

Natural Gas Delivery Plan

4th Quarter 2024 – 2034

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Acronyms

AGA – American Gas Association

AMI – Advanced Metering Infrastructure

AMR – Automated Meter Reading

API – American Petroleum Institute

ARMA – Association of Records Managers and Administrators

Bcf – Billion Cubic Feet

BYOD – Bring Your Own Device

C&I – Commercial and Industrial

CAGR – Compounded Annual Growth Rate

CARE Program - Consumers Affordable Resource for Energy

CE – Consumer’s Energy

CG – City Gate

CIP – Critical Infrastructure Protection

CO_{2e} – The number of metric tons of CO₂ emissions with the same global warming potential as one metric ton of another greenhouse gas

CoE – Center of Excellence

DIMP – Distribution Integrity Management Program

DR – Demand Response

ECAP – Enterprise Corrective Action Program

ECO – Enterprise Contractor Oversight

EIRP – Enhanced Infrastructure Replacement Program

ETR – Estimated Time of Restoration

FT – Firm Transport

GCM – Gas Communication Module

GCR – Gas Cost Recovery

GIS – Geographic Information System

GRN – Gamma-ray Neutron

GSMS – Gas Safety Management System

GTIE – Gas Technical Information Excellence

HCA – High-Consequence Area

HP – High Pressure

hp – Horsepower

IaaS – Infrastructure as a Service

IT – Information Technology

LAUF – Lost and Unaccounted for (gas)

LDCs – Local Distribution Companies

LFERW – Low Frequency Electric Resistance Welded

MCA – Moderate Consequence Area

MMbtu – Million British Thermal Units
MMCFD – Million Cubic Feet per Day
MP – Medium Pressure
MPSC – Michigan Public Service Commission
NERC – North American Electric Reliability Corporation
O&M – Operations and Maintenance
OTSRA – Operational Technology Security Reference Architecture
PAAS – Platform as a Service
PHMSA – Pipeline & Hazardous Materials Safety Administration
PIPES – Pipeline Inspection, Protection, Enforcement, and Safety Act
Plan – Natural Gas Delivery Plan
psi – Pounds Per Square Inch
psig – Pounds Per Square Inch Gauge
PSMS – Pipeline Safety Management System
RCV – Remote-Control Valve
RM – Regulated Diaphragm Meter
RORs – Random Outage Rates
RNG – Renewable Natural Gas
RP – Recommended Practice
RTU – Remote Terminal Units
SaaS – Software as a Service
SEA – Statewide Energy Assessment, an MPSC report dated September 11, 2019 (Case No. U-20464)
SCADA – Supervisory Control and Data Acquisition
SCC – Stress Corrosion Cracking
SMB – Small Business, as described in the Company’s gas demand response pilot
SP – Standard Pressure, also referred to as utilization pressure
TC – Top Connect Meter
TCF – Trillion Cubic Feet
TED-I – Transmission Enhancements for Deliverability and Integrity
TOD – Transmission Operated by Distribution
TP – Transmission Pressure
USM – Ultrasonic meters
VSR – Vintage Service Replacement
WC – Inches of Water Column

Revision History

Revision	Approval Date	Revision Description
0	12/16/2019	Initial Document
1	12/11/2020	First Revision
2	12/01/2021	Second Revision
3	12/01/2022	Third Revision
4	12/01/2023	Fourth Revision

I. Executive Summary

A. Introduction

Consumers Energy Company's ("Consumers Energy" or the "Company") natural gas system has served the people of Michigan safely, reliably, and affordably for decades, providing energy for residential and business space heating, water heating, meal preparation, grain drying, industrial processes, and electricity generation.

The natural gas system is critical because it provides the Company's customers with affordable and reliable fuel for heating and replacing it with electricity in the near term is neither technically feasible nor affordable.

The natural gas system is vast, and the age of the system requires investment beyond standard maintenance.

The Company is balancing costs by leveling out our previously accelerated investment spend on various programs spend dramatically which focuses on safety and reliability with the balancing of affordability, as customers need Consumers Energy to continue to invest in the gas system.

Natural gas remains a relatively clean, low-cost fuel to heat Michigan's homes and power the state's industries for the future—and the Company is continuing to modernize the gas storage and delivery system to ensure the sustainable delivery of safe, reliable, clean, and affordable energy to customers.

Technological changes and environmental concerns continue to create a time of unprecedented change in the energy industry. Consumers Energy continues to embrace the opportunities and meet the challenges of the coming decades by carefully planning for the future.

The Company's Commission-approved *Clean Energy Plan*, along with the *Electric Distribution Infrastructure Investment Plan*, will chart the path for its electric business. This annually updated *Natural Gas Delivery Plan* ("NGDP" or the "Plan") maps the Company's vision to continue safely serving customers with natural gas for the next 10 years, from the fourth quarter of 2024 to 2034.

The Plan was founded on the Company's commitment to providing a safe, affordable, reliable, and increasingly clean natural gas system for Michigan.

The Plan reflects the Michigan Public Service Commission's ("MPSC" or the "Commission") previous Orders in which Consumers Energy received insights on the natural gas system through the 2019 Statewide Energy Assessment ("SEA"), and also from the outcome of the Company's latest gas rate case, Case No. U-21308.

To continue updating this Plan, Consumers Energy also weighed input from peer gas utilities, industry experts, MPSC staff, and other key external stakeholders.

The Plan clearly outlines the next decade of investments in natural gas infrastructure, planning for natural gas supply and demand, and operational changes in accordance with the industry best practice of a Pipeline Safety Management System ("PSMS") protocol from the American Petroleum Institute ("API") Recommended Practice ("RP") 1173, or as Consumers Energy identifies it, as an expanded Gas Safety Management System ("GSMS").

Natural Gas Delivery Plan

Four key external drivers continue to prove critical to the natural gas business over the next decade:

External Drivers	Key Factors
Safety	Employees, customers, and the public must safely co-exist with natural gas assets. That means Consumers Energy must continue to anticipate risks and mitigate them proactively.
Increasing Regulation	Safety incidents across the nation’s gas infrastructure and changing policies regarding carbon and methane emissions will continue to result in new rules and increased regulatory oversight at the state and federal levels.
Changing Supply and Demand Patterns	The plan anticipates consistent domestic natural gas supply growth adequate to meet increases in long-term demand, enabled by mid-stream investment. This will limit commodity price increases over the longer term as the North American natural gas market expands, led by demand growth in exports and the industrial sector. Gas-fired electrical generation demand growth is limited by maturing renewable generation and electric storage technologies.
Environmental Focus	The impact of natural gas usage on climate change through carbon emissions and methane emissions is becoming more of a focal point of environmentally conscious customers and regulators as coal-based emissions from electric generation continue a downward trend.

The Plan documents the Company’s analysis and stakeholder input on these drivers and is built on the following four objectives that provide flexibility to adapt and continue to perform as an energy provider customers, regulators, and the people of Michigan can count on.

Objectives	Natural Gas Delivery Plan Outcomes
Safe	Expanded remote control and monitoring capabilities and maintaining pace of retiring vintage materials throughout the gas system to reduce the probability of incidents that would adversely affect the public, customers, and employees or contractors.
Reliable	Improved reliability, resilience, and system flexibility in preparation for more variable climate patterns, variable supply sourcing options, and regulatory and maintenance activities, with improved equipment reliability.
Affordable	Stable, predictable, and reasonable total bills, including gas asset investment costs, the commodity costs of natural gas, and costs to support additional regulatory requirements.
Clean	Reduction of the Company’s and its customers’ contribution to climate change through gas system decarbonization. Gas system decarbonization will include options for addressing greenhouse gas emissions of natural gas use, e.g., reduction of carbon dioxide and methane emissions across the delivery system.

Throughout the development of this Plan, the gathering of stakeholder input, and the SEA report, the Company considered the long-term future of the natural gas business along with the potential outcomes of current trends. The result is a plan that enables shorter-term activities and regulatory filings to be informed by and aligned with a long-term, predictable path to the future.

The Plan will guide the Company's actions today, and provide an evolving framework to monitor initial assumptions, gather new stakeholder input, adjust to potential new expectations for the future, and remain on a transparent pathway to a safe, reliable, affordable, and clean natural gas system for Michigan.

B. Consumers Energy’s Natural Gas System

The Company’s natural gas system contains 2,371 miles of transmission pipelines, more than 28,277 miles of distribution mains, and approximately 1.6 million services (see [Reference 1](#) for citation source). The system uses single meter stands, where one service feeds one meter (e.g., single family home) or multi-meter stands, where one service feeds multiple meters (e.g., apartment building) to provide natural gas to 1.8 million customers.

The Company operates 7 compressor stations on the transmission system, 1 compressor station on the distribution system, and 15 underground storage fields with a total of 826 wells.

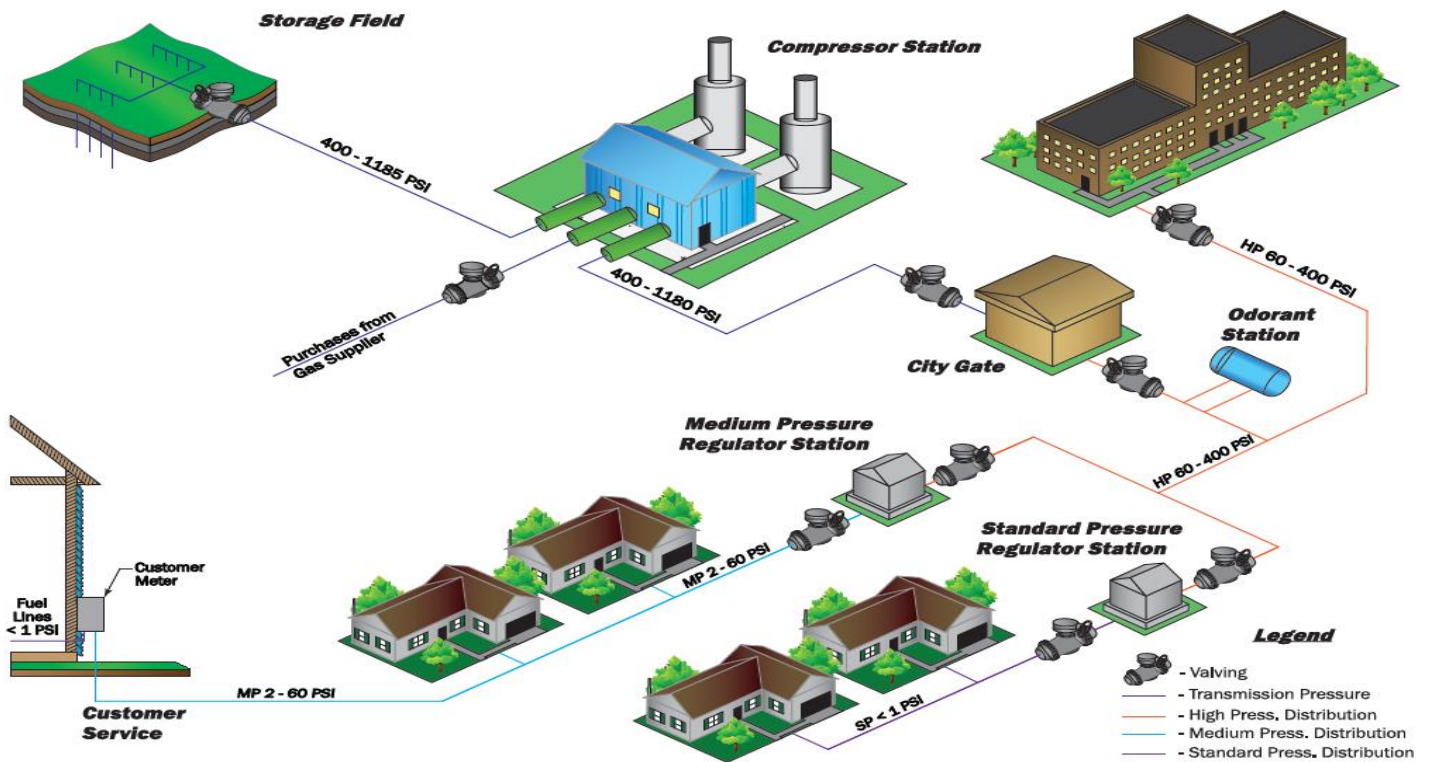
Consumers Energy receives gas supply into its transmission pipelines that operate between 400–1,185 pounds per square inch (“psi”), which are considered transmission pressure (“TP”) lines.

Within the natural gas system:

- Compressor stations are used to increase the pressure of natural gas for transportation in the system and for withdrawal from or injection into storage fields.
- City gate stations move gas from the transmission pipeline system to feed distribution mains that operate as high-pressure (“HP”) lines between 60–400 psi and medium pressure (“MP”) lines between 2-60psi.
- The gas is then routed throughout the distribution system and delivered to residential and business customers that operate on MP lines, and standard-pressure (“SP”) lines at less than 1 psi.

Consumers Energy safely operates its system and provides continuous service to approximately 1.8 million natural gas customers. An illustration of a typical natural gas system layout is shown in Figure 1.

Figure 1: Typical Natural Gas System Layout



Natural Gas Delivery Plan

Within the Transmission pipeline total above is Transmission Operated as Distribution (“TOD”) pipe. TOD is considered Transmission pipeline for DOT Reporting, but from an operating perspective is part of Distribution. The Figures below summarize the combination of the distribution main and TOD pipe by material, pressure, and installation year.

Figure 2A: Distribution Including TOD Mileage by Pipe Material

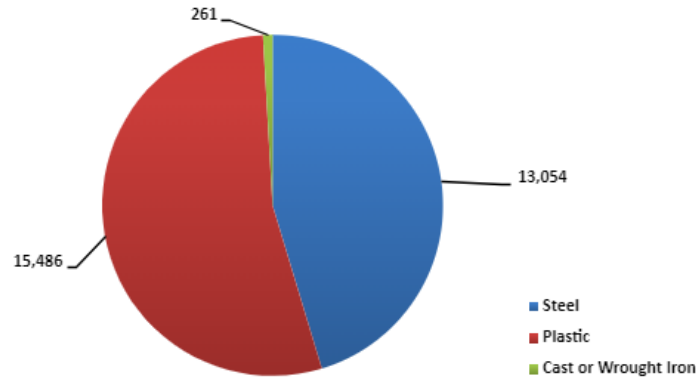


Figure 2B: Distribution Including TOD Mileage by Pressure

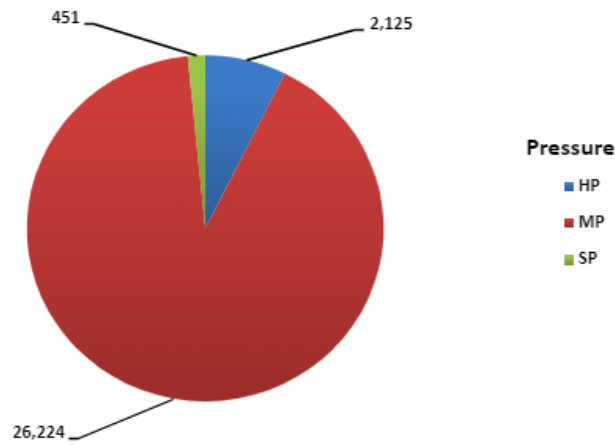
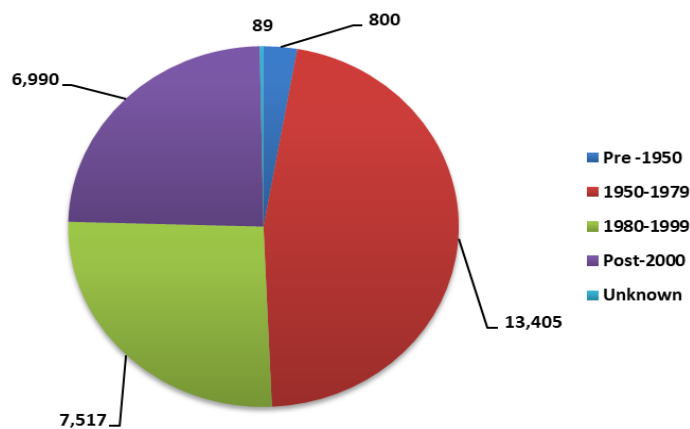


Figure 2C: Distribution including TOD Mileage by Installation Year



C. Pipeline Supply

Consumers Energy's system accesses seven interstate pipelines and one major intrastate pipeline.

This interconnectivity provides diverse access to supply from Appalachia, the Rockies, Canada, the Gulf Coast, and Mid-Continent production basins.

Pipeline deliveries must conform to fixed pipeline scheduling procedures, and are not instantaneous, barring expensive tariff options mimicking the on-demand availability of owned storage assets.

Pipeline supply encompasses both supply purchased directly at the Company's system interconnects, i.e., city gate supply, and gas purchased at receipt points upstream of the system.

Firm Transport ("FT") contracts reserving capacity on a pipeline can be both short- or long-term agreements representing an additional fixed cost to the user and are used to access specific sources of natural gas supply, including third-party storage.

Interstate pipeline supply into Consumers Energy's system generally ranges from 600 million cubic feet per day ("MMCFD") to 1,400 MMCFD. Overall, pipeline supply is required to fill storage in the summer season while meeting customer demand.

Generally, a mix of pipeline supply and storage supply withdrawals are used during the winter season.

D. Asset Classes

1. STORAGE

The gas storage system today includes 15 storage fields made up of 826 wells, totaling more than 300 billion cubic feet ("Bcf") of storage capacity with 154 Bcf of working gas capacity.

Storage assets continue playing an important role in customer affordability and system resiliency. The American Gas Foundation defines resilience as, "a system's ability to prevent, withstand, adapt to, and quickly recover from a high-impact, low-likelihood event such as a major disruption in a transmission pipeline."

- The stored gas is within the state, readily available under the Company's span of control, and provides price stability in times of high demand. Pipeline Supply capability alone is not sufficient to meet customer demand during times of high demand, therefore necessitating storage supply.
- On average, gas storage assets have supplied approximately 50% of customer gas deliveries during winter (November through March) and can provide up to approximately 80% on peak days if needed.

In developing the Plan, an analysis was completed for the gas storage assets to compare the role each storage field plays in the Company's annual operating plan.

The Plan calls for continuing execution of well inspection, well rehabilitation, increased remote well monitoring, and strategic new well drilling to optimize storage fields.

This work will increase efficiency and resiliency while lowering risk and cost.

Storage Fields and/or selected wells with high-cost, high-risk, and low deliverability will be evaluated for potential retirement and decommissioning.

2. COMPRESSION

Consumers Energy's fleet of compression assets are grouped into 8 stations: 5 storage—with 2 of those stations also acting as transmission stations, 2 strictly transmission, and 1 distribution compressor station.

- In aggregate, these stations contain 41 compressor units capable of producing more than 150,000 horsepower (“hp”).
- Gas compression assets are used to inject gas into and withdraw gas from storage fields, inject gas onto the Company's system from interstate pipelines, and boost transmission and distribution gas pressures seasonally.

Beginning in 2010, the Company made significant progress transforming the compression fleet from 1950s technology to modern, efficient, and clean running equipment.

To operate our compression fleet in a manner that delivers natural gas to the right place at the right time to serve and benefit our customers, Consumers Energy is:

- Improving reliability, operating flexibility, and resiliency of the compression fleet,
- Improving monitoring of operating parameters to better understand equipment health and to optimize maintenance work management,
- Optimizing the compression fleet, which may include addition of certain equipment for reliability or resiliency, and retirement of antiquated compression assets that do not positively affect the Company's plan to provide safe, reliable, affordable, and clean energy.
- Implemented lessons learned from the 2019 Ray Compressor Station (“Ray”) fire incident to improve resilience of the Ray station as well as overall system resilience.

3. TRANSMISSION

Gas transmission pipelines are the ‘expressways’ of the gas system, transmitting large quantities of gas at high pressures in large diameter pipes ranging from 4 inches to 36 inches.

Consumers Energy operates approximately 2,371 miles of gas transmission pipelines that are not part of distribution systems in its integrated system. This includes transmission pipelines, transmission lines within the storage fields, and TOD lines.

The Company's goal is to meet the capacity needs of Michigan as well as to optimize the transmission system in terms of age, materials, and technology to ensure public safety.

- The Plan details compliance with Pipeline & Hazardous Materials Safety Administration (“PHMSA”) requirements for inspections to address threats on the system and actions to mitigate risk.
- The Plan also continues investment in upgrading and replacing the Company's major pipelines and modernizing the system with remote-control valves (“RCVs”) to quickly isolate the system when system integrity is compromised.

4. DISTRIBUTION

Consumers Energy's distribution system moves gas from city gates through pressure regulation stations into neighborhoods and commercial and industrial ("C&I") districts to customer homes and businesses.

Gas enters the distribution system at 60–400 psi and residential meter service pressures are less than 1 psi.

The distribution system includes some of the Company's oldest facilities and is situated closest to customers. Therefore, replacing infrastructure to reduce risk and expanding remote monitoring in this area is a critical focus.

- The Company has approximately 28,277 miles of distribution pipeline, excluding TOD, with approximately 1,725 miles of vintage materials. The Company's system also contains 1.6 million services with 116,961 services comprised of vintage materials.
- Vintage materials include cast iron, bare steel, and copper, which were installed from the 1890s through the 1970s. These are the highest-risk assets in this system and are the primary risk drivers.
- The Company's distribution mains are approximately 54% plastic, 43% protected steel, and 3% unprotected steel and vintage materials.

While leaks in this asset class are at a lower pressure compared to the transmission system, they are also located much closer to the public.

To support expanded monitoring, the Company is implementing advanced leak detection and upgrading its Supervisory Control and Data Acquisition ("SCADA") system— this is further explained in the *Operational Capabilities* section.

In 2012, Consumers Energy launched the *Enhanced Infrastructure Replacement Program* ("EIRP"), targeting replacement of pipeline vintage materials over multiple decades.

Further, in 2017, the Company added the Vintage Service Replacement ("VSR") Program to eliminate identified vintage materials on services on a programmatic basis.

Removing vintage materials from the distribution system will improve customer safety and reliability by eliminating the higher-risk materials from the system, reduce/eliminate the standard pressure system improving system efficiency due to higher operating pressure, and reduce methane emissions into the atmosphere from older leaking pipes and services.

E. Operational Capabilities

As Consumers Energy moves forward with the Plan, the Company will require essential operational capabilities in the areas of people, process, and technology for each of the asset areas to ensure the Company achieves the 10-year goals and outcomes.

