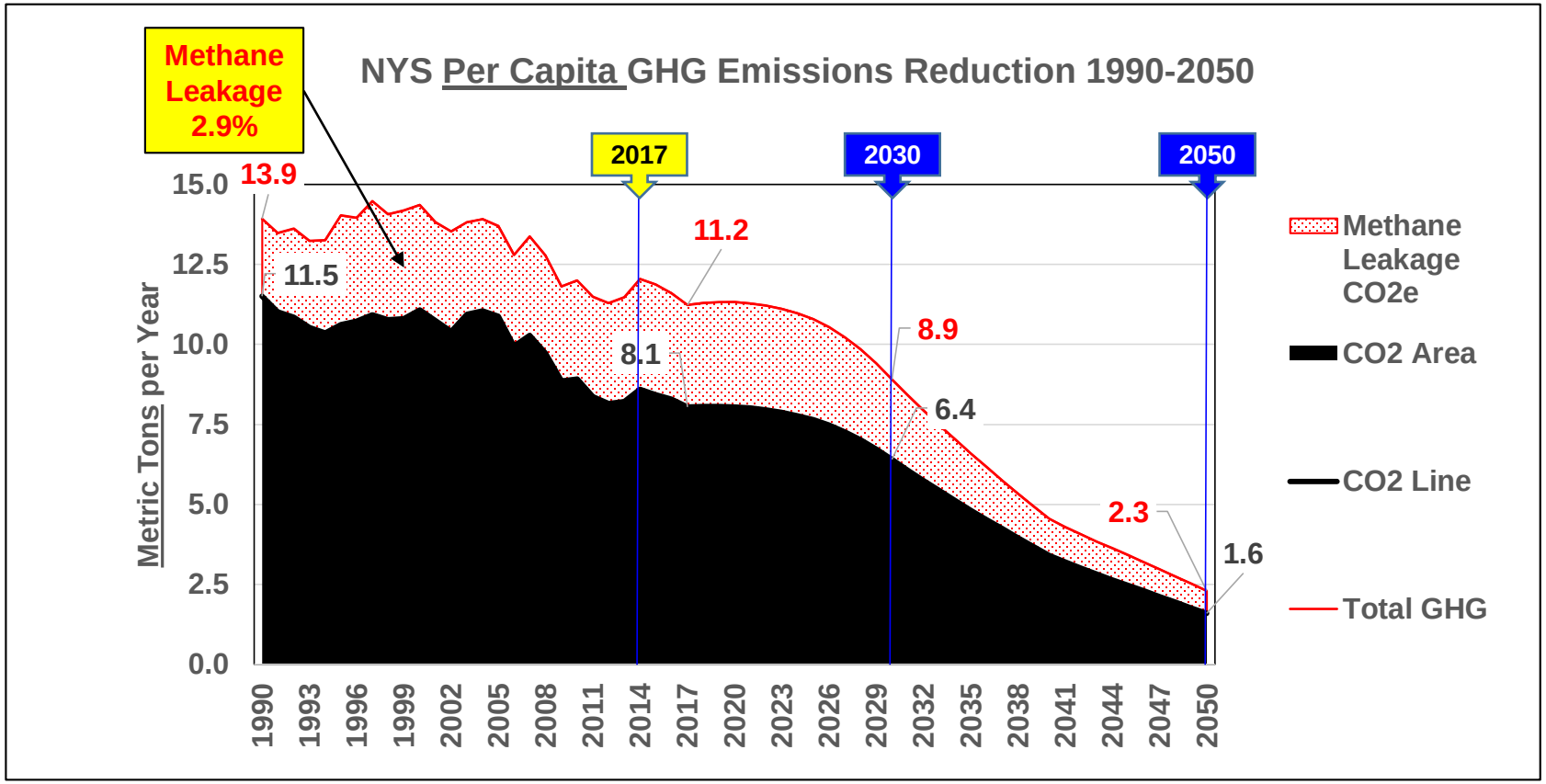
NYS – Per Capita Emissions Reduction Timeline

2017 Progress & Yearly Targets to Be CLCPA Compliant



Per Capita GHG Emissions will Come Down Dramatically As CLCPA Goals Are Met

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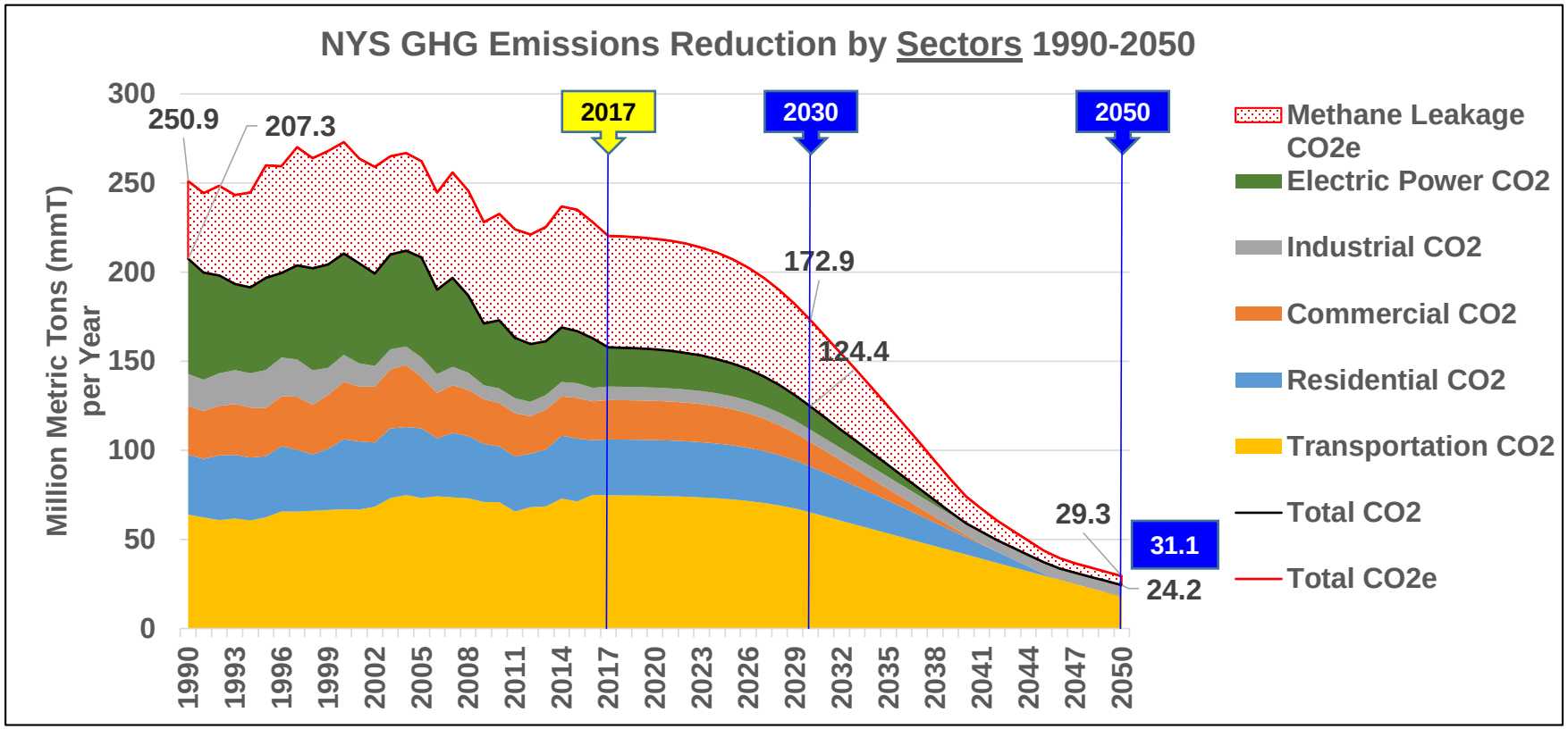
NYS – Sectors GHG Emissions Reduction Timeline

2017 Progress & Yearly Targets to Be CLCPA Compliant



- Electric Power CO_2 Reduced 66% (-42.5 mmT)
- Industrial CO_2 Reduced 58% (10.6 mmT)
- Commercial CO_2 Reduced 19% (5.1 mmT)
- Residential CO_2 Reduced Only 7% (2.3 mmT)
- Transportation CO_2 Increased 17% (10.8 mmT)
- Methane Leakage CO_2e Increased 43% (18.8 mmT)

