New York Gas Long-Term Plan

Low Carbon Fuels (LCF) Technical Conference

September 5, 2024

nationalgrid

1

Introduction

nationalgrid

Our Long-Term Plan Approach

- National Grid's long-term plan is to transform our New York gas utilities to enable **economy-wide decarbonization** while ensuring our customers have equitable access to **safe, reliable, and affordable energy.**

- Our analysis finds that the **necessary conditions do not exist today** to decarbonize the energy currently delivered by the gas network.

- This Long-Term Plan filing is intended to **build a foundation for the regulatory and policy innovations** necessary to reshape New York's energy economy and enable economy-wide decarbonization that is affordable, equitable, and maintains the safety and reliability of the gas system and the energy system overall.

- Our overarching recommendation is to **implement Climate Action Council's proposed Gas System Transition Plan Framework put forward in the Scoping Plan.**

Key Finding 1

LCF are necessary for any CLCPA-compliant gas decarb transition pathway

- All CAC scenarios require LCF for gas decarbonization
- Scoping plan is clear that LCF, electrification, efficiency are not zero-sum

Key Finding 2

Net benefits and emissions reductions from “balanced” and “LCF-constrained” scenarios are comparable

- Important caveat: LCF-constrained pathway causes high costs for remaining gas customers
- Costs outweigh benefits in all scenarios, after accounting for social cost of carbon
- Resource allocation should be based on cost-effectiveness

Key Finding 3

None of the resources necessary for the gas transition (LCF, electrification, efficiency) will scale sufficiently with current policies/regs

- Reference case illustrates “no new policy” pathway (not CLCPA-compliant)
- CLCPA-compliant pathways require between 1,549 and 3,686 Tbtu of LCF by 2050
- LCF-constrained scenario requires *more* RNG than balanced scenario in late-2030s

Key Finding 4

Instead of seeking to engineer a specific future by favoring certain clean heat technologies over others, we should work to enable all the resources necessary for the gas transition

- We must act immediately to put CLCPA targets within reach
- “Electrification vs. LCF” is a false choice. Both are needed.
- Next steps should be focused on establishing policies/regs to enable greatest cost-effective emissions reductions

National Grid's Vision for the Role of LCF

Transforming the gas system to play a complementary role alongside electrification and energy efficiency

Reduce gas system emissions today while electrification scales up

- The effect of GHG emissions on climate is cumulative, so we can't afford to wait for heat pump adoption to scale to reduce building and industry emissions.
- Incremental near-term decarbonization through use of LCF is not a substitute for electrification and energy efficiency.

Right-size the gas network to deliver 100% fossil-free energy by 2050

- In 2050 the gas network will deliver a blend of RNG (93%) and clean hydrogen (7%).
- Hard-to-electrify buildings and industry may pair LCF with heat pumps in hybrid configurations.
- Some customers will be served by dedicated 100% hydrogen infrastructure.
- NPAs should aim to achieve targeted deployment of electrification to maximize gas infrastructure cost savings, while heat pump incentives increase to make electrification more affordable for everyone. LCF will decarbonize remaining gas load.

Full life cycle accounting for GHG emissions to achieve lowest marginal abatement cost

- Policies should enable customers to choose the clean heat option that work best for them.
- End-user cost of LCF should reflect life cycle emissions to incentivize fuels with the lowest carbon intensity.

Build a sustainable circular energy economy to mitigate waste emissions and support renewable power

- Producing RNG from organic waste (agriculture, waste water, landfills) can reduce harmful methane emissions.
- RNG production and use is a powerful climate action tool because methane is 80x more potent than CO2 as a GHG.
- RNG can have a *negative* carbon intensity due to methane abatement.
- Green hydrogen production can reduce curtailment of renewable power generation and support development of more wind and solar.

The Role of Low Carbon Fuels (LCF) in the CAC's Scoping Plan

All CLCPA-compliant scenarios use LCF to decarbonize the gas system

Use of LCF in buildings is compatible with electrification

"Rapid and widespread building efficiency and electrification is needed *and supported by the strategic utilization of alternative fuels"* (p. 176)

Regional and typological variations affect full electrification suitability for individual buildings

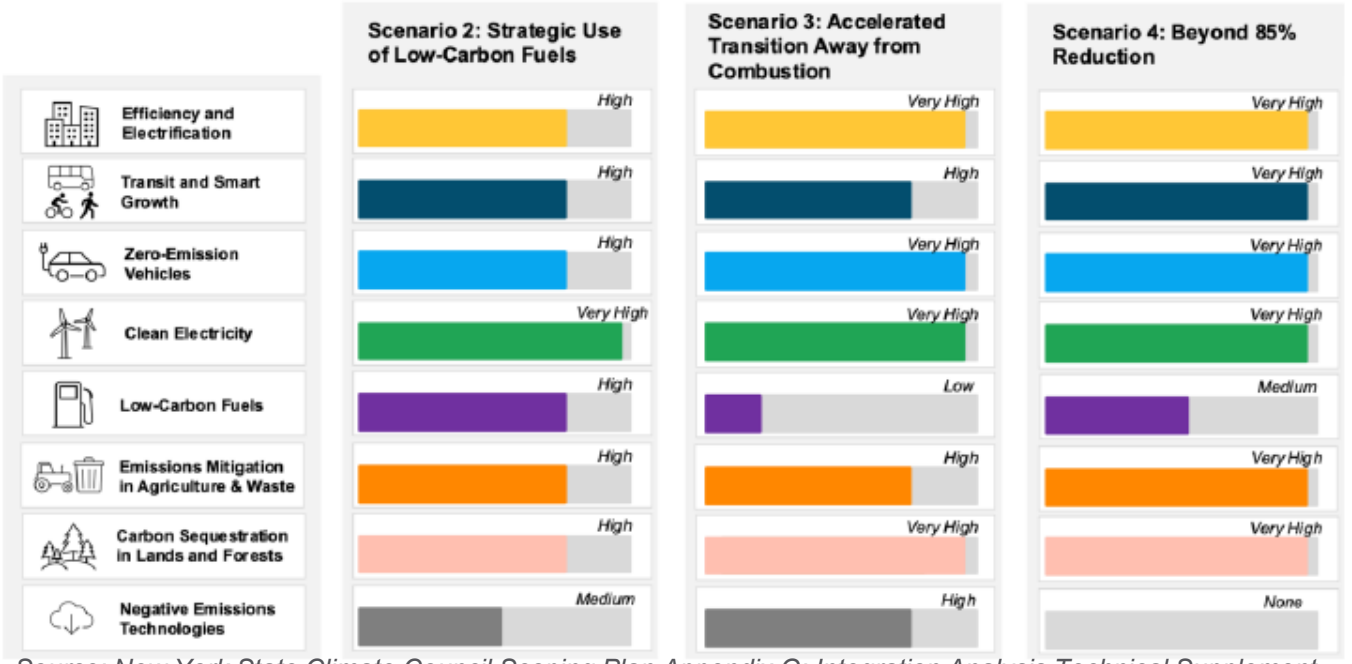
- In colder areas, "some homes that install cold climate ASHPs may need supplemental heat for the coldest days" (p. 179)
- "Larger multifamily, mixed use, or complex commercial buildings may…need supplemental heat on the coldest days" (p.178)

