NARUC
National Association of Regulatory Utility Commissioners

NARUC TASK FORCE ON NATURAL GAS RESOURCE PLANNING

EXPERT LEARNING SERIES: Gas Infrastructure Investments

March 6, 2024

Today's Agenda

Part 1: Expert speaker presentations *(recorded for website library)*

Moderator: Task Force Co-Chair Zerfuss, Pennsylvania Public Utility Commission

- **Nickolas Hellen**, Chief Engineer, Consolidated Edison Company of New York
- **Zach Kravitz**, VP of Rates & Regulatory, NW Natural
- **Paul Metro**, Director Infrastructure Academy, Energy Innovation Center Institute

Part 2: Q&A with expert speakers *(not recorded)*

Part 3: Lessons learned from Task Force members *(not recorded)*

EXPERT SPEAKER PRESENTATIONS

NARUC Task Force
Expert Learning Series

Nickolas Hellen

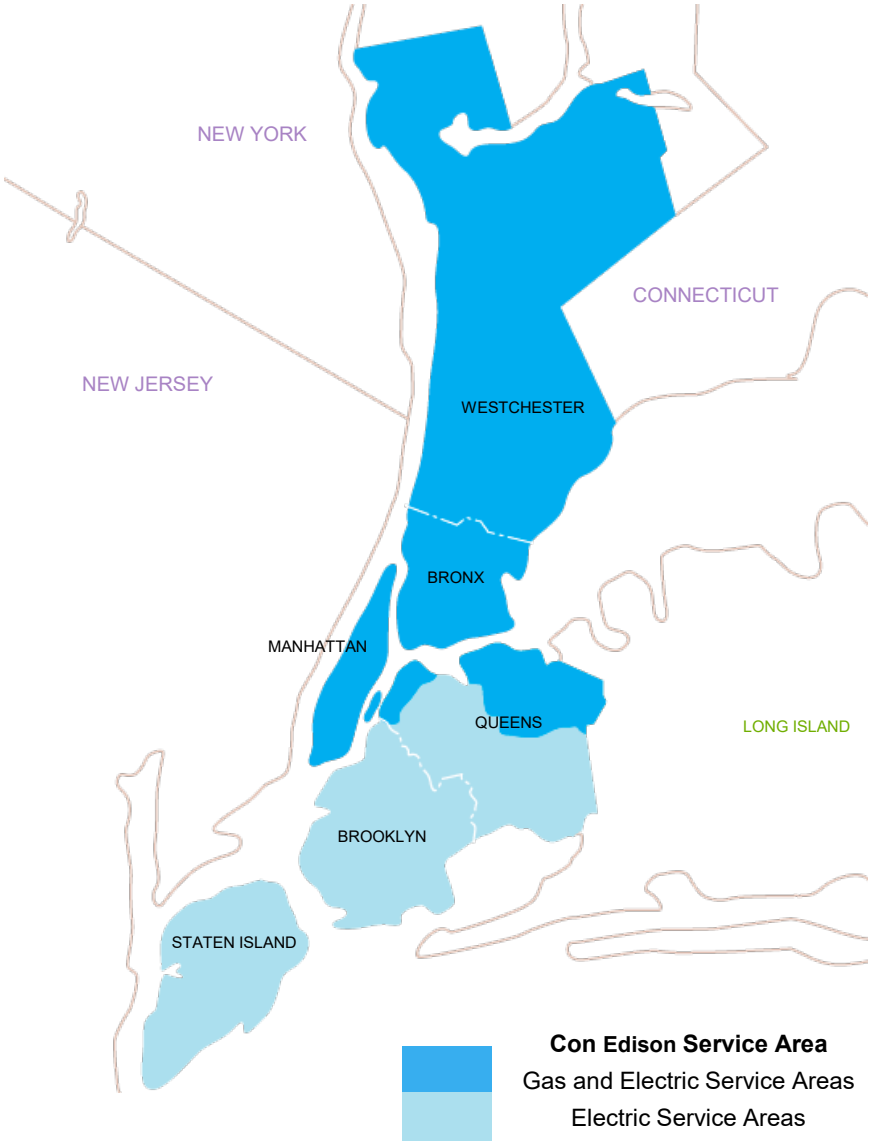
Chief Engineer – Consolidated Edison Company of New York

Agenda

- CECONY Franchise
- Regulatory Context
- Gas Long Term Plan - Pathways Summary
  - Peak Demand Forecast
  - Capital Expenditures
  - Projected Costs Summary
- Accelerated Depreciation
- Policy Priorities

CECONY Gas Franchise Areas

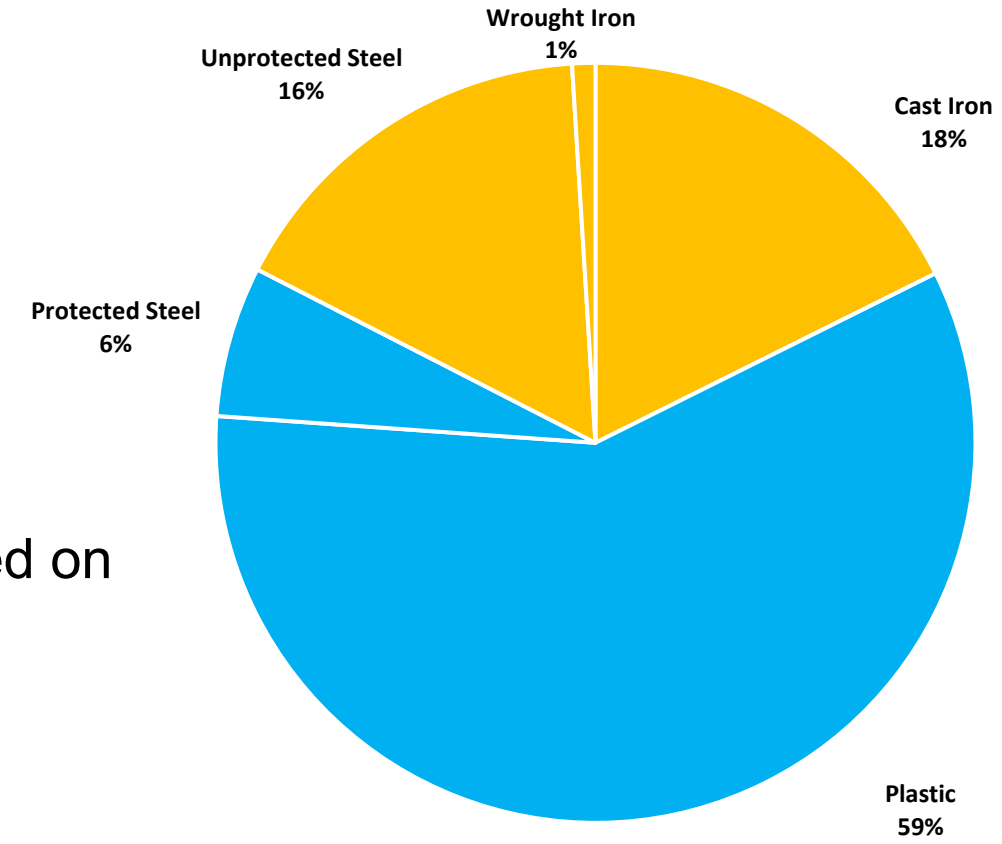
- Gas service territory includes Westchester, Bronx, Manhattan, and parts of Queens
- 1.1 million Gas customers served
  - 380,000+ services
  - 4,464 miles of gas mains
- 3.6 Million Electric customers served



CECONY Gas Distribution Mains Overview

- 4,363 miles of gas distribution main
  - 65% lower risk gas materials (plastic, protected steel)
  - 35% leak prone gas materials (cast iron, wrought iron, unprotected steel)
    - 3% of the national inventory[1]

- Over the last 5 years, 94% of all leaks have occurred on mains consisting of leak prone materials.



1. Based on 2022 numbers from PHMSA distribution annual reporting: https://www.phmsa.dot.gov/data-and-statistics/pipeline/gas-distribution-gas-gathering-gas-transmission-hazardous-liquids

CLCPA & Gas Long Term Plan

- **C**limate **L**eadership and **C**ommunity **P**rotection **A**ct
  - Passed legislature June 2019; effective January 2020
- Statewide GHG Emission Limits
  - 2030: 40% reduction from 1990 emissions
  - 2050: 85% reduction from 1990 emissions
- 70% renewable electricity by 2030
  - 100% by 2040
- Con Edison and O&R were required to submit an initial **Gas Long-Term Plan** by May 31, 2023, and a revised Long-Term Plan was submitted on November 29, 2023. The plans were required to include:
  - Demand and supply forecasts over a 20-year trajectory
  - An assessment of gas utility service territories
  - Forecast and planning methodologies for measuring reliability, rate impacts, and potential issues
  - Decarbonization pathway assessments

Gas Long Term Plan
Pathways Summary – 2042

On-track to achieve CLCPA goals (regulatory/legislative actions required)

	Reference	Hybrid	Deep Electrification
Pathway description	Reflects the current legal and policy environment and economic outlook	Relies on both clean electricity and low-carbon gaseous fuels (LCFs)	Heavily electrified use of energy
Gas Volume, % reduction from 2022	173 TBTU, 18% reduction	129 TBTU, 39% reduction	49 TBTU, 76% reduction
Gas sector emissions reductions from 2022 (scopes 1 and 3)	21%	61%	82%
Gas supply mix	5% Certified Natural Gas	38% RNG; 6% Clean Hydrogen; 57% Certified Natural Gas	13% RNG; 87% Certified Natural Gas
Electric peak, % increase from 2022	Con Edison: 32% ORU: 38%	Con Edison: 25% – 40% ORU: 20% – 45%	Con Edison: 70% – 105% ORU: 35% – 70%

Peak Demand Forecasts

Gas system peak demand is projected to reduce by 16% – 76% by 2042

Approach

Reference

- Combination of the winter load growth most recently experienced and the growth expected to be realized over a twenty-year period from known projects, the economy, and consumer behavior
- The forecast also includes residential and commercial growth, and accounts for Energy Efficiency/ DSM programs, natural conservation, and other modifiers such as DG/CHP, oil to gas conversion, end of life appliances/equipment, and any additional adjustment as required (*e.g.*, recovery from the COVID-19 pandemic).

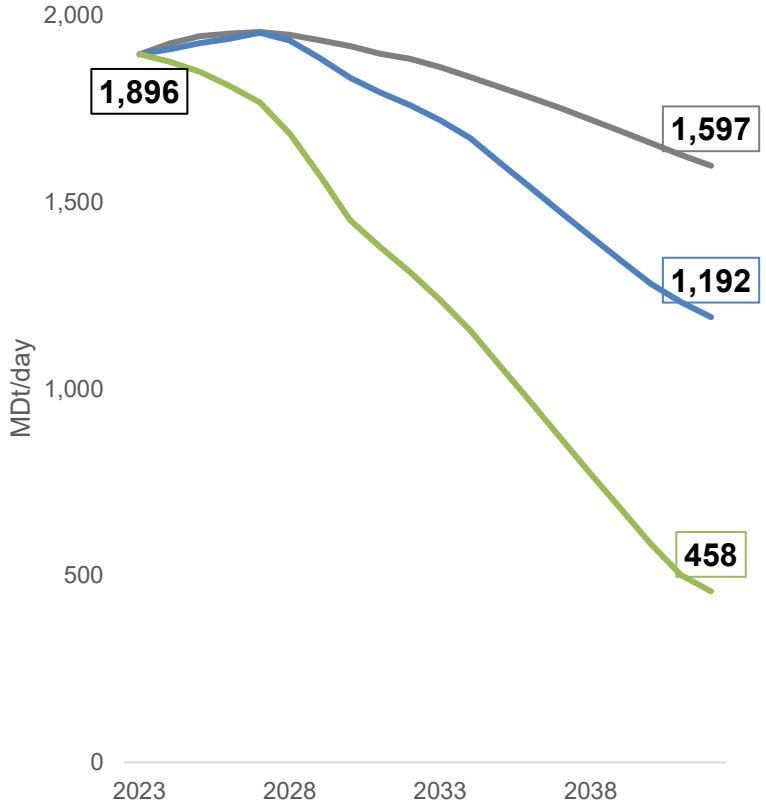
Hybrid

- Applies the sales-to-peak ratio from the Reference pathway to the sales forecast for each pathway to estimate peak demand