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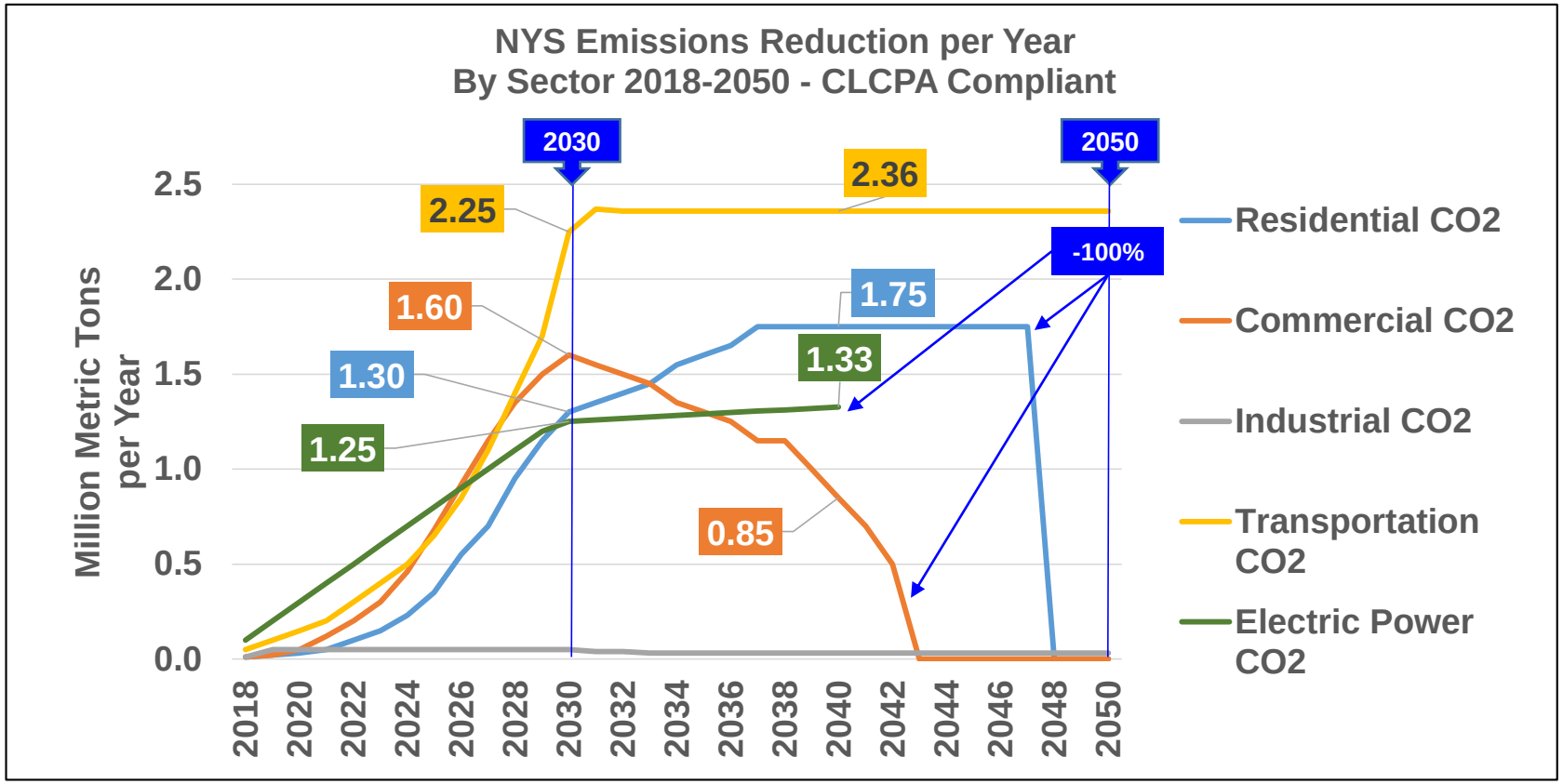
NYS – Sectors CO_2 Emissions Reduction

Yearly Reduction Rates to Be CLCPA Compliant



Sector Yearly CO_2 Emissions Reduction
Must Increase 10-20X to Meet CLCPA Goals

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NYS – Sector GHG Emissions Reduction

10 Year Timeframe Targets to Be CLCPA Compliant

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	% Reduced
Residential CO2	31.3	31.3	31.3	31.2	31.1	31.0	30.7	30.4	29.8	29.1	28.2	27.0	25.7	-23.5%
Commercial CO2	22.1	22.0	22.0	21.9	21.7	21.4	20.9	20.2	19.3	18.2	16.8	15.3	13.7	-49.5%
Industrial CO2	7.6	7.5	7.5	7.4	7.4	7.3	7.3	7.2	7.2	7.1	7.1	7.0	7.0	-61.7%
Transportation CO2	74.67	74.57	74.42	74.22	73.92	73.52	73.02	72.37	71.5	70.4	69.0	67.3	65.1	1.9%
Electric Power CO2	21.9	21.7	21.4	21.0	20.5	19.9	19.2	18.4	17.5	16.5	15.4	14.2	13.0	-79.9%
Methane Leakage CO2e	62.4	62.2	62.0	61.7	61.3	60.6	59.7	58.5	57.1	55.4	53.3	51.0	48.4	11.1%
Total CO2	157.5	157.1	156.5	155.7	154.6	153.1	151.1	148.6	145.3	141.3	136.5	130.9	124.4	-40.0%
Total CO2e	219.9	219.4	218.6	217.5	215.8	213.7	210.8	207.1	202.4	196.7	189.8	181.9	172.9	-31.1%

	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	% Reduced
Residential CO2	24.4	23.0	21.5	20.0	18.4	16.7	15.0	13.2	11.5	9.7	-71.1%
Commercial CO2	12.2	10.7	9.2	7.9	6.6	5.3	4.2	3.0	2.0	1.2	-95.7%
Industrial CO2	6.9	6.9	6.8	6.8	6.8	6.8	6.7	6.7	6.7	6.6	-63.5%
Transportation CO2	62.7	60.3	58.0	55.6	53.3	50.9	48.5	46.2	43.8	41.5	-35.1%
Electric Power CO2	11.7	10.4	9.1	7.9	6.6	5.3	4.0	2.7	1.3	0.0	-100.0%
Methane Leakage CO2e	45.6	42.6	39.5	36.3	33.0	29.5	26.0	22.3	18.4	15.1	-65.3%
Total CO2	117.9	111.3	104.7	98.1	91.6	85.0	78.4	71.8	65.3	59.0	-71.5%
Total CO2e	163.4	153.9	144.2	134.4	124.5	114.5	104.4	94.1	83.7	74.1	-70.5%

	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	% Reduced
Residential CO2	8.0	6.2	4.5	2.7	1.0	0.0	0.0	0.0	0.0	0.0	-100.0%
Commercial CO2	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100.0%
Industrial CO2	6.6	6.6	6.5	6.5	6.5	6.5	6.4	6.4	6.4	6.3	-65.2%
Transportation CO2	39.1	36.7	34.4	32.0	29.7	27.3	24.9	22.6	20.2	17.9	-72.0%
Electric Power CO2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100.0%
Methane Leakage CO2e	13.0	10.9	9.5	8.0	6.5	5.6	5.2	5.1	5.1	5.1	-88.2%
Total CO2	54.2	49.5	45.4	41.2	37.1	33.8	31.4	29.0	26.6	24.2	-88.3%
Total CO2e	67.1	60.5	54.8	49.2	43.6	39.4	36.6	34.1	31.7	29.3	-88.3%

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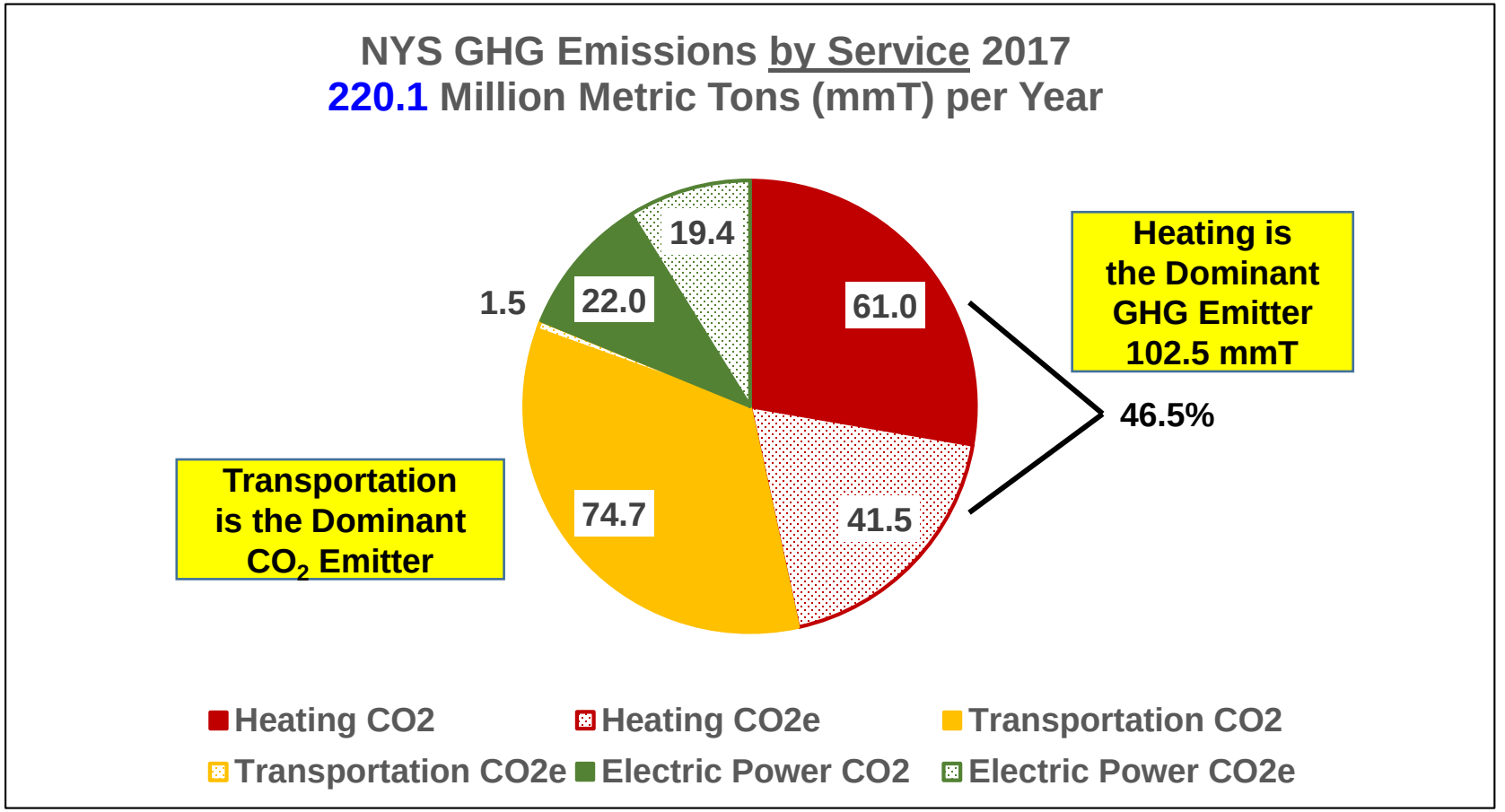
NYS – Emissions Reduction

