Using Less to Get More: The Role of EE in Decarbonization

October 31, 2022

ENERGY EFFICIENCY FORUM



Using Less to Get More

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CLIMATE FORWARD EFFICIENCY& BUILDING DECARBONIZATION

VA EEC FORUM October 31, 2022

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The American Council for an Energy-Efficient Economy is a nonprofit 501(c)(3) founded in 1980. We act as a catalyst to advance energy efficiency policies, programs, technologies, investments, & behaviors.

Our research explores economic impacts, financing options, behavior changes, program design, and utility planning, as well as US national, state, & local policy.

Our work is made possible by foundation funding, contracts, government grants, and conference revenue.

aceee.org @ACEEEdc



IPCC: Value of Efficiency In GHG Mitigation Pathways by 2050

FAQ2.2: Energy demand and supply in 1.5°C world Lower energy demand could allow for greater flexibility in how we structure our energy system. Low energy demand allows more choice With high energy demand, there is about which low-carbon energy supply less flexibility as virtually all available options to use to limit warming to 1.5°C. options would need to be considered. Low-carbon energy Low-carbon energy Low-carbon energy supply options' supply options* supply options* LOW demand High energy demand Example 1 Example 2



ewable energy (such as bicenergy, hydro, wind and solar), nuclear and the use of carbon dioxide removal techniques

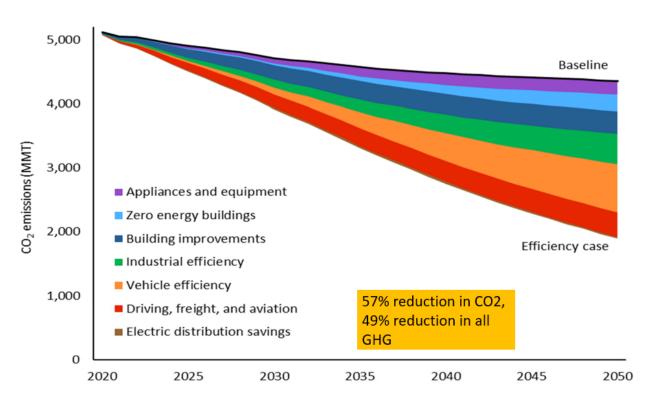
IPCC: Value of Efficiency In GHG Mitigation Pathways by 2050

	80% GHG by 2050 w/ high demand	80% GHG by 2050 w/ low demand
# of Mitigation Pathways	5	21
Cost of keeping emission at 44 GtCO2e/yr	\$24 T	\$7 T

IEA (2020): Global EE spending needs to triple to meet the Paris Agreement target



U.S. energy
efficiency can
cut economywide energy use
&
GHG emissions
in half by 2050





Source: ACEEE Halfway There, 2019

Climate-Forward Efficiency

Strategies to Use EE to Reduce GHG Emissions, Increase Health & Resilience, and Drive Equity





Setting EE Target

Premise: a 2013 study led by IPCC researchers show significant consequences for failing to reduce demand to keep warming below two degrees:

- Costs could be 3 times higher
- Decarbonization portfolio combinations shrink by a factor of 4
- Maximizing EE may need taxpayer-funded and market-based efforts

McKinsey study (2012): Achievable EE maximum of 23% in 2010-2020 will cost \$520B for a net benefit of \$1.2T (\$52B annual spending compared to \$8B)

Develop a maximum statewide EE potential based on a top-down approach (e.g., a high-level statewide potential of maximizing weatherization)



Centering Equity

- Most (if not all) customers and communities must be engaged to deliver on climate commitments and avoid exacerbating existing inequities in the energy and climate mitigation systems.
- Near-term actions:
 - All stakeholders participate in convenings on equity to build awareness and coalitions
 - Advocates lay groundwork by recommending a set of minimum equity standards
 - Regulators and utilities establish mechanisms to engage with customers and communities in program design, resource planning, and procurement decisions
 - Legislators and regulators authorize intervenor compensation for meaningful participation



Unlocking Utility EE Potential

Utilities' Long-Term Plans

Performance-Based Ratemaking

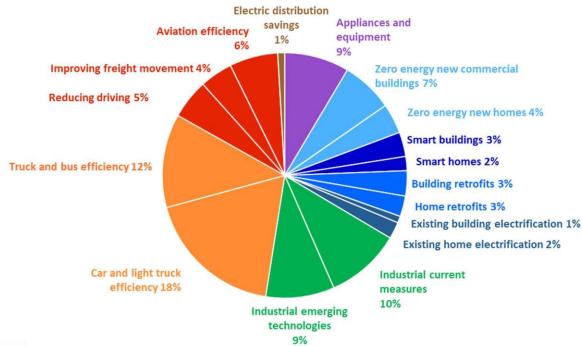
Updating Benefit-Cost Test

Updating EM & V



Allocation of Efficiency Savings

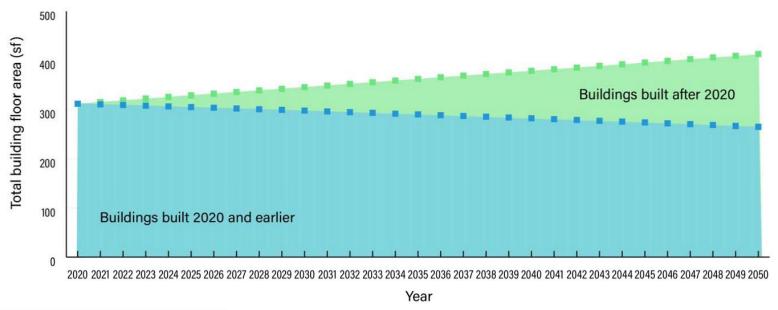
1/3 of those GHG reductions need to come from buildings