RNG enables emissions mitigation in the waste sector

"Biogas generation from landfills and from anaerobic digestion will continue, and a viable use for the biogas is needed." (p. 337)

Support for RD&D for LCF is a key component of buildings strategy

- Needed for "harder to electrify" buildings
- Develop standards for "life cycle GHG accounting" for "zero or negative emissions sources" (p. 213)



Source: New York State Climate Council Scoping Plan Appendix G: Integration Analysis Technical Supplement

Gas System Transition Plan Framework

- Consideration of "strategic use of alternative fuels…to meet customer needs for space heating or process use where electrification is not yet feasible or to decarbonize the gas network as it transitions." (p. 361)
- "Consideration of leveraging gas utility workers' and other workers reliant on the gas industry skillsets for the decarbonization and operation of the gas delivery system with alternative fuels…" (p. 362)
- Identifying needed statutory and regulatory changes to enable "potential use of alternative fuels like renewable natural gas and green hydrogen." (p. 363)

2

Low-Carbon Fuels in the Long-Term Plan Scenarios

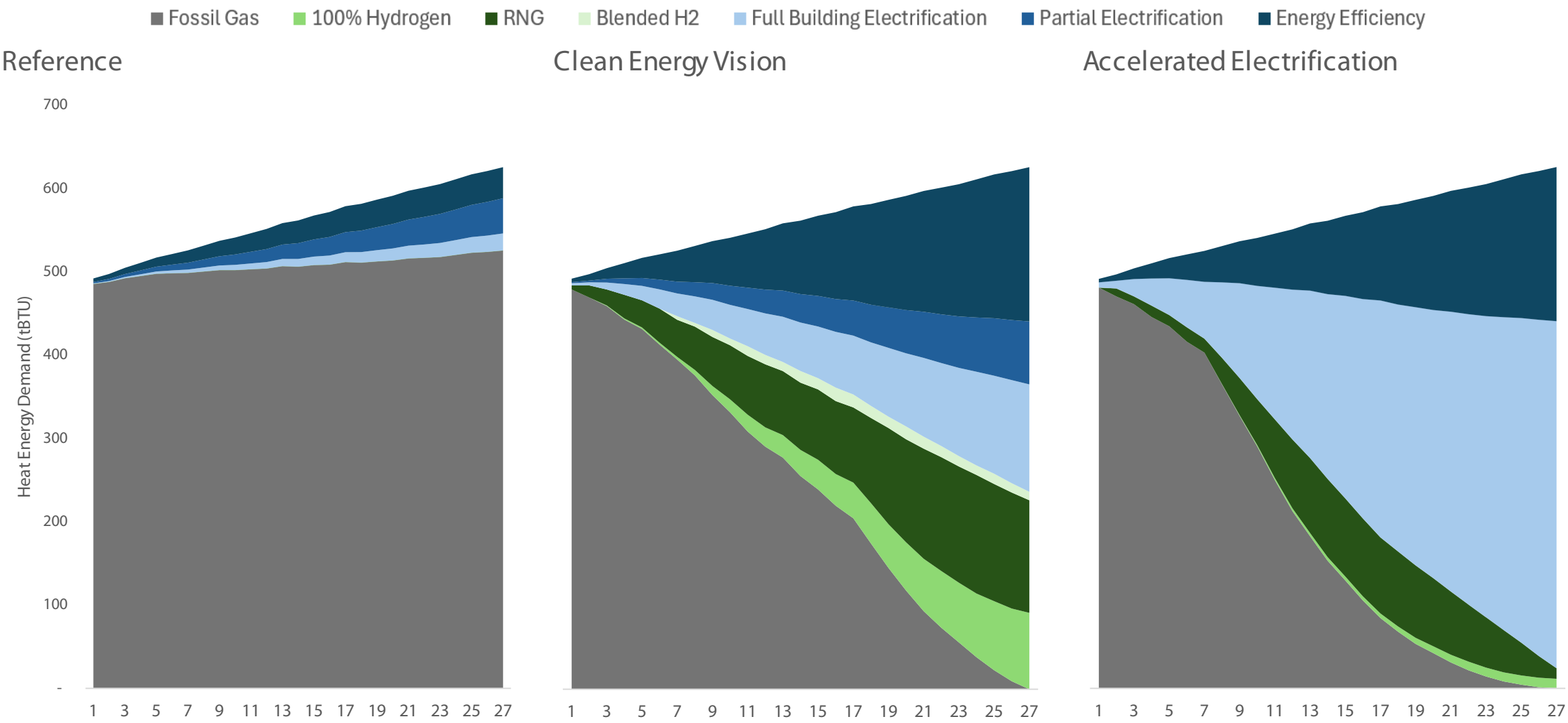
nationalgrid

Our Long-Term Plan Scenarios

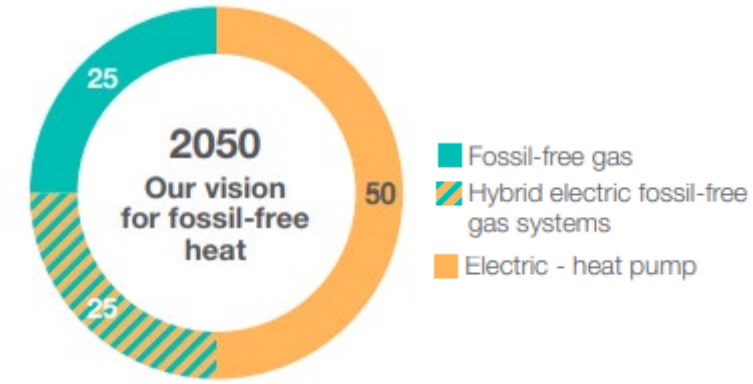
Reference Case	Clean Energy Vision (CEV)	Accelerated Electrification (AE)