Status by Service as of 2017



Focus on Reducing Heating and Transportation GHG Emissions Reduction Must Increase Dramatically to Meet CLCPA Requirements

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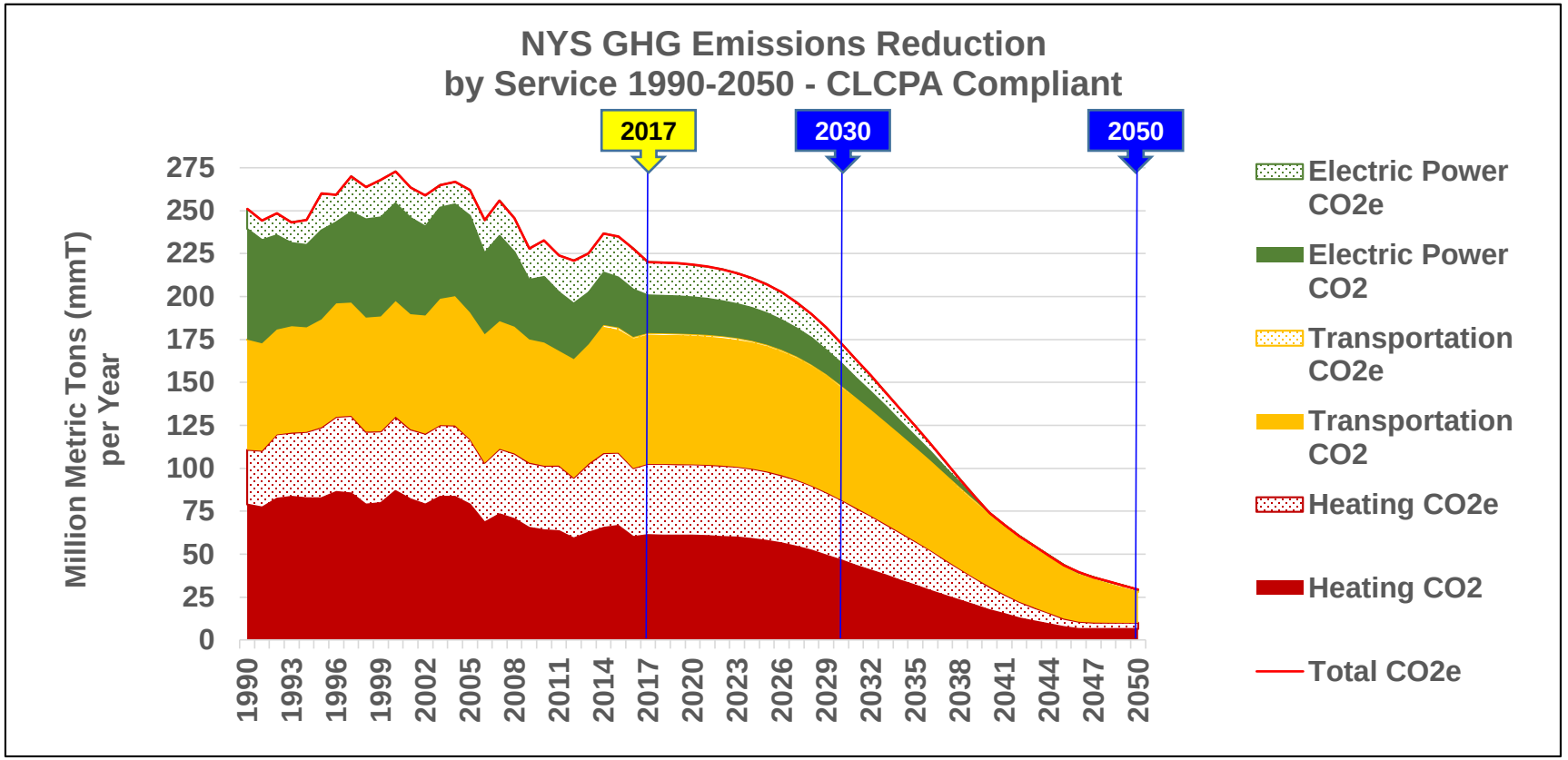
NYS – Services GHG Emissions Reduction Timeline

2017 Progress & Yearly Targets to Be CLCPA Compliant



- **Heating GHG Emissions Are 46.5% of Total CO_2e**
- **Total Heating CO_2e Reduced Only 7.5% (8.3 mmT)**
- **Transportation GHG Emissions Increased 19% (12 mmT)**
- **Electric Power CO_2 Reduced 46% (-34.7 mmT)**
- **Electric Power CO_2e Increased 9.7% (9.7 mmT)**

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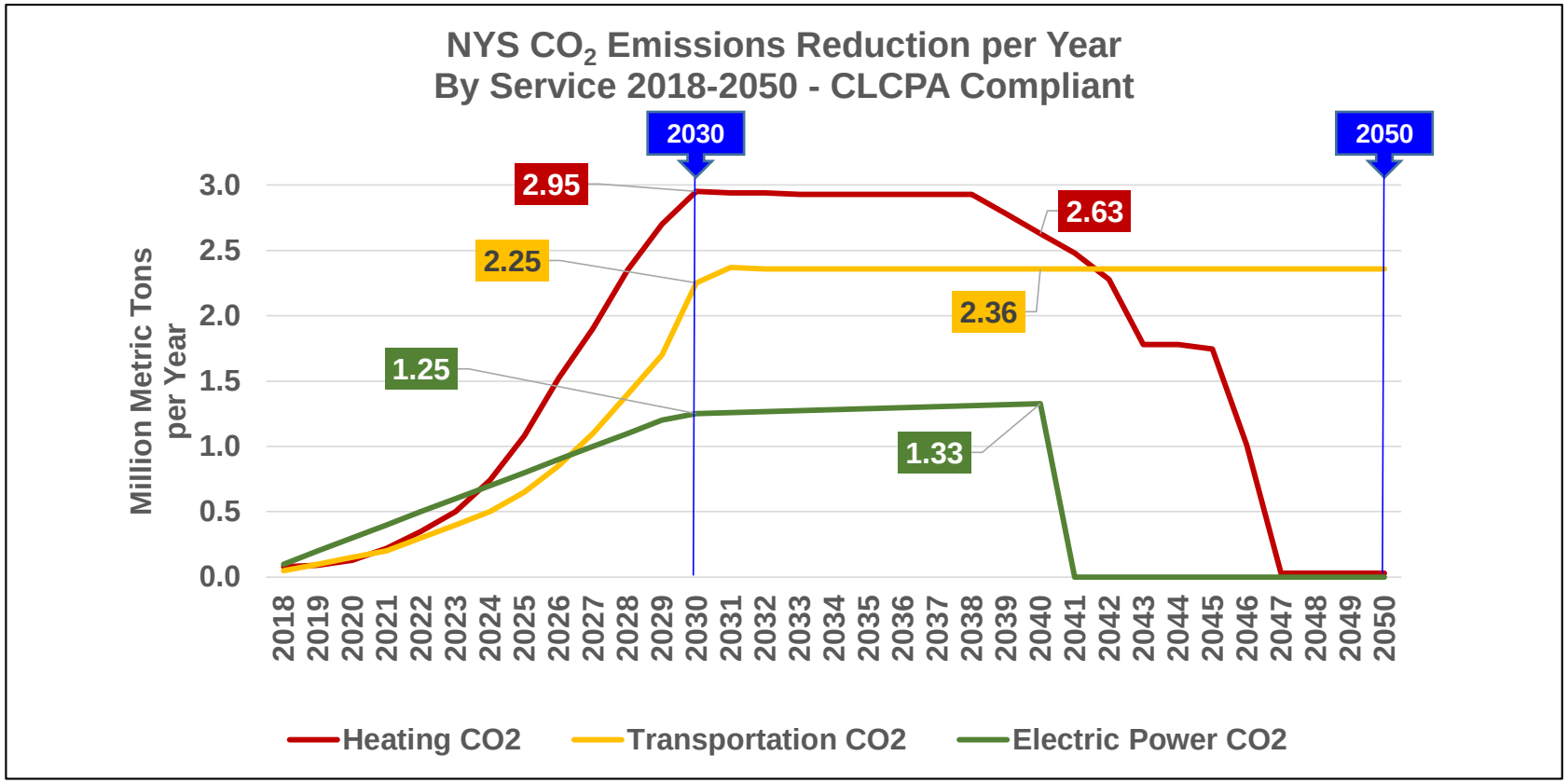
NYS – Services GHG Emissions Reduction