Source: ACEEE Halfway There, 2019

New & Existing Buildings Share of Building Floor Area (residential + commercial)





Source: ACEEE calculations based on data in EIA AEO 2020

Policies for New & Existing Buildings

Existing Buildings

- Building Energy Performance Standards
- Appliance Standards
- Fuel-switching
- Benchmarking
- Retro-commissioning & Building Tune-Up
- Time-of-Sale Disclosure

New Buildings

- Building Codes
- Appliance Standards
- Stretch Codes





Update: Emergence of Clean Heat Standards

Goal: Reduce greenhouse gas emissions resulting from use of fossil fuels in homes, commercial buildings, and industry.

Definition: A performance standard, applied to the providers of fossil heating fuels, requiring them to deliver a gradually-increasing percentage of low-emissions heating service to their customers. [from R. Cowart and C. Neme]

Where enacted/proposed: Colorado, Minnesota, and Vermont

CO: Senate Bill 21-264

MN: Minnesota Natural Gas Innovations Act

VT: H-0715



Update: Building Efficiency Codes and Standards

Current leading states for energy efficient building codes for residential and commercial buildings:

- Massachusetts, Washington, California, Vermont, Connecticut

Second-tier leading states:

- DC, PA, MT, MD, MN, ME, NY, NE, DE, NH, WVA

Building Performance Standard States:

- Colorado, Washington, Maryland, District of Columbia

Fuel-switching states:

- AK, TN, IL, MN, CO, DC, ME, NY, VT, CA, MA



Virginia: Positive Trends & Areas of Improvement

Regional Leader	Leading	Areas of Improvement
New Buildings	Code Compliance	Residential code stringency
	Zero-energy Buildings	Stretch code adoption
Existing Buildings	Health & Safety remediation in affordable housing	Building performance standards (data benchmarking)
		Fuel switching policies
		Minimum energy standards for state-owned housing





Thank you!

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ENERGY STAR: Benchmarking and Building Performance Improvement

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The biggest little label in energy efficiency











230 industrial plants

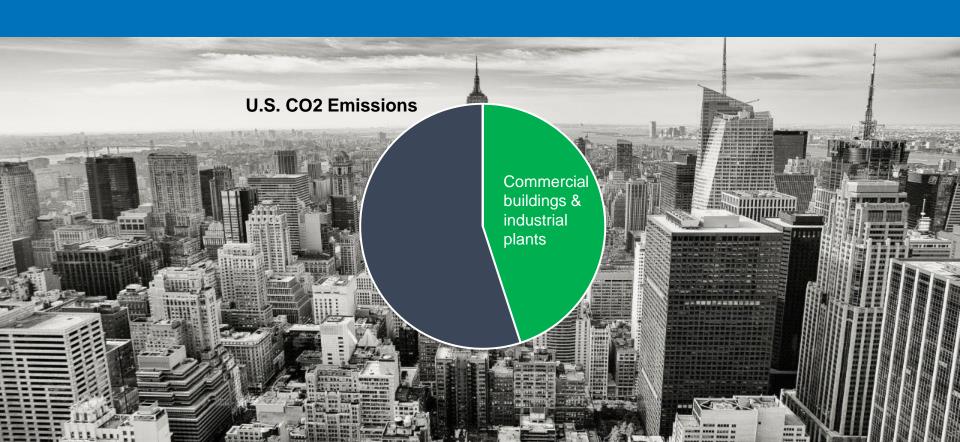


2.3 million new homes

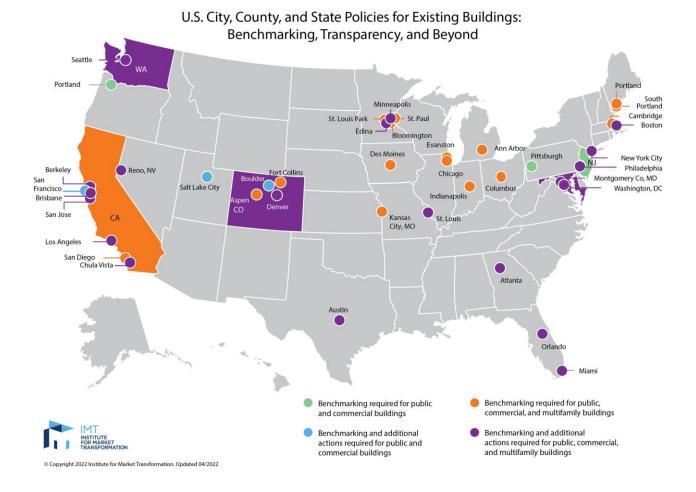




Why focus on buildings and plants?