People

Consumers Energy is focused on how to safely deliver to customers by ensuring the Company has the right people, with the right skills, at the right place and time.

To make sure these commitments are met, the Company is placing a strong focus on creating the right employee experience to ensure Consumers Energy is attracting and retaining the most qualified and talented candidates to ensure a diverse, equitable, and inclusive workforce, and providing the essential training needed to meet the demands of the system.

Process

To ensure the Company continues to best position itself for the future uncertainties, it will also assess operating models (e.g., governance, roles, responsibilities, structure, ways of working) and will adjust as required. The following are some examples of future process improvements:

- Consumers Energy will continue to ensure risk prioritization drives work management processes as the Company transitions its current relative (i.e., indexed) risk models to a complete probabilistic system risk model over time.
- The Company has implemented and is progressing to increase maturity of the RP API 1173, *Pipeline Safety Management System*, an industry-leading practice that Consumers Energy discussed in [Section V.B.3 – Gas Safety Management Systems](#).
- Gas Safety Management Systems (“GSMS”) will keep key performance indicators visible to leadership, and will increase focus on processes, procedures, and outcomes in the same manner leading companies in other industries have implemented ISO 9000 to assist with transparency, communication, and timely decision-making.

Technology

To fully enable the goals and outcomes of the Plan, the Company must invest in both new digital capabilities as well as the operations of its existing technology assets to keep them safe, secure, operating, and maintained.

This Plan shows the need to invest in both information and operational technologies (IT/OT), to provide digital capabilities essential for:

- Modernizing and expanding system monitoring to support 24/7 system control
- Improving data analytics to support asset reliability and optimization
- Optimizing compression and storage assets
- Modernizing the distribution and transmission system
- Incorporating predictive and condition-based maintenance
- Transforming work and asset management
- Ensuring physical and cyber security of Company assets
- Reducing methane emissions

Overall, these operational capabilities will enhance Company workforce resources, processes, and technologies to successfully execute the Plan.

In addition, these capabilities will further enable the Company to routinely assess the gas system and update the integrated Plan annually and/or as needed.

F. Initiatives

Consumers Energy is committed to innovatively moving forward with various types of new efforts categorized in the Plan as ‘initiatives.’

This work has a specific focus, with a series of deliberate actions to achieve future outcomes for the Company and Customers in areas such as:

Gas System Decarbonization

The Company is committed to reducing fugitive methane and carbon emissions from the delivery system, while also better understanding the emissions from the natural gas upstream suppliers and end-use customers. This commitment is embodied in the Company's Scope 1 net zero methane emissions goal and Scope 3 customer net zero carbon emissions goal. Please see [Gas System Decarbonization](#) for additional discussion.

Accordingly, long-term planning is under development to achieve these goals. This long-term pathway analysis will continue to assess reducing carbon while maintaining affordable, resilient, and reliable energy supplies to heat homes.

The analysis identifies the most cost-effective combination of technologies as pathways to decarbonize the natural gas system.

- Key decarbonization pathways include: energy waste reduction, carbon offsets, renewable natural gas ("RNG"), and potentially other decarbonization technologies in the future (e.g., hydrogen, carbon capture sequestration, electrification, geothermal, etc.). This strategy is expressed in the form of a reduction in tons of CO₂e per year.
- As part of our carbon offsets pathway, the Company's MI Clean Air Program was launched in 2022. MI Clean Air provides carbon offsets sourced in Michigan for customers who voluntarily want to reduce their climate impact from the use of natural gas.

Gas Demand Response ("DR")

As recommended in the MPSC's 2019 Statewide Energy Assessment (or SEA), Consumers Energy has completed two winter seasons of gas DR pilots to evaluate the costs and benefits associated with incentivizing residential and business customers to reduce their gas consumption during times of peak system demand or abnormal system conditions.

- Pilots were conducted during the 2020/2021 and 2021/2022 winter seasons. The results obtained from the Company's pilot indicate that a full-scale customer program for gas DR would not provide enough benefits to be cost effective.
- The results of the pilots are documented in evaluation reports, specifically (1) the *Smart Thermostat Winter Pilot Program Evaluation Report, 2021 Program Year*, dated August 27, 2021; and (2) the *Smart Thermostat Winter Pilot Program Evaluation Report, 2022 Program Year*, dated October 5, 2022.

Energy Waste Reduction ("EWR")

Since 2009, Consumers Energy has been implementing a diverse and balanced portfolio of EWR programs that have achieved significant energy savings for all major sectors and customer classes, including small businesses and low-income customers.

The Company will continue offering a portfolio of proven programs that have demonstrated market interest and acceptance, as well as exploring new programs.

See the Section(s) in the Plan for further detailed discussion on each initiative.

G. References

1. Source: U.S. Department of Transportation, Gas Distribution System Annual Report for Calendar Year 2022, submitted 03/12/2023.

II. Consumers Energy Natural Gas Delivery Plan

A. Vision Statement

The Company's original vision through early 2021 stated: Provide a **safe, reliable, affordable, and clean** gas supply to customers.

However, as the Company continues to clarify its objectives and incorporate stakeholder input, the vision statement has now evolved into the following: ***Deliver safe, reliable, and affordable natural gas to our customers while transforming the system to deliver cleaner fuels for a decarbonized future.***

This evolution was necessary due to the increasing focus by the Company and many external stakeholders, and includes Michigan's recently established climate goals for decarbonization. This is discussed more in the [Gas System Decarbonization](#) section.

B. Objectives

The Plan has four objectives to guide future investment decisions across the full system of storage, compression, transmission, and distribution, including all regulator stations and city gates.

Consumers Energy plans to use these objectives to help prioritize investment decisions based on factors such as risk, cost, and various impacts to the customer to ensure successful outcomes for the Plan.

The Plan's four objectives are:

- **Safe:** Zero incidents. The **safety** of employees, customers, and system is the Company's top priority.
- **Reliable:** The **reliability** and resiliency of the system is essential to operating as a trusted energy partner for Michigan.
- **Affordable:** Competitive, predictable prices. To have a safe and reliable system, investments must be made along with preventative maintenance. Therefore, the Company must balance system needs and the timing of investments with the **ability to maintain affordability** of the customer bill.
- **Clean:** Decrease the environmental footprint and determine the potential to evolve the system over time. Investing in a safe, reliable, and affordable system will help **provide a clean gas system** for the future. In addition, learning and assessing new decarbonization technologies that will allow customers to lower their emissions and use cleaner burning fuel in the future.

C. Objectives and Goals

The Company implements modeling results and input from industry experts and other external gas utilities to identify goals for each objective:

1. SAFE

Safety remains **the Company's top priority**. That means:

- Continuously reducing system risk.
- Focusing on process enhancements to improve gas system safety.
- Enhancing reliability and expanding 24/7 monitoring of the system.
- Modernizing the entire natural gas system, including the remediation of distribution and transmission assets, and replacing higher-risk vintage distribution mains and services.

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The Company is also placing an emphasis on **implementing best practices in GSMS** (API RP 1173), and **records management**. Consumers Energy will continue to use operational metrics to measure factors spanning the safety of personnel, assets, processes, as well as physical and cybersecurity.

The Company is moving to system-wide risk management to reduce overall system risk and better justify the necessary spending priorities.

2. RELIABLE

Consumers Energy continues to create and maintain a **reliable** system through dependable assets, measured through metrics such as gas flow deliverability, system optimization (utilization rate), and total system resilience to avoid unplanned outages.

The Company issues a **resilient storage and market supply plan for peak demand days**, and proactively balances peak customer demand primarily with storage and use of EWR. The Company continuously uses the lessons learned from events such as the Ray incident and the recent Line 400 incident.

Considering the Ray incident, the SEA, and the need to ensure **energy delivery resiliency and system reliability**, the Company's efforts will be to assess the current system's ability to adapt to winter single failures, and balance customer energy delivery resilience risk with safety and affordability while using gas assets to provide the agility needed to respond to the potential for changes in the natural gas market environment and connected systems.

The American Gas Foundation¹ provides definitions for both resilience and reliability as follows:

- **Resilience** is defined as *the set of energy system abilities that allow it to prevent, withstand, adapt to, and quickly recover from system damage or operational disruption.*
- **Reliability** is defined as *the ability of the energy system to deliver services in the quantity and with the quality demanded by end-users.*

The Company agrees with those definitions and considers both reliability and resilience critical to the Company and its customers. This shows the value of Consumers Energy having an underground transportation network that is highly reliable and resilient in delivering energy without interruption.

In addition, the Company also assesses the gas system resiliency needed due to potential climate change risk, as part of our publicly available [Climate Change Risk, Vulnerability and Resiliency Report](#).

3. AFFORDABLE

There is a continued and consistent **focus on delivering affordable** gas to customers with competitive and predictable prices. Consumers Energy continues to analyze average customer bills (total cost and cost per Mcf) to manage total costs to the customer.

The Company recognizes customer's bills will increase significantly over the course of the next few years due to inflation, the investment needs identified herein, and market forces. **The Company has a responsibility to keep bills as low as possible for all customers** and will continue to work with customers to mitigate these rising costs in the examples as follows:

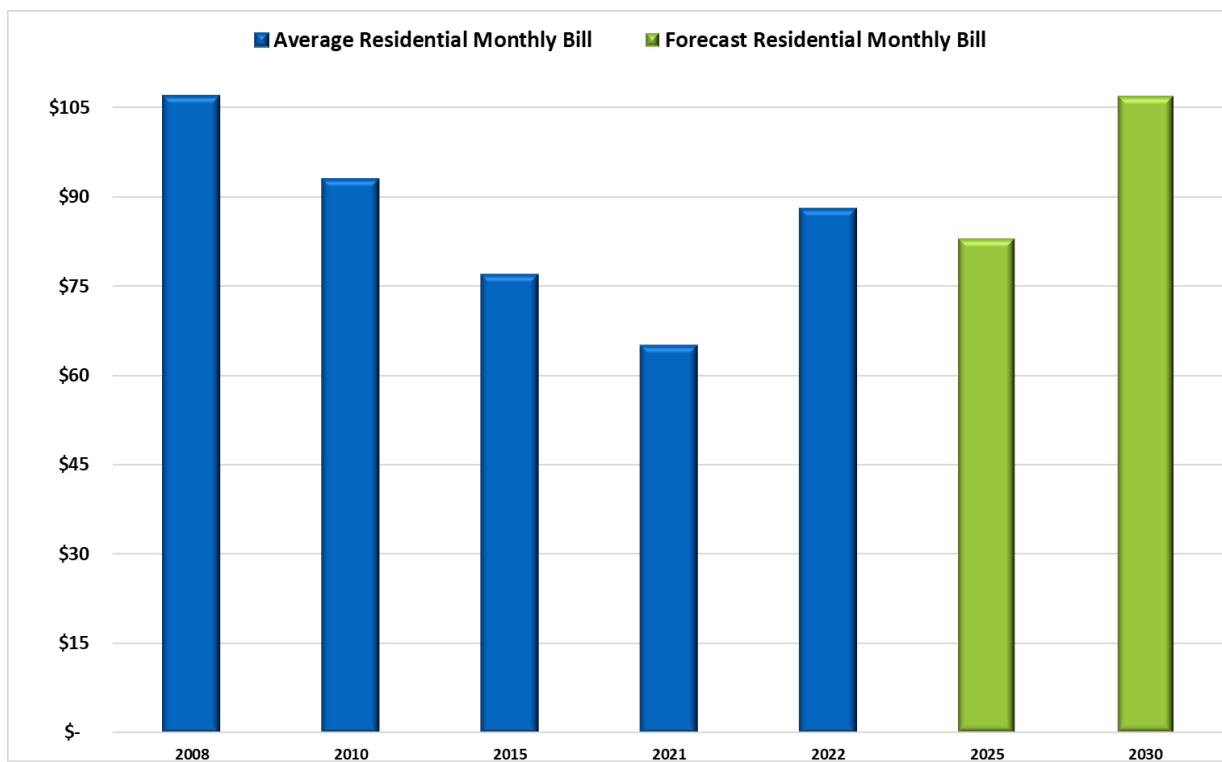
- The Company is committed to helping customers to use less of our product (natural gas) by providing energy-efficient products and resources. This includes winterization kits for homes and businesses and promoting customer assistance available.

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- Offering EWR choices for all classes of natural gas customers.
- Offering tariff options to customers will create the additional benefit of enabling decreased transportation costs for C&I customers during peak times.
- Continue our commitment to low-income customers through the Consumers Affordable Resource for Energy (“CARE”) Program, to support energy efficiency programs at 1% or more of sales, and measure customer satisfaction.

Figure 3 shows the history in blue and the forecast in green for the average monthly residential bill per year.

Figure 3: Average Monthly Residential Customer Bill History and Forecast



As shown in Figure 3 above, the average monthly bill decreased significantly at more than 5% per year through 2021, reflecting the Company’s gas supply strategy and system capital investments to maximize the value in lower gas commodity costs during this period. Over the same period, the Company increased capital investment spending by approximately 15% per year to the benefit of all customers.

The bill increase from 2021 to 2022, shown in Figure 3, stems primarily from an increase in the gas commodity price last year, due to a spike in the natural gas market. However, Figure 3 shows the same average monthly bill forecast projections in 2025 and 2030 as the last version of this Plan.

This bill is forecasted to reduce from 2022 to 2025 and then the growth rate from 2025 will be an approximate compounded annual growth rate of approximately 5% each year through 2030, which is comparable to the bill amount to that of 2008.

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However, even if the average bill increases to a 2008 historical value by 2030, the average forecasted bill decreases from 2008 to 2030 in real dollars when considering inflation rates from 2008 to 2030, which helps maintain affordability for customers now and in the future.

Consumers Energy recognizes that historical data isn't always relevant to our customers, however, it does show the Company's commitment to be at, or below, inflation over the years and works diligently to maintain value and affordability to its customers.

Going forward, the Company will continue to ensure commodity costs are in with the long-term infrastructure investment requirements needed for a safe, reliable, and clean gas system while also maintaining competitive, affordable, and predictable customer bills.

4. CLEAN

Consumers Energy is committed to Michigan, its natural resources, and a sustainable climate for generations to come. The Company's proposed *Clean Energy Plan*, as filed with and approved by the MPSC in June 2022, proposes to end coal use by 2025, increases renewables and energy efficiency, and meets customer needs with 90 percent clean energy resources.

The *Clean Energy Plan* puts the Company on a trajectory to meet its net zero carbon emissions goal for the electric system by 2040.

In support of Michigan's Healthy Climate Plan 2050 carbon neutrality goal, as well as other national and international efforts, the Company is evaluating changes to the natural gas business to reduce, offset, and replace methane and carbon emissions, including customer end-use.

The primary outcome by 2030 for 'clean' is to reduce the Company's gas system methane emissions by 80% and achieve net-zero methane emissions by 2030, which is a first step and important component of the decarbonization plan.

Additionally, the Company committed in 2022 to expand on its clean energy goals to include all emissions, including upstream suppliers and downstream customers, that are part of the entire gas delivery system to be carbon neutral by 2050, which includes an interim goal of 20% reduction in customer emissions by 2030. The initial step towards reducing customer end-use emissions is the launch of the MI Clean Air carbon offset voluntary program for residential, commercial, and industrial customers.

The Company is developing a long-term strategy in collaboration with stakeholders to achieve net zero carbon emissions associated with customers' use of natural gas in their homes and businesses. This plan will focus on energy efficiency, RNG, carbon offsets, other carbon reduction pathways, and will evaluate equity and environmental justice impacts for stakeholders and customers.

D. Alignment with Objectives, Goals, and Outcomes

For each of the objectives, goals, and outcomes, performance targets and completion dates were developed by analyzing the Company's historical performance and future needs of the system while benchmarking peer utilities as shown in this Plan.

The investments described in this Plan are necessitated by regulatory requirements, to improve safety, reliability, and the environment, while keeping customer bills affordable and predictable.

The Company will track these—as well as short-term operational metrics—by measuring and analyzing leading and lagging indicators. The list of headline metrics and corresponding 10-year outcomes for each objective is displayed below in Figure 4.

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Figure 4: Natural Gas Delivery Plan Objectives, Goals, and Outcomes

Objective	Goal	Delivery Plan	Outcome	Year Ending 2022	2030 Target
Safe	Zero Incidents	Replace high-risk materials in service, distribution, and transmission while moving to system-wide probabilistic risk management	Reduce System Risk	6.7%	2.1%
			Achieve GSMS maturity level	3.37	≥4.0
Reliable	Resilient and reliable system	Ensure supply reliability and system resilience by improving fleet reliability, leveraging storage, using our multiple interconnections, and in some cases, using redundancies and/or bypass alternatives in flow paths to improve system resilience	Maintain Gas Flow Deliverability	96%	95%
			Increase Resilience	86.9%	>91.5%
Affordable	Competitive, predictable prices	Improve value through stable and predictable total bill growth and spending	Annual average of monthly residential bill	\$88	\$107
			Increase Customer satisfaction survey	68	85+
			Increase Energy Waste Reduction	1.1%	1% year over year
Clean	Decrease air emissions footprint	Reduce gas system carbon equivalent emissions by eliminating methane leaks and implementing various technologies for gas system decarbonization	Reduce Scope 1 system methane emissions from 2005 baseline	4,597 Metric tons (MT)	15,128MT
			Reduce Scope 3 customer carbon emissions from 2022 baseline	Baseline Year	4 million MT

E. “Future Back” Scenario Modeling

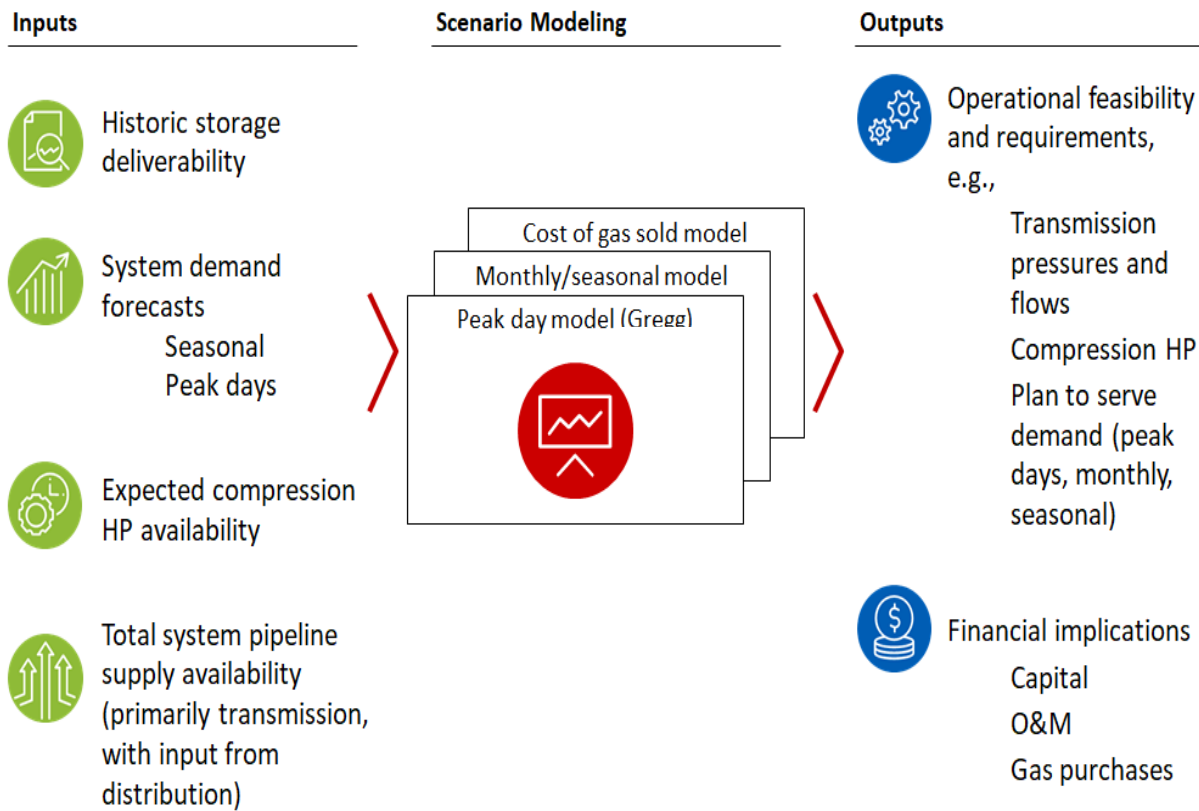
Originally, Consumers Energy worked with industry experts from October 2018 to March 2019 to support the creation of a holistic, long-term plan for the natural gas system. During that time, the Company talked with many other gas utilities to identify how to conduct a holistic review of the gas system by assessing internal risk models and system data to determine the optimal system configuration, with the goal of meeting the Company’s objectives of safe, reliable, affordable, and clean.

An external consultant helped consider various internal and external factors and industry trends. The Company then assessed several possible system configurations and potential future external scenarios based on the changing nature of the Company’s business, the industry, and the gas commodity environment. The intent was to determine the boundaries of possible system configurations under various peak day, monthly, and seasonal scenarios through 2030.

As part of the process, historical data from all asset areas, system demand forecasts, and total system pipeline supplies was reviewed and continues to be reviewed routinely.

The Company then inserted the updated data into various modeling tools to generate the future operational feasibility, financial implications, and other factors that could exist based on changing inputs. This approach is outlined below in Figure 5.

Figure 5: Approach to “Future Back” Scenario Modeling



Natural Gas Delivery Plan

The modeling assessed a range of extreme scenarios for market supply and demand and various system configuration as illustrated below in Figure 7 and Figure 8.