Yearly CO_2 Reduction Rates to Be CLCPA Compliant



Services Yearly CO_2 Emissions Reduction Must Increase 10-30X to Meet CLCPA Goals

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NYS – Services GHG Emissions Reduction

10 Year Timeframe Targets to Be CLCPA Compliant

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	% Reduced
Heating CO2	60.9	60.8	60.7	60.5	60.1	59.6	58.9	57.8	56.3	54.4	52.0	49.3	46.4	-41.2%
Heating CO2e	41.5	41.5	41.5	41.5	41.4	41.2	40.8	40.3	39.6	38.8	37.8	36.6	35.2	10.6%
Transportation CO2	74.7	74.6	74.4	74.2	73.9	73.5	73.0	72.4	71.5	70.4	69.0	67.3	65.1	1.9%
Transportation CO2e	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	
Electric Power CO2	21.9	21.7	21.4	21.0	20.5	19.9	19.2	18.4	17.5	16.5	15.4	14.2	13.0	-79.9%
Electric Power CO2e	19.4	19.3	19.1	18.8	18.4	18.0	17.4	16.8	16.0	15.1	14.1	13.0	11.8	1.8%
Total CO2e	219.9	219.4	218.6	217.5	215.8	213.7	210.8	207.1	202.4	196.7	189.8	181.9	172.9	-31.1%
Total CO2	157.5	157.1	156.5	155.7	154.6	153.1	151.1	148.6	145.3	141.3	136.5	130.9	124.4	-40.0%

	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	% Reduced
Heating CO2	43.5	40.5	37.6	34.7	31.7	28.8	25.9	22.9	20.2	17.5	-77.8%
Heating CO2e	33.5	31.8	29.8	27.8	25.7	23.5	21.1	18.6	15.9	13.7	-57.1%
Transportation CO2	62.7	60.3	58.0	55.6	53.3	50.9	48.5	46.2	43.8	41.5	-35.1%
Transportation CO2e	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	
Electric Power CO2	11.7	10.4	9.1	7.9	6.6	5.3	4.0	2.7	1.3	0.0	-100.0%
Electric Power CO2e	10.6	9.4	8.2	7.0	5.8	4.6	3.4	2.2	1.0	0.0	-100.0%
Total CO2e	163.4	153.9	144.2	134.4	124.5	114.5	104.4	94.1	83.7	74.1	-70.5%
Total CO2	117.9	111.3	104.7	98.1	91.6	85.0	78.4	71.8	65.3	59.0	-71.5%

	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	% Reduced
Heating CO2	15.0	12.8	11.0	9.2	7.5	6.5	6.4	6.4	6.4	6.3	-92.0%
Heating CO2e	11.5	9.5	8.0	6.5	5.0	4.2	3.7	3.7	3.6	3.6	-88.5%
Transportation CO2	39.1	36.7	34.4	32.0	29.7	27.3	24.9	22.6	20.2	17.9	-72.0%
Transportation CO2e	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	
Electric Power CO2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100.0%
Electric Power CO2e	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100.0%
Total CO2e	67.1	60.5	54.8	49.2	43.6	39.4	36.6	34.1	31.7	29.3	-88.3%
Total CO2	54.2	49.5	45.4	41.2	37.1	33.8	31.4	29.0	26.6	24.2	-88.3%

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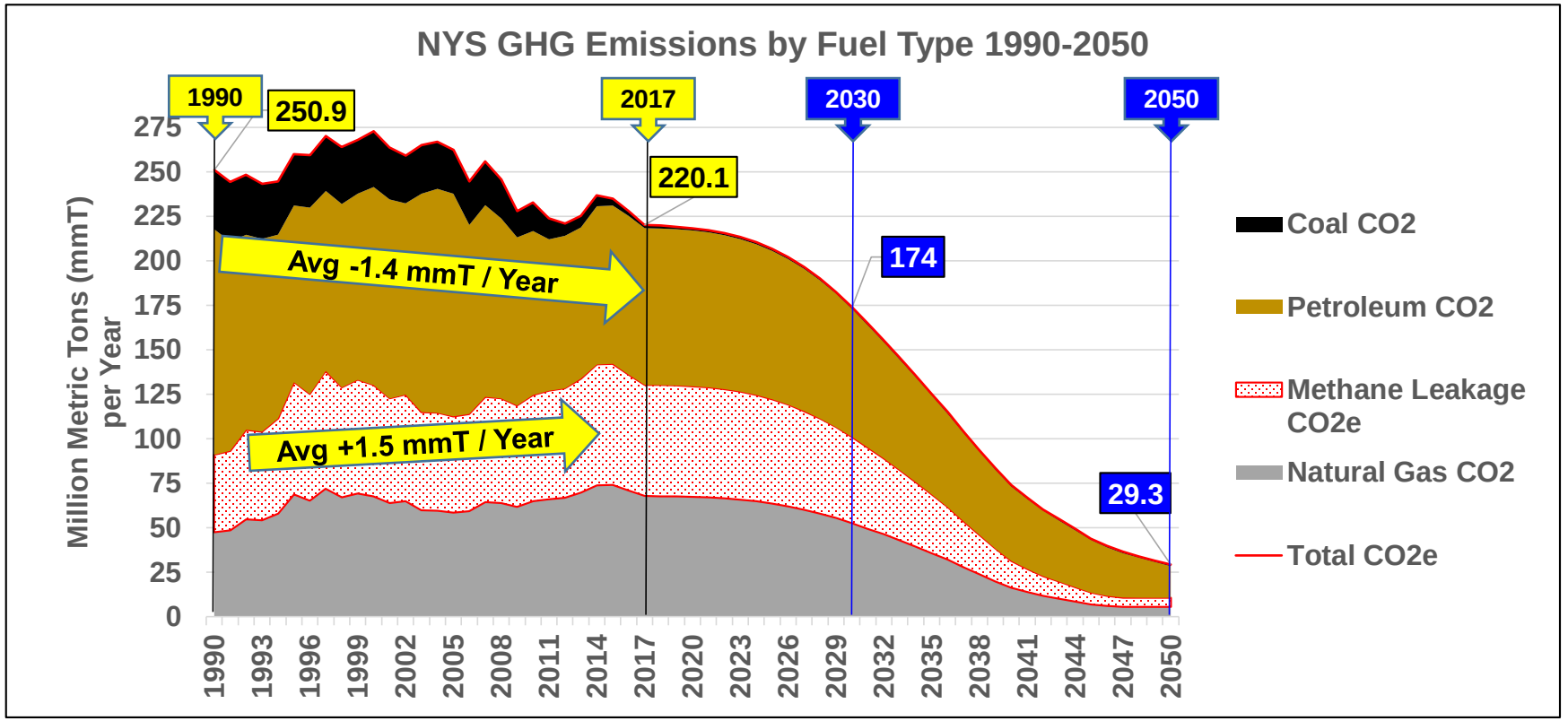
NYS – Fuel Types GHG Emissions Reduction Timeline

2017 Progress & Yearly Targets to Be CLCPA Compliant



- Coal CO_2 Reduced 94% (31.3 mmT)
- Petroleum CO_2 Reduced 30% (38.6 mmT)
- Natural Gas GHG Increased 43% (39.2 mmT)

Switching to Natural Gas with Methane Leakage Has Significantly Off-Set Coal and Petroleum CO_2 Emissions Reduction Progress, Only 12% Progress Over 27 Years