• Continuation of current policies • Accounts for enacted policies including All-Electric Buildings Act and NYC Local Laws 97 and 154 • Assumes increased energy efficiency/DSM funding at historic growth rate	• Balanced approach between LCF and electrification/efficiency • Includes rapid expansion of electrification and efficiency • Gas network transformed to play complementary role delivering LCF	• Based on Climate Action Council Integration Analysis Scenario 3; CAC3 scenario scaled to National Grid's service territory • "LCF-constrained" pathway; significant volumes of low-carbon fuels, less than CEV • Efficiency penetration same as CEV

- Scenarios are illustrative, not predictive.
- They are not proposals per se, but instead are hypotheticals intended to bracket the most likely gas transition pathways.
- National Grid does not recommend seeking to enable any CLCPA-compliant scenario to the exclusion of any other.
- Scenario analysis identifies "no-regrets" steps to be taken in near-term and establishes key indicators/signposts to guide future policy and regulatory decisions.

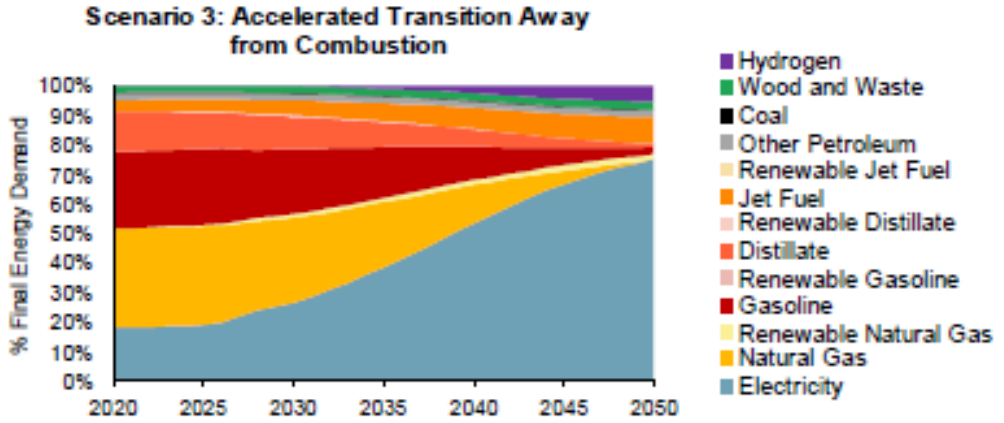
LTP Scenario Resource Requirements



CEV & AE Scenario Development



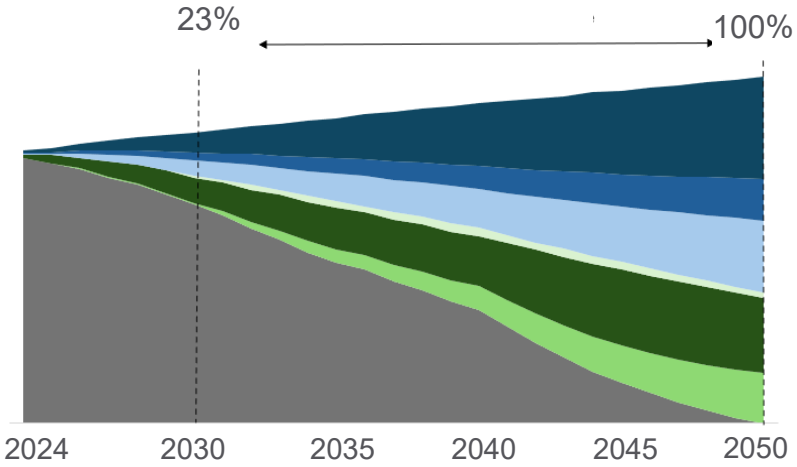
Foundational Analysis



Source: New York State Climate Council Scoping Plan Appendix G: Integration Analysis Technical Supplement