Source: IMT Building Performance Policy Center

State and Local Policies for Existing Buildings

Benchmarking and disclosure/transparency

- Building owners report energy (and water) use on an annual basis, which jurisdiction publicly disclose
- Track performance each year and encourages improvement

Systems assessment and tuning

- Audits/assessments Building owners must have an audit or assessment of the building completed, sometimes involving a corresponding requirement to take some of the identified measures (e.g., those with a quick payback period)
- Retrocommissioning/retuning Building owners must assess the operation of and "tune up" building systems to ensure they are operating properly and maximizing energy performance

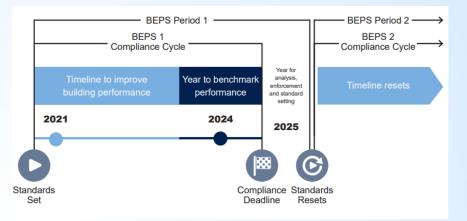
Building performance standards

- Building owners must achieve prescribed levels of energy or greenhouse gas emissions performance, often with interim standards and a final, long-term standard
- Leverage data from benchmarking and disclosure policies

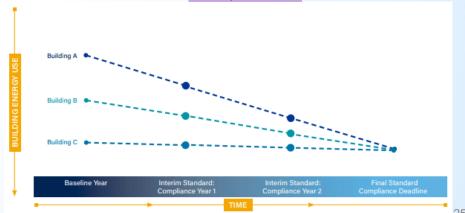


How are Building Performance Standard Policies Different?

- Performance-based
- Long-term policy, with multiple interim targets/standards that ratchet up
- Often, final standards align with state or local GHG reduction goals
- May include significant penalties and other enforcement for noncompliance



Source: St. Louis Building Energy Performance Standard (BEPS): <u>BEPS Compliance</u>
Pathways Fact Sheet



Source: Institute for Market Transformation



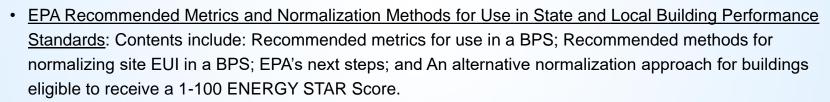
Variabilities of State and Local Building Performance Standard Policies passed to date

- Building sizes and types that are covered
- Performance level of the standards and the metric(s) on which compliance is assessed
- Alternative compliance paths that are available to building owners
- Level of penalties and other types of enforcement that buildings face if they fail to comply
- Timeframe of the policy, including interim and final standards
- Whether the assessment of performance attempts to normalize for business activity
- Whether the policy requires data verification or other data quality measures



EPA Existing Tools & Resources

- <u>EPA Benchmarking and Building Performance Standards Policy Toolkit</u>: Aims to inform decisionmakers who
 are exploring policies to reduce energy use and greenhouse gas (GHG) emissions from existing commercial
 and multifamily buildings
 - Section 1: Building Energy Benchmarking and Transparency
 - Section 2: Building Performance Standards
 - Section 3: State and Local Government Coordination
 - Section 4: Utility Data Access



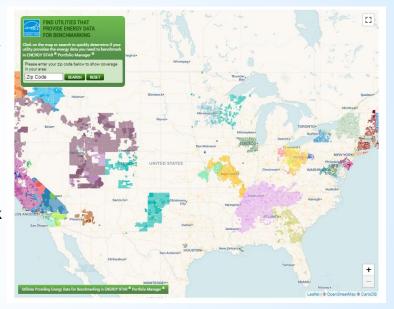
- ENERGY STAR® Portfolio Manager® the keystone reporting and data collection tool
- AVERT, COBRA, ESIST, & the ENERGY STAR Portfolio Manager Building Emissions Calculator tools for setting goals and estimating impacts
- See here for the full inventory of EPA's tools & resources: EPA Resources for Building Performance Policies



Portfolio Manager®

EPA Technical Assistance

- Advisory support and strategic discussions on policy design
- Implementation support including through use of ENERGY STAR Portfolio Manager
- Data sharing EPA can share anonymized aggregated data with you, including benchmarking activity for your jurisdiction and state or regional performance data
- Utility data access support EPA supports states and municipal utilities looking to ensure access to aggregated data for buildings owners and managers
- Reviewing draft policies and regulations
- Policymaker network For years, EPA has convened the network of state and local governments working on building performance policy through sessions and mailings. This engagement creates space for sharing updates and emerging offerings, encouraging best practice sharing, and opening up dialogue.



EPA's experience managing the tool on which all these laws depend—and 30 years of working with building owners—is infused into its technical assistance on BPS.