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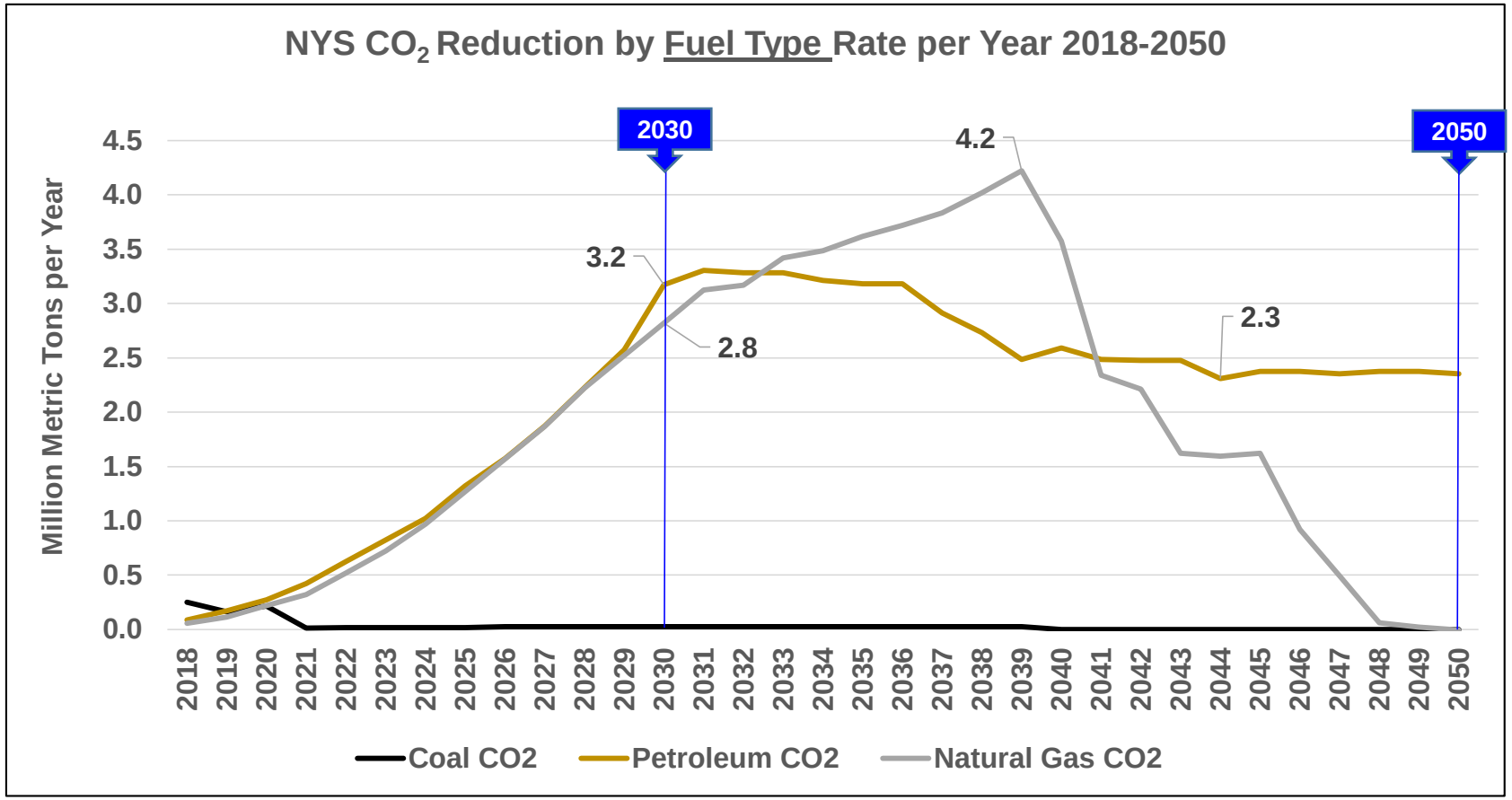
NYS – Fuel Types CO_2 Emissions Reduction

Yearly Reduction Rates to Be CLCPA Compliant



Fuel Type Yearly CO_2 Emissions Reduction Must Increase 30X to Meet CLCPA Goals

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NYS – Fuel Types GHG Emissions Reduction

10 Year Timeframe Targets to Be CLCPA Compliant

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	% Reduced
Coal CO2	1.6	1.4	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.0	1.0	-96.9%
Petroleum CO2	88.0	87.8	87.5	87.1	86.5	85.7	84.6	83.3	81.7	79.9	77.6	75.1	71.9	-43.2%
Natural Gas CO2	67.8	67.7	67.4	67.1	66.6	65.9	64.9	63.6	62.1	60.2	58.0	55.5	52.6	11.1%
Methane Leakage CO2e	62.4	62.2	62.0	61.7	61.3	60.6	59.7	58.5	57.1	55.4	53.3	51.0	48.4	11.1%
Total CO2	157.3	156.9	156.2	155.4	154.3	152.7	150.7	148.1	144.9	141.2	136.7	131.6	125.6	-39.4%
Total CO2e	219.7	219.1	218.2	217.2	215.5	213.3	210.4	206.6	202.0	196.5	190.0	182.6	174.0	-30.6%

	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	% Reduced
Coal CO2	1.0	1.0	0.9	0.9	0.9	0.9	0.8	0.8	0.8	0.8	-97.6%
Petroleum CO2	68.6	65.3	62.0	58.8	55.6	52.4	49.5	46.8	44.3	41.7	-67.1%
Natural Gas CO2	49.5	46.3	42.9	39.4	35.8	32.1	28.3	24.2	20.0	16.4	-65.3%
Methane Leakage CO2e	45.6	42.6	39.5	36.3	33.0	29.5	26.0	22.3	18.4	15.1	-65.3%
Total CO2	119.1	112.6	105.9	99.2	92.3	85.4	78.6	71.9	65.1	59.0	-71.6%
Total CO2e	164.7	155.3	145.4	135.5	125.3	114.9	104.6	94.2	83.6	74.1	-70.5%

	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	% Reduced
Coal CO2	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	-97.6%
Petroleum CO2	39.2	36.8	34.3	32.0	29.6	27.2	24.9	22.5	20.1	17.8	-86.0%
Natural Gas CO2	14.1	11.9	10.3	8.7	7.1	6.1	5.6	5.6	5.6	5.6	-88.2%
Methane Leakage CO2e	13.0	10.9	9.5	8.0	6.5	5.6	5.2	5.1	5.1	5.1	-88.2%
Total CO2	54.1	49.5	45.4	41.5	37.5	34.2	31.3	28.9	26.5	24.1	-88.4%
Total CO2e	67.1	60.4	54.8	49.4	44.0	39.8	36.5	34.0	31.6	29.3	-88.3%

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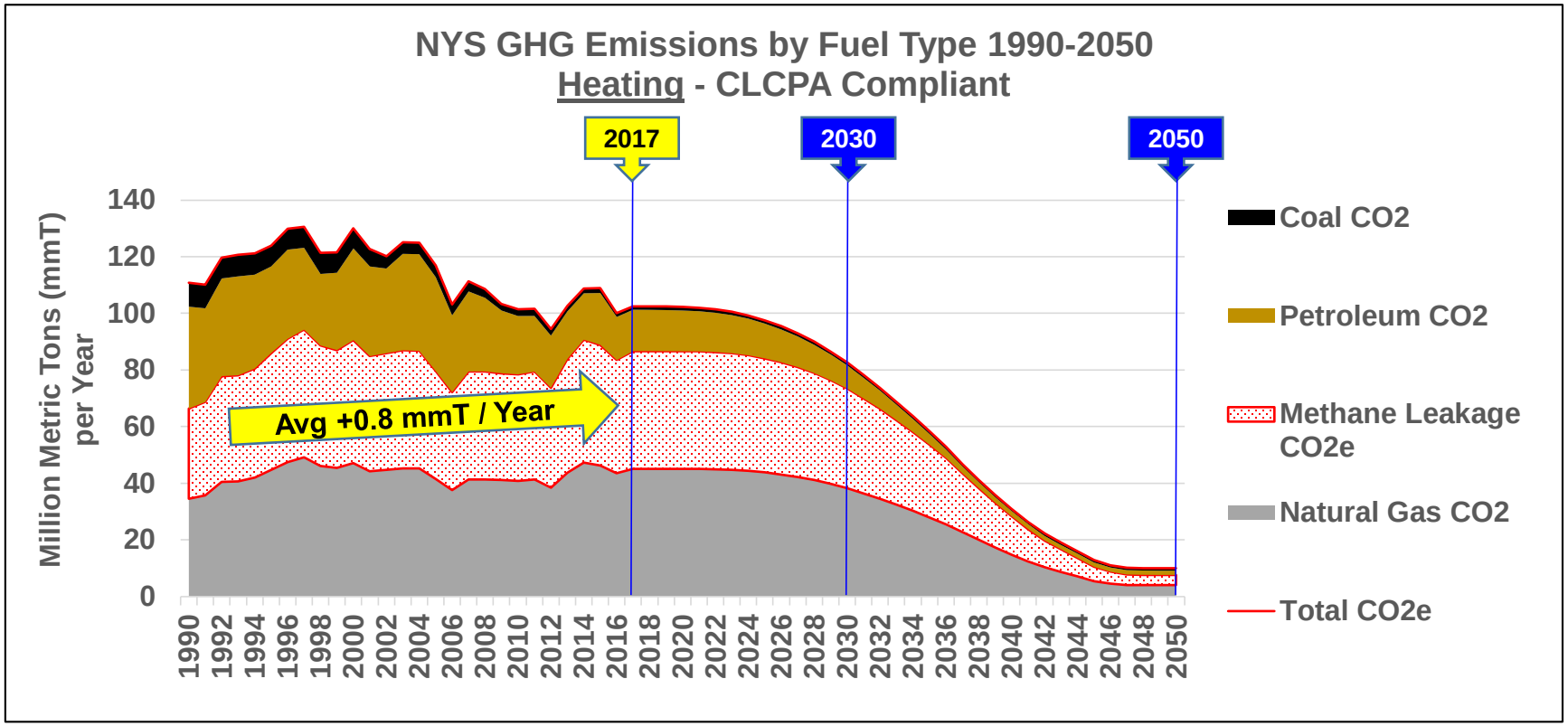
NYS – Heating GHG Emissions Reduction Timeline