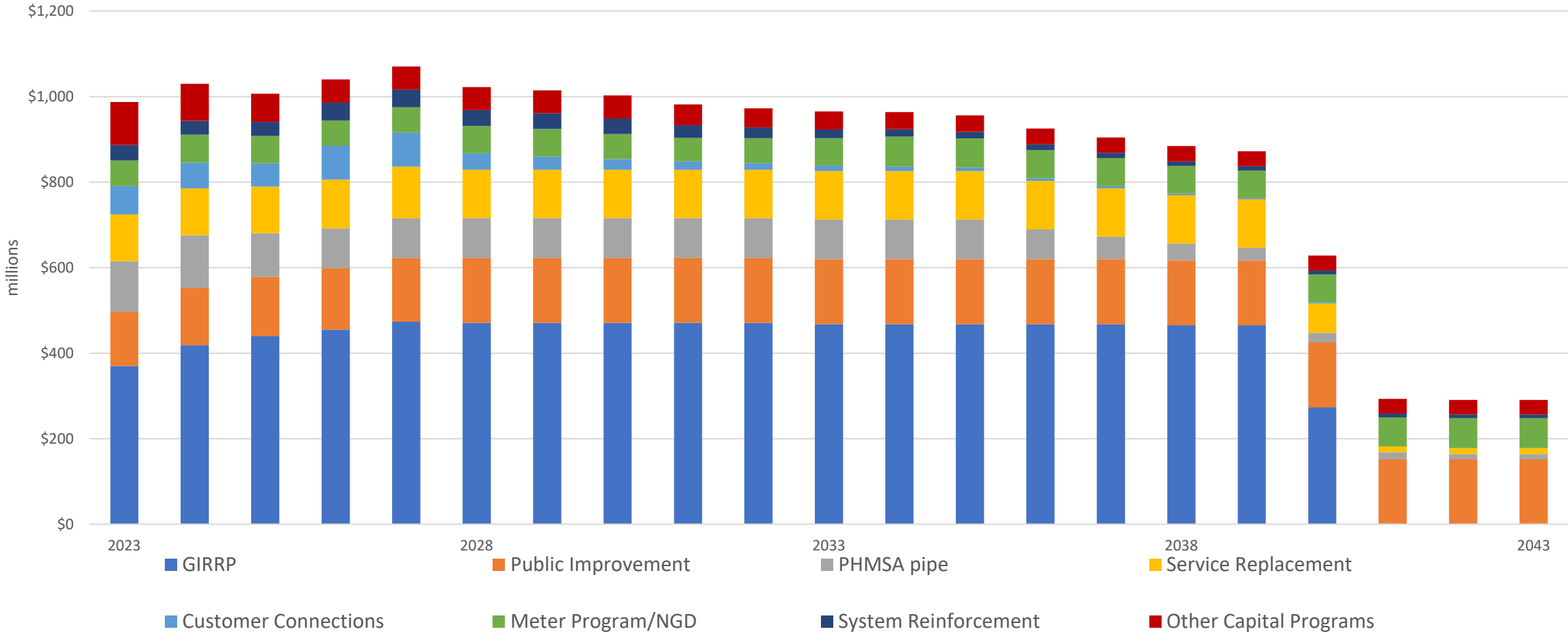
Deep Electrification

- *[same methodology as Hybrid]*

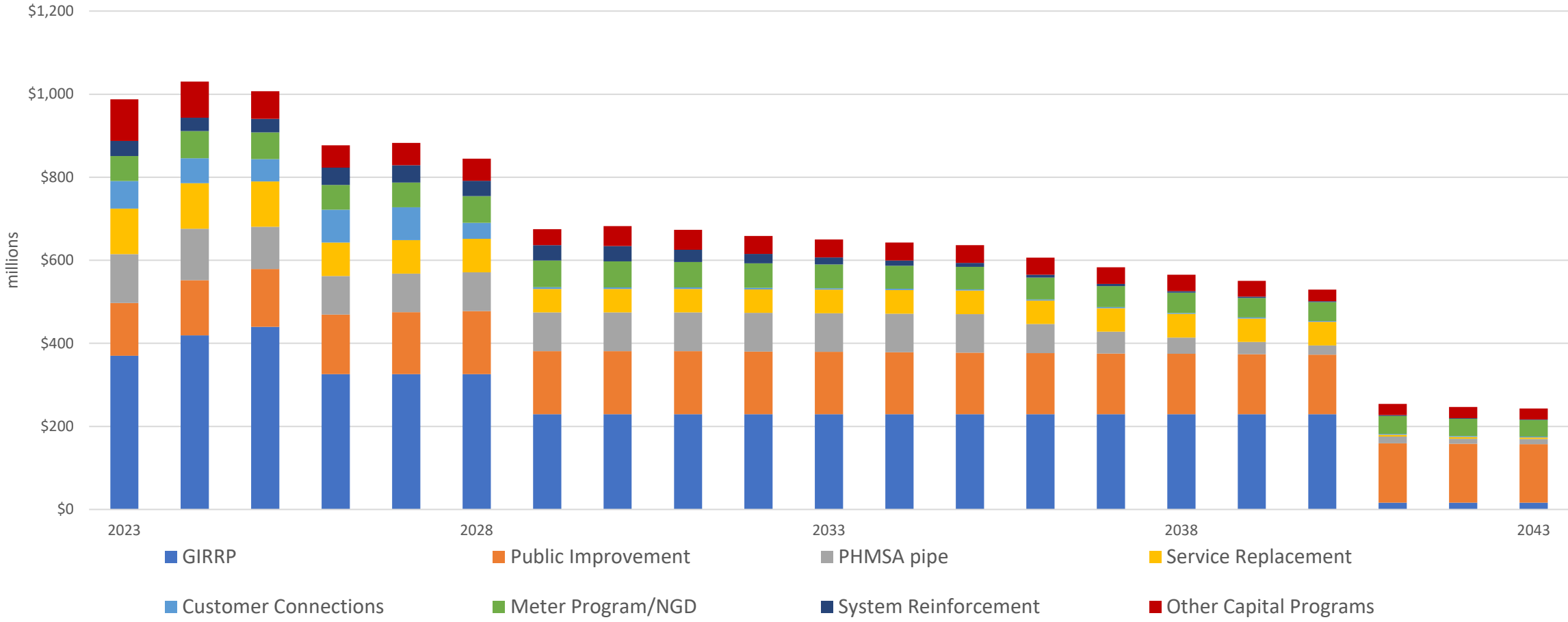
Firm Peak Demand by Pathway



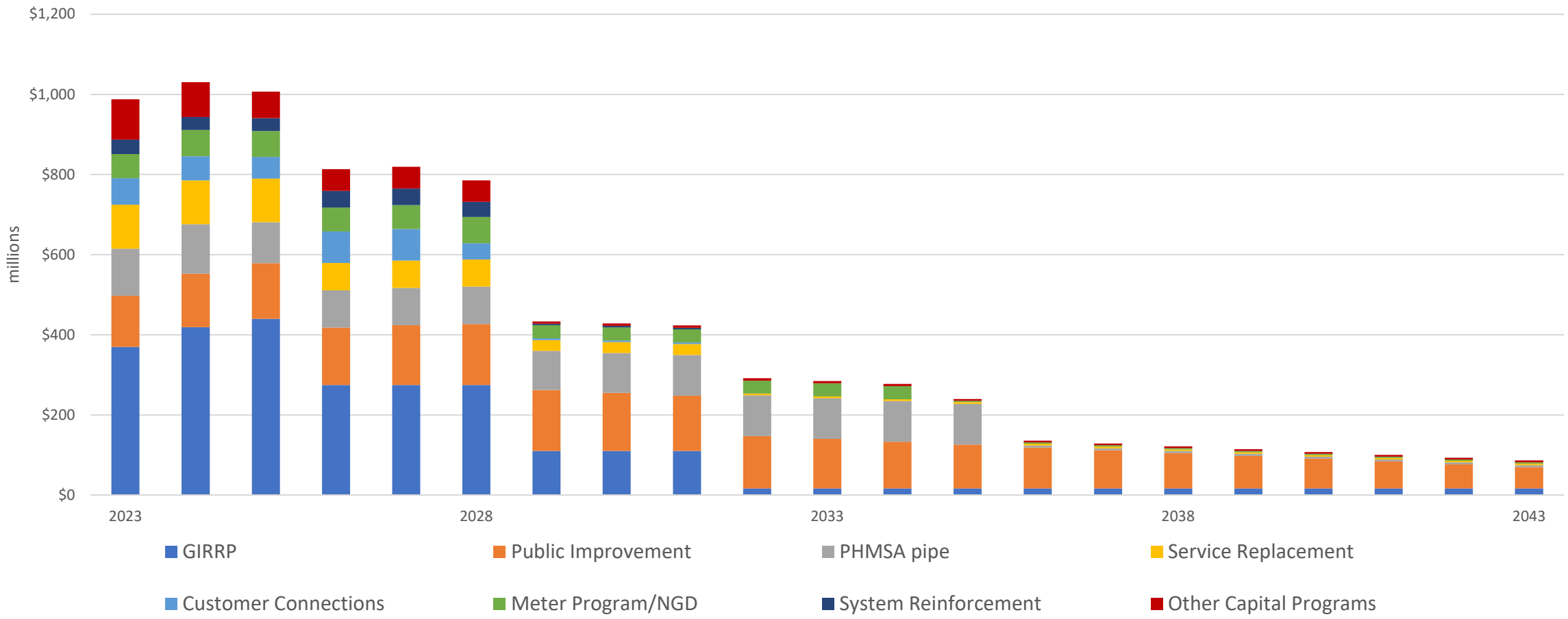
Capital Expenditure: Reference



Capital Expenditure: Hybrid



Capital Expenditure: Deep Electrification

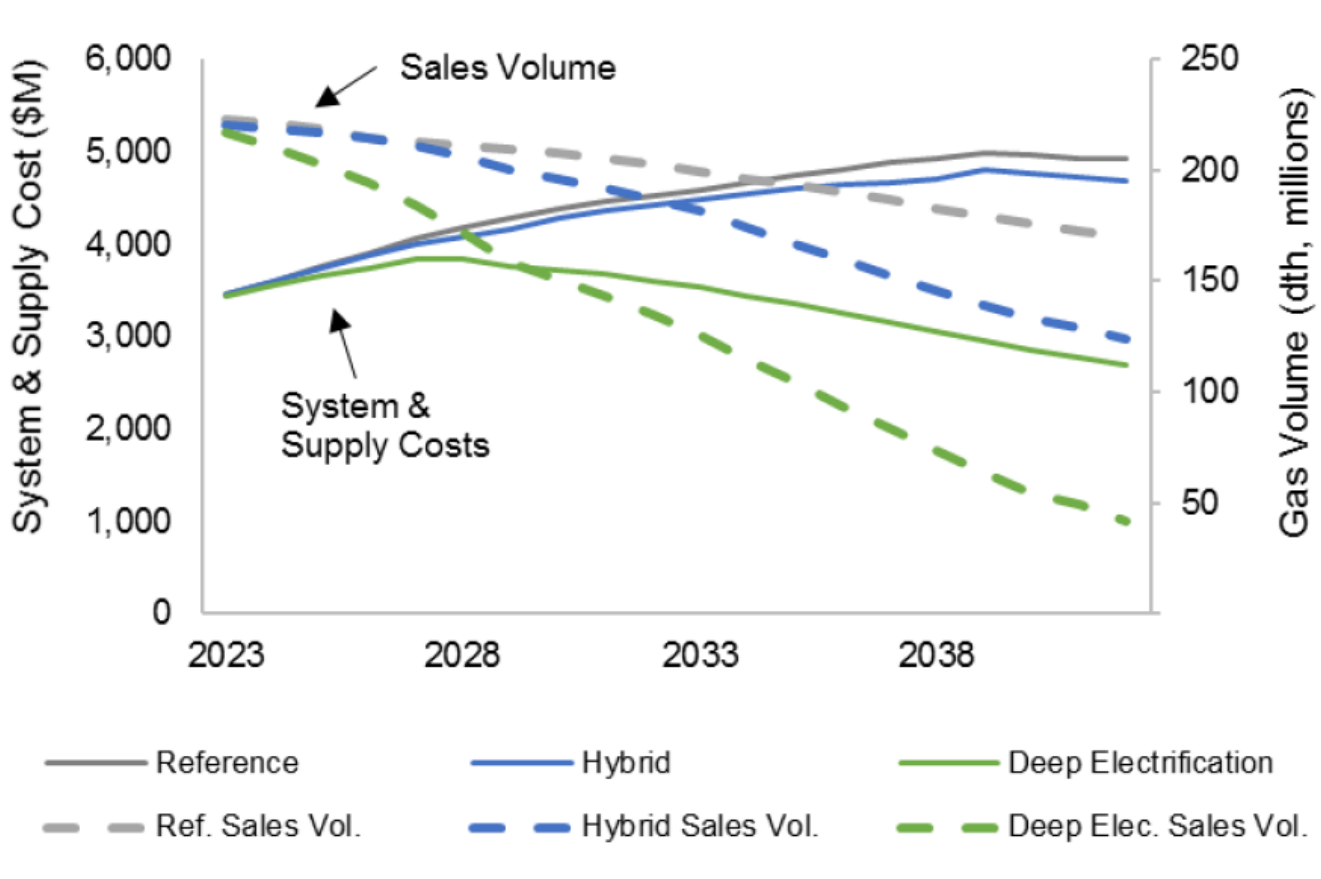


Projected Costs

- Reference
  - The Companies' combined rate base is forecasted to grow at a compounded annual growth rate of approximately 2%.
  - Customer costs grow from approximately $3.5Bn to $5bn by 2042.
- Hybrid
  - Reflect estimates of the Companies' capital investments and O&M costs required annually to reach the projected end state.
  - Annual O&M expenditures begin to decline after 2030 consistent with the timing for retirement of main and service assets.
  - The added expenses of using LCFs such as hydrogen blending in the larger distribution system, such as elevated leak response and regulator station replacements/retrofits, were included in the O&M cost estimates.
- Deep Electrification
  - Costs are projected to decline by 51% compared to the Reference pathway due largely to the significant decrease of the Companies' main replacement programs and other capital-intensive programs as system use declines and the distribution system is decommissioned
  - Annual O&M expenditures begin to decline starting in 2030 consistent with timing for significant abandonment of main and service assets
  - While system costs will decline significantly, so will the base of customers to which such costs apply