Figure 6: Extreme Modeling Range





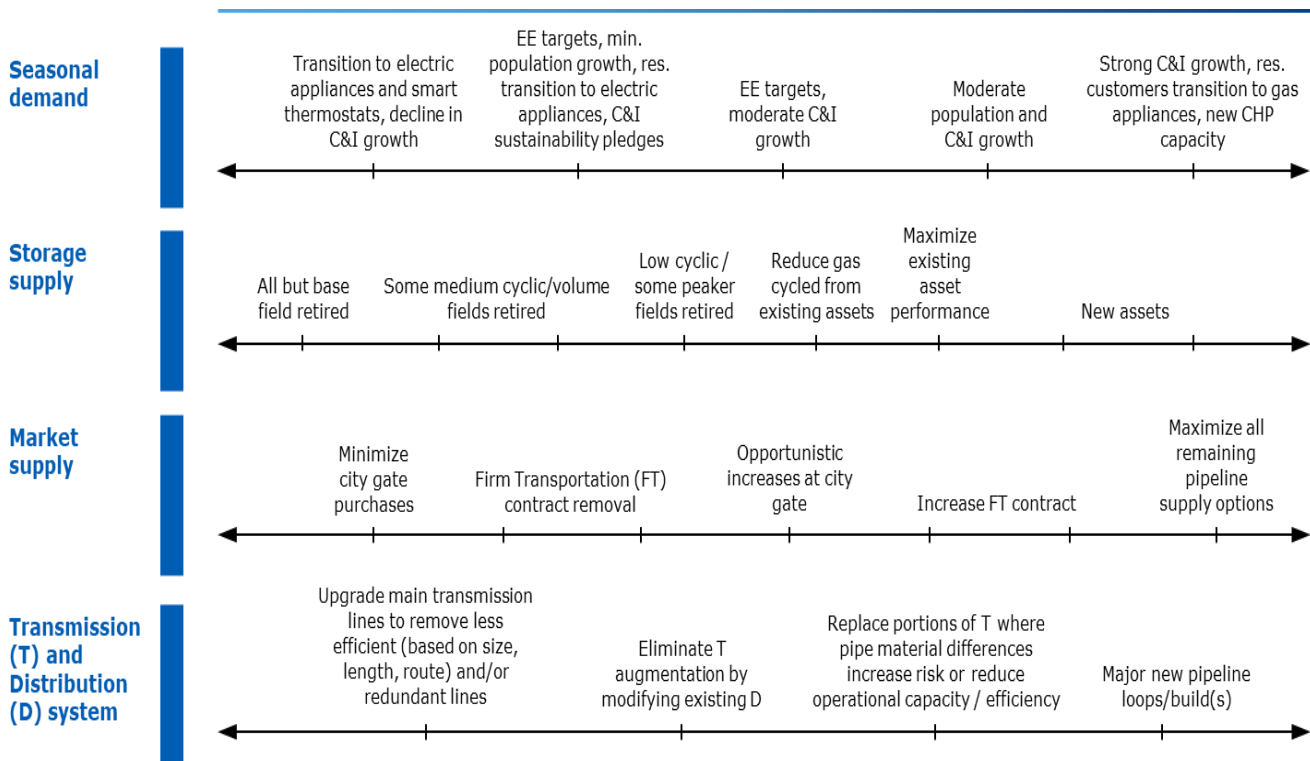
Example Extreme Scenarios	Overview
 High demand	Customer demand increases by 1-1.5% per year across residential and C&I, driven by factors such as population growth, commercial/industrial facility openings, and/or new gas-fired generation
 Low demand	Customer demand decreases by 2-4% per year through a combination of underlying residential demand reduction (electrification and EE/DR), several large Commercial & Industrial customers defecting, and/or strategic divestiture of territories
 Extreme market supply	Winter pipeline gas supply maximized across city gates, firm transportation opportunities, and any additional supply available to meet customer load (up to 2.5x increase from pipeline supply today); storage minimized to key fields (e.g. Ray, Overisel, Winterfield, and needle peakers) while others retired or reduced
 Extreme storage supply	Winter storage utilization maximized and options to increase storage performance/overall volume exercised (i.e. well improvement and new field acquisitions); minimum usage of pipeline supply

Figure 7: Scenario Modeling



Going forward, the Company runs a routine scenario analysis which allows Consumers Energy to better understand the potential system impacts of future changes to the Company’s system, market, or industry.

F. Asset Focus and Changes in the Plan

The modeling provides a data-driven, informed perspective on how to prioritize the Company's capital investments and operations and maintenance (“O&M”) spending for each asset class: storage, compression, transmission, and distribution.

Consumers Energy’s long-term goals and outcomes for each of the objectives were aligned for each of these asset classes to reduce asset and compliance risk by hardening the Company’s assets to meet customer demand.

A summary of the focus and most significant changes for each asset class that will help the Company achieve its objectives and long-term outcomes are updated in the Plan annually. These changes for each asset class (i.e., portfolio) are outlined below and described in more detail in the corresponding asset plan sections.

1. COMPRESSION

a. Focus

- Reduce system risk and methane emissions through retirement and decommissioning of vintage compression units and equipment to optimize customer value.
- Improve fleet reliability and maintain gas compression facility deliverability through increased system health monitoring, automation to maintain asset performance, and increase effectiveness of preventative maintenance.
- Improve system resilience and maintain gas compression facility deliverability through alternative flow path validation and creation, as well as implementation of robust design enhancements to existing equipment to protect major natural gas supplies from interruption. Use system supply requirements, station assessments, and the Total System Resilience process to inform investments.

2. STORAGE

a. Focus

- Optimize aging storage asset infrastructure to lower operating cost, maintain deliverability, and decrease emissions points.
- Assess wells to determine if they are underperforming. Optimize storage asset risk, in alignment with PHMSA requirements, and performance by coordinating remediation, plugging and decommissioning underperforming wells, maintaining storage capability with new and more efficient wells, and updating existing storage equipment and lateral pipelines.
- Increase cycling of peaker fields for cold weather events as prescribed in Gas Cost Recovery (“GCR”) filings.
- Use system supply requirements, the Storage Integrity Management Program, and the Total System Resilience process to inform investments.
- Invest in digital solutions for increased storage well monitoring.

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3. TRANSMISSION

a. Focus

- Obtain the necessary technology for system response and needed flexibility with capacity throughput and diversity of flow paths for total system resiliency to reduce system risk and methane reductions caused by aging infrastructure.
- Install the Mid-Michigan Pipeline to replace a portion of Line 100A.
- Increase the pipeline integrity scope to account for the additional remediation work for the transmission piping and to meet new regulatory requirements for Maximum Allowable Operating Pressure (“MAOP”) reconfirmation, as well as the incremental remediation as an outcome of inspecting TOD and storage lines.
- Attain 70% of RCVs installed on valves on the transmission system. To align with the prioritization of work and system outage schedules; the installation rate has changed to assume that 70% is complete by 2028 in lieu of 2026 as stated in the previous Plan.
- Upgrade the Company’s natural gas supervisory & control data systems, which allow for secure monitoring and control of the natural gas system, and upgrade city gates.
- Reduce the probability of high impact natural gas system failures having an effect on energy delivery to customers. In doing so, use the Total System Resilience process to inform investments. Be responsive to the MPSC Statewide Energy Assessment Recommendations pertaining to system resiliency.

4. DISTRIBUTION

a. Focus

- Reduce system risk and methane emissions while addressing system reliability and capacity. This will be accomplished by addressing aging or vintage infrastructure that is closest to the customers.
- Continue remediating vintage distribution main, standard pressure main, and vintage services to meet 2035 completion date. The annual targeted miles, as shown in [Figure 37](#), is revised to balance with affordability and account for labor requirements, municipality project schedules, identified remaining segment projects, etc.
- Ensure necessary funding for civic/asset relocation work to account for additional emergent and long-range projects in public infrastructure improvement.
- Remediation of line segments for which the Company has not been able to locate pressure test records that conform to Michigan Gas Safety Standards R 460.20314 and PHMSA for traceable, verifiable, and complete documentation.
- Use the Total System Resilience process to inform investments.

In closing, the Plan reflects a thorough analysis of the natural gas system, the natural gas commodity market, trends and practices across the industry, as well as regulatory and customer trends. Consumers Energy intends to routinely review the validity of the inputs and assumptions that led to the creation of the Plan, update it as appropriate, and continue to share the Company’s vision with stakeholders across Michigan.

G. References

1. Source: American Gas Foundation, prepared by Guidehouse. *Enhance the US Energy System’s Resilience: Realize the full potential of the gas distribution system*. October 2020.
2. [Consumers Energy Climate Change Risk, Vulnerability and Resiliency Report](#)

III. Pipeline Supply

A. Overview of Pipeline Gas Commodity Cost Trends

Over the past decade advancements in unconventional drilling production methods alongside increased mid-stream investment turned the U.S. into a net exporter of natural gas and transformed the domestic natural gas market from scarcity into one distinguished by frequent periods of oversupply.

Today, the expanding U.S. natural gas market continues to be molded by structural changes characterized by capital constraints, energy transition goals, and the growth of export capacity bringing global macro-economic influences. While more recent structural market changes make it less likely periods of sustained oversupply will occur, natural gas prices are projected to remain affordable over the long term as U.S. natural gas production continues to be projected as capable of meeting expanding market demand into the future.

The growth of shale gas has been the dominant force increasing domestic gas supply and lowering gas commodity cost levels from historic highs, and is projected to remain a driving force for continued natural gas market expansion due to favorable economics, a transparent market, and a resilient transportation system. The EIA estimates U.S. natural gas proved reserves at 625 TCF as of December 31, 2021, which is a 32% increase from 2020 and a new record for the U.S (see [Reference 1](#)).

Consumers Energy’s natural gas system in particular has been well positioned to benefit from the prodigious growth in shale production over the past decade. The largest U.S. shale production basin is in the nearby Marcellus and Utica Appalachian formations primarily in Ohio, Pennsylvania, and West Virginia. (See [Reference 2](#) in this section for citation source.) Appalachian production accounted for approximately one third of the U.S. production in 2022.

Figure 8: EIA Natural Gas Price from EIA (\$ per million BTU)



(See [References 3 and 9](#) in this section for citation source.)

As the Figure above illustrates, natural gas commodity prices and volatility decreased substantially after 2009, coinciding with the dramatic growth in domestic natural gas shale production over the past decade.

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The recent pandemic drill rig shut-ins interrupted this period of price stability, dislocating supply and demand fundamentals initially compounding an oversupplied market in 2020 driving natural gas prices lower, and then transitioned into an undersupplied market as demand rebounded past supply levels, driving prices and volatility upward, exacerbated further by subsequent geopolitical events.

Continued investment in oil and gas production has enabled natural gas supply levels to catch up with demand. The March EIA a2023 Annual Energy Outlook forecasts project domestic natural gas supply and demand levels rebalancing in 2023 around an average of \$5/MMBtu price level (See [Reference 3](#)) and then declining longer-term to between \$3 to \$4/MMBtu. (See [Reference 5](#)).

Storage Infrastructures Role

The U.S. gas market relies on storage to balance production and demand. Seasonal price differentials are the market's mechanism to achieve balance and can deviate substantially in any year.

Beyond seasonal cost savings, Consumers Energy's storage fields provide customers supply resiliency and balance, changing energy demand throughout the day and reducing exposure to market pricing fluctuations and supply availability risk, as experienced dramatically by some portions of the country during the February 2021 polar vortex weather event.

In addition, without storage, the interconnects to the market supply could not provide the customer demand needed on a peak day. Gas supplied by our storage fields provides the capacity to meet customer demand on the extreme cold days, as detailed in [Figure 13](#) in the *Storage Asset* section.

Delivering Customer Value through System Investment and Pipeline Supply Coordination

To ensure customer affordability, Consumers Energy will continue to evaluate both pipeline gas commodity (i.e., GCR) and investment costs when considering the total delivered price of gas that the customer pays. In this manner the Company will balance affordability with the investments necessary to achieve the safe, reliable, and clean goals to optimize overall customer value.

The Company's system investments integrate with the commodity supply plan to mitigate natural gas price volatility, supply risk, and enable commodity cost minimization for our customers.

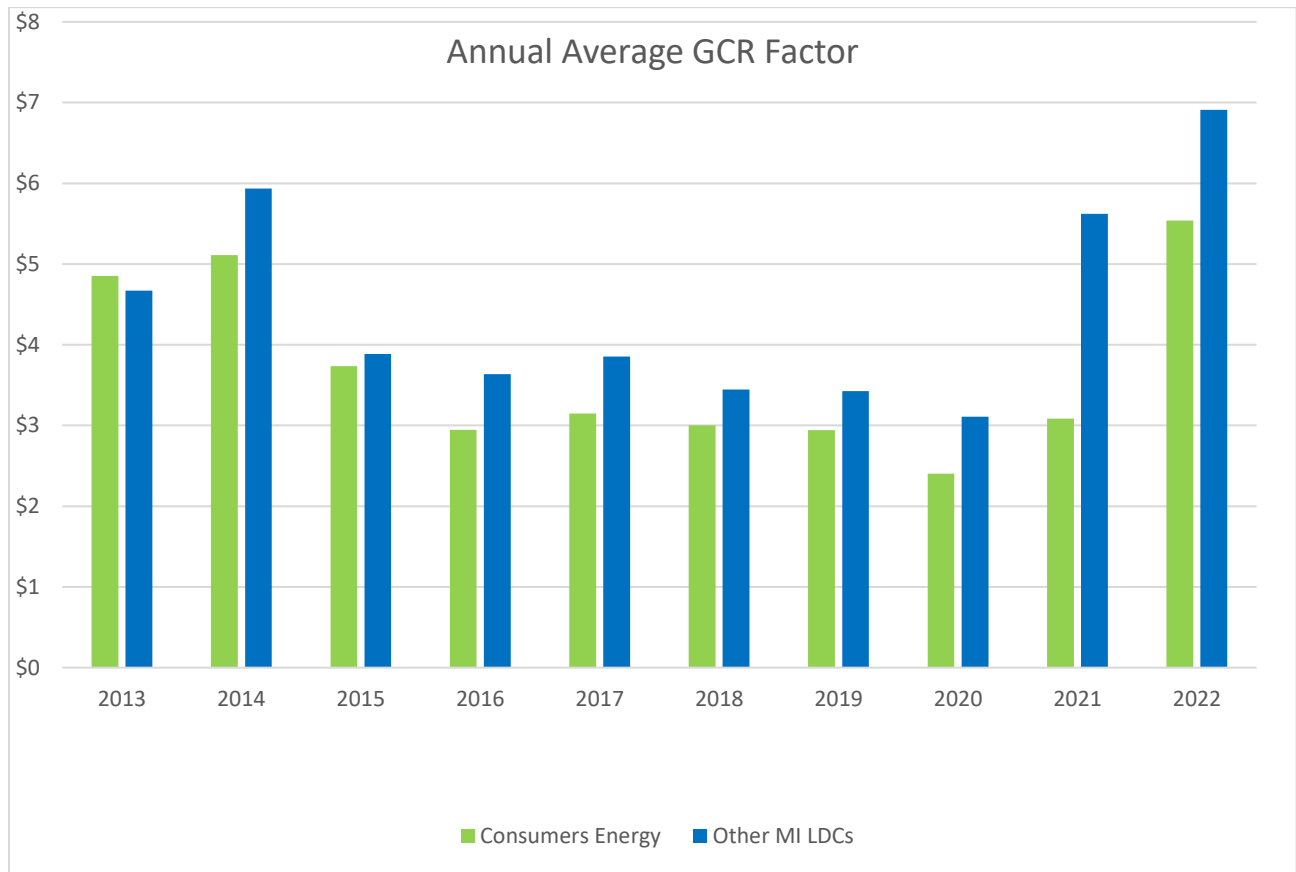
Consumers Energy's storage and system investments allow gas to be purchased in the summer months when decreased demand provides historically advantageous pricing relative to high-demand winter market conditions.

The Company operates 15 underground storage fields totaling more than 154 Bcf of cyclable storage capacity, allowing approximately 50% of customers' winter natural gas needs to be met from storage and up to approximately 80% of peak day requirements if necessary.

Consumers Energy's GCR gas commodity procurement plans also take advantage of the deliverability that Company investments provide to optimize natural gas market supply options to minimize commodity fixed costs. The Company also expects to incorporate value-added services to offset a portion of supply costs. This has resulted in GCR commodity costs often lower on average than other Michigan regulated gas utilities over the past decade.

Figure 9 shows the Company's annual average GCR price when compared to the average of the other Michigan Local Distribution Companies (LDC's) through 2022.

Figure 9: Annual Average GCR Billing Factor Price for Consumers Energy and Other Michigan LDCs



(See [Reference 4](#) in this section for citation source.)

As part of the Plan, total customer value considerations will provide the optimal trade-offs between commodity- and investment-related alternatives to maintain affordability for customers, considering total customer value will provide a balanced approach to accomplish the affordability objective.

B. Ongoing Refinement of Supply Plans

Consumers Energy’s GCR supply plans are detailed in a separate regulatory filing and updated annually.

These plans include procurement details that align with the broader objectives of creating a safer, more reliable (and resilient), affordable, and cleaner gas system. In this manner, the storage and compression asset portfolios and system investments have a significant impact on how the Company procures natural gas for customers.

Typically, the Company procures about 75% of its GCR supply requirements in the summer months for injection into storage fields to meet winter GCR customer demand.

- Storage provides price stability, lowers supply risk, and generally lowers commodity costs in the winter months. It also provides system flexibility and resilience to enable reliable and timely delivery services by efficiently balancing variable customer load throughout the day.

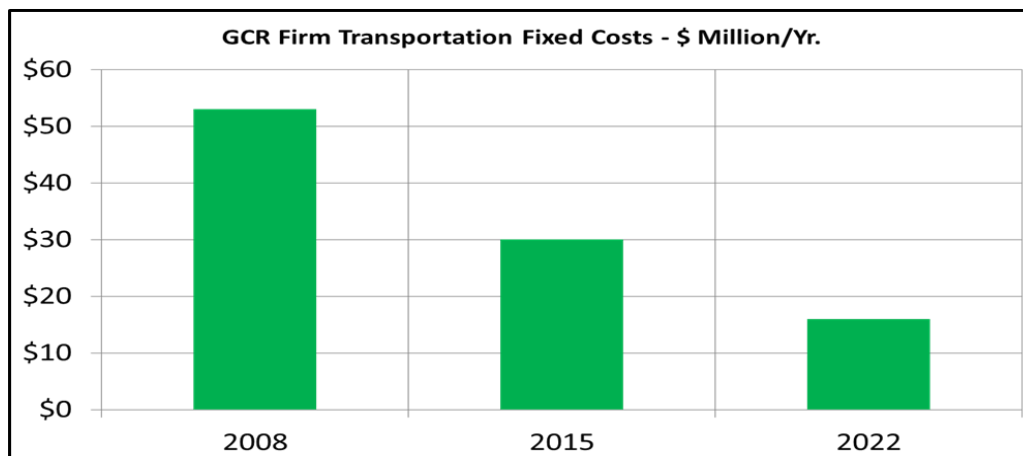
Natural Gas Delivery Plan

- Winter GCR sales constitute about 75% of total GCR annual sales. On the coldest days, storage can provide up to 80% of total customer demand, with the balance of demand served by the fixed (ratable) flowing pipeline supply.
- Providing storage supply options is a significant benefit for Michigan because the stored gas is close to the point of use and can be dispatched quickly to meet short-term demand spikes during cold weather cycles. The Company has sole control over the storage supply, which improves timeliness of supply and provides flexibility that supports total system resilience.

In the past, higher levels of transportation contracts were used to reduce supply availability, price volatility, and system deliverability risks. Over the past several decades, the Company has made investments in its transmission pipe, storage, and compression assets to increase the deliverability of storage assets and overall system flexibility capable of balancing customer demand and less flexible pipeline supply.

These investments along with the increase in regional supply have reduced the reliance on fixed cost transportation contracts born solely by the GCR customer class to mitigate these risks as shown below in Figure 10.

Figure 10: GCR Firm Transportation Cost



The increase in regional production, and new and expanded Midwest interstate pipeline capacity transformed the area’s supply fundamentals, and substantially increased the supply available at the Company’s system interconnects, i.e., city gate supply.

City gate supply has proven to be a reliable and competitive alternative to upstream purchases using interstate pipeline capacity.

The Company continually evaluates the evolving natural gas domestic market, and the impact to the gas supply portfolio, including an assessment of the FT contracts held. The Company could seek to add additional FT contracts to the GCR supply portfolio to address future supply, price or resilience risk. However, some external constraints exist on the interstate pipeline network. Depending on the interstate pipeline, there may be limited capacity available relevant to Company operating and planning needs.

The Company will continue to monitor and communicate with the market, assess city gate supply options, and weigh the potential contracted capacity options as they become available within the context of Consumers Energy’s broader system utilization and investment activities to ensure reliable, resilient, affordable, and clean natural gas delivery service.

C. References

1. Proved Reserves of Crude Oil and Natural Gas in the United States, Year-End 2021 (eia.gov)
<https://www.eia.gov/petroleum/drilling>
2. <https://www.eia.gov/outlooks/steo/report/natgas.php>
3. <https://www.eia.gov/petroleum/drilling/xls/dpr-data.xlsx>
4. https://www.michigan.gov/documents/mpsc/gasrates_592543_7.pdf
5. [Annual Energy Outlook 2023 - U.S. Energy Information Administration \(EIA\).](#)

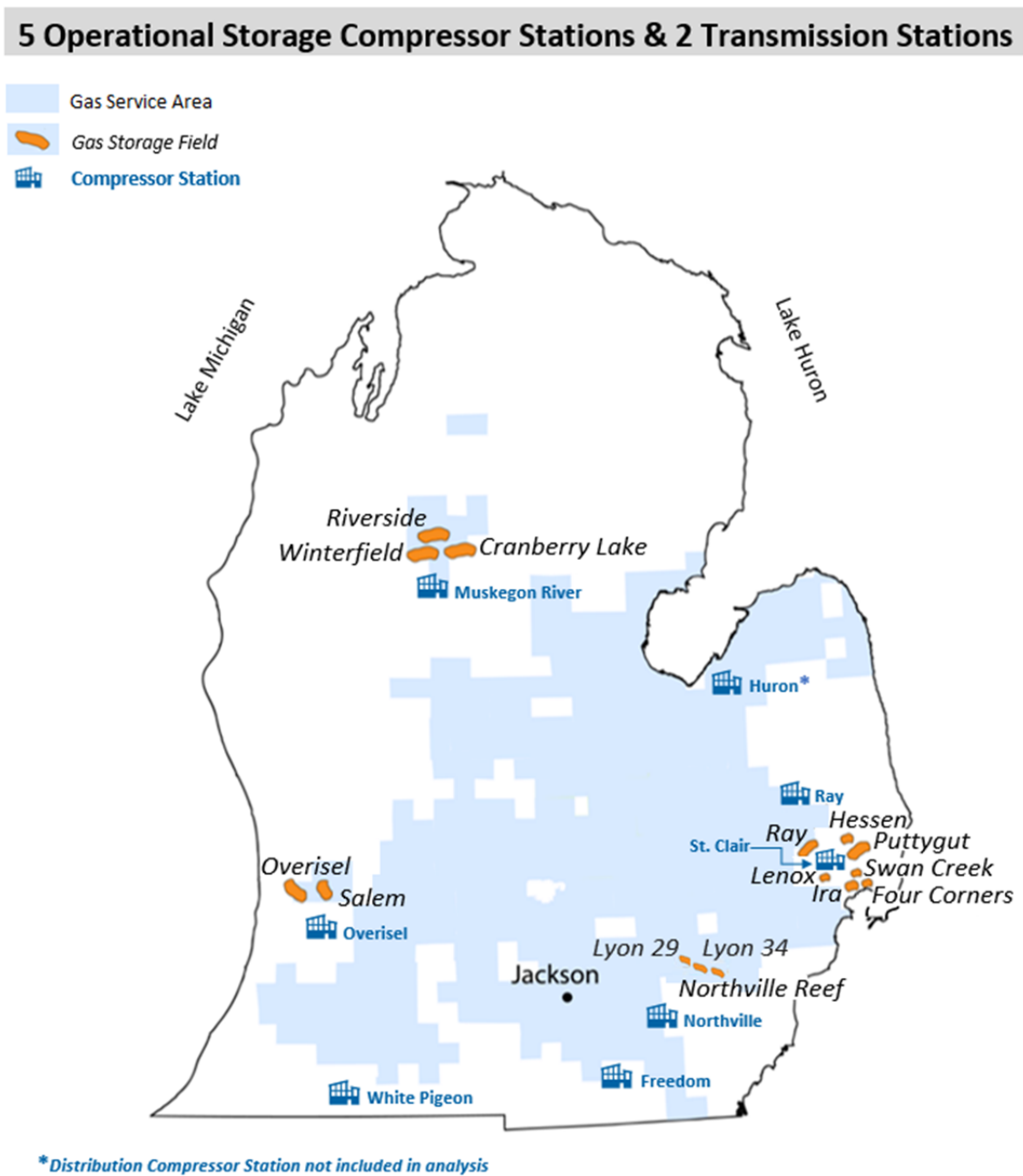
IV. Asset Classes

A. Storage Asset Plan

As a northern peninsula state, Michigan is geographically disadvantaged but geologically advantaged from a natural gas perspective.