Benchmarking, Management, and Reporting Tool



Assess whole building energy and water consumption, plus waste



Track changes in energy, water, greenhouse gas emissions, and cost over time



Track green power purchase



Create custom reports



Share/report data with others



Apply for **ENERGY STAR** certification, meet **ASHRAE**





Hundreds of metrics, including:



Energy use Source, site, weather normalized, demand



Water use
Water use
intensity,
Water Score
(for Multifamily)



Waste & Materials
Waste intensity, diversion rate



1-100 ENERGY STAR score



GHG emissions Indirect, direct, total, avoided

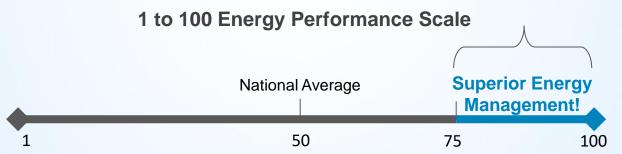


ENERGY STAR Certification and IAQ

- Benchmark building in ENERGY STAR Portfolio Manager
- Achieve an ENERGY STAR score of 75 or higher
- Minimum meet ASHRAE 62.1 and 55, meet IESNA Lighting Handbook

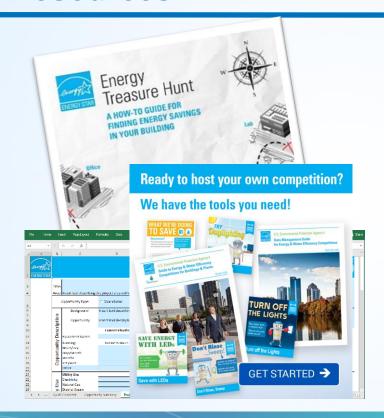


- Application must be verified by a licensed professional
- Re-apply annually to keep current but monitor energy use and IAQ more frequently.





EPA's ENERGY STAR Tools and Resources



- Portfolio Manager
- Cash Flow Opportunity Calculator
- Competition Guide
- Treasure Hunt maps
- ENERGY STAR certification
- Decarbonize your Design
- Online help/training
- Implementation support
- · ...and more!

energystar.gov



Thank You!

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Constructing the Future of Energy

VAEEC 2022 EE Forum | October 31, 2022

Shaun A. Hoyte





The Evolution of the Utility's Role in Clean Energy









Core Business

Three Commodities: Electric, Gas and Steam

Our Customers

Diverse market segments, unique building stock

Growth Strategy

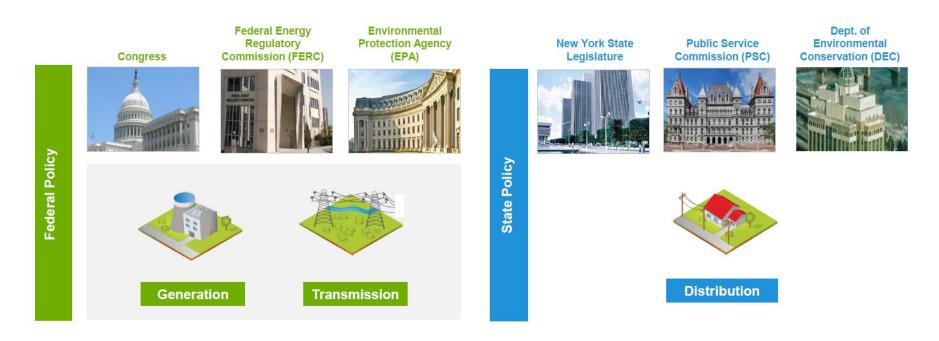
Investing \$1.5B in "EE" and heating electrification by 2025

Trusted Energy Advisor

Promote customer choice, education and incentives



Our Regulators



The distinction between federal and state policy is becoming less clear



New York's Energy Goals NYS NYC 100% sales of 85% GHG 850.000 40% GHG emissions new LDVs by emissions electric vehicles reduction (1990) 2035 reduction (1990); goal of 100% reduction (including 40% GHG emissions 6 GW Distributed offcotc) reduction (2005) Solar 100% emissions-80% GHG free generation emissions 70% electricity from reduction (2005); 9 GW renewables; goal of 100% offshore wind 100% 0.5 GW 3 GW energy storage; reduction clean electricity energy storage 10 GW distributed (including offsets) solar 2035 2025 2040 2050 2030 185 Tbtu energy 40% GHG emissions 80% GHG efficiency (EE) reduction: buildings > emissions 25K ft.2 reduction: buildings 3.5 Tbtu heat pump > 25K ft.2 savings 1 GW distributed solar Disadvantaged communities targeted to receive 35%-40% of benefits of clean energy and energy efficiency spending



New York's Energy Policies

New York State Goals

Climate Leadership and Community Protection Act (CLCPA)

- 85% Reduction in GHG Emissions by 2050
- 100% Zero-emission Electricity by 2040
- 70% Renewable Energy by 2030
- 9,000 MW of Offshore Wind by 2035
- 3,000 MW of Energy Storage by 2030

- 6,000 MW of Solar by 2025
- 22 Million Tons of Carbon Reduction through Energy Efficiency and Electrification

New Efficiency: New York ("NENY") Order

- Order based on New York State's 40% reduction in GHG emissions by 2030 goal
- Outlines 6-year EE budgets and goals for all JU utilities
- NYSERDA is committing an additional \$36.5 million to train over 19,500 New Yorkers for clean energy jobs

Con Edison's Clean Energy Commitment

- Integral player in the State's Clean Heat transition
- Triple "EE" investments by 2030
- Support for Clean Transportation through "EVs"
- Integrate energy storage solutions
- Provide 100% clean energy by 2040



Con Edison's Clean Energy Commitment



Build the Grid of the Future

Build a resilient, 22nd century electric grid that delivers 100% clean energy by 2040.