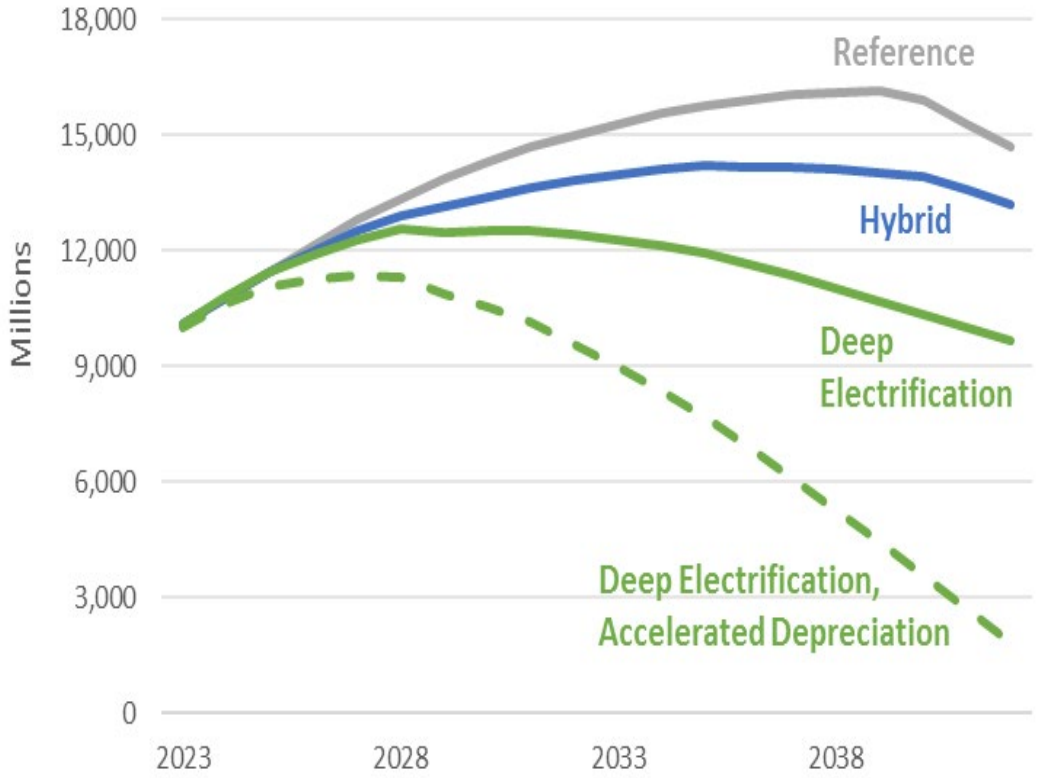
Projected Costs

Figure 62: Gas System and Fuel Supply Costs and Sales Volume (2023-2042)

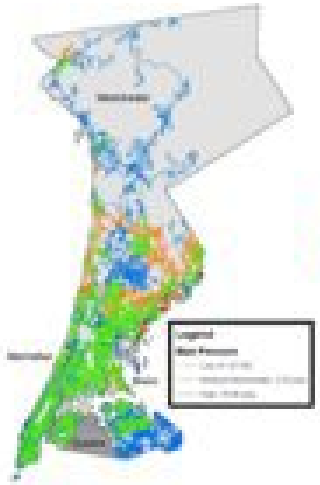


Accelerated Depreciation

- Gas system costs are borne by a declining number of customers
- This challenge is particularly acute for the Deep Electrification Pathway (although it applies to the Hybrid Pathway too)
- Con Edison evaluated how accelerated depreciation can help mitigate this challenge
- These figures illustrate that the System Rate impact of accelerated depreciation (at right, top) is modest
- However, the reduction in rate base by 2043 under accelerated depreciation (Deep Elec. Pathway) is significant

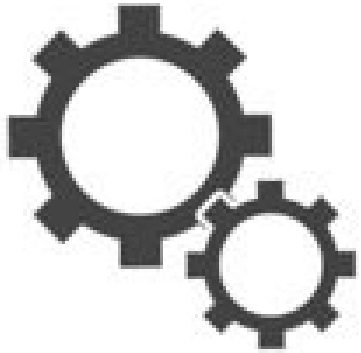


NPA Identification and Evaluation



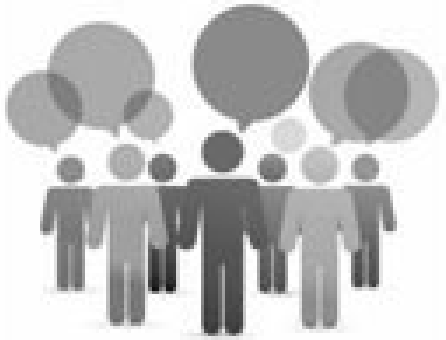
Identify System Needs

Forecasting; Infrastructure planning



NPS Suitability

Type of upgrades being considered, cost, timeframe needed). What type of work is and isn't suitable for alternative solution consideration



Competitive Solicitation/Program Development

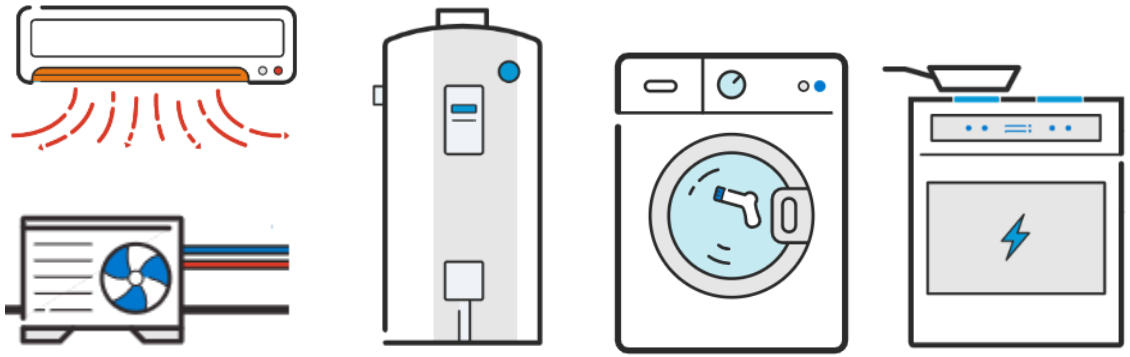
How to best address this need? Market solicitation, Energy Efficiency, etc.

BCA Evaluation & Procurement

Do the benefits of implementing alternative solutions outweigh the cost of the alternative solution?

Existing NPA Types

- Traditional Solution: **Gas main replacement**
- Alternative: **Whole Building Electrification / Electric Advantage Program**
  - Goal: Abandon Leak Prone Pipe without replacement
  - Target: Specific radial gas main segments serving a low number of customers (1-5)
  - All customers must agree to participate voluntarily
  - End-of-main customers are eligible to participate first, and remaining customers may join up until the main needs to be replaced



- Traditional Solution: **Gas distribution system reinforcement**
- Alternative: **Area Load Relief NPA**
  - Goal: Reduce peak load in targeted area to avoid system reinforcement
  - Target: Gas customer meeting geographic and system connection requirements
  - Utilize both Gas EE and Electrification
  - Analogous to Non-Wires Solutions/Alternatives

Policy Priorities

- Maintain an economic framework that supports continued operation of a safe, reliable, resilient gas delivery system that mitigates customer and utility impacts throughout the clean energy transition
- Reduce capital investment in the system by gradually reducing the gas geographic footprint
- Emphasize the continued importance of overall energy system reliability during the clean energy transition
- Continue to advocate for significant increases in energy efficiency to improve overall efficient use of energy in buildings

NW Natural
NARUC Natural Gas Task Force

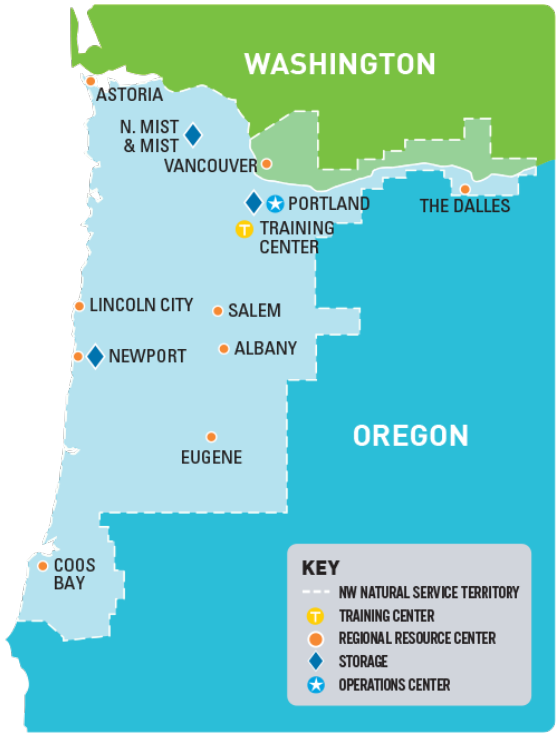
Zach Kravitz, Vice President, Rates & Regulatory
March 2024

NW Natural®

NW Natural at a Glance

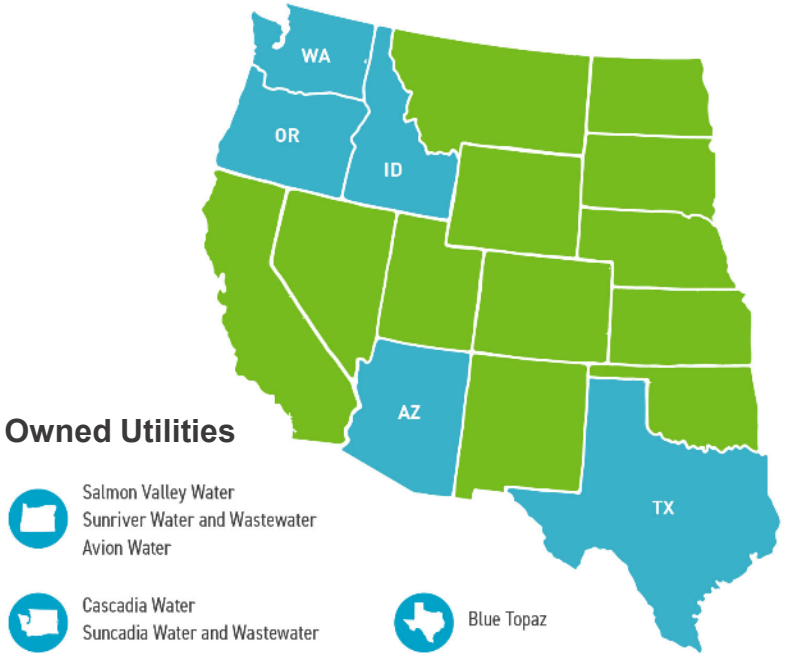
Gas Utility

- 2.5 million people served
- Approximately 800,000 connections
- 14,000 miles of modern pipeline



Water & Wastewater Utilities

- Nearly 165,000 people served through approximately 66,000 connections
- Supporting about 15,000 O&M service connections