Consumers Energy has 15 underground natural gas storage fields tapping into depleted hydrocarbon reservoirs deep underground through approximately 826 wells that tie into the Company’s gas system. Figure 11 illustrates the location of the storage fields in relation to the compression assets.

Figure 11: Map of Michigan with Storage Field and Compressor Station Locations



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The Company's storage assets are used to inject and withdraw natural gas to meet Michigan's winter energy needs as a safe, reliable, resilient, and low-cost alternative to traditional firm interstate transportation capacity. **This storage capacity provides customer value** by enabling the Company to purchase gas at lower prices in the summer and provides the capability to quickly adapt to customer demand and operational changes throughout the day, week, and month.

The flexibility of storage provides End User/Transport suppliers, Gas Customer Choice suppliers, and the Company the **ability to purchase gas in ways that provide economic benefits while ensuring supply adequacy during periods of high demand**. It also allows the Company to adapt to the demand of all customer classes due to warm or cold weather, and both planned and unplanned facility outages needed to support safe and reliable operations.

The storage fleet continues to play an important role during extreme weather situations and emergent operational changes by providing **quick access to high volumes of gas** that are geographically close to Michigan's demand centers at summer versus peak use pricing.

Michigan's winter demand peaks are due to residential heating and therefore significantly affected by weather conditions. These demand peaks often coincide with increased electric generation demand. Also, in contrast to electricity where energy moves instantaneously, natural gas moves at a slower speed.

Geographical **proximity of gas storage to customer load provides a systemic advantage** during the extremely cold winters. Growth of gas-fired generation to offset the retirements of coal-fired generation and support the maturation of renewable energy generation generally adds to the variation and peak needs during a day, therefore maintaining a safe and reliable storage asset portfolio is important to Michigan's electric reliability.

All the Company's gas storage fields are accessed through vertical or horizontal wells and are connected to compressor stations by storage pipelines. Improvements in field performance depend on the performance of the entire integrated facility since the gas flows through to get to the transmission system.

The Company's efforts to optimize overall field performance through multiple efforts (i.e., new wells, well rehabilitation, strategic plugging, etc.) are **leading to better performing fields that allow for a more resilient overall system** that can more readily adapt to system disruptions and customer demand each day. Since 2018, the Company has reduced the number of storage wells, becoming more efficient and safer, while maintaining relatively consistent levels of working gas. This provides quicker access to large quantities of natural gas than incremental pipeline supply purchases.

The storage fields provide approximately 154 Bcf of cyclic design capacity known as Working Gas. In addition to the natural gas cycled annually for customer use, a base level remains in place to ensure the field is adequately pressurized.

1. STORAGE ASSET MANAGEMENT

The Company's gas storage fields are segmented into baseload, intermediate, and peaking fields to serve different needs depending on daily, monthly, and seasonal demand deliverability requirements.

Storage fields in the system are used in three ways:

- Along with pipeline supply, **baseload** storage fields run daily during the winter to meet a foundation level of demand and provide more efficient supply paths to parts of the natural gas system further away from pipeline supply interconnects.
- **Intermediate** storage fields run during longer periods of higher demand.

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- **Peaker storage fields** run during the extreme hours and days when demand changes quickly—typically in the early morning when customers start their day and their gas appliances.

Table 1 lists all of Consumers Energy’s storage fields by type and the amount of working gas.

Table 1: Storage Field Types, Names, Working Gas, Base Gas, Total Gas Volumes, Number of Wells

Type	Storage Field Name	Working Gas Volume (Bcf)*	Base Gas Volume (Bcf)*	Total Gas Volume (Bcf)*	Number of Wells
Base	Winterfield	25.30	47.00	72.30	258
	Overisel	25.50	27.50	53.30	152
	Salem	11.60	18.90	30.50	71
	Cranberry	11.00	17.20	28.20	138
	Riverside	1.50	7.50	9.00	51
Intermediate	Hessen	13.50	3.48	16.98	24
	Putty gut	9.50	5.10	14.60	24
	Four Corners	2.39	1.39	3.78	6
	Swan Creek	0.42	0.23	0.65	1
	Ray	48.10	17.27	65.37	62
Peaker	Ira	2.00	4.25	6.25	15
	Lyon 29	1.23	0.95	2.18	3
	Lenox	1.20	2.03	3.23	11
	Lyon 34	0.70	0.66	1.36	5
	Northville Reef	0.50	0.72	1.22	5
<p>*NOTE: All gas volumes are in MMcf at 14.73 psi dry pressure base.</p> <p><i>A review of recent withdrawal seasons and reservoir integrity resulted in a 1 and 2.5 Bcf working gas increase at Overisel and Hessen, respectively. This does not change the total gas volumes of each reservoir.</i></p>					

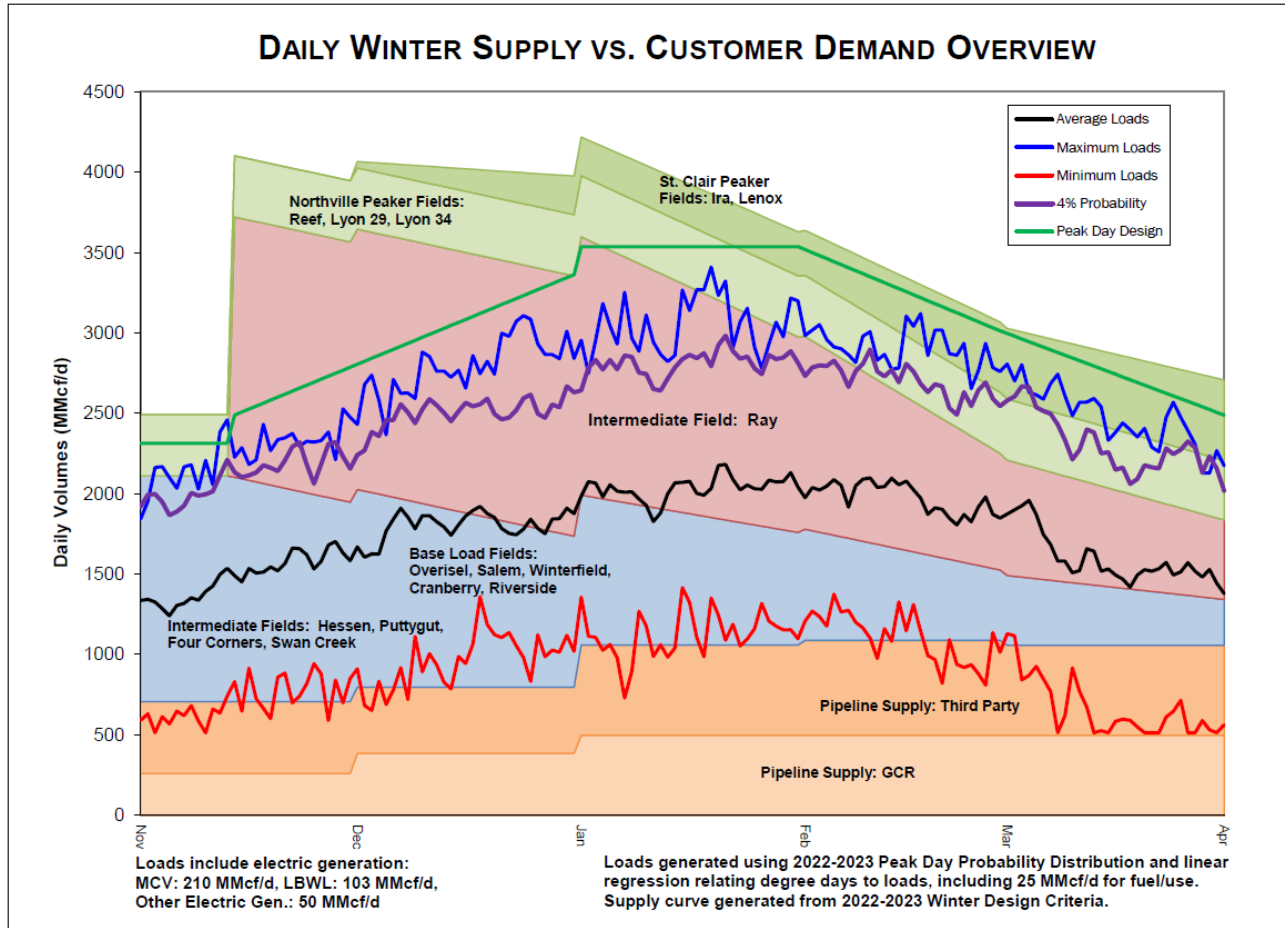
Each storage field has unique reservoir characteristics, including different cyclic capacities. This includes the ability to efficiently maximize storage utilization through leveraging the design and mechanical condition of the wells, transmission pipeline, attached compressor station, and system operating conditions such as weather.

During some situations, additional supply can be sourced from storage if additional resources such as available compression units or higher storage inventory are available.

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Figure 12 displays the wide variety of customer demand that needs to be considered as represented by the vertical space between the lime green (Minimum Loads) and the green (Design Peak Day) flows. Storage effectively allows for the variation in customer load as the Company can shut in or dispatch that supply as needed throughout the day.

Figure 12: Daily Winter Design Capacity and Loads



Delivery rate is the flow rate of gas per time (usually daily) that a specific storage field or well can provide.

The above supply curves (Daily Volumes) are based on many assumptions and therefore [Figure 15](#) is meant to help the reader conceptually understand how the Company’s storage fields are used based on their capabilities.

Fields designated as **needle peakers**, such as Lyon 29, typically have high per-well delivery rate, but fewer overall wells, while **baseload** fields, such as Winterfield, tend to have higher well counts but lower overall deliverability on a per-well basis.

Fields designated as **intermediate** fields also have relatively high deliverability characteristics as well as significant cyclic capacity that makes them suitable for both peaking and baseload operations.

Storage field deliverability is directly tied to the amount of gas within them, and as gas is removed from them to supply customers, their deliverability rate capability (Daily Volumes) decreases.

Natural Gas Delivery Plan

Consumers Energy’s historical storage usage follows a similar annual pattern: generally steady injection from April to October and withdrawal from November to March.

Injection and withdrawal plans consider the individual field capability and inventory as well as capability of the natural gas system and customer demand. Some fields take longer to fill or empty depending on their geology, inventory, and the use of compression. Their capability for accepting gas decreases as they are filled, and as field inventory decreases, the ability to provide supply decreases.

During the withdrawal season, baseload fields provide early winter gas, followed by intermediate fields, such as Ray, and needle peaking fields when the temperatures drop and customer demand increases.

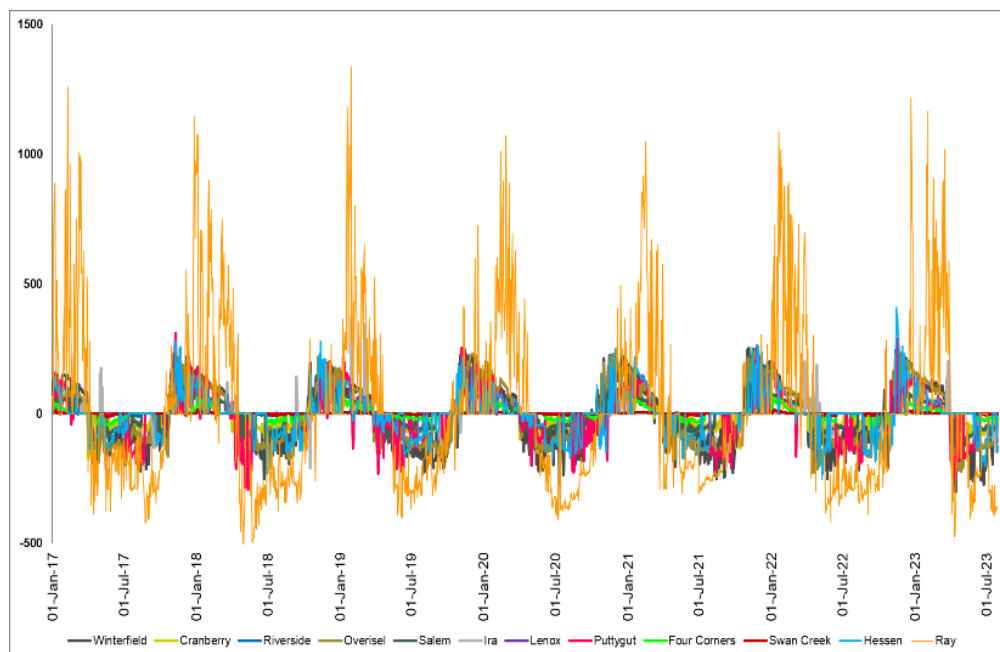
When temperatures rise, storage fields can be shut in for hours or days to adapt to customer load. This shut-in capacity can be used to provide system resilience in the event of unplanned outages on the system impacting supply.

The needle peaking fields serve multiple purposes:

- **Use during peak/design or near peak/design days.** Peaking fields may be needed when significant quantities of gas are required to meet customer demand. Because of its unique properties, the Ray field can be used as a needle peaker field when its inventory and gas conditioning equipment allow for it.
- These fields, depending on inventory, **can be used to reduce interstate pipeline supply needed** at the end of the winter season if they haven’t been used during near design weather or beyond. They also **can provide supply capacity reserve** off peak/design for resiliency.
- The needle peaker fields **diversify storage supply and reduce reliance on Ray to meet peaking needs**, and avoid relatively high fixed costs associated with interstate firm capacity and third-party storage. To aid in the reduction of our reliance on Ray, the Northville Gas Conditioning project is underway to help the fields provide quality gas when called upon.

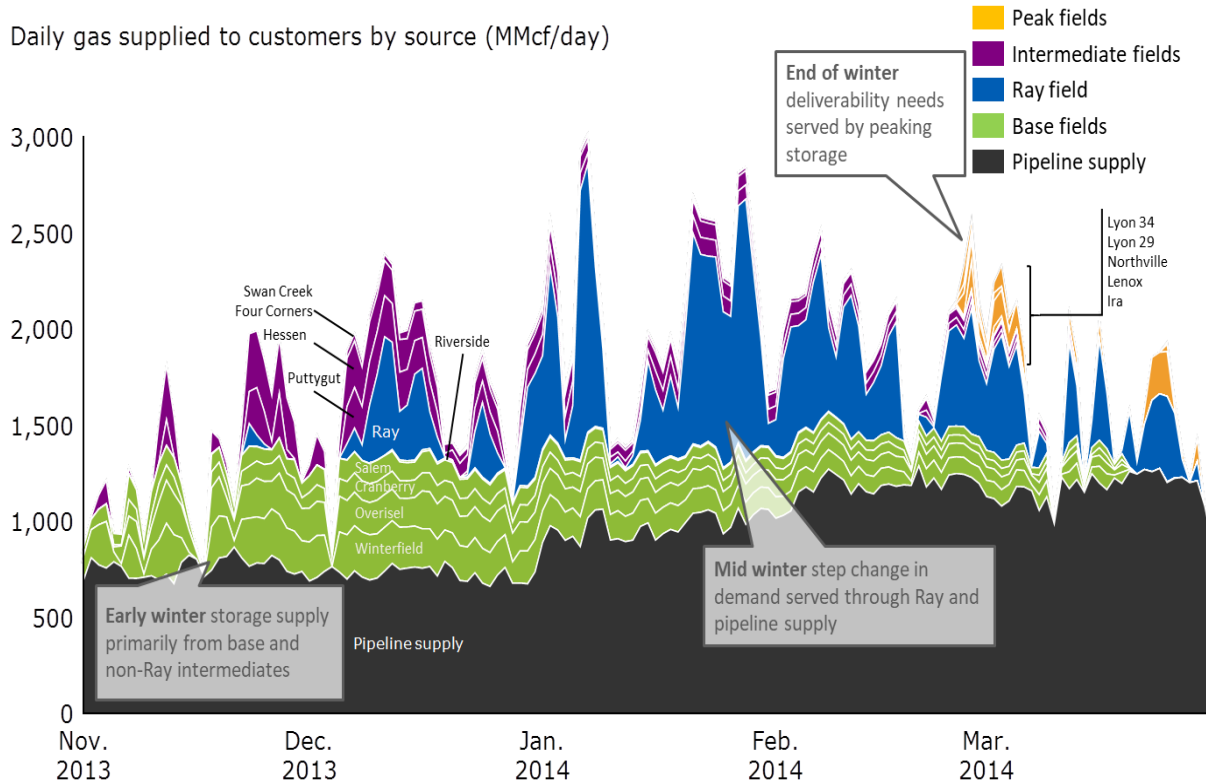
Figure 13 and Figure 14 show that Ray uniquely fills the roles of a peaker field (because it can deliver high rates of gas flow) and a baseload field because of its ability to hold a large volume of gas.

Figure 13: Daily Storage Field Injections (negative) and Withdrawals (positive) by Field from January 2017 - July 2023 (mmcF)



Natural Gas Delivery Plan

Figure 14: Gas Supply by Storage Field During Winter
(example from polar vortex of 2013-2014)



2. STORAGE WELL INTEGRITY PROGRAM

The key risk in storage field operations is degradation of the well, allowing gas stored in the reservoir below to escape and leak into the surrounding area.

PHMSA adopted the API RP 1171 by reference to establish code requirements for storage operators. The final rule for underground natural gas storage facilities was published by PHMSA in the 1st quarter of 2020.

Storage asset maintenance involves inspections (i.e., “logging”), repair, rehabilitation, plugging, and decommissioning for wells that provide less value to the customer than needed to justify remediation. In addition, new wells with horizontal drilling technology can be added to the system to enhance access to the storage field to replace decommissioned wells.

Well Inspections

Consumers Energy inspects or logs wells to determine their current state and to assess risk.

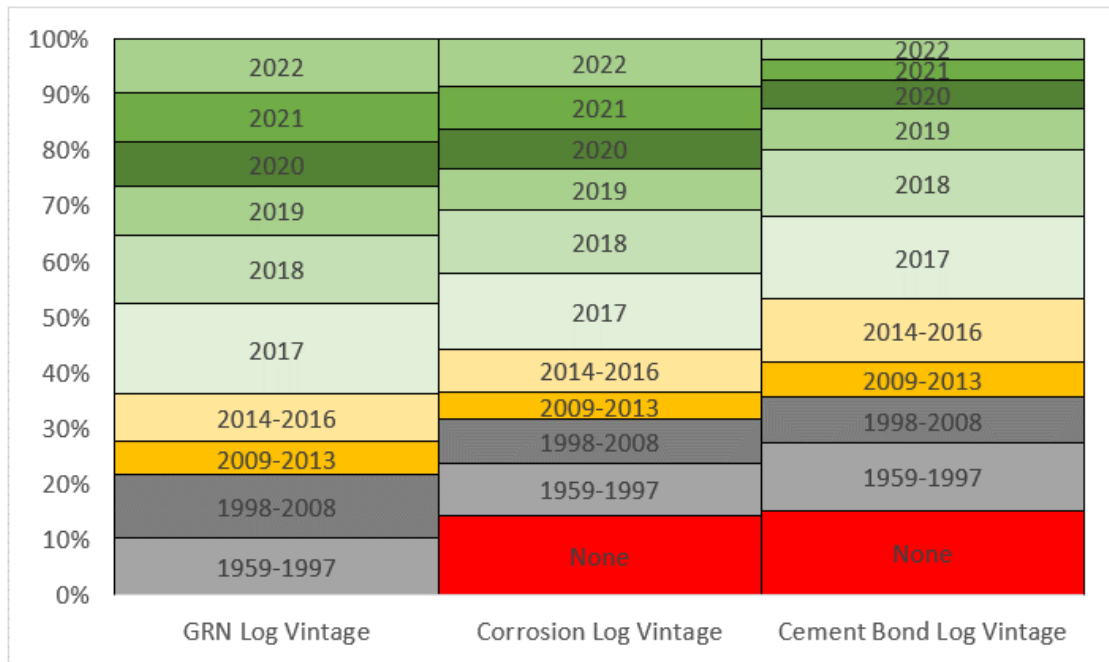
The Company has reviewed the requirement outlined in 49 CFR 192.12, and the applicable sections of API RP 1171.

Natural Gas Delivery Plan

These procedures govern operations, maintenance, integrity demonstration and verification, monitoring, threat and hazard identification, assessment, remediation, site security, emergency response and preparedness, and recordkeeping requirements that needed to be developed by January 18, 2018, for all existing underground natural gas storage facilities.