Empower All of our Customers to Meet their Climate Goals

Accelerate energy efficiency with deep retrofits, aim to electrify the majority of building heating systems by 2050, and all-in on electric vehicles.



Reimagine the Gas System

Decarbonize and reduce the utilization of fossil natural gas, and explore new ways to use our existing, resilient gas infrastructure to serve our customers' future needs.



Lead by Reducing our Company's Carbon Footprint

Aim for net zero emissions (Scope 1) by 2040, focusing on decarbonizing our steam system and other company operations.



Partner with our Stakeholders

Enhance our collaboration with our customers and stakeholders to improve the quality of life of the neighborhoods we serve and live in, focusing on disadvantaged communities.



Pathways to Carbon-Neutral NYC

What is a Pathway? Pathways represent three distinct technology deployment futures that all achieve a minimum of 80% direct emissions reductions by 2050, putting the City on a path toward carbon neutrality

A pathway is NOT: a roadmap or prediction to a "desired" future or an analysis of a policy outcome or intervention

Modeled Futures

Key distinctions

Policy reference case

• Includes existing key policies as of June 2019; includes clean energy resource targets (70x30) but does not include emissions reduction targets (LL97)

Electrification Pathway

 Explores increasing reliance of buildings, transportation and select steam production on electricity, while allocating limited supply of low carbon gas to power

Low Carbon Fuels
Pathway

• Explores how a larger supply of RNG can help decarbonize buildings; less buildings electrify, and heavier-duty vehicles rely on biofuels

Diversified Pathway

 Combines the building electrification penetration of the Electrification Pathway with higher RNG supply from the Low Carbon Fuels Pathway to maximize direct emissions reductions

Common pathway elements

- 100% clean grid by 2040
- Substantial EE investments
- Electrification of LDV
 & VMT reductions
- LL97 compliance by typology



Assumed Key Pathway Measures

		Electrification	LCF	Diversified
Buildings and Industrial	Energy Efficiency Retrofits	41% Tier 1	35% Tier 1	37% Tier 1
		37% Tier 2	44% Tier 2	43% Tier 2
		8% Recladding	6% Recladding	9% Recladding
	Electrification of Heating and DHW	59%	31%	62%
	Dual-Fuel Heating Systems	6%	0%	6%
	Gas Heat Pumps	2.5%	4.5%	2.5%
Transportation	Light Duty Vahiala Calaa	All new vehicle sales are 68% BEV, 12% PHEV, 20% ICEV by		
	Light-Duty Vehicle Sales	2040		
	Medium and Heavy-Duty Vehicle Sales	100% BEV by 2050	Increasing LCF	100% BEV by 2050
	Light Duty Vehicle Miles Traveled Reductions	17%		
Districts	Con Edison Steam System Customer Defection	Most small	Some small bldgs.	Most smaller
		buildings leave	leave, large bldgs.	buildings leave
		steam system	remain	steam system
	Con Edison Steam Electric Boilers	Yes	- Yes	
	New District Geothermal	Yes		
Electricity	Grid Clean Energy Standard	100% by 2040		
Low Carbon Gas	Biogenic RNG Supply in 2050	26 tBtu	61 tBtu	61 tBtu
	Low Carbon Gas Allocation Priority (includes biogenic RNG, synthetic RNG, and hydrogen)	1. Steam	1. Steam	1. Steam
		2. Electricity	2. Transportation	Buildings
		3. Buildings	3. Buildings	3. Electricity



Powering Programs for Equity

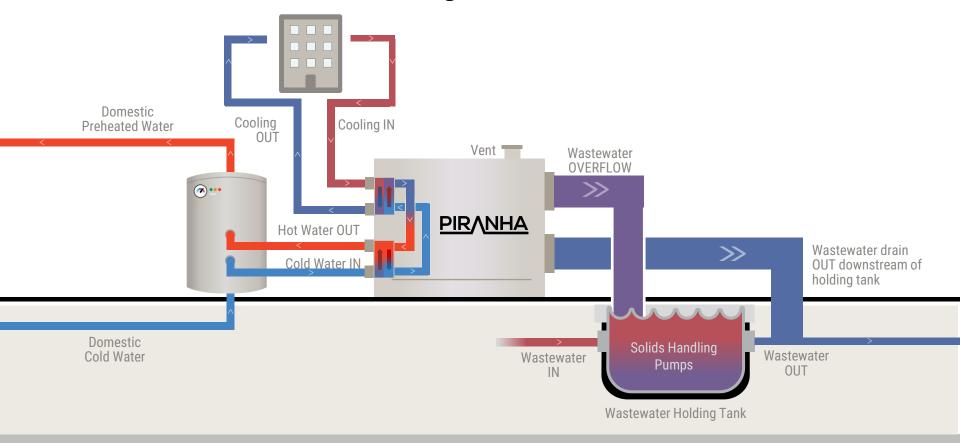
Technology	Customer Segment		
	Residential 1-4 Family Units		
	Multi-Family 5 Units and Above		
Energy Efficiency	Small-Medium Business 300 kW or Less		
	Large C&I 100 kW and Above		
	Public Partnerships (DCAS, NYCHA, NYPA)		
Energy Storage	Commercial & Industrial, and Multi-Family		
Electric Vehicles	C&I, Residential, and Multi-Family		
Heat Pump Technologies	All Market Segments		
Wastewater Heat Recovery	Commercial, Multi-Family, Hotels, & Hospitals		