System Snapshot

Gas Supply – Northwest Pipeline

- 60% supply from Canada
- 40% supply from the Rockies

LNG Peaker Plants

- Portland LNG – 0.6 Bcf
- Newport LNG – 1.0 Bcf

Mist Underground Gas Storage Facility

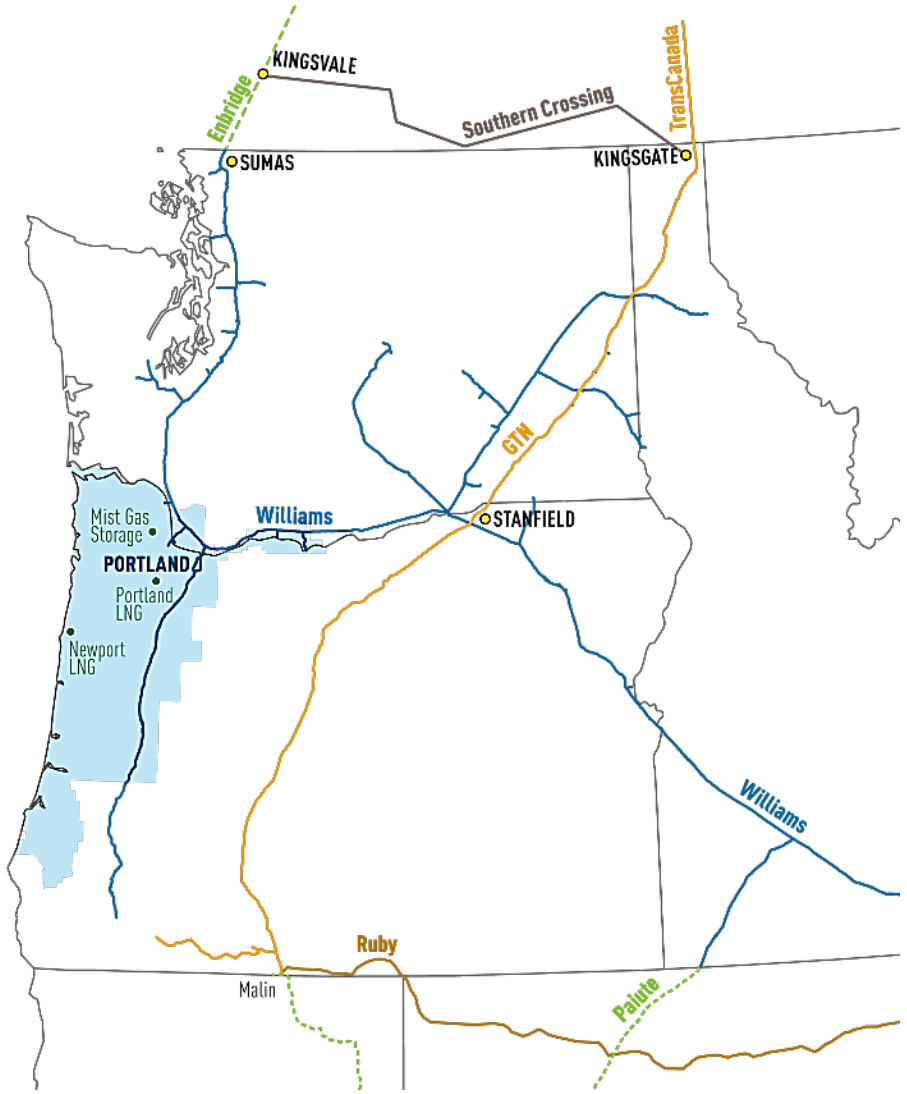
- 11.7 Bcf serving utility customers

North Mist Storage Facility for Electric Utility

- 4.1 Bcf serving Portland General under tariffed service

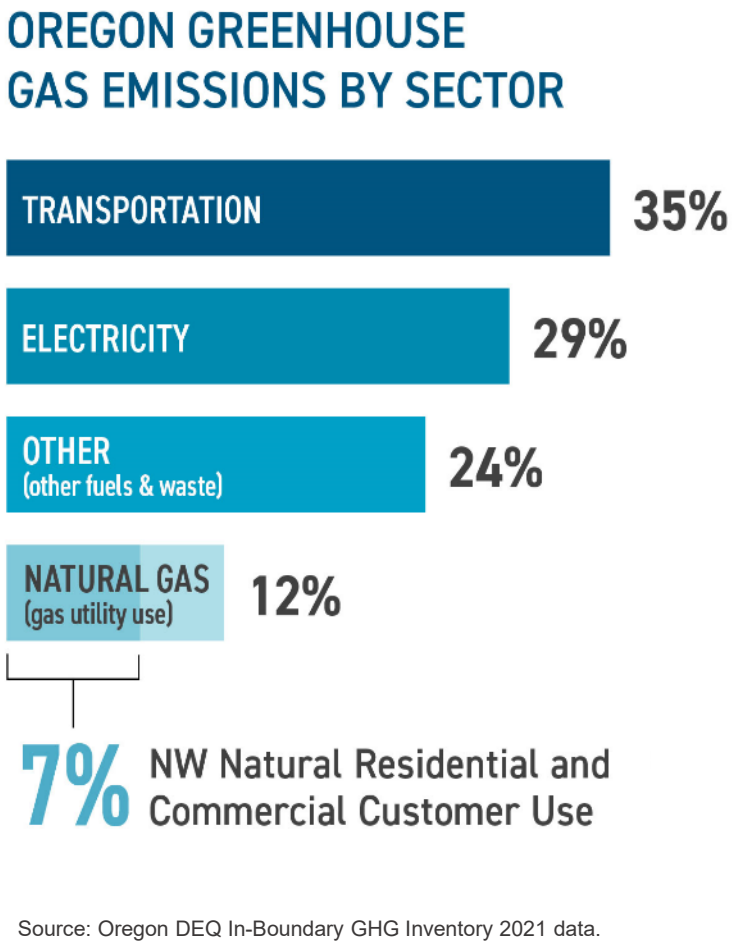
No Bare Steel or Cast Iron

- Completed in 2015 through OPUC approved System Integrity Plan
- Annual prudence review and cost recovery mechanism



Oregon Environmental Policy Landscape

Oregon Climate Protection Plan (Invalidated 12/23)	Administrative rule that applied to fuel suppliers, including natural gas utilities, but not to electric utilities. Goal of the program was to reduce covered emissions **90% by 2050** relative to 2017-19 baseline
Oregon Clean Energy Plan HB 2021	Requires Oregon electric utilities to reduce emissions 80% by 2030, 90% by 2035, and **100% by 2040** relative to 2010-12 baseline.



Source: Oregon DEQ In-Boundary GHG Inventory 2021 data.

Winter Peak: Very Recent Example

Severe weather lasting 5 days: January 12–16, 2024

- Interrupted all interruptible customers

Event System Stats:

- Record Firm Sendout: 802,361 dekatherms on 01/13/2024
- Previous Record: 792,746 on 12/22/2022

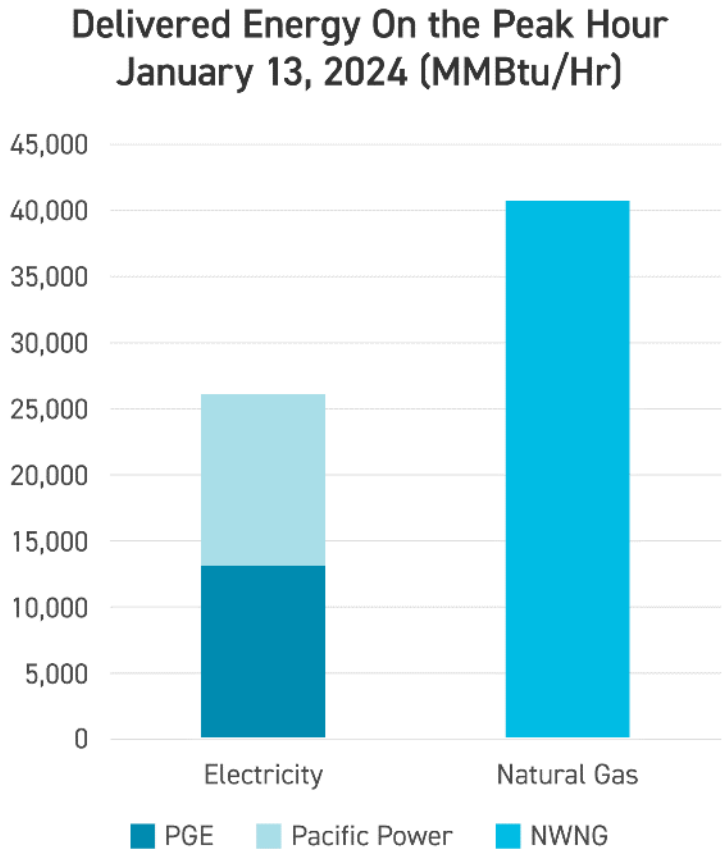
Record high withdrawals from storage facility: 456,571 dekatherms

- During this long peak event, 5 all-time highest withdrawals from our facility

January storm week shows criticality of energy system diversification

Entity	Overall Outages
NW Natural	266
PGE	524,600
PacifiCorp – Oregon	146,000
EWEB	37,000

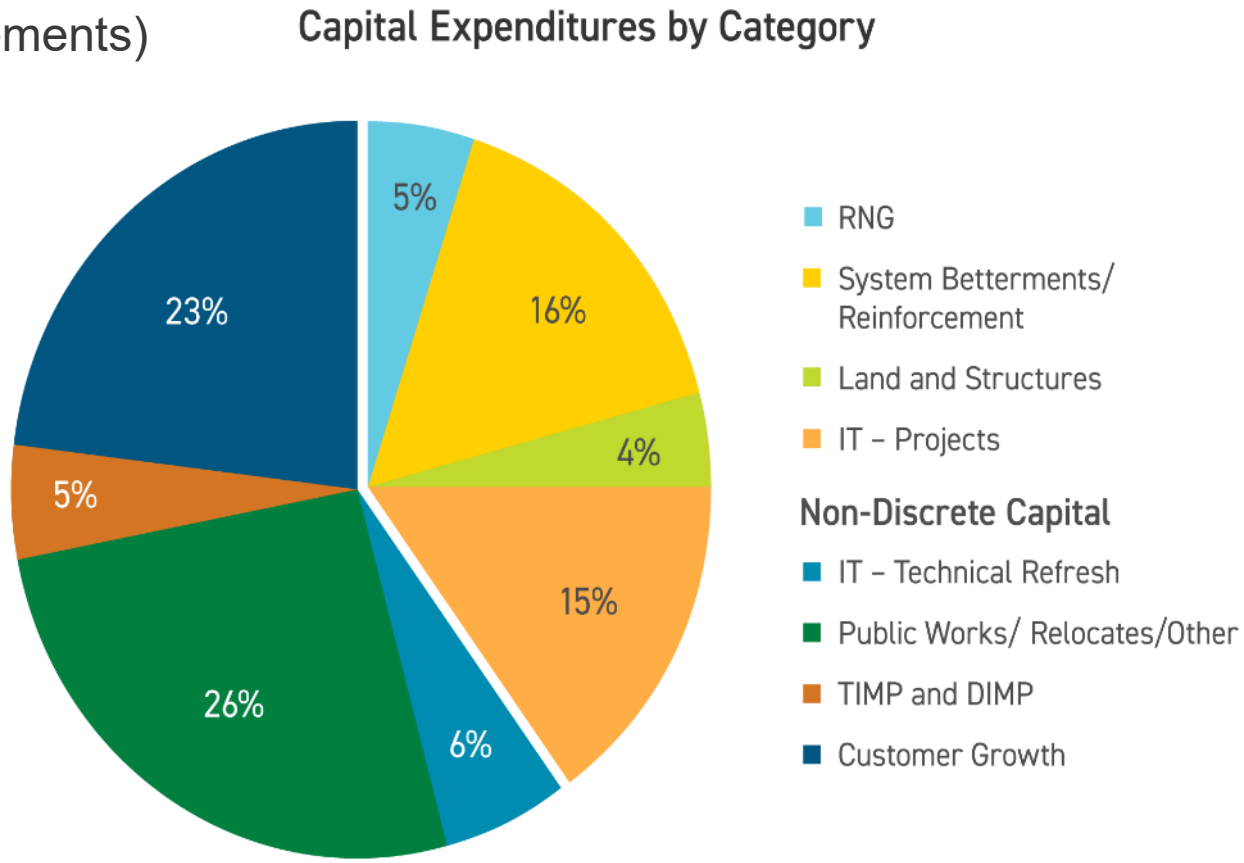
During the peak hour on January 13, 2024, NW Natural delivered 55% more energy than PGE and Pacific Power combined.



Source: ICF Using EIA Real Time Operating Grid Data

Key Drivers for Capital Investments

- Winter Peak Capacity (Betterments & Reinforcements)
- Pipeline Safety
- Environmental Goals & Policy
- Facilities and Regional Resource Centers
- IT&S Modernization
- Customer Growth
- Other (Public Works Projects, Relocates, Transportation, Equipment)



What's next for the gas system

LDCs must maintain the energy system safely.

- Winter peak resources must be invested in. Storage is critical.
- Pursue demand response/non-pipeline solutions for distribution reinforcement projects.
- Must recognize the customer resiliency value: fireplaces, water heaters, generators, cooktops.

LDCs now becoming decarbonization companies.

- This will require significant investment.
- RNG and decarbonized fuel projects require capital and human resources.
- Blending hydrogen, piloting geothermal networks and other non-traditional utility services.

Gas and electric systems are interconnected – need to change siloed planning.

- Hybrid systems (electric heat pump + back-up furnace) reduces use by 80%, alleviates electric capacity constraints.
- Customers will use far less gas, but the gas system is the lowest cost capacity resource (massive "battery").

How do we get there: pragmatic solutions, joint system planning, new approaches to regulation.

Proposing a New Approach

Embrace low-use customers while protecting existing customer base

- New Premise Fixed Charge: Protects against intraclass subsidies.
  - An increased fixed charge to reflect new customers' lower usage compared to our existing customer base, and thereby protecting against intraclass subsidies through the decoupling mechanism.
  - New residential rate for new premises that increases the fixed charge from ~$8/month to ~$26.25/month.
- Low-Use Line Extension Allowance (LEA): Provides higher allowance for low-use customers.
  - Responsive to a Commission order in our most recent rate case that required NW Natural to factor, among other things, new customers' environmental compliance costs into our LEA methodology (DCF model).
  - Breaks the link between customer throughput and amount of LEA provided.

Mitigate rate volatility with multi-year plans

- Key drivers for capital expenditures are increasing and will cause upward rate pressure.
- Updating rates annually will smooth out increases and avoid the large jump in rates.
- Decreases the frequency of rate case filings and helps manage competing priorities in current policy environment.