2017 Progress & Yearly Targets to Be CLCPA Compliant



- Coal CO_2 Reduced 85% (-7.2 mmT)
- Petroleum CO_2 Reduced 59% (-21.4 mmT)
- Natural Gas GHG Increased 30% (+20.2 mmT)

Switching to Natural Gas Heating with Methane Leakage Has Off-Set Petroleum Heating CO_2 Emissions Reduction, Only 7.5% GHG Progress Over 27 Years

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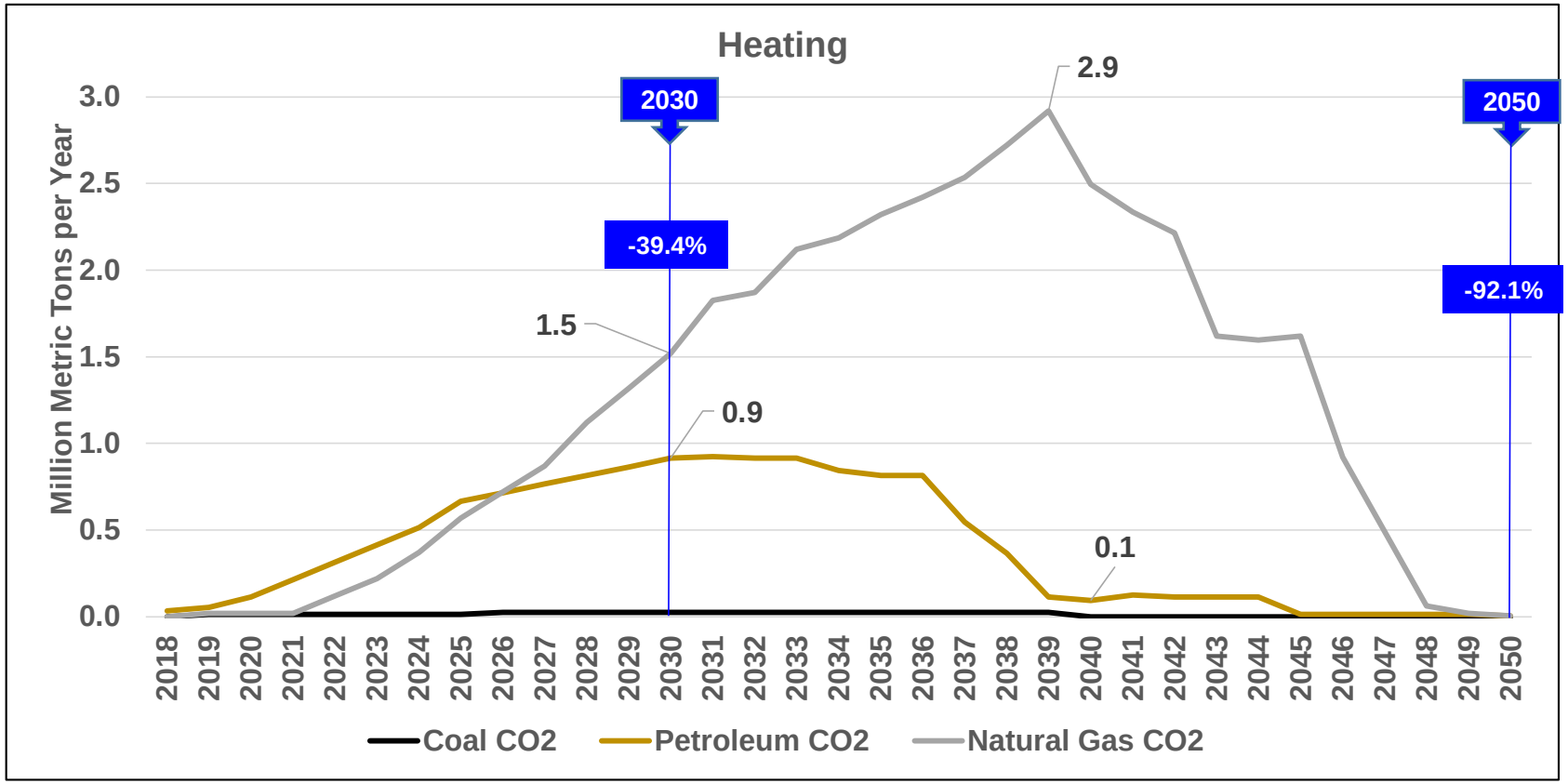
NYS – Heating CO_2 Emissions Reduction

Yearly CO_2 Reduction Rates to Be CLCPA Compliant



Fuel Types Yearly CO2 Emissions Reduction Must Increase 9-15X to Meet CLCPA Goals

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NYS – Heating GHG Emissions Reduction

10 Year Timeframe Targets to Be CLCPA Compliant

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	% Reduced
Coal CO2	1.25	1.24	1.22	1.21	1.19	1.18	1.16	1.15	1.12	1.10	1.07	1.05	1.02	-87.8%
Petroleum CO2	14.6	14.5	14.4	14.2	13.9	13.5	13.0	12.3	11.6	10.8	10.0	9.1	8.2	-77.2%
Natural Gas CO2	45.1	45.1	45.1	45.1	45.0	44.7	44.4	43.8	43.1	42.2	41.1	39.8	38.2	10.6%
Methane Leakage CO2e	41.5	41.5	41.5	41.5	41.4	41.2	40.8	40.3	39.6	38.8	37.8	36.6	35.2	10.6%
Total CO2	61.0	60.9	60.7	60.5	60.0	59.4	58.5	57.2	55.8	54.1	52.2	49.9	47.5	-39.9%
Total CO2e	102.5	102.4	102.2	102.0	101.4	100.5	99.3	97.5	95.4	92.9	90.0	86.5	82.7	-25.4%

	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	% Reduced
Coal CO2	1.00	0.97	0.95	0.92	0.90	0.87	0.85	0.82	0.80	0.80	-90.5%
Petroleum CO2	7.3	6.4	5.5	4.6	3.8	3.0	2.4	2.1	2.0	1.9	-94.8%
Natural Gas CO2	36.4	34.6	32.4	30.2	27.9	25.5	23.0	20.3	17.3	14.8	-57.1%
Methane Leakage CO2e	33.5	31.8	29.8	27.8	25.7	23.5	21.1	18.6	15.9	13.7	-57.1%
Total CO2	44.7	41.9	38.8	35.8	32.6	29.4	26.3	23.1	20.1	17.5	-77.8%
Total CO2e	78.2	73.7	68.7	63.6	58.3	52.8	47.4	41.8	36.0	31.1	-71.9%

	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	% Reduced
Coal CO2	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	90.5%
Petroleum CO2	1.7	1.6	1.5	1.6	1.5	1.5	1.5	1.5	1.5	1.5	95.8%
Natural Gas CO2	12.5	10.3	8.7	7.1	5.5	4.5	4.0	4.0	4.0	4.0	88.5%
Methane Leakage CO2e	11.5	9.5	8.0	6.5	5.0	4.2	3.7	3.7	3.6	3.6	88.5%
Total CO2	15.0	12.7	11.0	9.4	7.8	6.9	6.4	6.3	6.3	6.3	92.1%
Total CO2e	26.5	22.2	18.9	15.9	12.8	11.0	10.1	10.0	9.9	9.9	91.0%