Clean Energy Vision

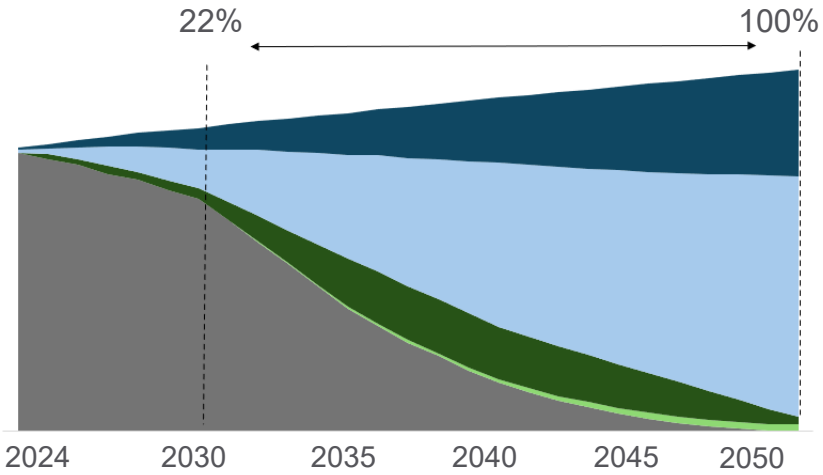
Fossil Gas Reduction from 2018 Baseline



LTP Scenario

Accelerated Electrification

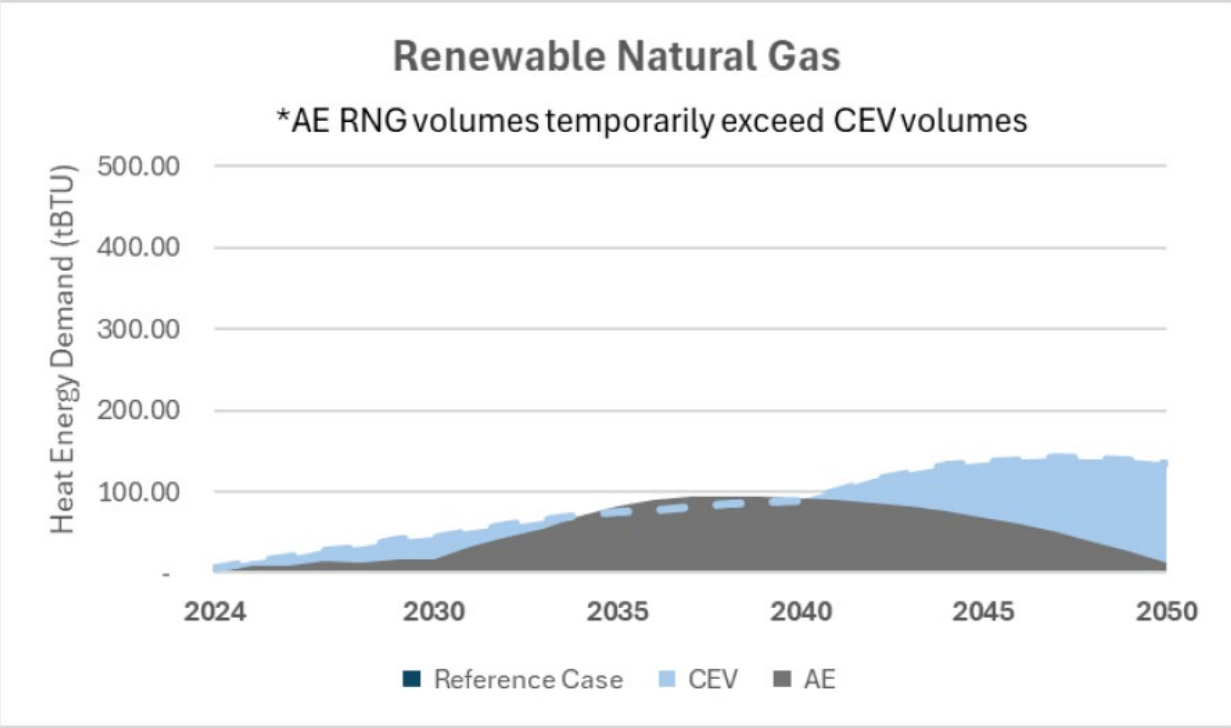
Fossil Gas Reduction from 2018 Baseline

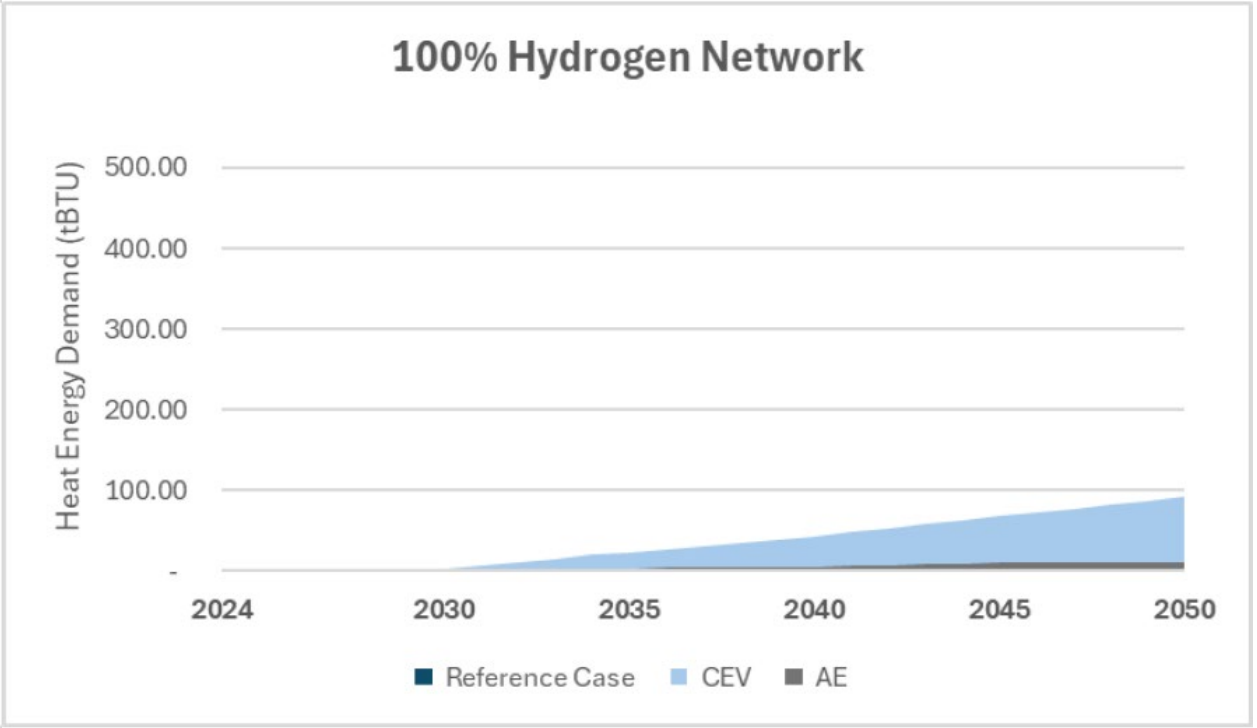


Gas Transition Resource Requirements

- The resources necessary to achieve the gas transition are common to the CEV and AE scenarios.
- While the CEV is National Grid's vision for the energy transition, **choosing between the CEV and AE scenarios is not necessary** because neither is achievable without rapidly achieving scale in the following areas:
  - Electrification of Heat
  - Energy Efficiency
  - Low-Carbon Fuels
- **None of these resources will be available in sufficient volumes to achieve the CEV or the AE** without transformational policy and/or technical innovations.
- Instead of trying to engineer a specific future by favoring certain clean heat technologies over others, **we should work to enable all the resources necessary for the gas transition**