NW Natural®

Stronger by Design

RESILIENT, RELIABLE, RENEWABLE

EICI / Infrastructure Academy Presentation for NARUC Task Force on Natural Gas Resource Planning

March 2024

Energy Innovation Center

A globally recognized clean energy innovation hub

- 200,000 square foot innovation living-lab with 26 tenants
  - Model for resilient and sustainable commercial buildings
  - Energy transition tech transfer labs in microgrids, direct current, batteries, magnetics and energy storage solutions
  - Private capital developers & operators in renewables, batteries & thermal microgrids
- Future of Clean Equitable Energy, Learning, & Work
  - Low carbon power and equitable learning & workforce development
  - Innovative ecosystem of not-for-profit, NGOs, university tech transfer, for-profit, and private equity
- Model of public/private/corporate/academic/government collaboration with over 500 partners

Energy Innovation Center Institute *(501c3)*

Established in 2014 to help build the EIC eco-system and run its programming

- Clean Energy Transition *(science, technology, policy, innovation, commercial application)*
  - Production, storage, movement, consumption, electricity, renewables, H2, Carbon Capture Utilization and Storage (CCUS), Long-Duration Energy Storage (LDES), EV, alternatives, electrification, standardization, cyber security, etc.
  - Resiliency, sustainability, zero-carbon and other emissions
  - Energy security and energy equity
  - Advise energy utility, infrastructure industry, regulators, authorities, and governing bodies

- Equity *(disadvantaged community "DAC" focused)*
  - Workforce development focused on minorities and others with significant barriers
    - 4,051+ new work entrants (86% of grads employed, 89% POC)
    - $54 million in total employed graduate aggregate earnings
    - 1,800+ incumbent worker training and upskilling

Infrastructure Academy

Next generation critical infrastructure and utility training, testing and certification facility

- Innovative training, testing and certification center purpose built for the critical infrastructure and utility industries
  - New employees and incumbent workers
  - Training covers current job skills and new skills needed for energy transition
  - Traditional and advanced classrooms, labs, and live mock infrastructure systems
    - Pole farms, leak town, hydrogen town, construction equipment, confined space, lock-out-tag out
  - On-site testing and certification for energy technologies and devices
- Designed for the entire utility and infrastructure industry
  - Leverage across region, sub-infrastructure industries, and companies

4 Takeaways To Consider

Sustainable Energy Transition

- Current natural gas consumption and demand models predict a robust natural gas market through 2050
- US natural gas pipeline network needs to be safe and reliable to deliver natural gas and future non-carbon gaseous fuels
- Workforce training in the pipeline industry has the potential to benefit Disadvantaged Communities now and in the energy transition through 2050
- Policy Recommendations regarding natural gas emissions and retrofitting pipelines for non-carbon gaseous fuels

Infrastructure Investments

Clean Energy Transition

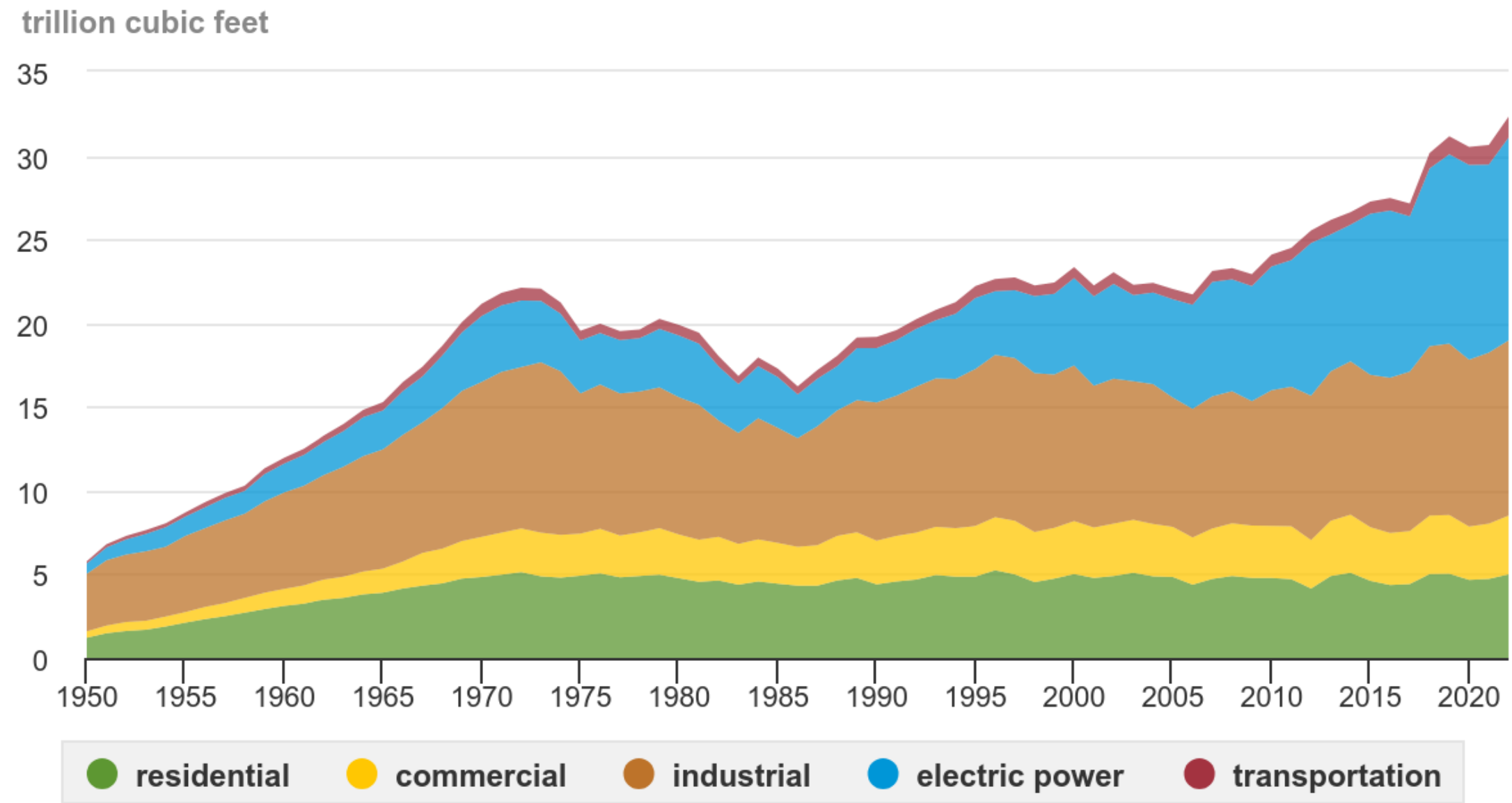
- Reducing fossil fuel consumption of coal, oil, and natural gas will be critical to transitioning to a lower carbon energy system
- Additional investments in domestic natural gas production and transportation will assist the U.S. to reach net-zero emission goals
- Replacing high risk existing natural gas pipelines and installing new natural gas pipelines will prepare the U.S. to transport zero-carbon fuels, increase pipeline safety, and reduce methane releases

Current Natural Gas Consumption and Future Demand

Issues to Watch

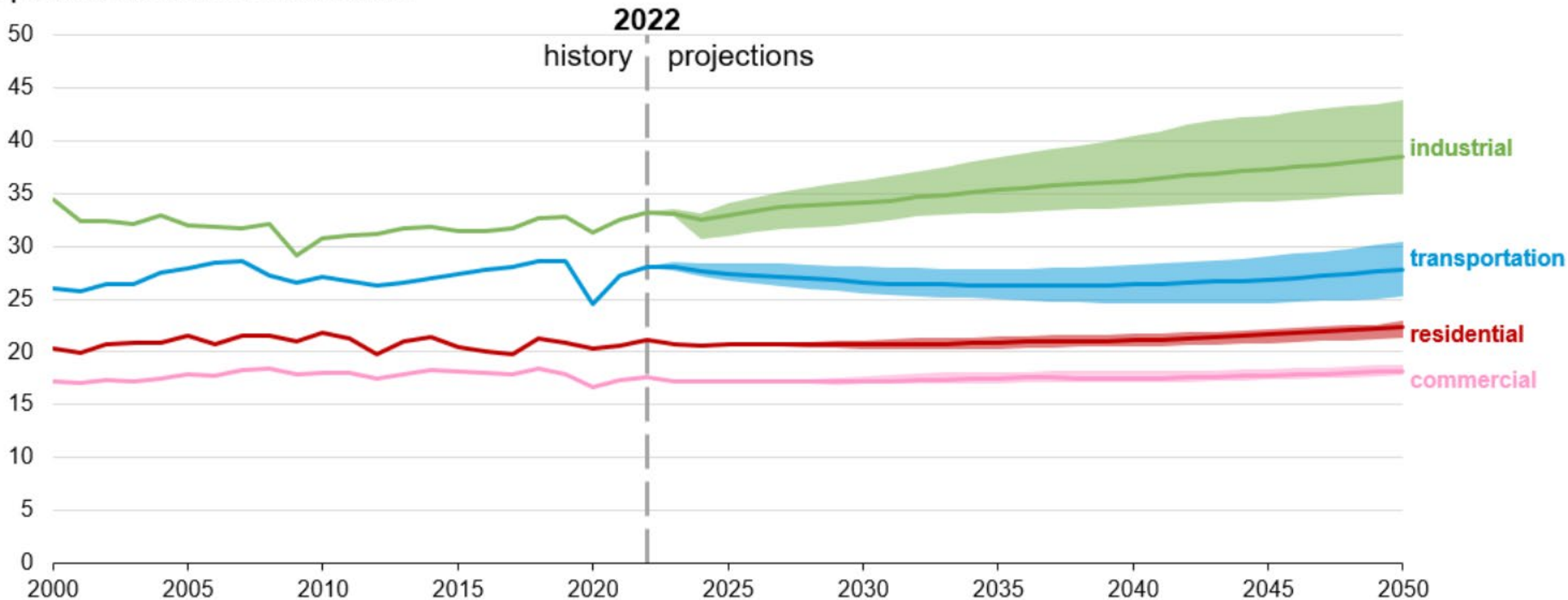
- Potential Sustainable Energy Technology advances may alter natural gas consumption and demand
- Consumer demands will drive the market i.e. Electric Vehicle demand is slowing
- Nearly 50% of US household's heat/cook with some type of carbon fuel such as natural gas, oil, propane, coal, wood. Converting to all electric will be slow and costly
- Disadvantaged Communities will suffer the most during an energy transition if the transition energy is not competitive with carbon fuels

U.S. natural gas consumption by sector, 1950-2022



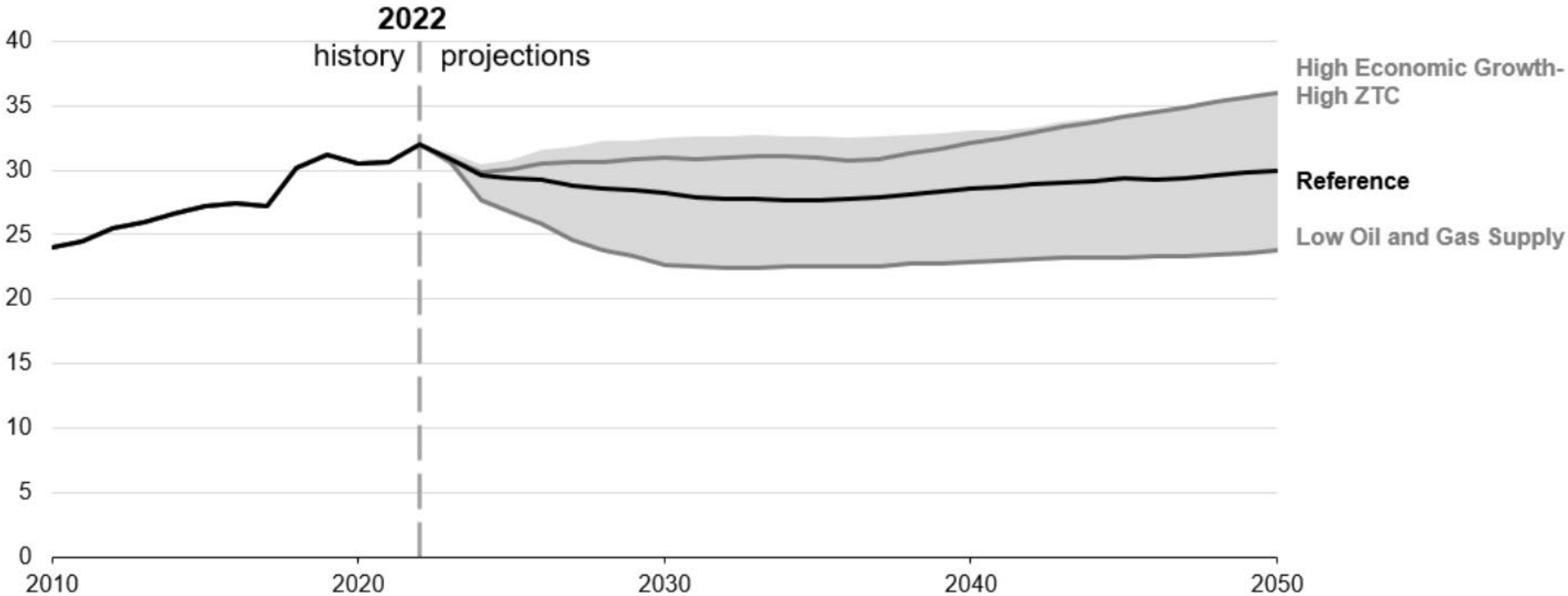
Data source: U.S. Energy Information Administration, *Monthly Energy Review* , Table 4.3, April 2023; preliminary data for 2022
Note: Transportation includes pipeline and distribution use and vehicle fuel.