- Integrity assessments of underground storage wells began in 2017 to support the anticipated compliance timeframe for completing all risk management activities.
- Based on these new requirements, all wells will have three current logs at the completion of the 10-year rehabilitation program. Figure 15 below outlines the portfolio of wells based on current or outdated/missing log information, highlighting the importance of well inspections going forward.

Figure 15: Breakdown of Storage Wells by Logging History (current vs. outdated or missing)



Well Rehabilitation

The Company’s 10-year Well Rehabilitation Program began in 2017, following a PHMSA interim final rule to address underground storage safety issues.

This program involves remediating wells across Consumers Energy’s storage portfolio to return them to ‘like-new’ condition as well as to comply with the baseline assessment period of the final rule from PHMSA.

- Primary benefits of the well rehabilitation include a safer and more efficient long-term storage operation by reducing risks stemming from factors such as corrosion, gas migration, leaks, and well integrity issues.
- Improved well deliverability.

Natural Gas Delivery Plan

Well Reassessment/Preventative and Mitigative Measures Program

A well-specific Preventative & Mitigative (P&M) Measures Program is in development for each well after the well has been worked on as part of the Well Rehabilitation Program.

The current proposed plan provides a 21-year outlook for well work that will continue to verify and monitor well integrity. This P&M Program will begin in 2024, as outlined by the seven-year assessment cycle prescribed by 49 CFR Part 192.12.

Items included in the P&M Program include specific activities depending on well type: facility, observation, and class II disposal wells. Maintenance includes items such as logging frequency, fill depth checks, slickline cleanout of paraffin for wells with known paraffin issues, mechanical integrity testing (MIT) on wells with tubing and packer systems, and fluid checks on wells with known water levels.

New Well Drilling

The purpose of the program is to identify the best locations to drill new wells within the storage assets.

Important considerations include: the sequencing of well logging, remediation, new drilling, and plugging to ensure continued deliverability.

Consumers Energy is taking a holistic system view that these activities follow a logical sequence. For example, new well drilling should precede well plugging and decommissioning if practical, to ensure short-term flow is not significantly compromised. Options to accelerate drilling should be considered, when possible, to ensure remediation, new well drilling, and plugging follow an optimal schedule.

- Drilling new wells includes centralizing multiple wells to one location. This reduces overall operational maintenance and could reduce overall storage pipeline lengths.
- Using seismic mapping and reviewing of existing well information to place the well within the best part of the reservoir for increased deliverability while minimizing liquid production.
- Using safe drilling operations that provide a clean well for injection and withdrawal.
- New wells allow for drilling to current standards and potentially allow for plugging of aging wells that may present higher risk.

Well Re-Entry

A subset to the New Well Drilling Program has been initiated and focused on re-entering existing horizontal or deviated wells and drilling new drain holes.

Re-entering an existing well further **helps to improve field and well deliverability**, especially for wells that were drilled off structure or too deep on the structure. The additional rate can be used to either improve the field overall deliverability or allow for plugging of nearby vertical wells if they have integrity concerns but have fair to good flow rates to reduce risk without impacting storage field performance.

Additional benefits to the program include using part of an existing well to plugback the original horizontal well and drilling additional drain holes to increase deliverability. This work uses wells with good integrity and coil tubing equipment that is a closed system.

The re-entry work is also less expensive than a full new well as the casing and pipeline are already installed.

Natural Gas Delivery Plan

Well Plugging

Well plugging is performed on certain wells, balancing risk with reliability and customer value.

- Plugging poor-performing, high-risk wells helps decrease maintenance expenses and reduce risk to the natural gas system.
- After a well is plugged, the Company can reduce its land footprint by restoring the area.
- Plugging a well reduces methane emissions by reducing maintenance related venting, and fugitive emissions associated with system piping and wellhead components.

Plugged Well Monitoring

CE has contracted a third party to review all CE and third party plugged wells within the gas storage boundaries. The work included creating wellbore diagrams and classifying the plugging as questionable, adequate, or exceptional.

The classification will be used to determine the monitoring frequency for the wells after they are baseline monitored. The intent of the monitoring work is to check for any potential gas leakage through ground staining or methane emissions detection.

This work will be recurring with a frequency based on the plugging classification and the evidence of gas leakage.

Storage Lateral Pipeline Replacement

The purpose of the storage lateral pipeline replacement program is to replace and upgrade storage laterals based on their age, condition, relative risk, and their association with the other gas storage programs. Primary improvements anticipated from the program include:

- Installation of launcher and receiver barrels that allow for pipeline inspections.
- Potentially changing the pipeline length and size based on the new well drilling and well plugging programs.

These changes will help reduce risk while creating a more efficient path for gas flow to the larger natural gas system.

3. STORAGE FIELD ASSET PLAN

In alignment with the Storage Well Integrity Program and based on scenario modeling completed in 2018 through the lens of Consumers Energy's four objectives, the Company assessed the potential retirement of four low-cyclic fields to consolidate the storage system.

These storage fields were: Swan Creek, Four Corners, Lyon 34, and Riverside. Collectively, these fields provide less than 1.5% of the Company's gas supply throughout the winter.

The model results indicated that three fields still provide value to the gas system and customers and showed that Riverside may be a viable candidate for retirement.

- Retiring Riverside would have minimal cyclic impact, given the small amount of working gas volume at 1.48 Bcf, but has other operational considerations because it directly supplies three small city gate stations.
- Riverside contains about 9% of the system's total number of storage wells. Retirement would eliminate an estimated 14% of total risk associated with storage wells, i.e., 5.8 metric tons of methane emissions.

Natural Gas Delivery Plan

- The remaining three fields represent just under 2% of the overall system risk and are currently providing significant supply resiliency. They also have a high deliverability to well count ratio that is used to supply peak demands.

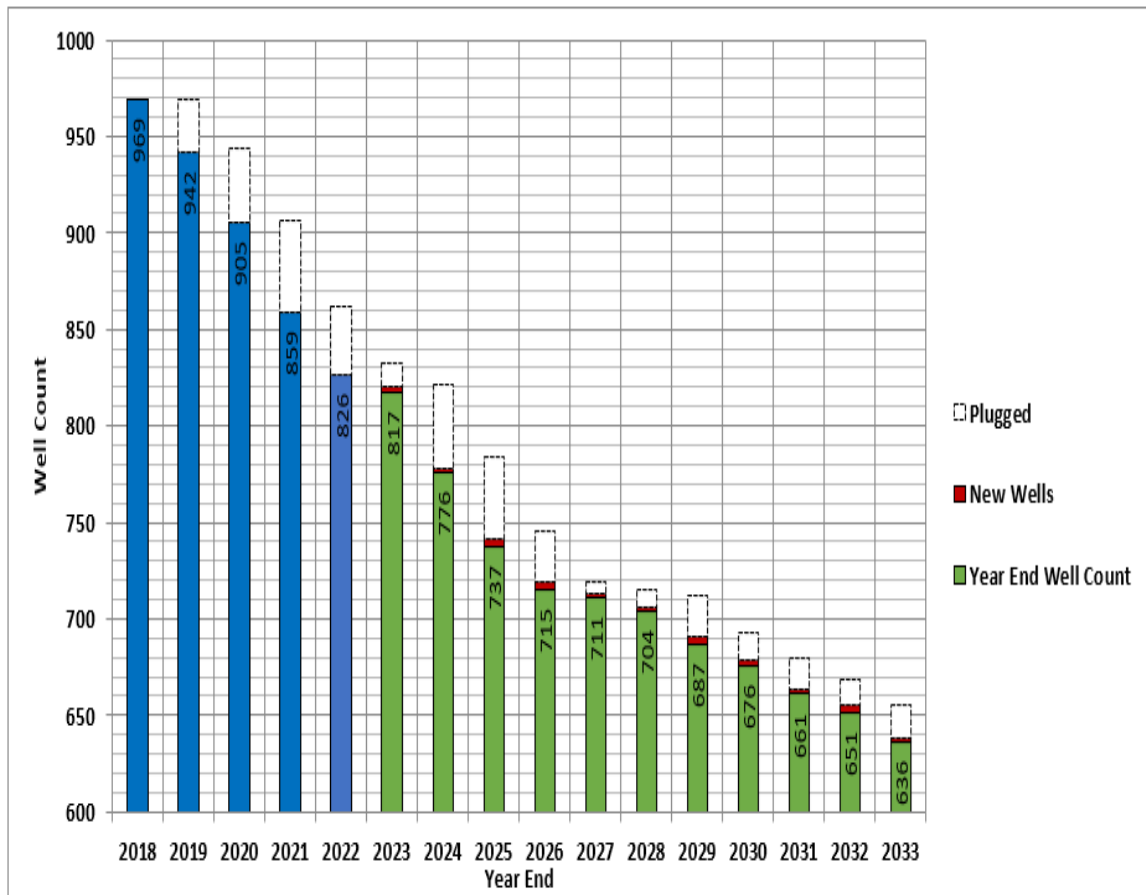
Considering the items stated above, the Company has now decided to move forward with decommissioning the entire Riverside gas storage field.

The Company’s engineering team worked to review alternate supply options for the three city gates. As a result of the decision to decommission the field, there are multiple projects that span the distribution, transmission, and storage assets that are moving to the engineering phase of work. The execution schedule for these projects occurs between 2023 and 2027. Retirement of the Riverside storage field will reduce O&M expenses associated with these active storage and transmission assets.

The Company’s Plan strives to reduce risk and cost while increasing deliverability and avoiding the capacity reduction that would impact GCR purchasing. As a result, the entire cost picture are included in decisions going forward.

Figure 16 shows the combined approach of the Storage Well Integrity Program and the retirement of the Riverside storage field to reduce the total number of gas storage wells on the system over time.

Figure 16: Storage Well Integrity Program Overview



Natural Gas Delivery Plan

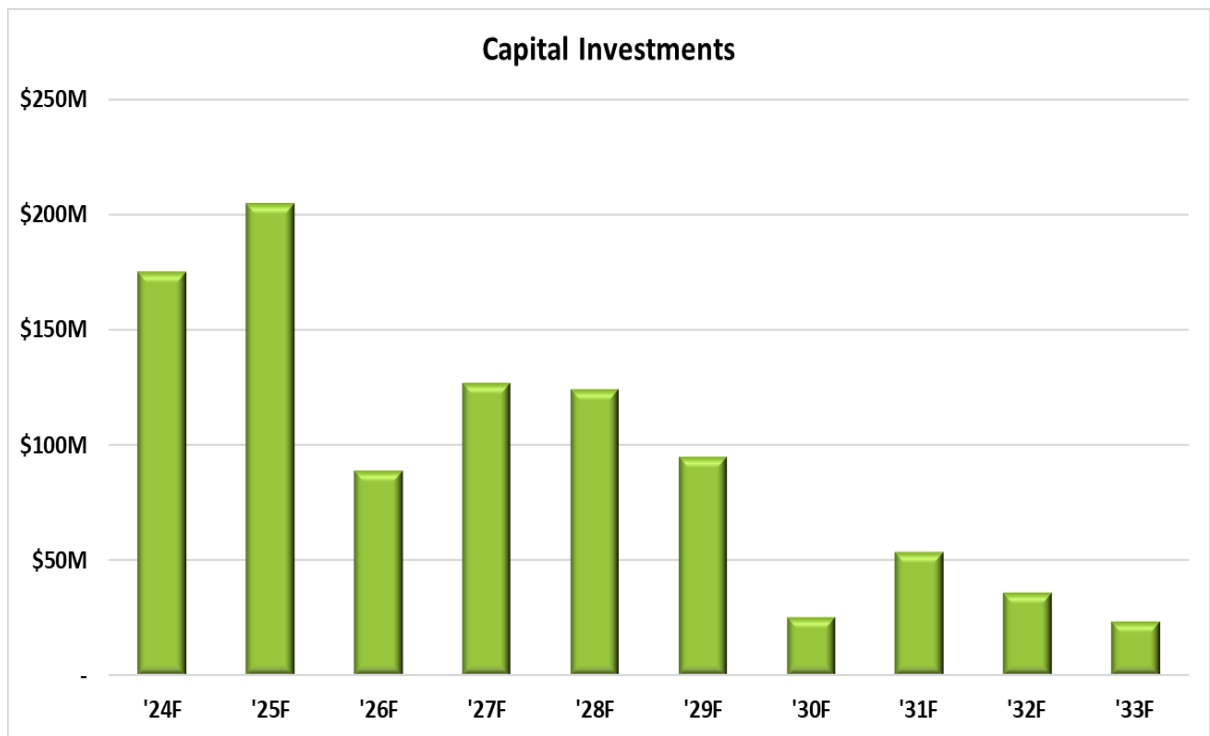
Figure 17 identifies that this Plan would reduce the overall number of wells, which will result in lower risk, operating costs, and lower methane emissions while ensuring system resiliency, deliverability of gas flow per well, and potentially improving gas quality resulting in less risk to compressor station operations and downstream facilities.

This reduction in the overall number of wells will have a minimal reduction in working gas capacity from an approximate current amount of 154 Bcf to a forecasted amount of 152 Bcf in 2027.

4. STORAGE ASSET FINANCIALS

Figure 17 shows the spending needed to efficiently and effectively execute the Storage Well Integrity Program and other investments in the storage asset area.

Figure 17: Storage Capital Investment Plan



This investment plan aligns with Company objectives by reducing asset risk (safe), increasing the deliverability of each remaining well and positively affecting the natural gas system’s resiliency (reliable), reducing the overall well count (affordable), reducing the emissions points in this system (clean).

B. Compression Asset Plan

Consumers Energy has eight compressor stations that pressurize and condition natural gas for safe transport through the pipeline and distribution systems, as well as injection into and withdrawal from underground storage.

The compression fleet can be segmented, based on the purpose of the compressor station, into storage, transmission, and distribution stations, as described below in Table 2.

Table 2: Overview of the Four Types of Compressor Stations

<i>Description</i>	<i>Storage Compressor Stations</i>	<i>Transmission Compressor Stations</i>	<i>Transmission and Storage Compressor Stations</i>	<i>Distribution Compressor Station</i>
<i>Purpose</i>	Inject gas into and withdraw gas from underground storage fields. Condition gas as needed to meet customer needs.	Receive and transport gas throughout the gas delivery system. Condition gas as needed to meet customer needs.	Compression units are storage units that also provide transmission compression.	Boost gas pressure through the distribution system when agricultural processes such as grain drying increase demand in the rural Thumb region of Michigan.
<i>Number of Stations & Station Names</i>	<p>3 Stations</p> <ul style="list-style-type: none"> • Ray • Muskegon River • St. Clair 	<p>2 Stations</p> <ul style="list-style-type: none"> • White Pigeon • Freedom 	<p>2 Stations</p> <ul style="list-style-type: none"> • Overisel • Northville 	<p>1 Station</p> <ul style="list-style-type: none"> • Huron

See [Figure 11](#) for a map of Company compressor stations and the storage fields they support.

Consumers Energy operates the fleet with local Company personnel while monitoring it through Gas Control with SCADA.

The Company monitors system pressures, flows, and key high-volume customers. The station control room is linked to the other utility back-up control rooms in real-time, per the control room standard for physical and cybersecurity assurance.

Consumers Energy has a plan to upgrade its data historian systems to improve monitoring and system analytics.

Natural Gas Delivery Plan

Table 3 provides a more detailed summary of the compression units at the storage and transmission stations.

The Freedom Upgrade project was completed in 2023 and the station now has five Waukesha units totaling 18,750hp. The existing BA and TLA units have been decommissioned.

Table 3: Summary of Compressor Units

Station	Mothballed/Retired				Operable			
	Units	# Units	Unit HP	Total HP	Units	# Units	Unit HP	Total HP
Ray	Quad	2	5,391	10,782	CAT 3616	5	4,735	23,675
	Turbines	2	3,538	7,076				
	Clark TCVD	1	6,000	6,000				
Muskegon River	HVC	2	3,286	6,571	TLA	2	3,400	6,800
					HBA	4	2,600	10,400
					Turbine(Suction boost)	1	10,076	10,076
					Turbine(Suction boost)	1	10,500	10,500
St. Clair					Waukesha	4	4,835	19,340
					T-4500	2	3,971	7,942
Overisel				TLA	4	2,700	10,800	
Northville					TLA (Transmission)	2	2,700	5,400
					TLA (Storage)	2	2,700	5,400
White Pigeon	KVT	2	2,000	4,000	W-330	2	3,600	7,200
	W-330	2	3,600	7,200	CAT 3616	3	4,735	14,205
					V-250	2	2,000	4,000
					CAT 3608	1	2,370	2,370
Freedom				Waukesha	5	3,750	18,750	
Huron				CAT 3512	1	1,035	1,035	
System Total		11	41,629		41		157,893	

1. COMPRESSION ASSET MANAGEMENT

The Company’s 2022 system weighted average compression utilization of 22% is below industry average of about 50%. The utilization rate is a simple calculation using the amount of time that a compression unit is available to operate vs. the amount of time that it does operate.

Utilization is impacted by winter weather conditions and typically trends up when the winter is colder than normal, and a higher amount of storage is used. It will trend down when winter weather is warmer than normal, and a lower amount of storage supply is used.

Natural Gas Delivery Plan

It also is affected by how and where gas is delivered by suppliers, the interstate pipeline delivery pressure verses Company transmission line pressure, conditions outside of the Company’s natural gas system, asset availability, and other factors.

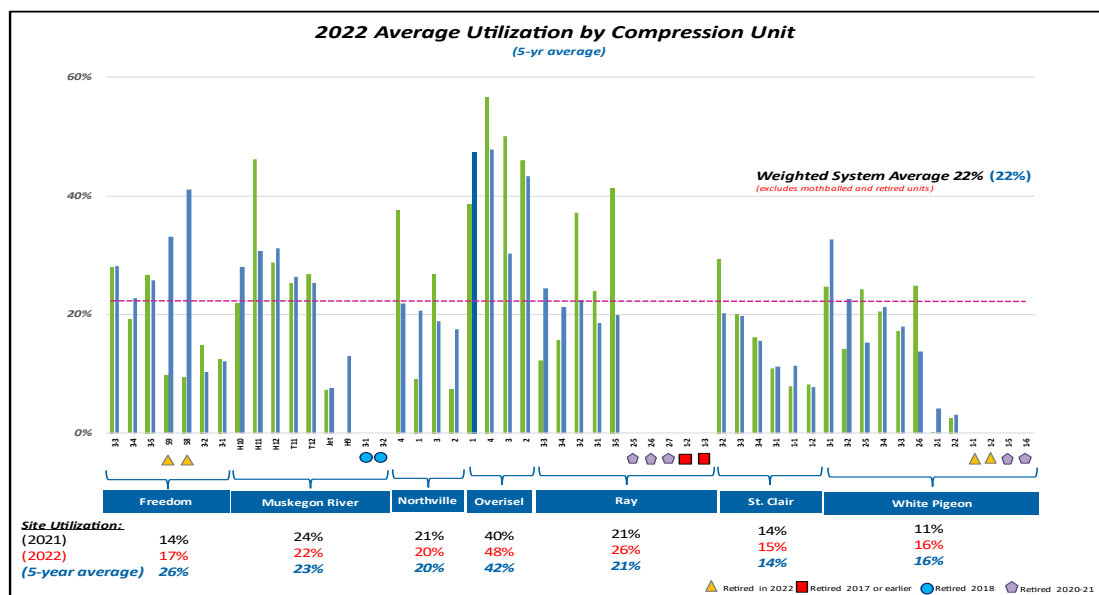
Overall, Consumers Energy doesn’t anticipate compression assets having a utilization rate as high as the industry average due to the uniqueness of the Company’s natural gas system.

- The Company’s compression assets are used more to serve the peak day and seasonal needs of the Company’s storage assets, both for injection and withdrawal. Some compression assets are needed to ensure reliability at the station to avoid negative impacts to our customers as well as to provide the flexibility necessary to enable use of city gate supply as described above in the [Ongoing Refinement of Supply Plans](#) sections.
- Another consideration, given the locational supply flexibility offered by the Company’s natural gas system, is that interstate pipeline supply-focused compression may fall below industry average utilization depending on market pricing conditions.

The fact that the system is designed for conditions it must meet but does not see every day has provided affordability, reliability in near design conditions, system resilience, and allowed the Company to adapt to outages and unforeseen operating conditions, all of which speaks positively about its ability to deliver gas to our customers everyday throughout the year.

However, the Company believes that an increase from the current 22% compression utilization is possible and can be achieved through efforts to improve the reliability of compressor stations and allowing the retirement of some aging units. This will increase the utilization of the other compressor units and will be accomplished while considering the Company’s natural gas system’s resilience and supporting that system’s maintenance needs. Figure 18 illustrates the 2021 utilization of each compressor unit.

Figure 18: 2022 Average Utilization by Compressor Unit



This chart includes mothballed units—these are units not currently in service. Overall, the Company has a goal to achieve 30-40% utilization for the entire compressor fleet.

Currently, daily compression data is not easily accessible nor consolidated across the system because it is manually tracked locally.

Natural Gas Delivery Plan

In addition, the Daily Gas Report database is limited regarding compression information because it only accesses a select pool of information from the Gas Control SCADA/Citect system and there are historical accuracy issues. The plan to address this deficiency is to address it through the Gas Compression historian upgrade.

In 2022, Gas Compression initiated the Gas Compression Digital Mobility Project that will increase productivity by eliminating the need to return to a desktop computer or kiosk to complete work, improve quality by using software technology, improve accuracy by recording information just in time and done at place of work, and improve safety by providing access to safety information on location.

This will be followed by the roll out of Digital Work Management Projects that will provide value to the Company through increased productivity by reducing the need to return to the desktop kiosk for updates, improved quality through increased accuracy of updates completed at the time and place of work, and improved safety through real-time information used at work sites rather than printed procedures.

The Compression Demand Schedule as seen below, is a communication tool that describes how much horsepower is needed at each station to meet planned needs for anticipated operational conditions, including design conditions. RORs are used to analyze potential compression buffer or shortfalls in terms of units and hp at each station.

The Company is the supplier of last resort and must be prepared for design conditions that are not regularly seen, and that contribute to lower than peer compression utilization.

Figure 19 shows the monthly compression demand schedule that indicates the required quantity of units, hp, and projected peak demand months for each station.