LCF Resource Requirements by scenario





Availability of Supply

Resource potential for RNG is sufficient to meet NY's gas transition needs

Table 4-2: Estimate of Annual RNG Production from Eastern U.S. States, and Potential RNG Supplies Available to New York

RNG Supply Cases Defined by AGF	Annual RNG Supply Potential Eastern U.S. in 2050 (TBtu/year)	Estimated Share of Eastern U.S. RNG Supply potential in 2050 (TBtu/year)	
		NY State	National Grid (NY only)
Low Supply Case	1,158	150	83
High Supply Case	2,199	285	158
Regional share of non-power, non-industrial natural gas sales in 2020		13.0%	7.2%

Figure 4-2: Estimated Annual RNG Production, Low Resource Projections from the AGF Study, TBtu/year

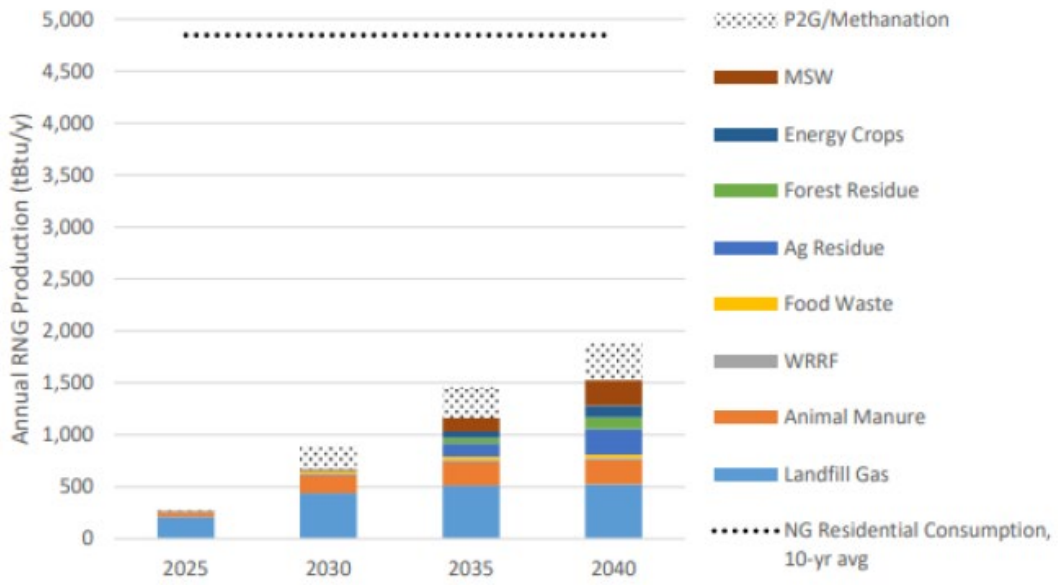
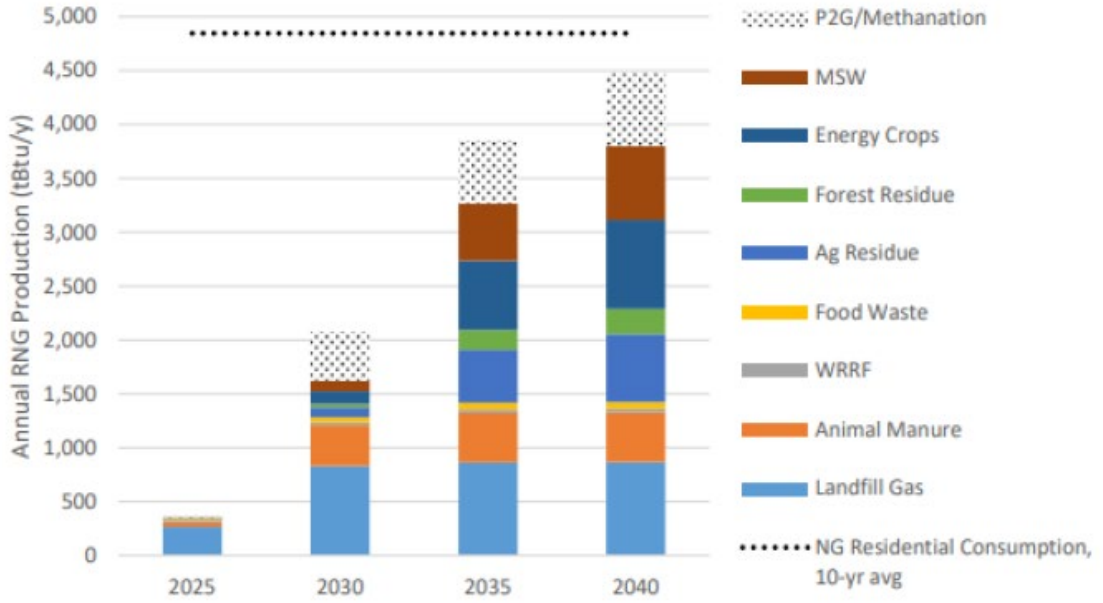


Figure 4-3: Estimated Annual RNG Production, High Resource Projections from the AGF Study, TBtu/year



Source: American Gas Foundation, Renewable Sources of Natural Gas: Supply And Emissions Reduction Assessment, available at https://gasfoundation.org/wp-content/uploads/2019/12/AGF-2019-RNG-Study-Full-Report-FINAL-12-18-19.pdf

RNG in Current Portfolio

Newtown Creek RNG Facility

- Joint project between National Grid and NYC Department of Environmental Protection
- Commissioned March 2023
- RNG produced from Water Resource Recovery Facility
- Forecasted to produce between 137,000-237,000 Dth/year
- Environmental attributes are being sold in open market
- Environmental attributes are not claimed by National Grid