Total energy consumption by end-use sector
quadrillion British thermal units



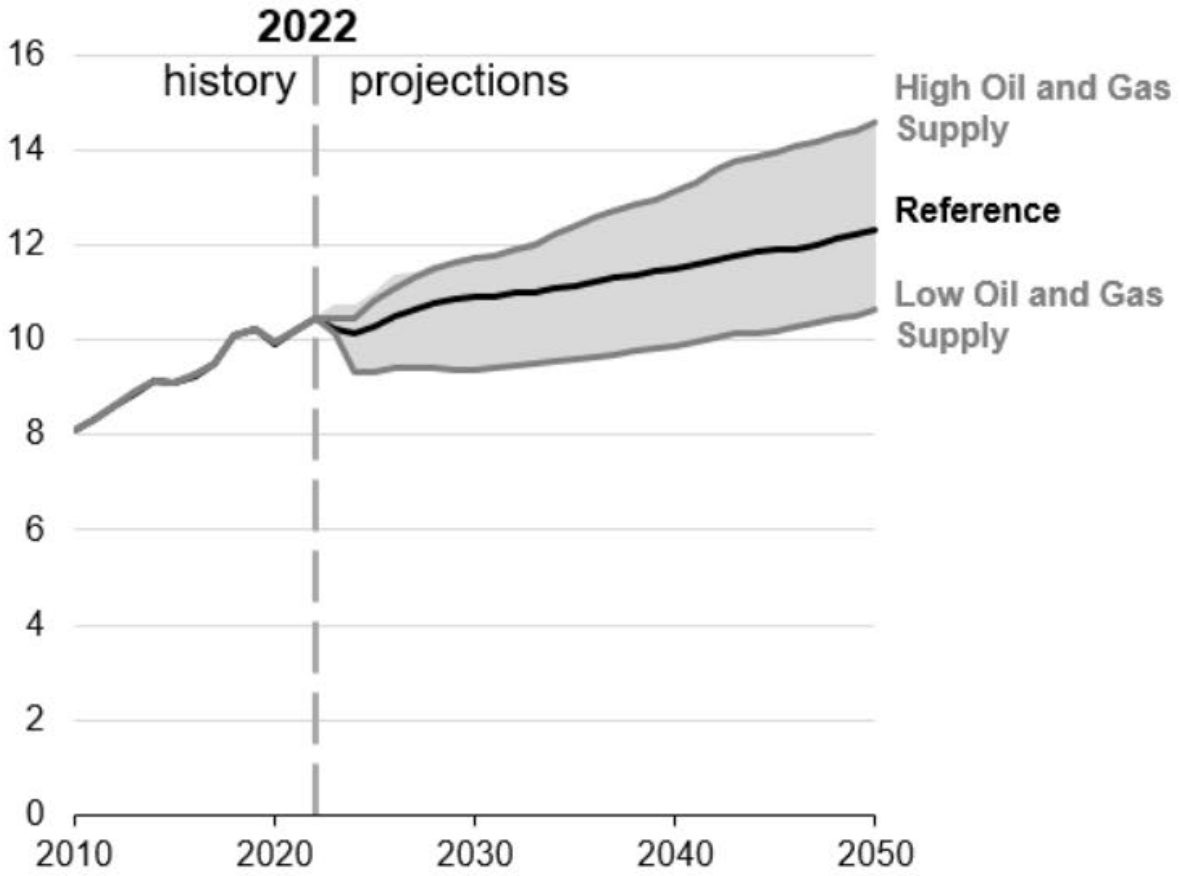
Data source: U.S. Energy Information Administration, *Annual Energy Outlook 2023* (AEO2023)
Note: Total consumption in end-use sectors includes purchased electricity and electricity-related losses. Each line represents AEO2023 Reference case projections. Shaded regions represent maximum and minimum values for each projection year across the AEO2023 Reference case and side cases.

Natural gas consumption
trillion cubic feet

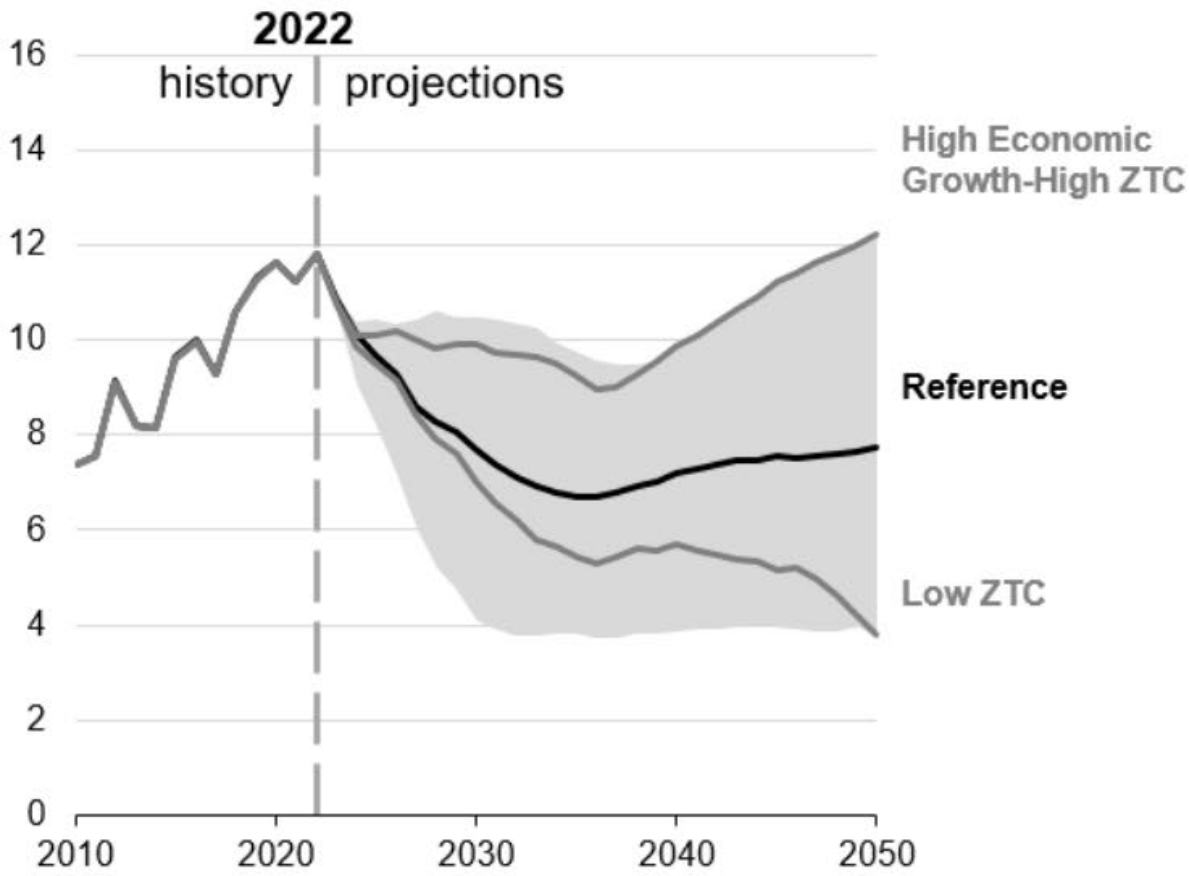


Data source: U.S. Energy Information Administration, *Annual Energy Outlook 2023* (AEO2023)
Note: Shaded regions represent maximum and minimum values for each projection year across the AEO2023 Reference case and side cases. ZTC=Zero-Carbon Technology Cost.

Natural gas consumption in industrial sector
trillion cubic feet



Natural gas consumption in electric power sector
trillion cubic feet



Data source: U.S. Energy Information Administration, *Annual Energy Outlook 2023* (AEO2023)
Note: Shaded regions represent maximum and minimum values for each projection year across the AEO2023 Reference case and side cases. ZTC=Zero-Carbon Technology Cost.

Natural Gas Pipeline Network Facts

- The U.S. natural gas pipeline network is a highly integrated network that moves natural gas throughout the continental United States.
- The pipeline network has about 3 million miles of mainline and other pipelines that link natural gas production areas and storage facilities with consumers.
- In 2021, this natural gas transportation network delivered about 27.6 trillion cubic feet (Tcf) of natural gas to about 77.7 million consumers.
- **ref: U.S. Energy Information Administration - EIA - Independent Statistics and Analysis**

Pennsylvania Stats

New Analysis: Pennsylvania's Abundant Natural Gas and Oil Resources Provide Over $75 Billion in Economic, Trade & Job Benefits Ref: 202.682.8114 | press@api.org

- HARRISBURG, PA, May 16, 2023 — The American Petroleum Institute-Pennsylvania (API Pennsylvania) today released new analysis on the growing economic contributions of America's natural gas and oil industry in all 50 states, including investment in Pennsylvania ranging from taxes and workforce wages paid to indirect and induced jobs in retail, manufacturing, agriculture and other sectors throughout the energy supply chain. The study, commissioned by API and prepared by PricewaterhouseCoopers (PwC), showed that the industry supported more than 423,000 jobs and contributed over $75 billion toward the state's economy in 2021.

API report on Pennsylvania

According to the findings, in 2021, the Pennsylvania Oil and Gas industry directly and indirectly:

- Supported 423,700 total jobs (93,060 direct and 330,640 indirect) or 5.6 percent of Pennsylvania's total employment.
- Generated an additional 3.6 jobs elsewhere in Pennsylvania's economy for each direct job in the state's natural gas and oil industry.
- Provided $40.3 billion in labor income ($14.3 billion direct and $26.0 billion indirect) to Pennsylvania, 7.5 percent of the state's total.
- Contributed $75.0 billion to Pennsylvania's total gross domestic product ($35.9 billion direct and $39.1 billion indirect), 8.9 percent of the state's total.

API report on Pennsylvania

In 2021, the U.S. led the world in natural gas and oil production and the benefits of that leadership permeated throughout non-producing and producing states alike. At the national level in 2021, the natural gas and oil industry:

- Supported 10.8 million total jobs or 5.4 percent of total U.S. employment.
- Generated an additional 3.7 jobs elsewhere in the U.S. economy for each direct job in the natural gas and oil industry.
- Produced $909 billion in labor income, or 6.4 percent of the U.S. national labor income.
- Supported nearly $1.8 trillion in U.S. gross domestic product, accounting for 7.6 percent of the national total.
- Ref: “Impacts of the Oil and Natural Gas Industry on the US Economy in 2021” April 2023 American Petroleum Institute

Gas Pipeline Miles by System Type - 2022

Time run: 2/15/2024 5:49:04 PM

Data Source: US DOT Pipeline and Hazardous Materials Safety Administration
Portal Data as of 2/14/2024 12:11:10 AM

Excludes Type R Gas Gathering

State: (All Column Values) **Fed/State:** (All Column Values) **Regulated By:** (All Column Values)

System Type	System Detail	Miles
GAS DISTRIBUTION	Main Miles	1,356,358
	Service Miles	965,167
GAS GATHERING	Miles	112,120
GAS TRANSMISSION	Miles	300,936
Grand Total		**2,734,580**

Natural Gas Transmission Network

Transmission Line Customers

- 70 Million Residential Households
- 5.5 Million Commercial Businesses
- 182,000 Industrial Manufacturing Facilities
- 1,800 Electric Power Plants
- Ref: American Gas Association, “Annual End Users” December 29, 2020

Natural Gas Network Capacity

Unmatched Peak Day Energy Delivery

- The Natural Gas network is physically designed to meet a design peak day demand
- The Natural Gas network can deliver product to meet fixed and variable demand
- On a peak demand day, the Natural Gas network can deliver up to 4X as much energy as the electric network on a peak day –ref: “Investing in the US Natural Gas Pipeline System to Support Net Zero Targets”, Columbia University, The Center on Global Energy Policy, April 2021, Blanton, Lott, Smith

FERC Order 636

Interstate Pipeline Deregulation and Open Access Reduced Natural Gas transportation and commodity costs

- The Natural Gas network was deregulated through FERC Order 636 and created open access frameworks for commercial and industrial customers and thereby lowering natural gas prices via market competition
- FERC Order 636 created new secondary capacity markets where transmission pipeline capacity can be sold and traded
- FERC Order 636 created market based rates via spot market hubs and underground storage

Natural Gas Pipeline Investments

Brief History of the Natural Gas Pipeline Network Development

- Most of the Local Distribution Systems were developed between 1950 and 1970
- Since 1970 more than ½ Trillion Dollars have been invested in the natural gas infrastructure across the US – Ref: American Gas Association, “Gas Utility Construction Expenditures by Type of Facility”, 2020
- The EIC reports that in 2019 alone, over 46 transmission pipeline projects with 16 BCF/d of capacity entered the pipeline network
- Continued increased demand by end-users is driving new pipeline construction thus increasing spending on natural gas infrastructure
- Regional public and government opposition have increased in some areas of the US, while other areas promote natural gas production and pipeline construction

Distribution Network Investments

Safety Driven and Demand Driven

- After the San Bruno and Allentown Incidents, a “Call to Action” was announced by the US DOT and the National Association of Pipeline Safety Representatives (NAPSR)
- Pipeline Replacement of “Risky” pipelines was mandated
- Cast Iron and Bare Steel distribution pipelines were required to be replaced
- Pipeline and Hazardous Materials Safety Administration (PHMSA) created Pipeline Integrity programs to identify risky pipe (pipes that are prone to leak or catastrophically fail) and force operators to reduce risk by replacing risky pipes
- For Example: Pennsylvania in 2011 identified 13,000 miles of risky pipeline that needed to be replaced. The average cost of distribution pipeline replacement in PA is above $1.1 million per mile

Distribution Network Investments

Additional Distribution Network Investment

- New Customer Connections – as new home sales increase, the heating/cooking fuel of choice in Natural Gas
- Safety Requirements mandated by PHMSA
  - Remote control valves
  - Leak detection equipment
  - Emission reductions

Gas Distribution Cast/Wrought Iron Pipelines

Date run: 2/16/2024

Data Source: US DOT Pipeline and Hazardous Materials Safety Administration Portal - Data as of **2/16/2024**

Notes:

- Sort any column by hovering over the column header, then selecting sort order.