Figure 19: 2023 Monthly Compression Demand Schedule (Example)

				2024 MONTHLY COMPRESSION DEMAND SCHEDULE (10-20-2023)											
				WITHDRAWAL			INJECTION						WITHDRAWAL		
Compressor Stations	#Units	Unit HP	Total HP	Jan 2024	Feb 2024	March 2024	April 2024	May 2024	June 2024	July 2024	Aug 2024	Sept 2024	Oct 2024	Nov 2024	Dec 2024
WHITE PIGEON	Min Req'd HP***			18,670	18,670	18,670	18,670	18,670	18,670	18,670	18,670	18,670	18,670	18,670	18,670
W-330 (2-5,2-6)	2	3,600	7,200												
CAT 3616 (3-2,3-3,3-4)	3	4,735	14,205	4	4	4	4	4	4	4	4	4	4	4	4
V-250 (2-1, 2-2)	2	2,000	4,000												
CAT 3608 (3-1)	1	2,370	2,370	1	1	1	1	1	1	1	1	1	1	1	1
Unavailable Units (Notes)															
FREEDOM	Min Req'd HP			11,250	11,250	11,250	11,250	11,250	11,250	11,250	11,250	11,250	11,250	11,250	11,250
Waukesha (3-1,3-2,3-3,3-4,3-5)	5	3,750	18,750	3	3	3	3	3	3	3	3	3	3	3	3
Unavailable Units (Notes)															
OVERISEL	Min Req'd HP			8,100	8,100	8,100	5,400	5,400	8,100	8,100	8,100	8,100	8,100	8,100	8,100
TLA (1,2,3,4)	4	2,700	10,800	3	3	3	2	2	3	3	3	3	3	3	3
Unavailable Units (Notes)		Fuel gas & Unitized cooling project		Fuel gas	Fuel gas		Unitized Cooling	Unitized Cooling	Fuel gas	Fuel gas	Fuel gas	Fuel gas	Fuel gas	Fuel gas	Fuel gas
RAY	Min Req'd HP			-	23,675	23,675	14,205	14,205	18,940	18,940	23,675	23,675	23,675	18,940	-
CAT 3616 (3-1,3-2,3-3,3-4,3-5)	5	4,735	23,675	0	5	5	3	3	4	4	5	5	5	4	0
Unavailable Units (Notes)														*See Notes	
ST. CLAIR	Min Req'd HP***			19,040	19,040	22,222	12,702	12,702	14,280	14,280	14,280	14,280	14,280	12,702	12,702
Waukesha (3-1,3-2,3-3,3-4)	4	4,760	19,040	4 Recip	4 Recip	**5 Units	3 Units	3 Units	3	3	3	3	3	3 Units	3 Units
Turbine (1-1,1-2)	2	3,971	7,942						Turbines used only while Field Pressures allow for injection						
Unavailable Units (Notes)				Pit 1 comp work	Pit 1 comp work										
MUSKEGON RIVER	Min Req'd HP***			28,619	28,619	28,619	8,600	8,600	8,600	8,600	8,600	8,600	8,600	14,600	26,019
TLA (T-11, T-12)	2	3,400	6,800	2	2	2	1	1	1	1	1	1	1	2	2
HBA (H-9,H-10,H-11,H-12)	4	2,600	10,400	4	4	4	2	2	2	2	2	2	2	3	3
Turbine (Suction Boost-existing)	1	10,500	10,500												
Turbine (Suction Boost-new)	1	11,419	11,419	1	1	1	0	0	0	0	0	0	0	0	1
Unavailable Units (Notes)															
NORTHVILLE	Min Req'd HP			5,400	5,400	5,400	2,700	2,700	2,700	2,700	5,400	5,400	5,400	5,400	5,400
Unit 182 (Transmission)	2	2,700	5,400	1	1	1	1	1	1	1	1	1	1	1	1
Unit 334 (Storage)	2	2,700	5,400	1	1	1	0	0	0	0	1	1	1	1	1
Unavailable Units (Notes)															
Total	40	157,901		91,079	114,754	117,936	73,527	73,527	82,540	82,540	89,975	89,975	89,975	89,662	82,141

Minimum required horsepower reflects what is required to pump Design rates, backup engines are required for planned and unplanned outages.
 * Ray HP in November required up to the start of Ray field survey, 2 units available post survey
 ** St Clair turbines are available for March withdrawals if base field pressures allow or for use with peaker fields
 *** If the indicated number of units cannot be met then other units (engines or turbines where applicable) must be substituted to try to meet HP Demand requirements even if there is no requirement for the units

Natural Gas Delivery Plan

The demand schedule highlights the variation in monthly peak demands for storage and transmission compressor stations. In general, storage compressor stations tend to have greater variability in hp requirements month-to-month as they are used to adapt to varying customer demand while meeting summer injection and winter withdrawal needs.

- The lower hp utilization at St. Clair and Ray reflects how the Company uses the capability of those facilities to adapt to operational conditions. This reflects their ability to be adjusted as needed to meet continuously varying customer demand and system conditions.
- High utilization of most of the hp typically occurs when those facilities are using storage inventory and that compression is needed for withdrawal, which occurs later in the winter, generally during February and March.

Late season focus remains on cycling the base storage fields to reduce the risk of gas migration in the fields, and this results in some stations' utilization being comparatively low. That hp is necessary for supply reliability in meeting design winter conditions and system resilience.

Using compression to cycle fields allows the Company to hold inventory in more prolific storage, and thus reduces the need to procure large quantities of more expensive pipeline transportation and supply during the winter, which is not guaranteed to be available.

Peak day demands, including those that may be associated with gas-fired generation, are expected to primarily be met with peaking storage at Northville, St. Clair, and Ray, given their high deliverability characteristics and their ability to be used to respond throughout the day needed by the varying electric generation load.

- To manage reliance on Ray, and to support the system resilience, hp is needed to refill Northville and St. Clair after a peak demand period in the winter to facilitate more frequent cycling of the needle peakers.
- The lower utilization at White Pigeon reflects market conditions and locational pricing that is currently more favorable for supply to be received through Freedom and Northville.

Swings in utilization at the transmission compressor facilities will vary with market conditions and planned and unplanned upstream facility outages.

Maintaining access to supply and flexibility for changes in the location in supply helps keep consumer market prices lower and the natural gas system more resilient.

Transmission compressor stations, on the other hand, have more stable daily and monthly peak demands to meet ongoing gas demand and transport needs throughout the year. However, there are changing conditions at those stations throughout the year that affect utilization, like available interstate pipeline pressures.

2. COMPRESSION ASSET PLAN

Based on the scenario modeling, five long-term recommendations for compression reflect new operating realities and align with the Company's objective of continuously improving the system's reliability and resiliency. The recommendations are:

- a. Accelerate the implementation of preventative maintenance program and practices, and gradually implement more predictive technologies.
- b. Decommission retired/mothballed compressor units.

Natural Gas Delivery Plan

- c. Optimize the fleet of compressor units at Muskegon River to meet volume and pressure requirements.
- d. Evaluate contingency options for resiliency and opportunities that mitigate risk of outages at the compression stations.
- e. Assess feasibility of retiring additional compression assets to focus investment on most critical units and optimize portfolio.
- f. Complete the Implementation of API RP 1164 Cyber Security.
- g. Compressor Station Compliance with Proposed Michigan NOx RACT Rule.

The following sections describe each recommendation in more detail.

Implement Enhanced Maintenance Program and Practices, and More Predictive Technologies

Consumers Energy will enhance maintenance practices to ensure the implementation of more proactive and efficient prevention programs. This will eliminate expensive, reactive events, improve the compression fleet's ROR, reduce downtime and overall maintenance costs.

The Company's current compression maintenance practices don't allow for analytics-based decision making or preventative and predictive maintenance. This is primarily due to the following:

- Compression is operating on a break-fix cycle.
- Maintenance data (such as failure records and work order maintenance logs) is incomplete.
- Equipment condition data, such as temperature and in-flow pressure, is limited.

The Company also needs to improve record-keeping practices across compressor stations because there is no standardized entry methodology or nomenclature for SAP entries.

Station performance and maintenance schedules and data are stored separately at each station in local templates. Investing in digital infrastructure will enable these important factors to be standardized across the fleet, and for performance monitoring and improvement to occur more efficiently.

Decommission Retired Compressor Units/Auxiliary Assets

Currently, there are 11 retired compressor units not being operated. These units have been disconnected and removed from the system. The Company's goal is to decommission these units.

The retired units, are located at Muskegon River, St. Clair, Ray, and White Pigeon:

- Muskegon River – Two HVC units (3-1 & 3-2)
- Ray – Two Quad units (1-1, 1-2), two turbines (2-5, 2-6) and one Clark TCVI (2-7)
- White Pigeon – Two KVT units (1-1, 1-2) and two W-330's (1-5, 1-6)

Four KVG units (306, 316, 319, 320) at Muskegon River were decommissioned during 2020, and three HVC units (2-2, 2-3, 2-4) at St. Clair were decommissioned in 2021-2022.

The units in Plant 1 and Plant 2 at Freedom were decommissioned in 2023 after the completion of the Plant 3 Upgrade project. Engineering and planning activities are underway to support decommissioning activities at Ray, Muskegon River, and White Pigeon.

Optimize Fleet of Compressor Units at Muskegon River to Meet Volume and Pressure Requirements

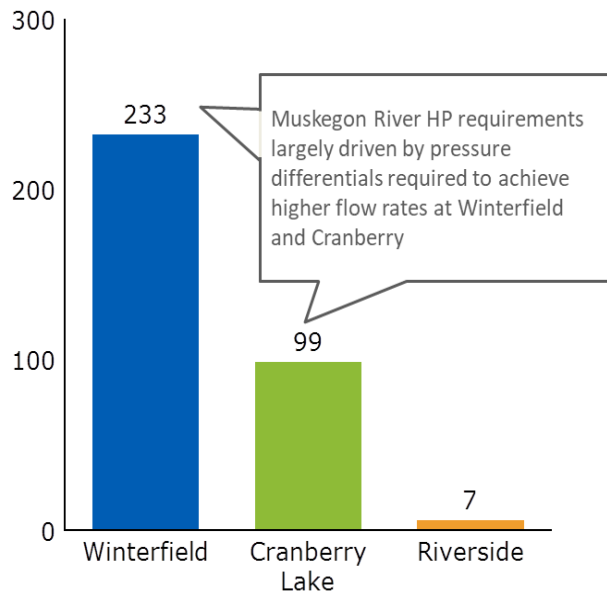
With the decision made to retire the Riverside storage field, another high-level evaluation was completed that validated the Muskegon River compressor station without the Riverside storage field still brings value to the system:

- The Muskegon River storage compressor station will still be used to pressurize gas to inject into and withdraw from the Winterfield and Cranberry Lake storage fields.
- Muskegon River hp requirements are largely driven by pressure differentials required to achieve higher flow rates at Winterfield and Cranberry Lake, and the total cyclic volume supplied from Riverside is 1% of the supply from the storage fields in the region (Riverside, Winterfield, Cranberry Lake), as shown in Figure 20. Replacing the antiquated suction boosting compression with a new turbine will enable more reliable suction boosting and higher cycling from the remaining two storage fields. Therefore, the impact at the Muskegon River compressor station from retiring Riverside is minimal, if any.

Figure 20: Maximum Daily Flow & Cyclic Capacities for Storage Fields Supported by Muskegon River

Deliverability: Riverside maximum observed rate is <3% of Winterfield's rate

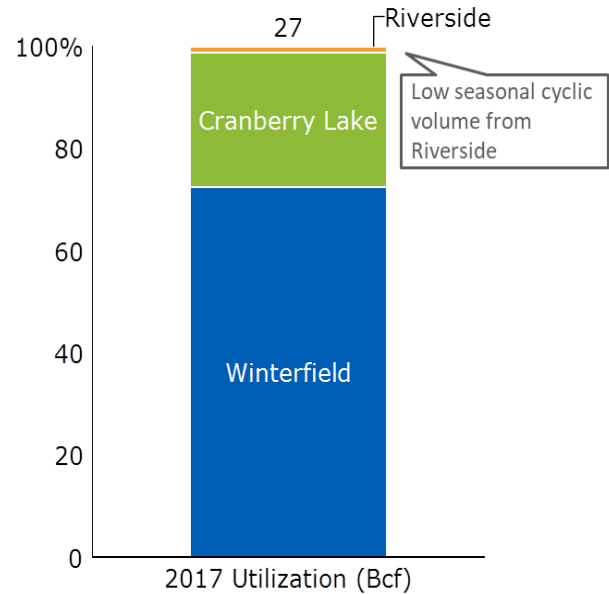
Winter '16/'17 max daily withdrawal rates in Marion fields (MMcf/d)



Note: Maximum daily withdrawal rates are based on actuals reported in Daily Gas Report for Winter 2016-2017

Cyclic: total volume supplied represents 1% of supply from Marion fields

Breakdown of 2017 total cyclic utilization of Marion fields (Bcf)



Consumers Energy is optimizing the compression horsepower at Muskegon River to meet volume and pressure requirements by:

- Completing the retirement of Plant 3 HVC pressure boosting units due to their age and ROR performance (2018).

Natural Gas Delivery Plan

- Completed installation of an in-kind replacement for suction boosting turbine. (Commissioning in winter 2022-23).
- Retiring the existing turbine after the installation of the new turbine is complete.
- Rebuilding to like-new the existing HBA and TLA units to extend their useful operating life.

Evaluate Contingency Options for Resiliency and Opportunities that Mitigate Risk of Outages at Compression Stations

The Company will be further analyzing resiliency in Compression, Storage, and Transmission, including gas flow path analysis and review of design improvements and hazard assessments.

A logical review of interrelated systems will occur in a manner that can identify specific potential failure points and quantifiable impacts. The components reviewed are typical of the following:

- Compression: compressors and engines including coolers, unit control and unit specific auxiliaries
- Gas Conditioning equipment
- De-hydration equipment
- Natural Gas Heaters
- Slug catchers
- Filter-separators
- Scrubbers
- Mechanical-Structural
- Main Gas Headers
- Isolation and control valves, regulators, and fire gate valves
- Fuel / Pilot Gas Systems
- Compressed Air Systems
- Electrical Instrument & Controls
- Transformers, Switchgear, MCCs, Panels
- Station Control and Network Systems
- Instruments

In addition, the Company will evaluate the overall gas compression system to identify recommended investments to support an overall increase to system resiliency:

- Areas that will be evaluated include, but are not limited to, a bypass out of the Ray Storage facility directly into the transmission pipeline system, mitigation of single point failures in the system, and fleet-wide system improvements.
- Results from site hazard assessments and focused self-assessments have been used to evaluate each station to make recommendations to standardize system design to mitigate overall risk to the system.

Natural Gas Delivery Plan

Annually Assess Feasibility of Retiring Additional Compressor Units to Prioritize Investment on Most Critical Units for an Optimized Portfolio

The Company will annually assess the feasibility of retiring additional compression assets to prioritize investment on the most critical assets for an optimized portfolio. This includes the following:

- Monitor signposts such as reliability, performance and load changes over time.
- Evaluate station/asset reliability and required units.
- Incorporate system resilience assessments.
- Assess station layout risk and developing mitigations.
- Develop business cases for retirements/additions.

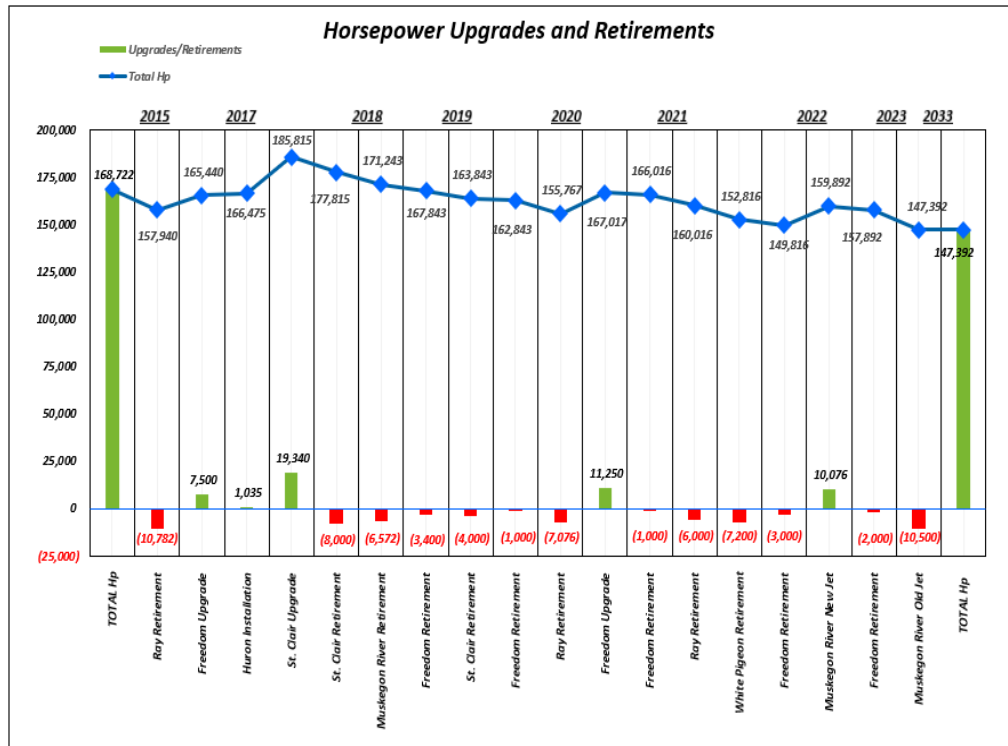
A transformation of compression maintenance practices to be more predictive and proactive, for example, will reduce ROR and increase the reliability and performance of compression assets.

As these practices demonstrate further increases to reliability, the Company will evaluate the compression portfolio to identify the appropriate number of reserved capacity assets and amount of capability required at each station to meet peak demand. This aligns with the Plan’s aim to improve supply resiliency and system optimization, including increasing the weighted average compression utilization rate as one of the 10-year outcomes.

Furthermore, the Company will monitor other factors that may impact the evaluation of whether to retire or upgrade compressors over time. For example, increasing market supply, storage cycling, or storage deliverability via compressor stations such as Overisel and Northville may require increasing hp at these two stations to reliably handle the increase in peak or seasonal throughput.

Figure 21 shows the Company’s current plan to optimize the compression fleet with an approximate net reduction of 21,328 hp from 2015 to 2033 without impacting customer deliverability.

Figure 21: Compression Fleet Optimization (2014-2032)



Implementation of API 1164 Cyber Security Upgrades

The Company is working to implement major modifications to the gas SCADA environment to ensure compliance with API 1164, Transportation Security Administration (“TSA”) cyber security standards, and the internal Operational Technology Security Reference Architecture (“OTSRA”).

The API RP 1164, TSA, and OTSRA requirements will collectively be referred to as the *Gas Security Standards*. This work involves the design, acquisition, installation, and implementation of network equipment, processes, and site modifications needed to comply with the *Gas Security Standards*.

Key Objectives:

- Modernize and standardize the gas SCADA networks at the gas compressor stations and control rooms.
- Mitigate cyber security vulnerabilities in the gas SCADA networks.
- Allow Consumers Energy to fully comply with the Gas Security Standards.
- Fulfill the Company’s commitment to the MPSC to provide a secure gas system to meet customer needs.

Compressor Station Compliance with Michigan NOx RACT and Federal Good Neighbor Rules

These rules impact the older, slow speed units at Northville, Overisel, White Pigeon Plant 2 and Muskegon River Compressor Stations. Each of these compressor stations have 4 engines that will require modification to achieve the proposed NOx RACT emission limit of 3.0 grams/brake-HP.

Overisel is in an area that is currently designated as ozone non-attainment and would be subject to the Michigan NOx RACT rule including the March 2024 compliance date.

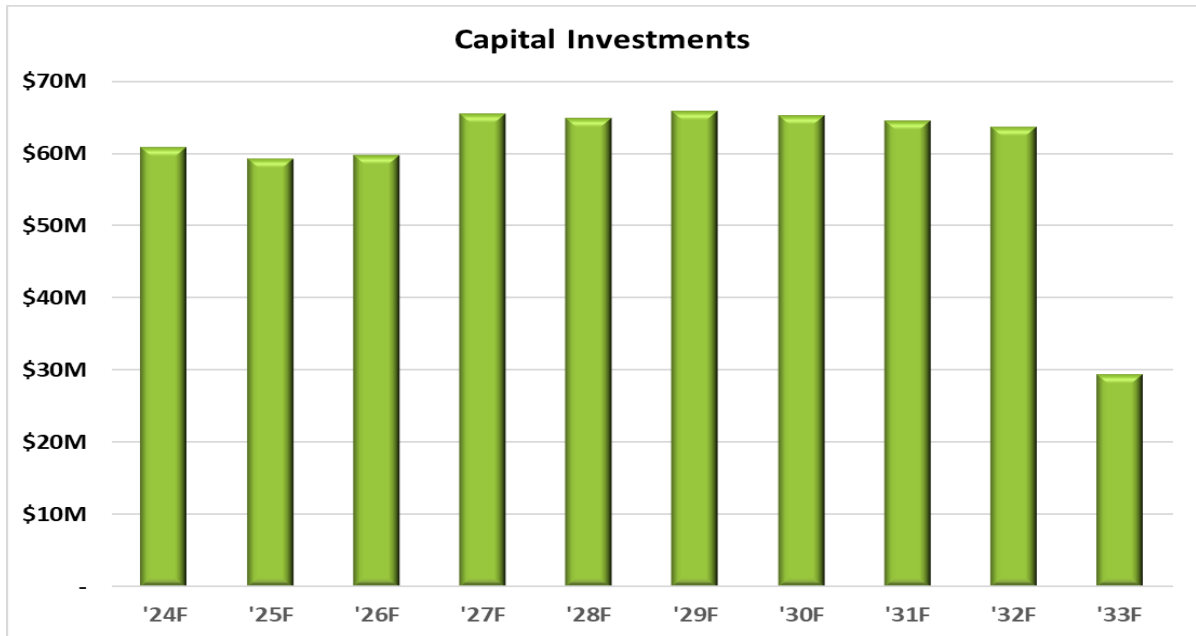
Northville, White Pigeon, and Muskegon River are in an attainment area but have engines that would need to be retrofitted to achieve compliance with the NOx emission limit in the federal Good Neighbor rule - which go in effect in 2026.

3. COMPRESSION ASSET FINANCIALS

Based on the modeling and planning to date, the forecasted capital investment plan for the Company’s compression assets is shown in Figure 22.

This capital investment plan will be updated routinely as the assessments are completed, and business cases are created to support the necessary spend plan in the future.