American Organic Energy

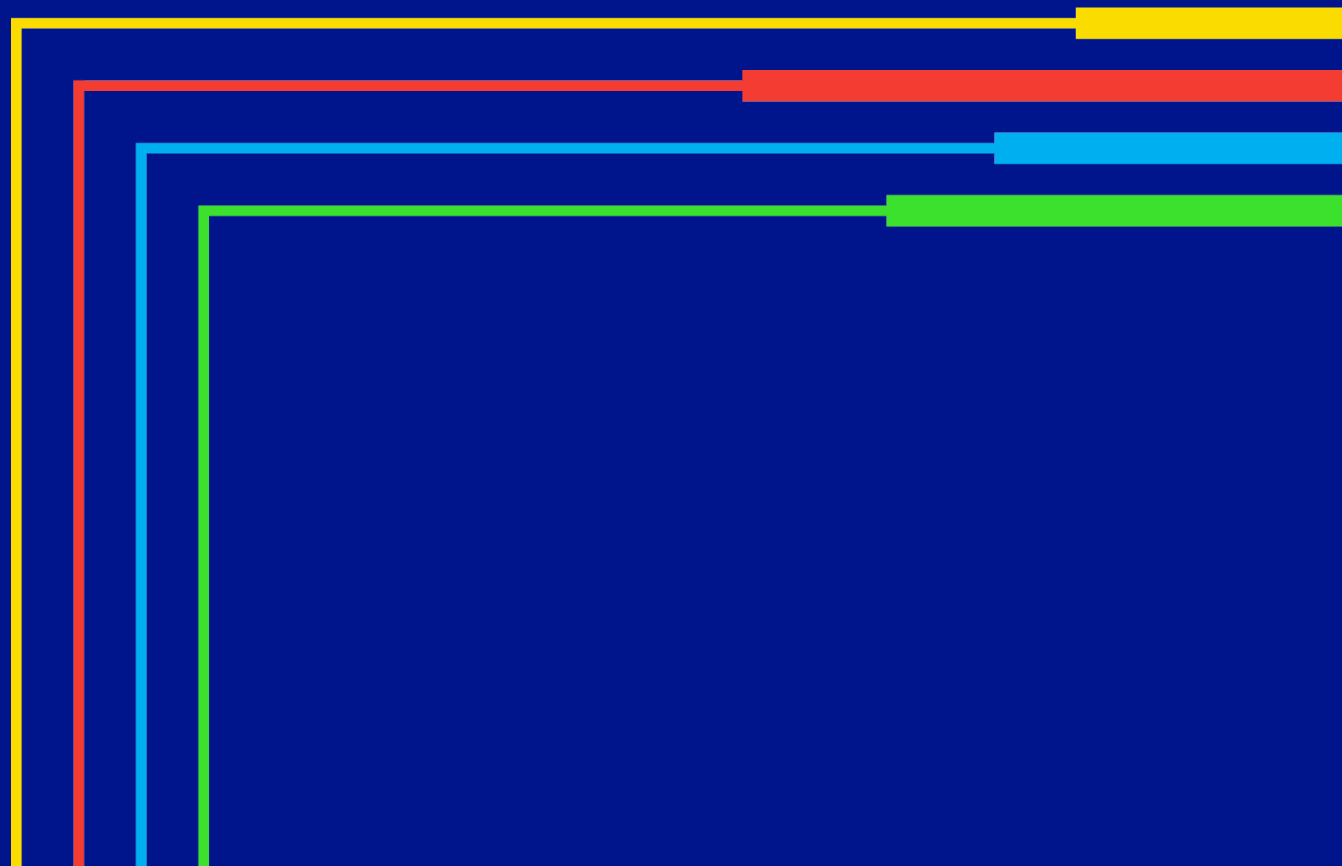
- Project underway at Yaphank, NY Long Island Compost facility
- Capacity to convert 180,000 tons of food into RNG, compost, fertilizer, and other sustainable byproducts annually
- Production capacity estimated to be 1,499 Dth/day
- National Grid will purchase a purchase a portion of the RNG, but not the environmental attributes

RNG Interconnections

- Supporting interconnection of RNG via deferred recovery mechanism in KEDNY/LI rate case
- Projects expected to inject approximately 5,435 Dth/day
  - KEDNY Interconnection 1 – Jamaica Water Resource Recovery Facility
  - KEDNY Interconnection 2 – Biogas Corporation Food Waste RNG
  - KEDLI Interconnection 1 – South Shore Water Reclamation Facility
  - KEDLI Interconnection 2 – Enterprise Food Waste RNG

3

GHG Accounting



nationalgrid

LTP Framework for GHG Accounting

Emissions impacts assessed according to NY's current framework established by DEC in Part 496 and accompanying RIS.