Year: 2022

State	Main Miles	% of Total Main Miles	Service Count	% of Total Service Count
NEW JERSEY	2,904	8.1%	0	0.0%
NEW YORK	2,481	5.0%	3,537	0.1%
MASSACHUSETTS	2,413	11.0%	1,258	0.1%
PENNSYLVANIA	2,059	4.2%	0	0.0%
MICHIGAN	1,616	2.6%	7	0.0%
CONNECTICUT	1,014	12.1%	8	0.0%
ILLINOIS	980	1.6%	40	0.0%
MARYLAND	972	6.2%	20	0.0%
RHODE ISLAND	590	18.3%	25	0.0%
ALABAMA	464	1.4%	219	0.0%
DISTRICT OF COLUMBIA	397	32.6%	1	0.0%
MISSOURI	394	1.4%	0	0.0%
VIRGINIA	144	0.6%	75	0.0%
NEBRASKA	128	1.0%	6	0.0%
OHIO	109	0.2%	5	0.0%
LOUISIANA	79	0.3%	390	0.0%
CALIFORNIA	51	0.0%	58	0.0%
INDIANA	48	0.1%	15	0.0%
DELAWARE	42	1.1%	0	0.0%
NEW HAMPSHIRE	40	2.0%	6	0.0%
MISSISSIPPI	32	0.2%	0	0.0%
TEXAS	21	0.0%	0	0.0%
MAINE	14	1.0%	13	0.0%
WEST VIRGINIA	7	0.1%	0	0.0%
FLORIDA	6	0.0%	0	0.0%
KENTUCKY	3	0.0%	92	0.0%
TENNESSEE	0	0.0%	4	0.0%
KANSAS	0	0.0%	0	0.0%
GEORGIA	0	0.0%	0	0.0%

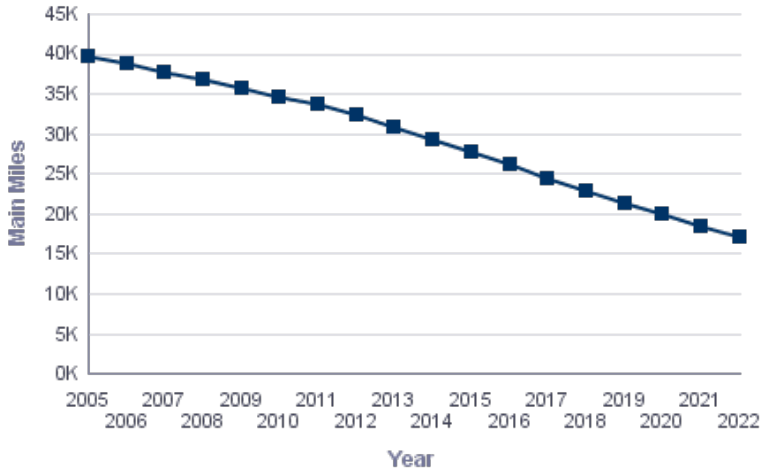
Gas Distribution Cast/Wrought Iron Main Miles and Service Count State Trend

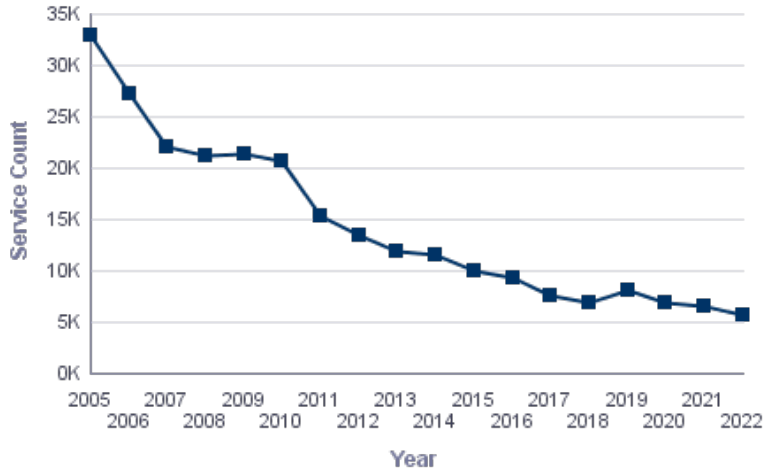
Date run: 2/16/2024

Data Source: US DOT Pipeline and Hazardous Materials Safety Administration Portal - Data as of **2/16/2024**

State: (All Column Values)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Main Miles	39,645	38,704	37,720	36,813	35,623	34,592	33,669	32,406	30,904	29,359	27,765	26,201	24,467	22,853	21,268	19,922	18,314	17,010
Service Count	32,862	27,232	22,050	21,216	21,323	20,728	15,408	13,511	11,991	11,618	10,028	9,345	7,652	6,985	8,064	6,984	6,518	5,779





Gas Distribution Bare Steel Pipelines

Date run: 2/16/2024

Data Source: US DOT Pipeline and Hazardous Materials Safety Administration Portal - Data as of **2/16/2024**

Notes:

- Sort any column by hovering over the column header, then selecting sort order.

Year: 2022

State	Main Miles Bare Steel	% of Total Main Miles	Service Count	% of Total Service Count
OHIO	5,280.07	8.8%	58,045	1.6%
PENNSYLVANIA	5,246.13	10.6%	168,230	5.8%
NEW YORK	4,256.17	8.5%	178,816	5.4%
TEXAS	4,237.76	3.7%	299,761	5.2%
KANSAS	3,502.48	14.8%	38,138	3.9%
CALIFORNIA	3,398.42	3.1%	1,040	0.0%
WEST VIRGINIA	2,329.40	21.1%	51,383	13.2%
OKLAHOMA	1,095.67	4.0%	36,300	2.9%
MASSACHUSETTS	931.71	4.3%	122,595	8.9%
MICHIGAN	799.45	1.3%	17,200	0.5%
MISSOURI	652.91	2.3%	2,853	0.2%
MISSISSIPPI	514.43	2.9%	12,763	2.1%
ALABAMA	466.25	1.4%	118,294	11.2%
ARKANSAS	453.32	2.2%	17,068	2.3%
NEBRASKA	447.94	3.4%	5,169	0.8%
INDIANA	385.65	0.9%	6,716	0.3%
KENTUCKY	360.64	1.9%	8,999	1.0%
FLORIDA	351.07	1.1%	11,173	1.1%
ARIZONA	329.13	1.3%	2,903	0.2%
VIRGINIA	327.20	1.5%	8,486	0.6%
NEW JERSEY	202.05	0.6%	84,966	3.5%
COLORADO	191.89	0.5%	15,249	0.9%
LOUISIANA	169.53	0.6%	8,438	0.7%
RHODE ISLAND	140.78	4.4%	36,387	18.7%
IOWA	131.74	0.7%	5,669	0.6%
MARYLAND	117.55	0.8%	54,383	5.0%
CONNECTICUT	114.94	1.4%	31,255	6.6%
ILLINOIS	110.09	0.2%	9,048	0.2%
HAWAII	89.50	14.3%	6,015	17.6%
MINNESOTA	70.22	0.2%	732	0.0%
NEW MEXICO	52.51	0.4%	9,445	1.4%
GEORGIA	32.08	0.1%	9,685	0.4%
TENNESSEE	29.25	0.1%	117	0.0%

State	Main Miles Bare Steel	% of Total Main Miles	Service Count	% of Total Service Count
WASHINGTON	26.57	0.1%	37	0.0%
SOUTH DAKOTA	25.00	0.5%	1,608	0.7%
DISTRICT OF COLUMBIA	20.85	1.7%	5,658	4.5%
ALASKA	8.02	0.2%	0	0.0%
DELAWARE	5.74	0.2%	382	0.2%
NEW HAMPSHIRE	4.47	0.2%	2,856	3.0%
NORTH DAKOTA	3.38	0.1%	68	0.0%
SOUTH CAROLINA	3.00	0.0%	717	0.1%
WYOMING	2.85	0.0%	28	0.0%
OREGON	1.96	0.0%	29	0.0%
MONTANA	1.75	0.0%	2	0.0%
IDAHO	1.25	0.0%	0	0.0%
WISCONSIN	0.50	0.0%	2	0.0%
MAINE	0.00	0.0%	26	0.1%

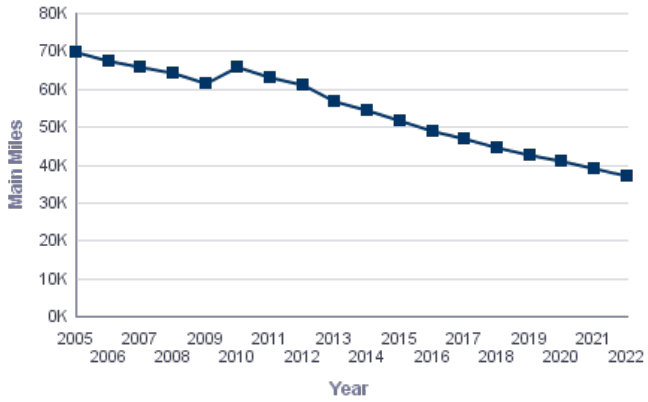
Gas Distribution Bare Steel Main Miles and Service Count State Trend

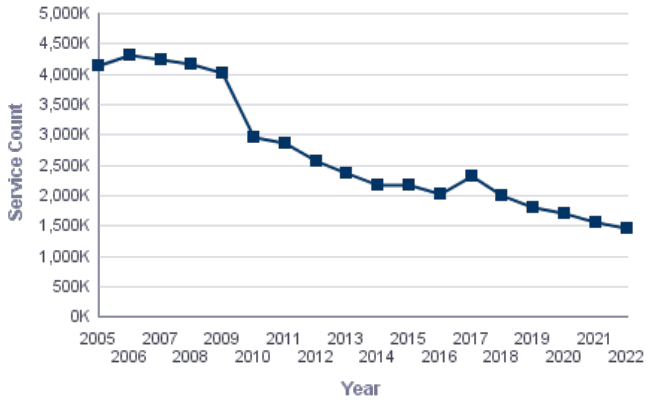
Date run: 2/16/2024

Data Source: US DOT Pipeline and Hazardous Materials Safety Administration Portal - Data as of **2/16/2024**

State: (All Column Values)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Main Miles	69,798	67,408	65,689	64,127	61,432	65,656	63,019	61,209	56,878	54,455	51,487	48,845	47,021	44,643	42,691	41,153	39,103	36,923
Service Count	4,146,310	4,306,596	4,225,567	4,161,369	4,005,567	2,961,317	2,859,197	2,555,558	2,361,984	2,179,837	2,171,613	2,018,564	2,314,310	1,985,575	1,802,348	1,700,100	1,566,686	1,448,734





PHMSA Regulations

- In late 2009, PHMSA implemented **pipeline** safety regulations for managing the integrity of gas distribution pipelines. Operators were required to create Distribution Integrity Management Program (DIMP) by August 2011.
- Operators are required to know the specific characteristics of their system and operating environment to identify threats, evaluate the risk and take measures to reduce the risk.
  ref:Pipeline and Gas Journal August 2022 Volume 249, No. 8
- Risk reduction occurs through the removal of risky pipes
- Pennsylvania's Long-term infrastructure improvement plan
  - LTIIP—Long-term infrastructure improvement plan —The plan and supporting documents identified in 66 Pa.C.S. § 1352 (a) (relating to long-term infrastructure improvement plan) that shall be submitted to and approved by the Commission for a utility to be eligible to recover costs from a DSIC mechanism, which includes information regarding the utility's eligible property and its repair and replacement schedule.