Source: RMI – Regulatory Solutions for Building Decarbonization Regulatory Solutions for Building Decarbonization - RMI



Wastewater Heat Recovery Installation





NYS Clean Heat

- Statewide Clean Heat Program ("JU")
- Investing \$1.5B in "EE" and heating electrification by 2025
- Potential shift from "summer peaking system" to "winter peaking system"

Why Should I Upgrade to Heat Pumps?

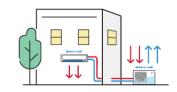
Heat pumps are a state-of-the-art heating and cooling technology. They help you save energy and money, reduce your reliance on fossil fuels, and make your business more comfortable for employees and customers.

Plus, save thousands with our rebates.

Clean Heat Technologies Available:

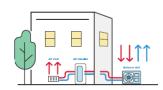
Ductless Mini-Split

Sleek, quiet, and more efficient than oil and gas-fueled systems.



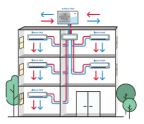
Central Air-Source

Provides both central air-conditioning and heat.



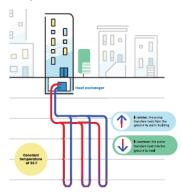
Variable Refrigerant Flow

Get personalized comfort with simultaneous heating and cooling in different zones.



Geothermal Technology

Provides heating, air conditioning, and hot water using the constant year-round temperature underground.



Heat Pump Water Heater

More efficient and lasts longer than standard heaters.



How Our Rebates Work

Thousands of business owners like you are switching to energy-efficient clean heating and cooling technology with rebates from Con Edison.

Just schedule a free energy assessment and a participating contractor will visit your business to identify project opportunities.

Once you decide to upgrade, we'll pay about 50% of the cost directly to the contractor. No waiting for rebates—just pay the difference.

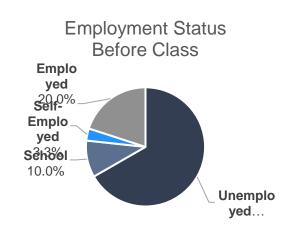
Don't wait—be part of the clean energy future today and get power you can feel good about.

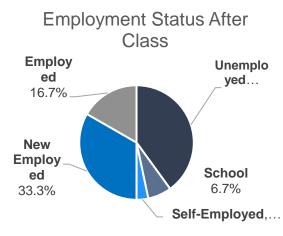
Contact Us

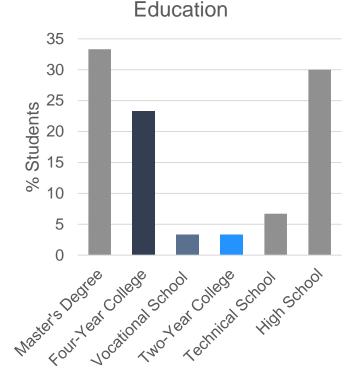
Visit conEd.com/CleanHeatSmallBusiness Email CleanHeatSMB@conEd.com Call 1-555-555-5555

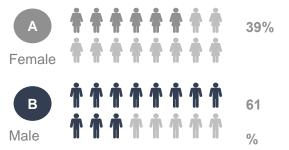


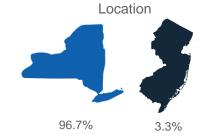
Workforce Development: The Clean Energy Academy