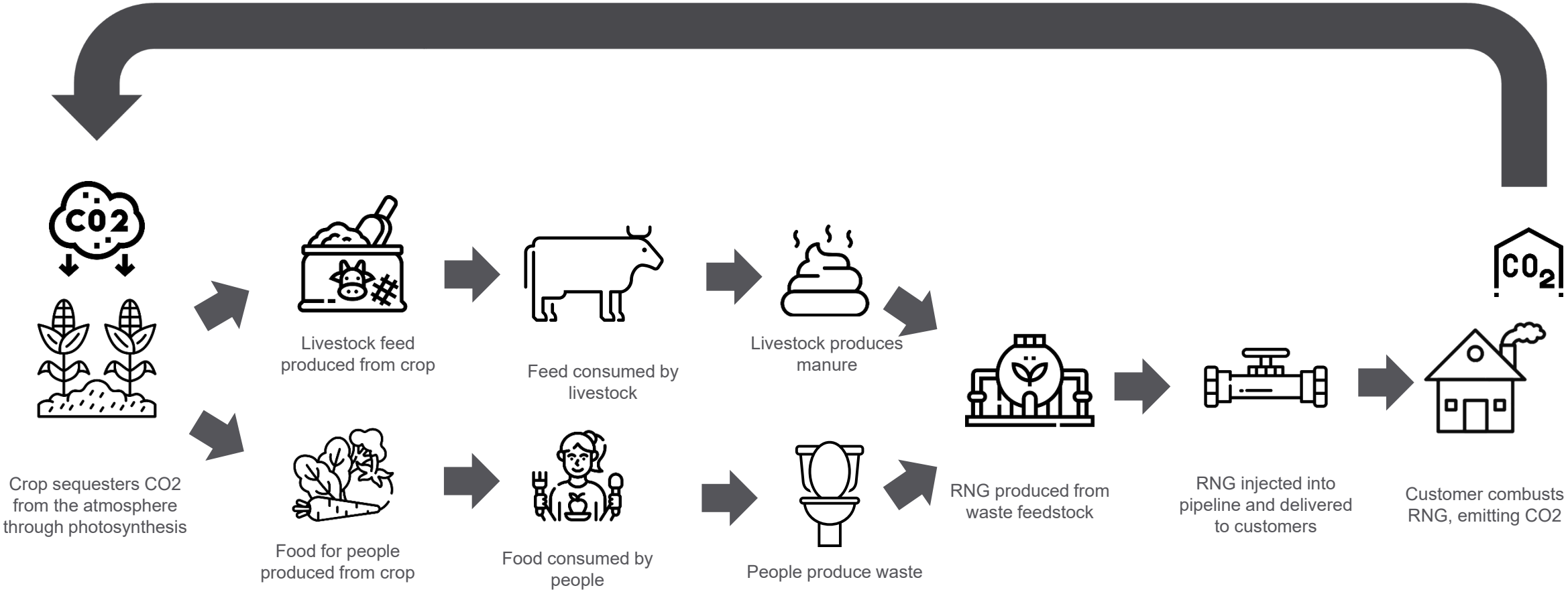
NY's Current Framework

- CO2 emissions from RNG are considered energy sector emissions ("gross accounting")
- GWP-20 is used for all purposes
- Out-of-state life cycle emissions from fossil fuels are included in state inventory

Considerations for the Future

- Existing approach results in double-counting CO2 emissions from RNG use and will increase the cost of CLCPA compliance.
- Costs would be lower under "standard" accounting for biogenic CO2
- Standard accounting could be adopted without amending CLCPA or Part 496
- Life cycle emissions for LCF can and should be considered without amending CLCPA or Part 496.
- National Grid does not advocate for altering CLCPA's GWP-20 requirement

RNG Biogenic Carbon Cycle – No Change in Atmospheric CO2



4

Barriers & Recommendations

nationalgrid

Barrier to Scaling 2

Cost and availability

- RNG and clean hydrogen are more expensive than conventional natural gas.
- US RNG production is growing at a rate of roughly 30% annually, with 60 new RNG projects coming online in 2023. Meeting New York's gas decarbonization needs will require growth to be sustained over time.
- Despite significant potential for IRA tax incentives to spur hydrogen and RNG development and reduce costs, implementation has been inconsistent.

Stakeholder Buy-in

- Continued stakeholder engagement is necessary to build trust and support on safety and feasibility.
- It is essential that accurate, evidence-based information is provided to stakeholders and community members.

Recommendations

Implement Scoping Plan

- Evaluation of strategic opportunities should proceed through development of “gas transition plan.”
- Objective should be to ensure sufficient LCF will be available to meet 2050 needs and to maximize cost-effective decarbonization while electrification scales up.
- Scoping plan proposed “research agenda” should be implemented.
- RD&D programs should be established and scaled up.

Gas Decarbonization Performance Standard

- PSC has authority under CLCPA to enact a performance standard to require gas utilities to reduce carbon intensity of the fuel they deliver.
- Standard should increase over time consistent with emissions targets.
- Compliance credits should be generated according to life cycle GHG emissions to avoid “leakage.”
- Program should be designed to reduce emissions at lowest achievable cost per ton.
- Next steps: establish EM&V framework

Accurate GHG Accounting

- All LCF policies should incorporate life cycle assessment of GHG emissions, and New York should establish a life cycle assessment framework based on Argonne National Lab’s GREET model similar to the approach in California.
- US and international standards for biogenic CO2 accounting are consistent with the CLCPA.
- NY DEC should align GHG inventory accounting with established standards.

Q&A

nationalgrid

Appendix

nationalgrid

Renewable Natural Gas

Pricing and Volumes in Long-Term Plan Scenarios

Forecasted Price per MMBtu

2030	2040	2050
$16.03	$14.16	$13.54

Supply Curve by Feedstock

Feedstock	2030	2040	2045	2050
Landfill gas & wastewater treatment	66%	67%	62%	66%
Milk cows, 500+ head	28%	27%	35%	27%
Hogs, 1000+ head	6%	6%	3%	6%

Source: E3 report - https://fileservice.eea.comacloud.net/FileService.Api/file/FileRoom/14633268

- "Conservative" view
- Assumes RNG only sourced from anaerobic digestion, not thermal gasification
- Assumes "fair share" of sustainable biomass available in the US east of the Mississippi River