Figure 22: Compression Capital Investment Plan



Overall, this investment plan for the compression assets aligns with the Company’s objectives by reducing asset risk (safe), reducing the ROR and increasing utilization rates (reliable), optimizing the fleet with more modern equipment and modifying maintenance practices (affordable), and reducing the amount of equipment emissions (clean).

Natural Gas Delivery Plan

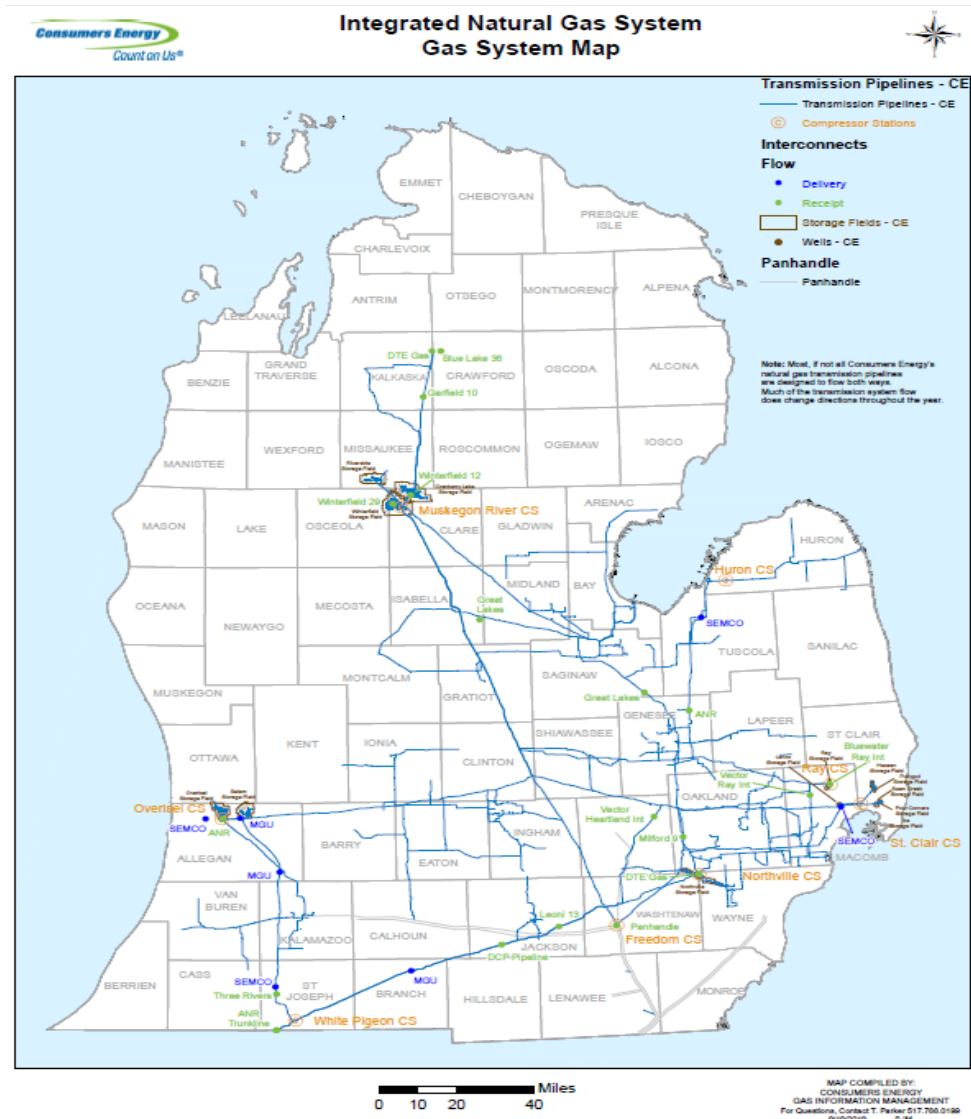
C. Transmission Asset Plan

The Company’s transmission system is the ‘expressway’ of the gas system, transmitting large quantities of gas in pipe diameters ranging from 4 inches to 36 inches, at high pressures. Per the Company’s 2022 Transmission DOT Report filing, there are 2,371 miles of pipeline that consists of:

- 1,569 miles of mainline pipelines—pipeline that the Company operates that connects with interstate supply
- 22 miles of pipeline within compression stations
- 258 miles of storage pipes—pipeline connecting from transmission to storage supply
- 522 miles of TOD, which are higher pressure distribution pipeline downstream of city gates but operating at transmission pressures and maintained using transmission standards

Figure 23 provides an overview of the Company’s transmission system.

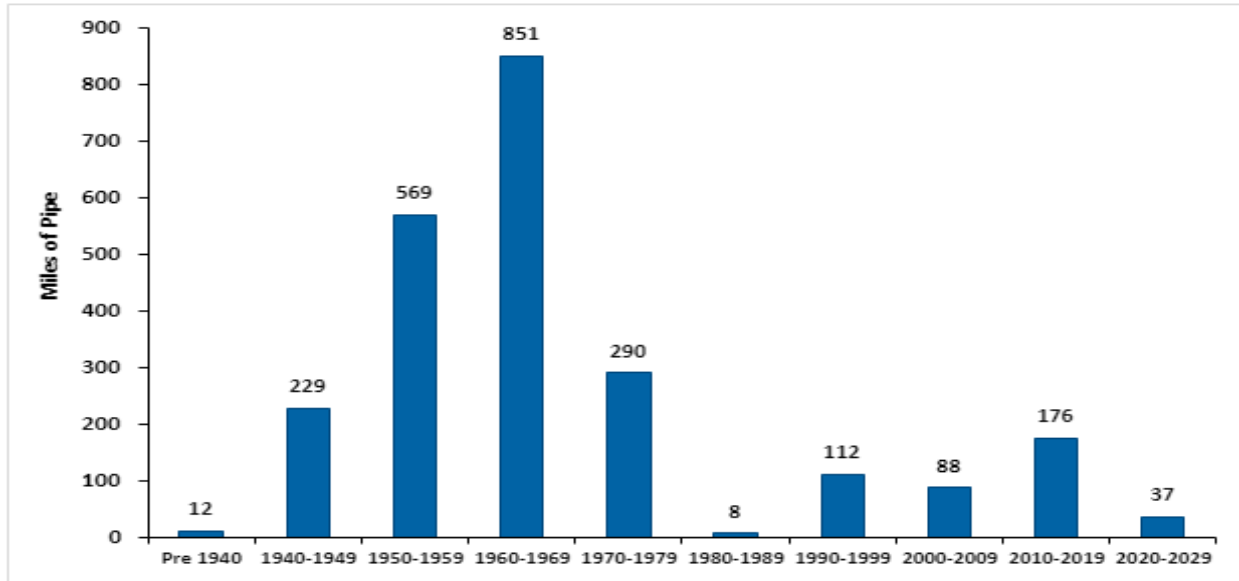
Figure 23: Map of Integrated Natural Gas Transmission System



Natural Gas Delivery Plan

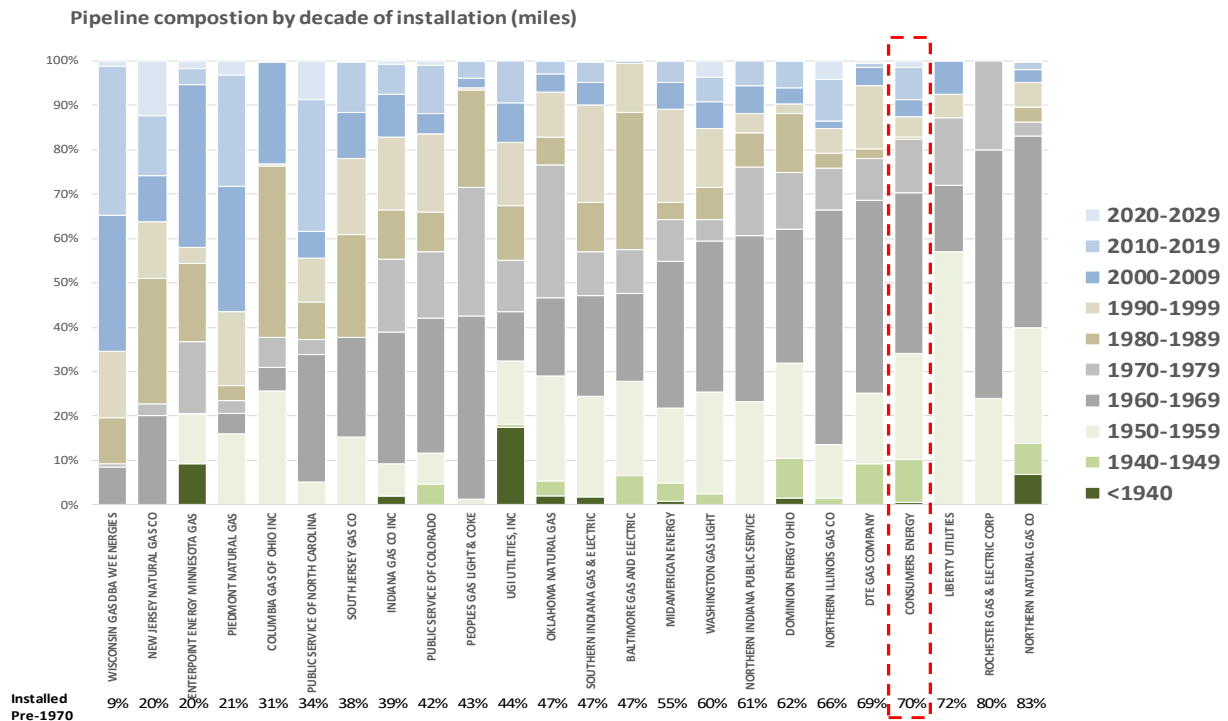
The weighted average age by miles for the transmission pipeline system is 51 years old. Approximately 1,951 miles, or 82%, of transmission pipe was installed in the 1970s or earlier, as shown in Figure 24. (See [Reference 1](#) in this section for citation source.)

Figure 24: Transmission Pipeline by Decade of Installation



Consumers Energy operates one of the oldest transmission systems in the country compared to industry peers as shown in Figure 25. (See [Reference 1](#) in this section for citation source.) Through an extensive inspection plan which includes maintenance and remediation as discussed below the Company ensures the safety and integrity of the transmission system.

Figure 25: Transmission Pipeline Age Relative to Peer



1. TRANSMISSION ASSET MANAGEMENT

a. Capital Remediation for Transmission Pipeline (i.e., “mainlines”)

By the end of 2025, all transmission mainline miles will be inspected regardless of consequence area classification. This does not include transmission miles within the storage fields, compressor stations, TOD segments or transmission lines installed within the last 10 years.

Within the transmission mainline miles are high-consequence areas (“HCA”) and moderate consequence areas (“MCA”). HCA and MCA classifications are currently inspected on a recurring basis, six and nine years, respectively.

In addition to the planned, on-cycle inspections, the Company is planning risk mitigation inspections for transmission lines that display early signs of deteriorating conditions, such as Stress Corrosion Cracking (“SCC”).

- SCC is a form of environmental cracking that requires three conditions to develop, susceptible material (steel), stresses on the pipeline that are higher than the threshold for SCC and an environment that supports cracking such as local soils and groundwater.
- Many factors can affect the initiation and propagation of SCC, but a pipeline’s coating system provides the primary barrier with Cathodic protection providing a secondary barrier.
- The environmental factors that support SCC can develop under the right conditions when the coating on a pipe is compromised or dis-bonded.
- In 2015, one of the Company’s pipelines ruptured due to SCC. Since that time, the Company has assessed pipelines that have the highest potential for SCC to occur, and there have been instances where SCC was found and remediated.

The Company started the construction of the Mid-Michigan Pipeline project in 2023 to replace an existing 70-year-old pipeline that has shown signs of SCC and experienced the rupture in 2015.

This project is further discussed in below in the section concerning the *Transmission Enhancements for Deliverability and Integrity* (“TED”)-I program.

b. Inspection for Transmission Operated by Distribution (TOD) Pipelines

The Company has 522 miles of TOD pipelines. Within this total, 104 miles of TOD reside within HCAs and will follow the inspection cadence discussed above.

For the remaining non-HCA TOD pipelines, the Company is extending the Low Stress Assessment process to inspect and remediate areas with low cathodic protection levels to ensure continued safe operation.

c. Transmission Enhancements for Deliverability and Integrity projects

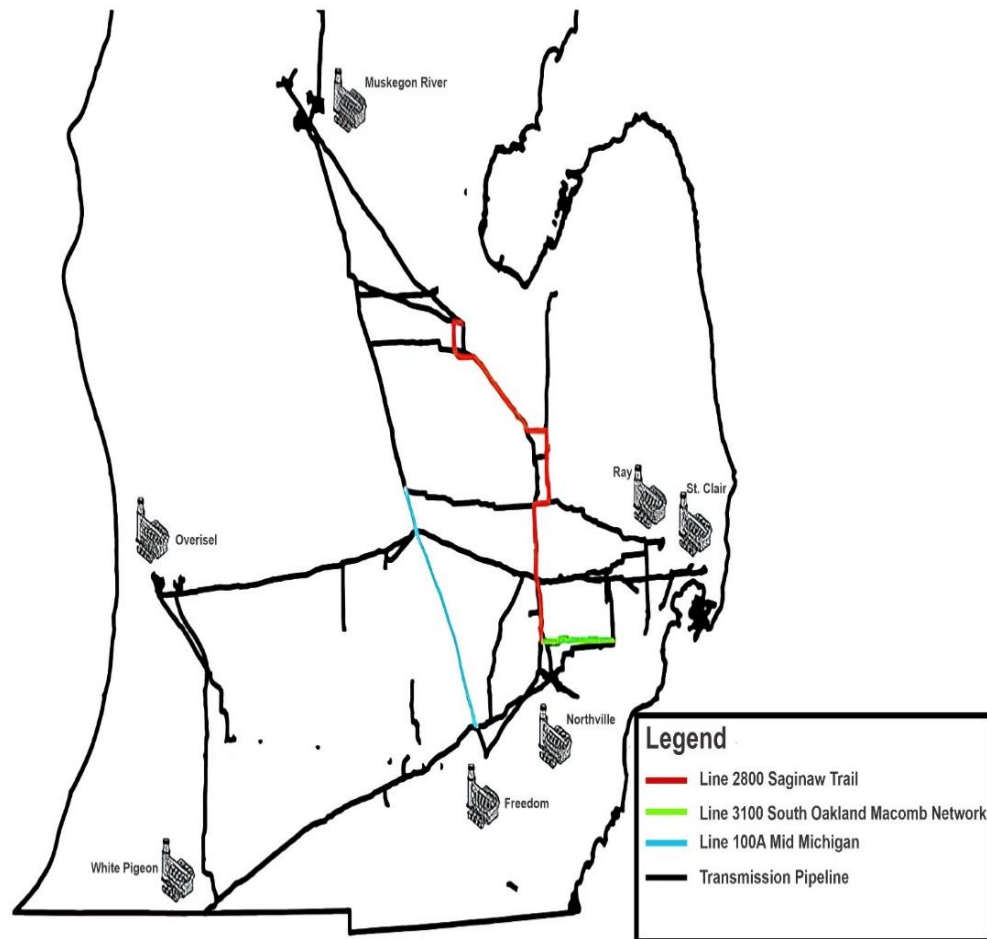
Transmission Enhancements for Deliverability and Integrity (“TED-I”) pipeline projects focus on maintaining integrity and deliverability, and include transmission pipeline replacements of higher relative risk pipe to ensure safe operation.

Higher relative risk pipe includes segments with previous anomalies or stress characteristics related to integrity management risk mitigation. Consumers Energy identified certain transmission pipelines to replace or upgrade due to their condition.

Natural Gas Delivery Plan

The major TED-I projects are Saginaw Trail Pipeline (started in 2017 and completed in 2020), the South Oakland Macomb Network (started in 2018 with construction and completed in 2021), and Mid-Michigan Pipeline (construction 2023 and 2024). They are shown below in Figure 26.

Figure 26: Map of TED-I Gas Transmission Pipeline Projects



As transmission lines age, there are two primary factors considered for replacement, capacity needs and integrity. All transmission lines are continuously evaluated based on these two factors, which forms the basis for prudent decision making in repair versus replacement. Capacity requirements are factored into line replacements to ensure customer deliverability.

- TED-I pipeline projects improve customer reliability and advance public safety by replacing or retiring higher relative risk pipe segments and, in some cases, increasing capacity which in many cases enhances system resilience.
- Additionally, the replaced pipelines also have enhanced pipeline pressure control and isolation capabilities.
- The Company is planning a transmission interconnect with DTE Gas in 2025 that will improve overall system resiliency to the benefit of customers of both Companies. In accordance with 1929 Public Act 9, the Companies plan to file for a certificate of necessity to construct and operate the interconnect by the end of the first quarter of 2024.

The TED-I plan will be continually evaluated based on integrity assessment results, analysis, construction efficiencies, and system modeling.

Natural Gas Delivery Plan

d. City Gates

Consumers Energy operates 90 city gates as of December 31, 2022, where pressure is regulated, and the natural gas is odorized for safe delivery to homes and businesses. For the purposes of this document, a city gate is a distribution center and / or fuel station. Over-pressure protection and SCADA monitoring equipment are located at city gates.

- City gates are an important component to the natural gas system in that they reduce transmission line pressure for distribution use and in some cases improve the quality of gas before entering the distribution systems.
- Most city gates also inject an odorant into the gas stream for leak detection through the sense of smell. Please see the section titled [Odorizers](#) below in the distribution asset plan.
- Additionally, city gate facilities and the equipment located within them have a reasonable life span of about 50 years. However, age alone is not the primary factor for rebuilding a city gate.

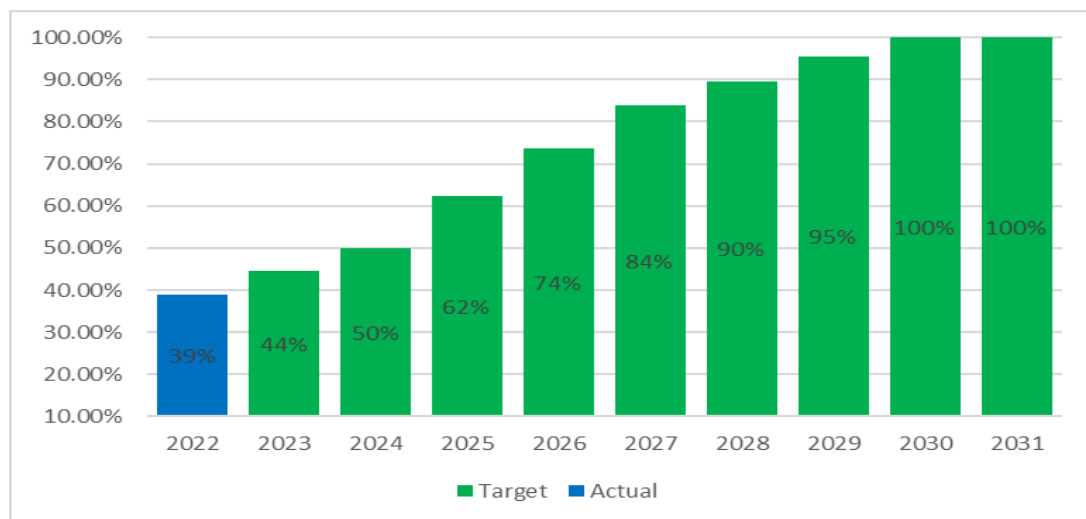
The Company has developed a ranking rubric that provides quantifiable risk ranking for each city gate. With expert judgement, the risk ranking model will help provide input into the rebuild prioritization.

The city gate fleet goal is to ‘modernize’ 90% of the Company’s city gates within this 10-year plan. *Modernization* is defined as upgrading the following mechanisms: emergency shutoff system, bath heater system, separation systems, and the required SCADA transducers for each stage.

The 10-year plan shown on Figure 27 calls for the modernization of 5-11 city gates each year. In addition to full rebuilds, components required for modernization will be rebuilt or added as appropriate rather than full rebuilds as specific station needs dictate in consideration of customer affordability.

After modernization is complete, city gates will be rebuilt on a cycle that will ensure the entire fleet is rebuilt within 50 years, or as required for safety, customer demand, and high-performance demand.

Figure 27: City Gate Attribute Modernization Plan



To achieve this target, the continued level of spending at between \$1 to \$13 million per city gate, or \$40 to \$55 million annually for the entire program for the next 10 years is prudent. (See [Reference 3](#) in this section for citation source.) In addition, a Gas SCADA system upgrade is conducted.