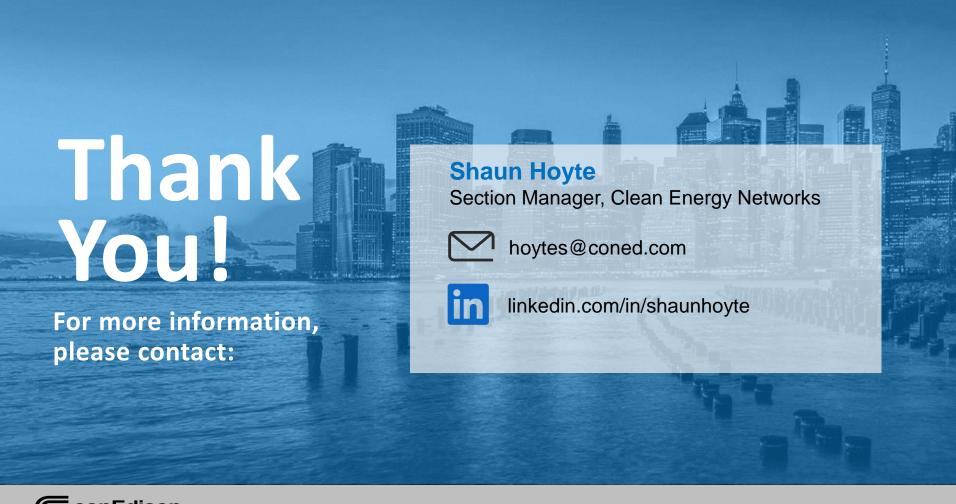


The Future Electric Grid

Figure 20: Con Edison's Future Grid

FUTURE conEdison Advanced operator controls Seamless functionality between the Comprehensive and secure two-way underground grid and customer technologies communications network Reliability & Safety & Clean Energy & Resiliency Security Flexibility *Con Edison Distributed System Implementation Plan (DSIP)













Columbia Gas of Virginia Your Energy, Your Future

Erich Evans October 31, 2022





Natural Gas Is A Key Contributor To Virginia's Economy

NiSource has six¹ energy delivery companies

- provide essential natural gas and electric service to nearly 4 million customers
- Columbia Gas of Virginia serves natural gas to nearly 300,000 customers.
 - provides service to residential, commercial and industrial customers in 98 communities over a 20,000 square mile service area
 - investing in the future by expanding its system to meet demand and by replacing aging infrastructure

Columbia Gas® of Virginia A NiSource Company Columbia Gas of Virginia

¹ - Virginia, Kentucky, Maryland, Ohio, Pennsylvania and Indiana

Greenhouse Gas Protocol Scopes & Emissions

capital goods

fuel and energy related

transportation

and distribution

Defining Scope 1, 2 & 3 **HFCs** N₂O **PFCs** Scope 2 Scope 1 INDIRECT DIRECT Scope 3 Scope 3 INDIRECT INDIRECT purchased goods and transportation services and distribution purchased electricity, steam,

eased assets

employee

business

travel

neating & cooling for own use

generated in

operations

Upstream activities Reporting company Downstream activities

company

facilities

company

vehicles

Source: WRI/WBCSD Corporate Value Chain (Scope 3) Accounting and Reporting Standard (PDF), page 5.

processing of

sold products

use of sold

products

end-of-life

treatment of sold products investments

Franchises

leased assets

Driving Down Methane Emissions

Advanced leak detection and methane reduction technologies



Picarro Vehicles

- An industry leader in analytics-driven methane detection
- Finds and eliminates large leaks
- Complements pipeline replacement work to accomplish substantial methane emissions reductions



Zero Emissions Vacuum and Compression (ZEVAC) Technology

 Powered by compressed air; depressurizes a pipeline and moves natural gas into an adjacent pipeline, minimizing methane release



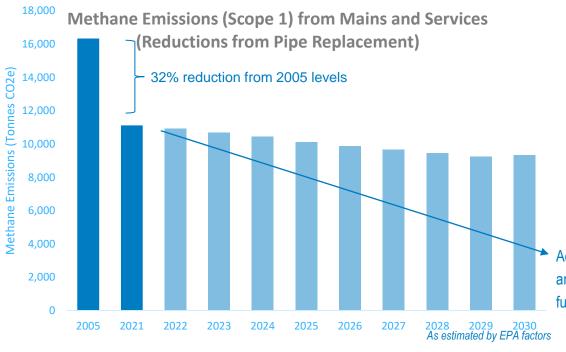
Satellite Detection and Methane Measurement

Source: Satelytics Illustrative

Methane reduction technologies also enhance safety, reliability and resiliency

Continued CVA Methane Reductions

Infrastructure modernization plus advanced leak detection and repair to accelerate reductions



- Columbia Gas of Virginia eliminated vintage cast iron main in 2015
- The Virginia SCC approved extending Columbia's SAVE program for 2022-2023, includes capital investments of \$63 million and \$72 million, respectively
- Implementing advanced leak detection and repair to determine expected additional methane reductions
- Studies indicate most methane emissions are from relatively few large volume leaks

Advanced Leak Detection and Repair will drive further methane reductions

Developing an Example Resource Mix for the Future

Context and Purpose

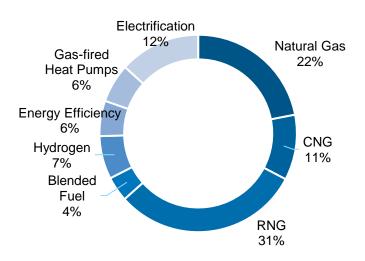


- Designed to illustrate a possible pathway to achieve decarbonization, but not representative of future specific actions
- Represents paths in which Columbia Gas of Virginia's business can be decarbonized
- Developed with information and data currently available, and planning tool will be updated as new information becomes available
- Information presented is a work in progress and will be used to inform NiSource corporate goals