CEV Scenario	AE Scenario
2,233 TBtus	1,420 TBtus

Clean Hydrogen

Pricing and Volumes in Long-Term Plan Scenarios

Forecasted Price per MMBtu

2030	2040	2050
$25.95	$20.71	$17.81

CEV Scenario	AE Scenario
1,206 TBtus	129 TBtus

LTP Emissions Factors

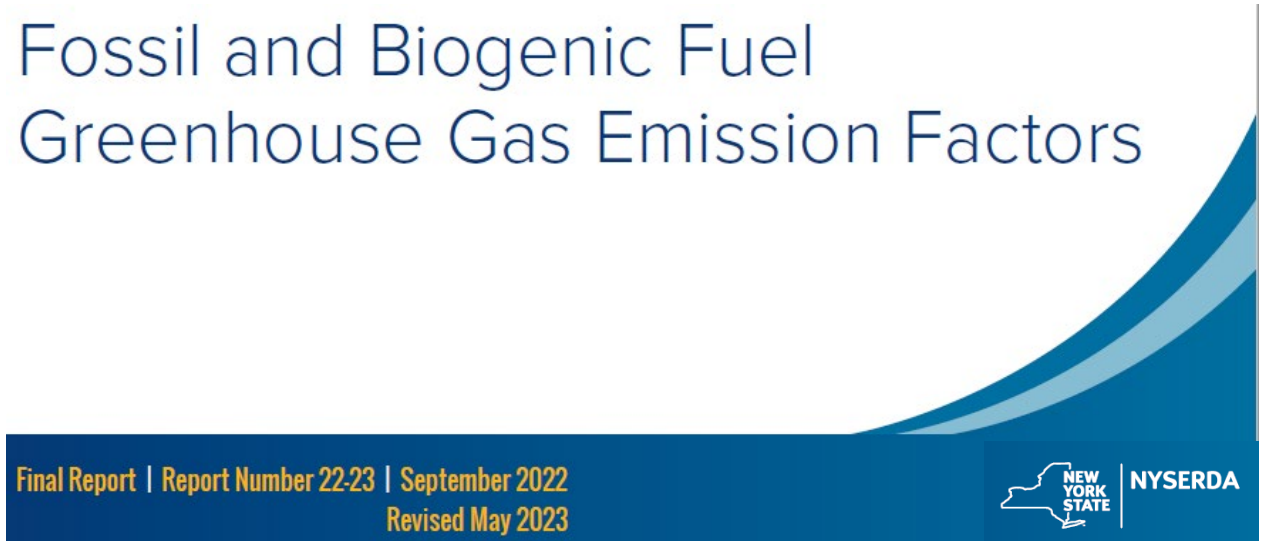


Table 1. Gross versus Net Biogenic CO_2 Emissions Accounting Convention

Application	Biogenic CO_2 Accounting	CO_2	CH_4 and N_2O
Evaluating State GHG Emission Reduction Limits	Gross	Combustion: Include emissions from fossil and biogenic fuels. Upstream out-of-state: include emissions from fossil fuels only.	
Monetizing Value of Avoided GHGs	Net	Combustion: Include emissions from fossil fuel only. Upstream out-of-state: Include emissions from fossil fuels only.	Combustion: Include emissions from fossil and biogenic fuels. Upstream out-of-state: include emissions from fossil fuels only.

Table 2. Sector- and Fuel-Specific Fuel Cycle GHG Emission Factors for Common Fuels (metric ton/MMBtu) under Net Biogenic Accounting Convention

Sector	Fuel	CO_2	CH_4	N_2O
Residential and Commercial Buildings	Natural Gas	6.50E-02	3.62E-04	2.46E-07
	Renewable Natural Gas[(c)]	0	5.28E-06	1.06E-07
	Heating Oil - Fossil[(d)(e)(f)]	8.93E-02	1.32E-04	8.94E-07
	B5 Heating Oil Blend[(d)(e)(f)]	8.52E-02	1.26E-04	8.81E-07
	B10 Heating Oil Blend[(d)(e)(f)]	8.10E-02	1.20E-04	8.69E-07
	B20 Heating Oil Blend[(d)(e)(f)]	7.27E-02	1.09E-04	8.45E-07
	B50 Heating Oil Blend[(d)(e)(f)]	4.78E-02	7.53E-05	7.73E-07
	B100 (100% biogenic heating oil) or Renewable Diesel[(d)(e)(f)]	0	1.06E-05	6.34E-07
	Residual Fuel	8.69E-02	1.22E-04	8.24E-07
	LPG	8.02E-02	1.26E-04	3.76E-07
	Kerosene	8.33E-02	1.20E-04	8.04E-07
	Wood	0	3.17E-04	4.22E-06

Table 3. Sector- and Fuel-Specific Fuel Cycle GHG Emission Factors for Common Fuels (metric ton/MMBtu), under Gross Biogenic Accounting Convention

Sector	Fuel	CO_2	CH_4	N_2O
Residential and Commercial Buildings	Natural Gas	6.50E-02	3.62E-04	2.46E-07
	Renewable Natural Gas[(c)]	5.29E-02	5.28E-06	1.06E-07
	Heating Oil - Fossil[(d)(e)(f)]	8.93E-02	1.32E-04	8.94E-07
	B5 Heating Oil Blend[(d)(e)(f)]	8.86E-02	1.26E-04	8.81E-07
	B10 Heating Oil Blend[(d)(e)(f)]	8.79E-02	1.20E-04	8.69E-07
	B20 Heating Oil Blend[(d)(e)(f)]	8.65E-02	1.09E-04	8.45E-07
	B50 Heating Oil Blend[(d)(e)(f)]	8.23E-02	7.53E-05	7.73E-07
	B100 (100% biogenic heating oil) or Renewable Diesel[(d)(e)(f)]	7.41E-02	1.06E-05	6.34E-07
	Residual Fuel	8.69E-02	1.22E-04	8.24E-07
	LPG	8.02E-02	1.26E-04	3.76E-07
	Kerosene	8.33E-02	1.20E-04	8.04E-07
	Wood	1.03E-01	3.17E-04	4.22E-06

GHG Accounting for RNG

Established Consensus for Climate Benefits

Intergovernmental Panel on Climate Change (IPCC):

- "Bioenergy has a significant GHG mitigation potential, provided that the resources are developed sustainably and that efficient bioenergy systems are used."
- "Bioenergy is different from the other RE [renewable energy] technologies in that it is a part of the terrestrial carbon cycle. **The CO2 emitted due to bioenergy use was earlier sequestered from the atmosphere and will be sequestered again if the bioenergy system is managed sustainably."**

Source: https://www.ipcc.ch/site/assets/uploads/2018/03/Chapter-2-Bioenergy-1.pdf

California Air Resources Board (CARB):

- Low Carbon Fuel Standard (LCFS) utilizes life cycle GHG accounting to carbon intensity of eligible fuels.
- Life cycle assessment "includes direct emissions associated with producing, transporting, and using the fuels, as well as significant indirect effects on GHG emissions, such as changes in land use for some biofuels."