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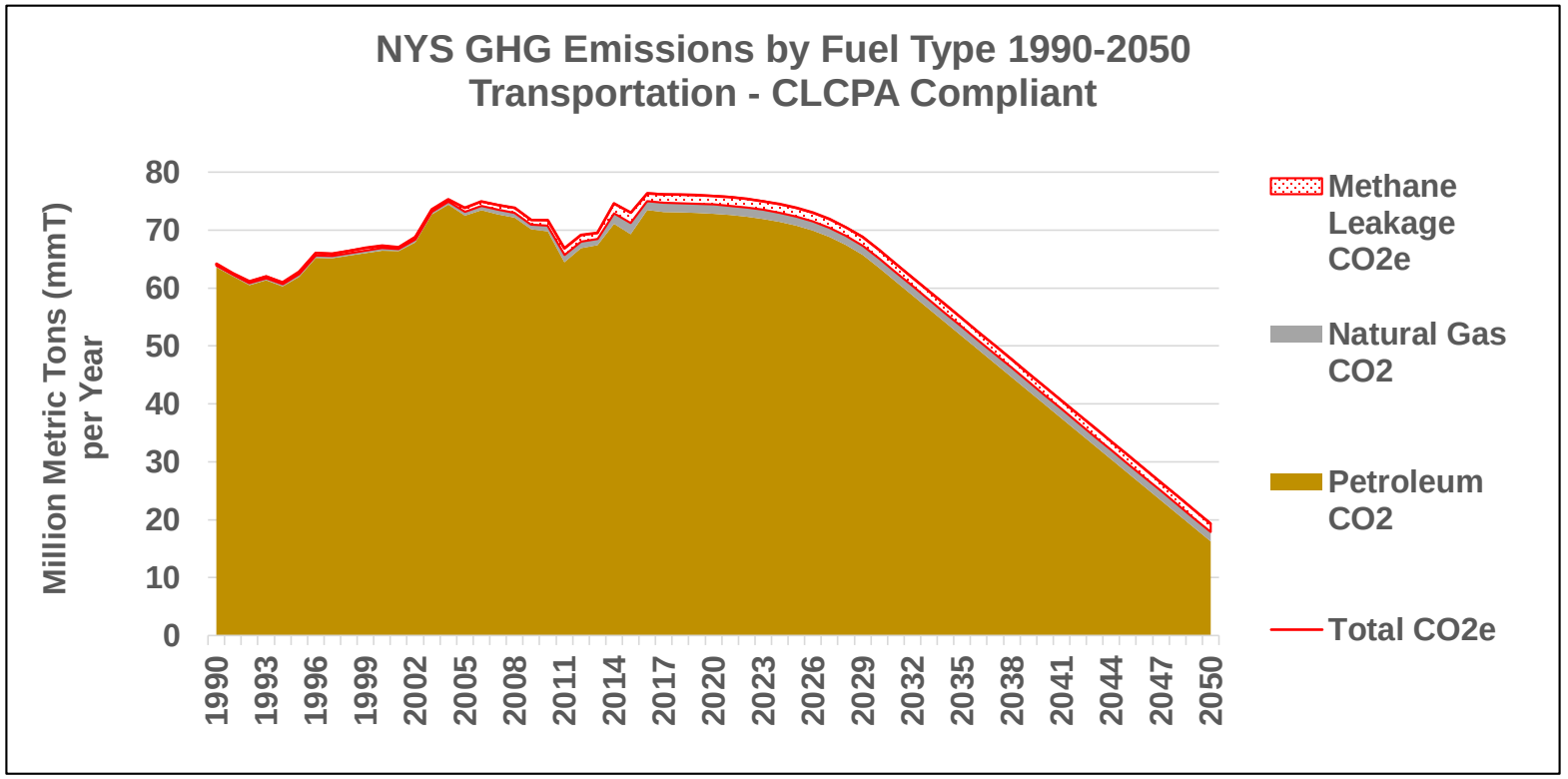
NYS – Transportation GHG Emissions Reduction Timeline

2017 Progress & Yearly Targets to Be CLCPA Compliant



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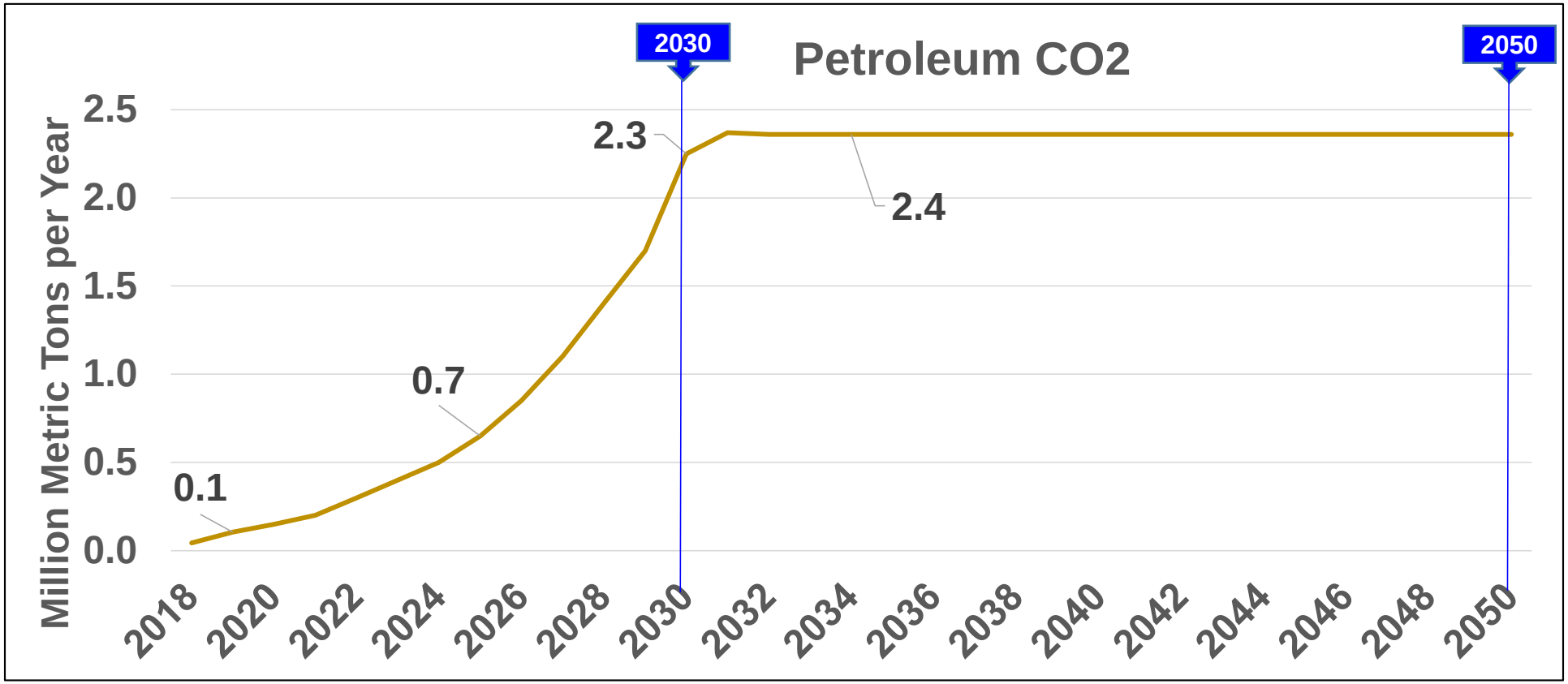
NYS – Transportation CO_2 Emissions Reduction

Yearly CO_2 Reduction Rates to Be CLCPA Compliant



Transportation Yearly CO2 Emissions Reduction Must Increase 7-23X to Meet CLCPA Goals

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NYS – Transportation GHG Emissions Reduction

10 Year Timeframe Targets to Be CLCPA Compliant

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	% Reduced
Coal CO2	0	0	0	0	0	0	0	0	0	0	0	0	0	NA
Petroleum CO2	73.1	73.0	72.8	72.6	72.3	71.9	71.4	70.8	69.9	68.8	67.4	65.7	63.5	-0.2%
Natural Gas CO2	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	435.3%
Methane Leakage CO2e	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	435.3%
Total CO2	74.7	74.6	74.4	74.2	73.9	73.5	73.0	72.4	71.5	70.4	69.0	67.3	65.1	1.9%
Total CO2e	76.1	76.1	75.9	75.7	75.4	75.0	74.5	73.9	73.0	71.9	70.5	68.8	66.6	3.7%

	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	% Reduced
Coal CO2	0	0	0	0	0	0	0	0	0	0	NA
Petroleum CO2	61.1	58.7	56.4	54.0	51.7	49.3	46.9	44.6	42.2	39.9	-37.3%
Natural Gas CO2	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	435.3%
Methane Leakage CO2e	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	435.3%
Total CO2	62.7	60.3	58.0	55.6	53.3	50.9	48.5	46.2	43.8	41.5	-35.1%
Total CO2e	64.2	61.8	59.5	57.1	54.7	52.4	50.0	47.7	45.3	42.9	-33.1%

	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	% Reduced
Coal CO2	0	0	0	0	0	0	0	0	0	0	NA
Petroleum CO2	37.5	35.1	32.8	30.4	28.1	25.7	23.3	21.0	18.6	16.3	74.4%
Natural Gas CO2	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	-435.3%
Methane Leakage CO2e	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	-435.3%
Total CO2	39.1	36.7	34.4	32.0	29.7	27.3	24.9	22.6	20.2	17.9	72.0%
Total CO2e	40.6	38.2	35.9	33.5	31.1	28.8	26.4	24.1	21.7	19.3	69.9%