Columbia Gas of Virginia Example Resource Mix

Balancing Decarbonization with a Cost-Effective, Reliable Supply to Customers

Example Resource Mix - 2050



The development of an example resource mix seeks to balance different planning objectives including:

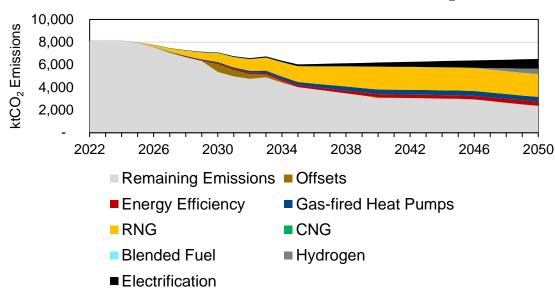
- Affordability/Rate Stability
- Sustainability
- Optionality
- Local Economic Impact

^{*}For illustrative purposes only

Columbia Gas of Virginia Decarbonization Horizon

Ramps up after potential buildout of supply chain

Breakdown of Carbon Abatement Actions (ktCO₂)



^{*}For illustrative purposes only

Short-term (2020s)

- Switch to CNG
- Step-wise roll out of demand-side programs, rising to 0.2% efficiency improvement per year by 2026 and 0.5% per year by 2029
- Begin RNG injection and hydrogen blending in late 2020s to start building out supply chains
- · Use offsets to further reduce emissions

Medium-term (2030s)

- Scaling up RNG procurement
- Scale up demand-side programs to achieve ~1.0% annual efficiency improvement by mid 2030s

Long-term (2040s)

- Build out hydrogen supply chain to support select industries
- Limited additional roll out of demand-side programs
- Co-ordinate with power gen customers on fuel choice to comply with VCEA



Example Resource Mix Benefits All Stakeholders

Industrial Customers	Electric Generation Customers	Virginia Residents
 Access to low carbon fuels to improve ESG credentials and protect against future carbon policies in US and globally Option to access pure hydrogen at scale when technology is ready and policy support is viable Continue access to gas infrastructure, providing 	 Continue access to natural gas to support electric resiliency and reliability needs Option to access pure hydrogen at later stage to comply with VCEA if competitive against other options 	 Employment opportunities from demand-side program implementation and local production of RNG and hydrogen Improved environmental outcomes
-	 Access to low carbon fuels to improve ESG credentials and protect against future carbon policies in US and globally Option to access pure hydrogen at scale when technology is ready and policy support is viable Continue access to gas 	 Access to low carbon fuels to improve ESG credentials and protect against future carbon policies in US and globally Option to access pure hydrogen at scale when technology is ready and policy support is viable Continue access to natural gas to support electric resiliency and reliability needs Option to access pure hydrogen at later stage to comply with VCEA if competitive against other options Continue access to gas infrastructure, providing resiliency vs sole reliance

A Number of Uncertainties Will Impact How Decarbonization Could Play Out

Policy



- Federal and state emission targets
- Carbon prices
- Building codes and gas ban
- Grants and subsidies

Gas Production



- Domestic production and exports
- Price competitiveness vs other fuels

Customer Behaviors



- Participation in energy efficiency programs
- Willingness to adopt new technologies (e.g. heat pumps)

Technology



- Technology readiness
- Cost and performance improvements
- Supply chain availability

The pace and extent of these factors may be driven by market and regulatory forces

Considering the Reduction Technologies & Initiatives

Columbia Gas of Virginia supports federal funding opportunities and benefits for Virginia customers

Technology		Description	Indicative Technologies	Federal Funding Support
Energy efficiency		> Reduction in end use thermal energy demand in residential, commercial and industrial buildings	> Upgrades to HVAC, plumbing, insulation and replacement of windows, roofs, & cooking equipment	✓
Gas-fired heat pumps		> Replacement of gas-fired boilers and furnaces with gas-fired heat pumps to achieve a step change in energy efficiency	> Gas absorption heat pumps for space and water heating	✓
Renewable Natural Gas	RNG	> RNG is biogas that has been upgraded to have the same quality as pipeline natural gas. Biogas can be produced from different feedstock including agricultural waste, manure, municipal waste, plant material, sewage, and food waste.		✓
Hydrogen	H ₂	 Blending of hydrogen with pipeline gas is capped at 20% to avoid need for customer equipment replacement/retrofit Dedicated supply of pure hydrogen to industrial and/or electric power customers 		✓
Certified Natural Gas	CNG	> CNG is certified by a third party as meeting certain requirements, resulting in lower Scope 3 emissions for LDCs. CNG is either sourced through physical transactions, which currently dominate market, or certificates (similar to Renewable Energy Credits)		Indirect
Electrification	食	> Existing gas appliances or equipment are replaced with electric appliances for the same application	> Electric air source heat pumps, induction stoves, electric boilers, electric motors/turbines (industrial customer)	✓
Offsets		> Reduction in GHG emissions, or increase in carbon storage, that is used to compensate for emissions that occur elsewhere.	> Carbon capture and storage, direct air capture, Nature-oriented solutions like forest regrowth, wetland restorations, restorative agriculture	Indirect

Opportunity for