Pipeline Investments

- Replacing high risk existing natural gas pipelines and installing new natural gas pipelines will prepare the U.S. to transport zero-carbon fuels, increase pipeline safety, and reduce methane releases
- Pipeline replacement investments should be forward looking and pipelines designed to transport hydrogen and other non-carbon gaseous fuels
- Research retrofitting of current pipelines to transport non-carbon gaseous fuels
- Hydrogen properties:
  - Lower BTU than natural gas
  - Lighter than air
  - Can precipitate out of certain pipelines
  - Causes embrittlement and leaks in certain steel pipelines
  - Has a wider range of explosive range than natural gas

Workforce Training

- **“No two energy systems are the same; therefore, clean energy transitions will occur in a variety of contexts with a range of challenges. No matter where they occur, it is imperative that these transitions leave no one behind. That is why we must learn and engage with as many people as possible to holistically manage transitions effectively,” said US Secretary of Energy Jennifer M. Granholm.**
- Equity *(disadvantaged community “DAC” focused)*
  - Workforce development focused on minorities and others with significant barriers
- The only restraint in clean energy transition is a trained workforce
- Natural Gas and oil industry supports 11.3 million jobs in the US

ref: Impacts of the Oil and Natural Gas Industry on the US Economy in 2019 July 2021 Prepared for American Petroleum Institute

Table E-2. The Economic Impact of the Onshore Upstream Subsector of the Oil and Natural Gas Industry in Selected States, 2019
(Thousands of jobs; Billions of dollars)

State	Employment[1]		Labor Income[2]		Value Added	
	Direct	Total	Direct	Total	Direct	Total
Alaska	9.3	28.6	$1.7	$2.9	$5.1	$7.3
California	29.1	399.4	$2.8	$34.1	$7.0	$58.0
Colorado	42.2	235.4	$12.5	$25.2	$10.7	$30.7
Louisiana	43.4	153.4	$6.0	$11.9	$8.8	$19.4
Montana	4.5	21.1	$0.5	$1.3	$0.5	$1.8
New Mexico	28.2	72.7	$2.4	$4.6	$9.3	$13.3
North Dakota	23.5	58.4	$2.6	$4.7	$5.8	$9.2
Ohio	17.5	146.0	$0.8	$9.2	$9.9	$23.9
Oklahoma	94.9	257.6	$8.7	$18.4	$21.3	$36.6
Pennsylvania	27.4	188.9	$2.3	$14.2	$13.3	$31.9
Texas	334.4	1,549.1	$82.9	$162.9	$122.5	$245.4
Utah	5.9	44.4	$0.4	$2.6	$0.8	$4.6
West Virginia	13.2	39.8	$1.1	$2.6	$3.3	$5.9
Wyoming	16.8	37.2	$1.5	$2.6	$3.3	$5.2
Subtotal	**690.5**	**3,231.9**	**$126.2**	**$297.2**	**$221.6**	**$493.1**

Source: PwC calculations based on the IMPLAN model and data from IHS Markit, Alaska's Department of Natural Resources, and the Energy Information Administration. Details may not add up to totals due to rounding.
(1) Employment is defined as the number of direct, indirect, and induced payroll and self-employed jobs, including part-time jobs.
(2) Labor income is defined as annual wages and salaries and benefits as well as proprietors' income.

These results were calculated using the IMPLAN model, an input-output model based on government data.

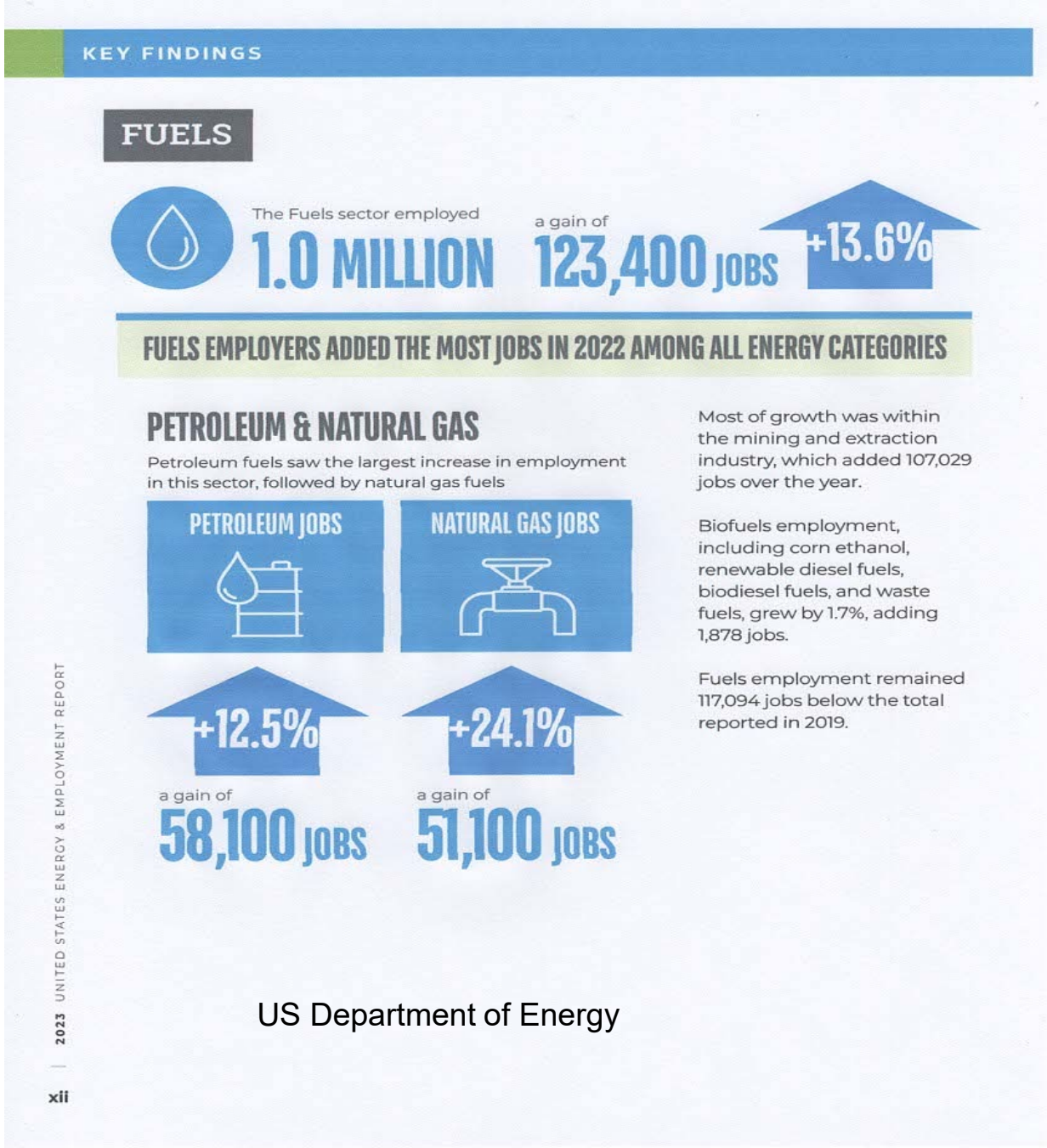
American Petroleum Institute July 2021

TABLE 2. United States Energy Workforce Demographics and Characteristics[15]

	Number of Workers	Energy Workforce Average	National Workforce Average
Male	5,757,198	73%	53%
Female	2,065,291	26%	47%
Gender Nonbinary	42,810	<1%	insufficient data
Hispanic or Latino	1,410,187	18%	19%
Not Hispanic or Latino	6,455,112	82%	82%
American Indian or Alaska Native	169,238	2%	<1%
Asian	531,464	7%	7%
Black or African American	721,120	9%	13%
Native Hawaiian or Other Pacific Islander	81,827	1%	<1%
White	5,889,528	75%	77%
Two or More Races	395,173	5%	3%
Unknown Race	76,949	<1%	insufficient data
Veterans	709,961	9%	5%
18 to 29	2,334,990	30%	22%
30 to 54	4,172,277	53%	54%
55 and Over	1,358,033	17%	24%
Disability	180,538	2%	4%
Formerly Incarcerated	96,950	1%	2%
Represented by Unions, Collective Bargaining Agreements, and/or Project Labor Agreements	849,959	11%[16]	7%

National sources: BLS (2023a, 2023b, 2023c, 2023d), Jobs EQ (2022), Prison Policy (2022)

Reference: US Energy and Employment Report 2023, US Department of Energy



US Department of Energy

Justice 40 Initiative

Created by Executive Order 14008

- The Justice40 initiative establishes a goal that 40% of the overall benefits of certain federal investments—including investments in climate change; clean energy and energy efficiency; clean transit; affordable and sustainable housing; training and workforce development; the remediation and reduction of legacy pollution; and the development of critical clean water infrastructure—flow to disadvantaged communities
- Many states, such as Pennsylvania, have passed regulations regarding diversity and energy transition
- Natural Gas utilities and infrastructure have an increased demand for technical field workers due to increase natural gas demand and retirements
- Natural Gas utilities in Pennsylvania want their workforce to mirror the populations in which they provide service to

Infrastructure Academy Training

The secret sauce is recruiting, vetting, and training for jobs that actually exist. Don't just train workers and hope they find work opportunities

- Use community partners for recruiting such as religious groups, associations, unions, community organizers
- Training curriculum should include hands on training and life skills
- Prepare the students for interviews through training
- Enter into contractual agreements with Natural Gas Utilities to provide them with students that are apprenticeship ready and expect the utilities to hire from the students you provide

Energy Innovation Center Institute - workforce

Innovative, industry-recognized model to break cycles of poverty by connecting the strained talent in DAC to the high-road jobs that surround them

- Key Performance Indicators 2016 – 2023

8,734	4,971	4,051	86%	89%
Recruited	Trained	Graduated	% Employed	% People of Color

- Utilities, energy and critical infrastructure, banking, healthcare, facilities management
- 11 Employer Partners with 10 four-week training programs – target 600 employed/year
- All training is free to our students (paid for by employer partners under contract)
  - All programs offer a stipend to our students
  - Each class offers stacked credentials

Workforce Training

Enhanced Natural Gas Operator Qualification (OQ) Training – OQ training is required by PHMSA

- New and Incumbent worker training
- Safety Training should not be easy. Create an Enhanced Qualification program based on knowledge, skills, and abilities
- Pipeline Safety Management Systems

Recommendations and Policy Issues to Address

Natural Gas infrastructure will be robust beyond 2050 therefore:

- Above all considerations, ensure that the Natural Gas Production, Distribution, and Transmission pipeline networks are safely operated through compliance of the federal and state Pipeline Safety Regulations
- Minimize Natural Gas emissions through additional regulations on leak inspections and repair. Why not fix all leaks immediately? Should be a national wide policy that supports safety and emissions. Accelerate risky pipeline replacement. Develop state level methane reduction targets.
- Consider requiring jurisdictional Natural Gas utilities to retrofit pipelines, that need to be replaced, and new pipelines installation to be designed to transport hydrogen and other non-carbon gasses
- Monitor Natural Gas jurisdictional utility Workforce Training and Hiring. Create a base line demographic and compare year to year through annual reports. Ensure workforce mirrors service territory. Implement enforcement criteria that effects utility's rate of return

Recommendations and Policy Issues to Address

Rate Making Considerations Related to Energy Transition

- *Regulatory Compact* - Government regulators grant jurisdictional utilities exclusive service territories and provides an opportunity to earn a return on their investment. The jurisdictional utility agrees to submit their operations to full regulation and agrees to an obligation to serve all customers within their service territory.
- Given the Regulatory Compact, abolition of Natural Gas distribution/transmission networks will require Stranded Cost recovery for the jurisdictional utility. A quick eradication of these networks will require a substantial cost burden on the remaining customer base. Stranded Costs historically negatively effect Disadvantaged Community ratepayers the most
- The concept of "stranded costs" is not new to the energy utility industry. Stranded costs are investments made by a utility in good faith and often with the approval of state regulators that later became unneeded, uneconomic or otherwise unviable due to a change in public policy that was outside of the utility's control ref: S&P Global, Market Intelligence, Jan 2022

Recommendations and Policy Issues to Address

Rate Making Considerations Related to Energy Transition

- Stranded Costs will make energy transitions more expensive unless the current pipeline network can be utilized in transporting non-carbon gasses
- Now is the time to develop energy transition policies to minimize stranded costs
- New energy alternatives such as wind and solar are more expensive, without government subsidies, per energy unit. Ratemaking policy should include scenarios incase government subsidies are eliminated.
- Disadvantaged Community ratepayers have the least amount of flexibility in paying higher rates due to energy transition. The cost of converting natural gas appliances to all electric are out of reach for about 1/3 of the population in Pennsylvania. Costs associated with rewiring homes, purchasing new appliances, and increased rates will adversely effect DAC ratepayers
- It is estimated that 50% of homes in Pennsylvania use some type of fossil fuel to heat and cook with. Conversion of these homes will take decades to complete.

Thank You

- Paul Metro
- Director Infrastructure Academy in Pittsburgh
- pmetro@eicipgh.org
- 717.329.4760