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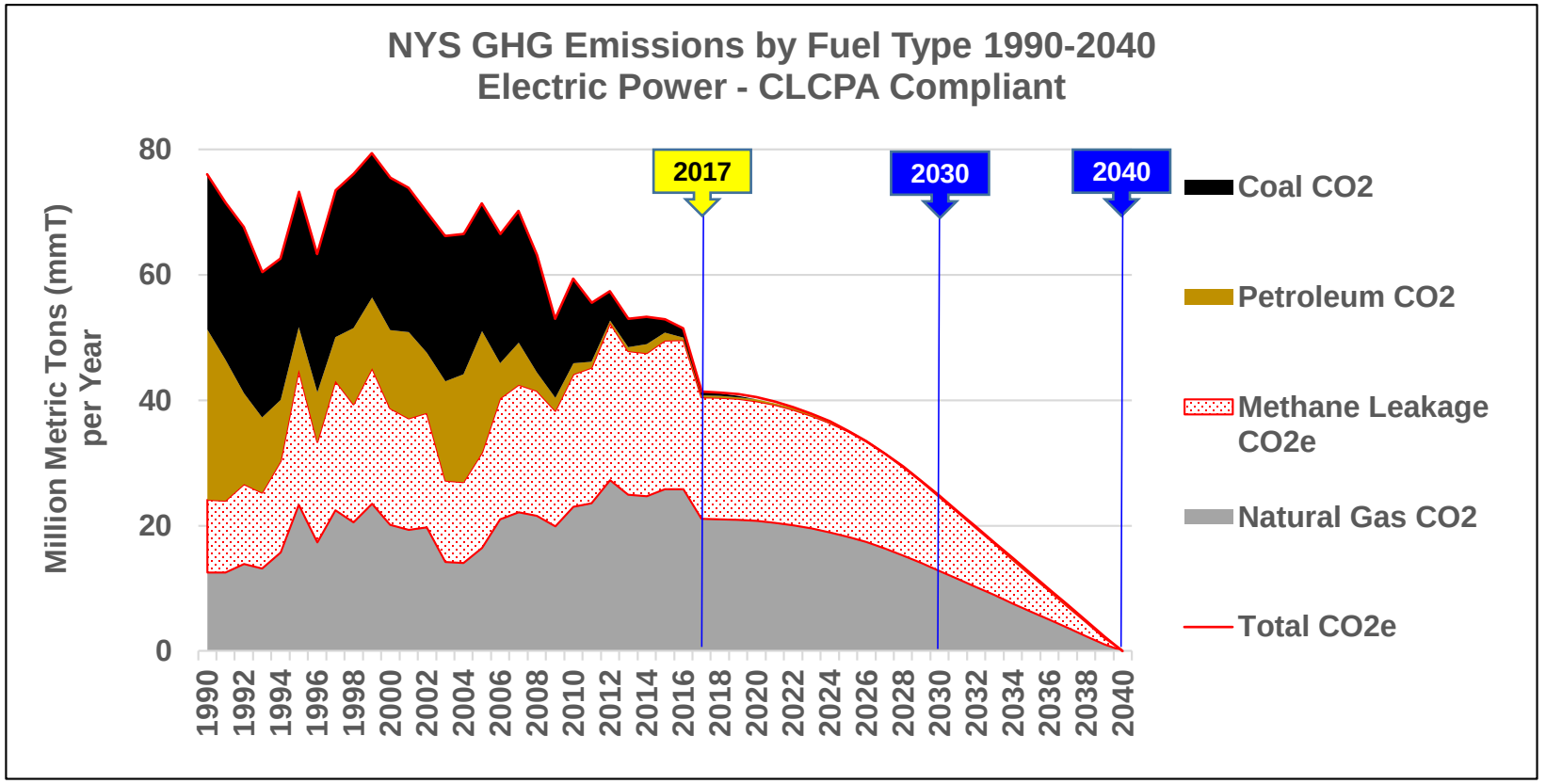
NYS – Electric Power GHG Emissions Reduction Timeline

2017 Progress & Yearly Targets to Be CLCPA Compliant



Achieving Emission Free Electric Power by 2040 Requires Replacement of Remaining Natural Gas Power Plants

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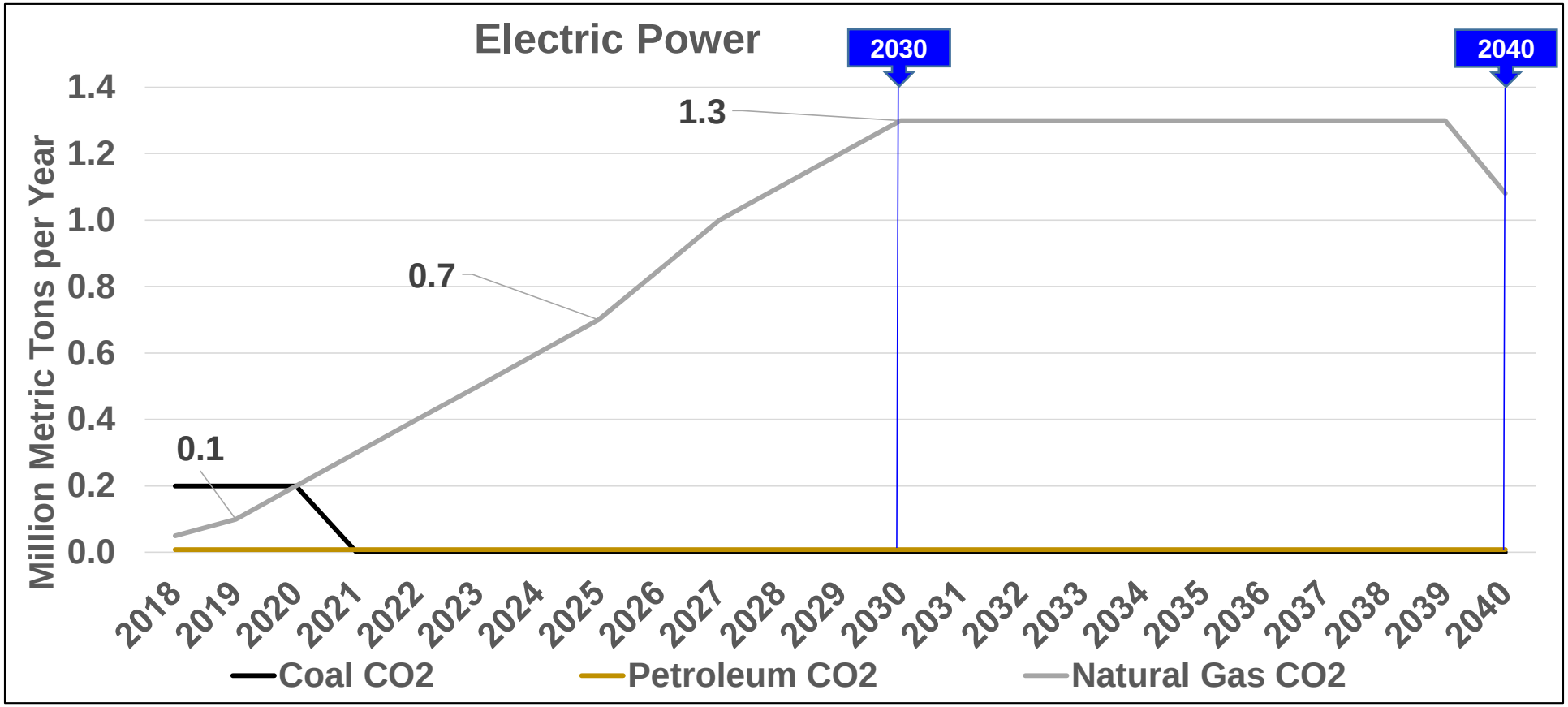
NYS – Electric Power CO_2 Emissions Reduction

Yearly CO_2 Reduction Rates to Be CLCPA Compliant



Yearly CO2 Emissions Reduction
Must Increase 7-13X to Meet CLCPA Goals

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NYS – Electric Power GHG Emissions Reduction

10 Year Timeframe Targets to Be CLCPA Compliant

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	% Reduced
Coal CO2	0.4	0.2	0.0	0	0	0	0	0	0	0	0	0	0	-100.0%
Petroleum CO2	0.31	0.30	0.29	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.23	0.22	0.21	-99.2%
Natural Gas CO2	21.0	20.9	20.7	20.4	20.0	19.5	18.9	18.2	17.4	16.4	15.3	14.1	12.8	1.8%
Methane Leakage CO2e	19.4	19.3	19.1	18.8	18.4	18.0	17.4	16.8	16.0	15.1	14.1	13.0	11.8	1.8%
Total CO2	21.9	21.7	21.4	21.0	20.5	19.9	19.2	18.4	17.5	16.5	15.4	14.2	13.0	-79.9%
Total CO2e	41.3	41.0	40.5	39.8	38.9	37.9	36.6	35.2	33.5	31.6	29.5	27.2	24.7	-67.5%

	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	% Reduced
Coal CO2	0	0	0	0	0	0	0	0	0	0	-100.0%
Petroleum CO2	0.20	0.19	0.19	0.18	0.17	0.16	0.15	0.14	0.14	0.00	-100.0%
Natural Gas CO2	11.5	10.2	8.9	7.6	6.3	5.0	3.7	2.4	1.1	0.0	-100.0%
Methane Leakage CO2e	10.6	9.4	8.2	7.0	5.8	4.6	3.4	2.2	1.0	0.0	-100.0%
Total CO2	11.7	10.4	9.1	7.9	6.6	5.3	4.0	2.7	1.3	0.0	-100.0%
Total CO2e	22.3	19.8	17.3	14.8	12.4	9.9	7.4	4.9	2.3	0.0	-100.0%

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