Natural Gas Delivery Plan

e. Remote Control Valves (RCV)

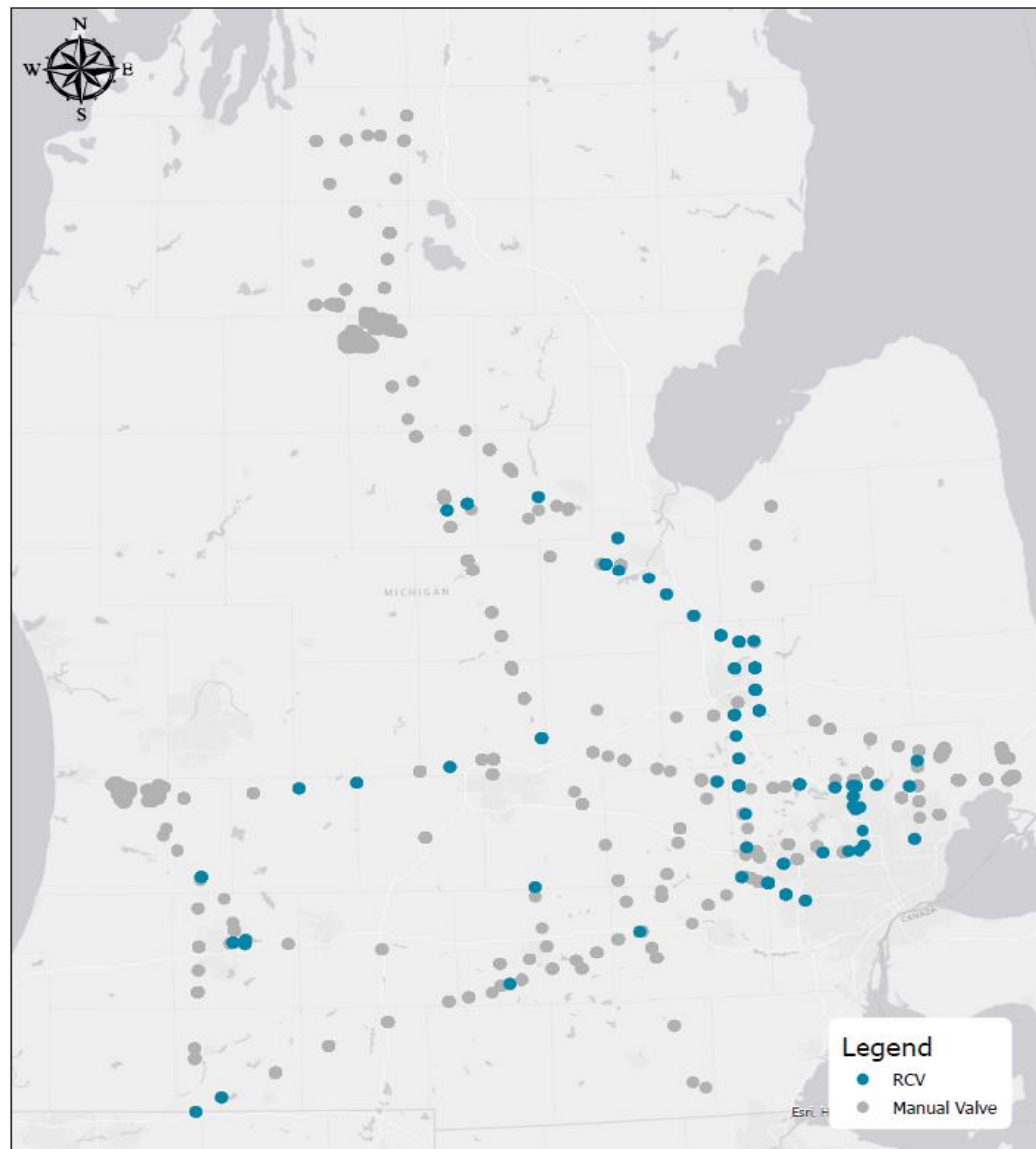
RCVs are important safety components in the natural gas system. RCVs reduce response time in the event of damage to a transmission line or a rupture event. The ability to remotely and quickly stop the flow of gas is essential, and RCVs are the standard for achieving this across the system.

It is important to note that RCVs do not prevent failures from occurring but are intended to minimize the time gas flows after a failure. These RCVs also allow for manual operations if a condition calls for an operator to override the RCV.

- Check valves will also be used on transmission tap lines when appropriate to aid RCVs in the isolation of a particular transmission segment.
- Check valve technology prevents the back feeding of gas in the event of an emergency.

In 2017, RCVs were first installed in HCAs and at flexible points in the system, as mapped in Figure 28. (See [Reference 2](#) in this section for citation source.)

Figure 28: RCVs as of April 2022



Natural Gas Delivery Plan

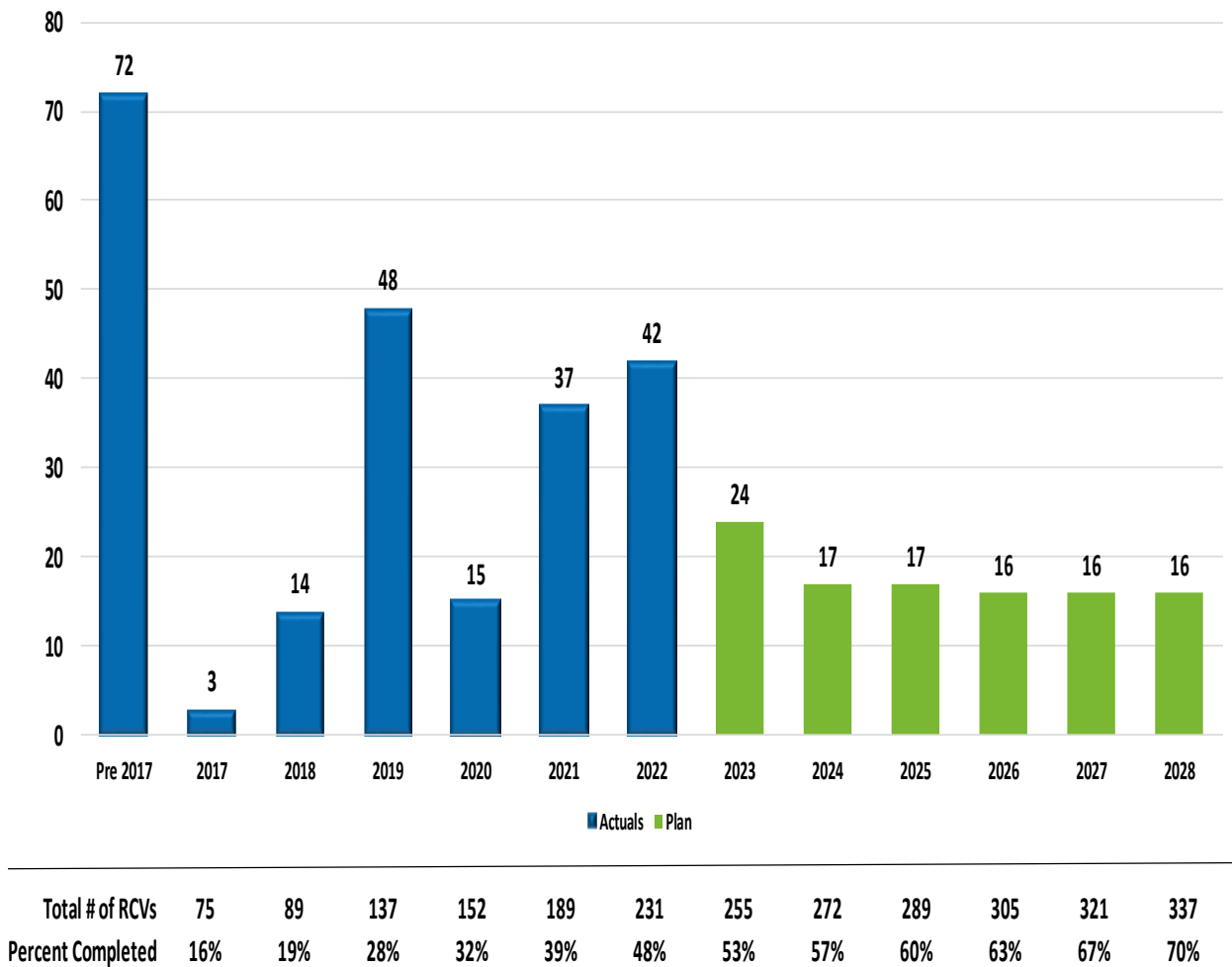
To leverage RCVs as a means of increasing the safety of the transmission system, the Company is planning an installation rate toward a goal of 70% of the system valves by 2028, as shown in Figure 29.

This safety benefit is the time reduction to isolate the system during an emergency or abnormal operating condition. The current goal aligns with the continuously evolving prioritization of work, available resources, and system outage schedules.

In addition, a Gas SCADA system upgrade is being conducted to support this plan. Currently, the Company has 481 valves on the transmission system, requiring approximately 336 additional RCVs to reach the 70% goal.

Figure 29 below represents the year in which the RCVs have been installed and are planning to be installed with final commissioning of RCVs sometimes occurring in the subsequent year.

Figure 29: Current RCV Installation Rate



Natural Gas Delivery Plan

f. Other Transmission Investments

In addition to the Transmission Investments mentioned above the Company routinely invests in other programs that ensure safety, resiliency, reliability, and compliance with regulations. These include:

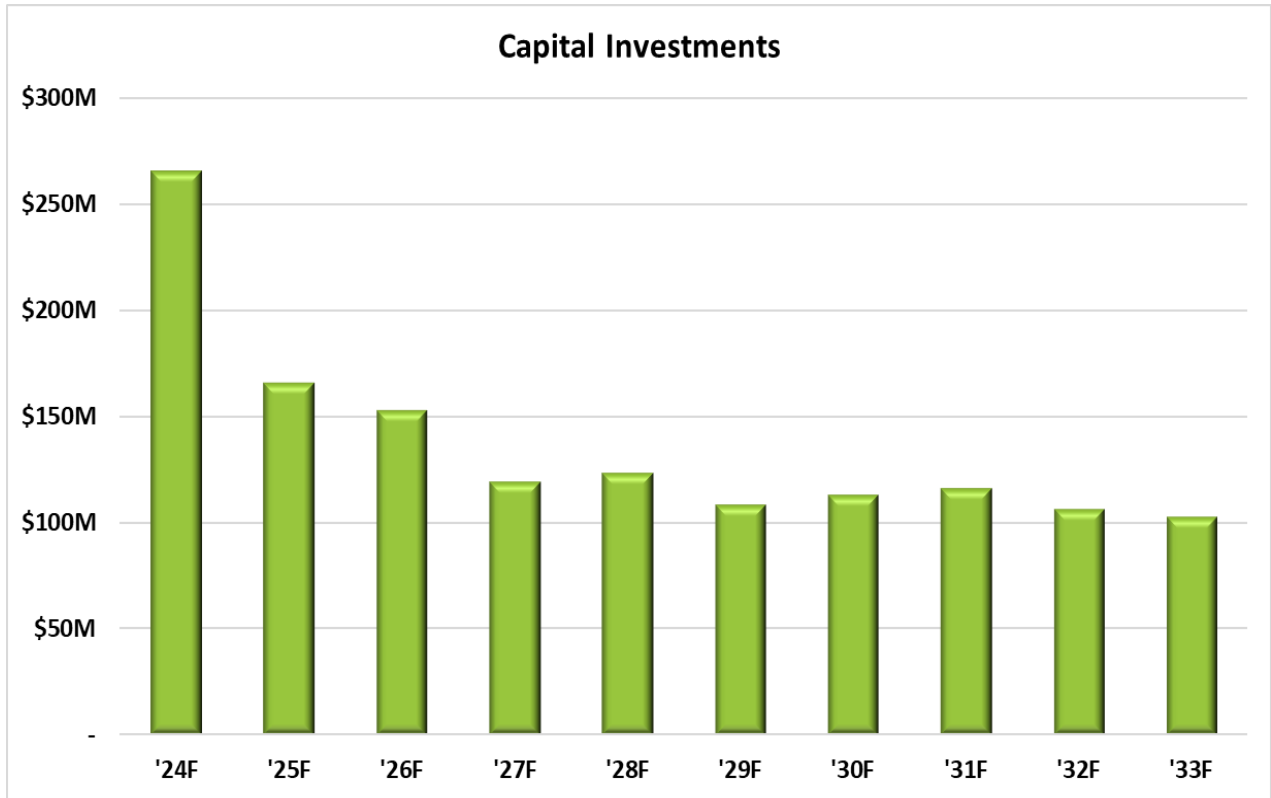
- Asset Relocation Transmission investments include gas transmission infrastructure replacement projects that are required due to civic improvement activities initiated by federal, state, or local governmental units where transmission pipeline location or depth of cover requires relocation of an existing pipeline to prevent third-party damage, eliminate physical conflicts with other utilities, and to ensure continued safe operation. A major project in the near term that has received an Act 9 certificate of necessity to construct is the relocation of a transmission line in Sleepy Hollow State Park in 2024, in conjunction with the Mid-Michigan Pipeline project.
- Cathodic Protection Program allows the Company to maintain compliance with federal regulations for cathodic protection of facilities.
- MAOP Compliance – Pipeline investments involve MAOP verification and remediation of the Company’s transmission pipelines, including Transmission Operated by Distribution pipelines.
- Deliverability Base Field Measurement investments are essential to ensure accurate gas quality and measurement.
- Deliverability Base Pipeline expenditures support maintaining operations in accordance with the Michigan Gas Safety Standards (“MGSS”). Types of projects include:
 - Replacement of valves, and if necessary, the associated valve operators, when inspection determines that the valves no longer perform as needed, which may mean valves no longer turn or they may not fully seal off the flow of gas (MGSS Rules 192.145, 192.150, 192.179).
 - Replacement of piping due to MAOP revisions identified as a result of class location changes (49 CFR 192.5 and 192.611).
 - Construction of new sectionalizing valves and tap valves to improve system deliverability and help meet valve spacing requirements defined by 49 CFR 192.179; (iv) reconfiguration of tap piping (i.e., laterals) and associated valving upstream of city gate facilities as companion projects to city gate rebuilds.
 - Installation or retirement of pipeline taps to Transfer Meter Site facilities being attached to the Company’s system.

2. TRANSMISSION ASSET PLAN AND FINANCIALS

Consumers Energy’s transmission inspections, remediation work, city gate modernizations, and RCV installations provide the basis for the capital investment plan shown in Figure 30.

Overall, this investment plan for the transmission asset class aligns with the objectives by reducing asset risk (safe), ensuring the pipelines can flow when required (reliable), providing the necessary resiliency to obtain either pipeline or storage gas supplies and being remote controlled for system agility (affordable), and reducing the amount of emissions in this system (clean).

Figure 30: Transmission Capital Investment Plan



3. REFERENCES

1. U.S. DOT PHMSA reported figures (March 2022)
2. Geographic Information System (GIS) database
3. Capital Budget O&M (September 2021), Capital Budget Engineering (September 2021)

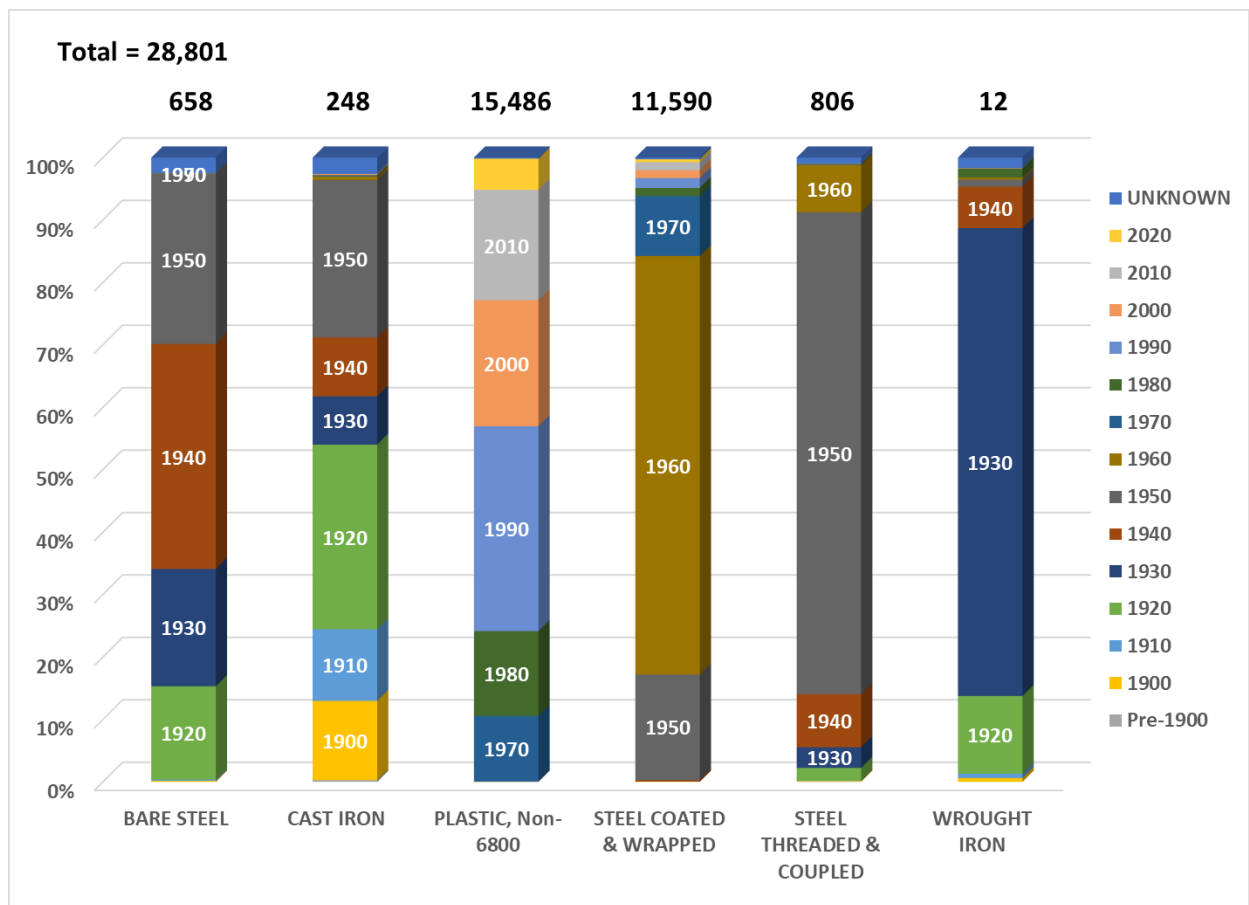
D. Distribution Asset Plan

The distribution system moves gas from city gates through pressure regulation stations to neighborhoods, C&I districts, and customer homes and businesses.

- Consumers Energy had 28,277 miles of distribution pipeline, 522 miles of TOD pipeline, and 1.6 million services as of December 31, 2022.
- Gas enters the distribution system at 60–400 psi, and residential meter service pressures are less than 1 psi. The distribution system includes some of the Company’s oldest facilities and is situated closest to the public. Therefore, reducing risk in this area is a critical focus of the plan for safety and reliability.

The Company’s system is comprised of a variety of materials with installations dating as far back as the early 1900s as shown in Figure 31 below. (See [Reference 1](#) in this section for citation source.)

Figure 31: Distribution Main by Materials and Installation Date (includes TOD)



Cast and wrought iron pipelines are among the oldest in the Company’s distribution system. Nearly 65% of these pipeline types were installed pre-1940 making them over 80 years old and still deliver natural gas to customers today.

Natural Gas Delivery Plan

The age of the pipelines makes them susceptible to corrosion and cracking due to the degradation of the iron alloys (i.e., pipes rust and get brittle with age) and pipe joint design.

The following factors increase the risk involved with a system that contains vintage materials:

- Bare steel (also called ‘uncoated’) pipelines are considered higher risk due to corrosion and cracking caused by age and lack of protective coating. External corrosion occurs on metal pipe due to soil and moisture conditions. Bare steel pipe is in direct contact with these corrosive conditions.
- Fluctuations of temperatures during the seasons, as experienced in Michigan, create additional risks. Once the ground freezes at low temperatures, pipelines are susceptible to frost heave causing new cracks to form and existing cracks to expand.
- Natural gas vapors are lighter than air and will generally rise and dissipate quickly. These vapors will move through the soil finding the path of least resistance. Frozen ground acts as a vertical barrier causing gas to gather and pushing it horizontally until it finds an opening (porous/cracked foundations, water/sewer lines) often leading into a building.
- Water infiltration - In underground low-pressure gas pipelines, a leak may result in water infiltration (also called ‘water ingress’). Groundwater enters the gas pipeline through a crack or corroded section of pipe, and eventually blocks the gas flow to the customer. In winter months, the water can freeze causing additional blockages, customer meter freeze-offs, and/or expanding existing pipeline cracks.

PHMSA classifies the highest risk materials, in order of risk, as:

- Cast iron (249 miles in the system)
- Bare steel (658 miles in the system)
- Threaded & coupled steel (806 miles in the system)

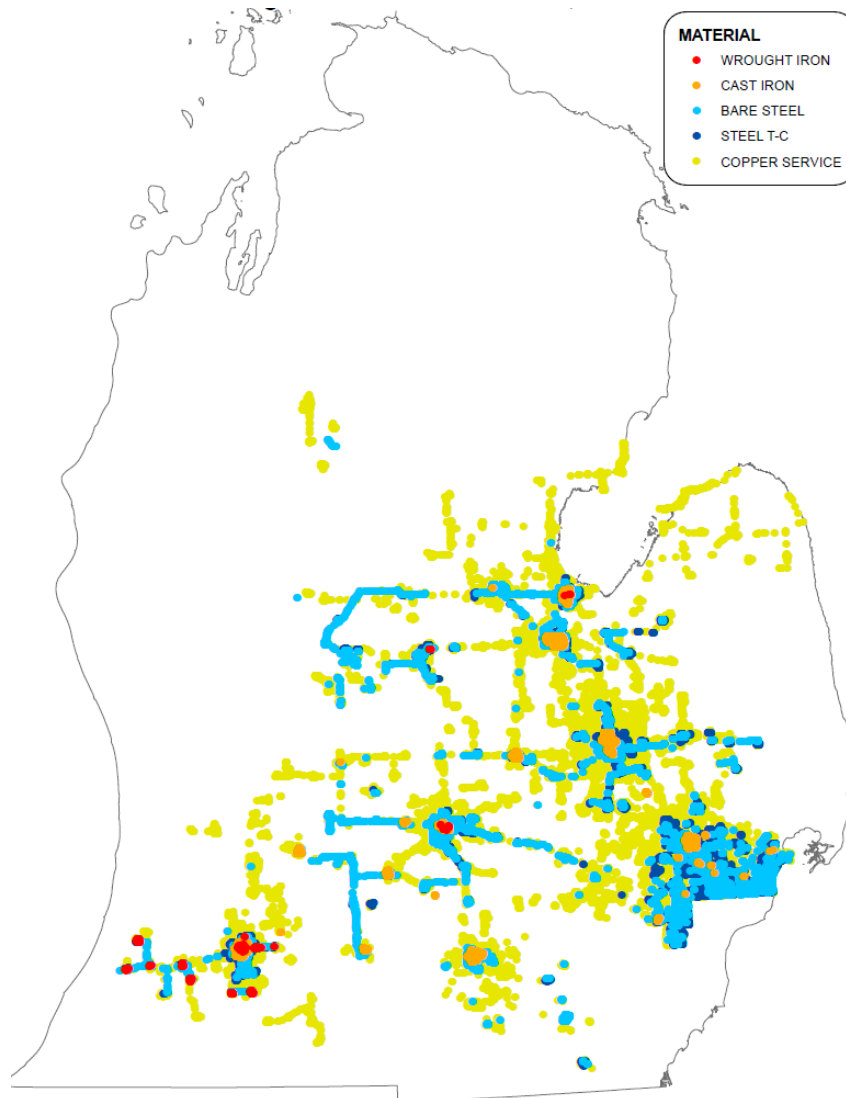
And as less frequent materials:

- Wrought iron (12 miles in the system).

These at-risk materials total 1,725 miles of main or approximately 6.0% of all distribution main miles. Of the remaining 1,725 miles, there are 1,495 miles located within the SP/MP system and 230 miles are in the HP system.

Figure 32, on the following page, is a map of these at-risk materials for the Company’s system. (See [Reference 2](#) in this section for citation source.)

Figure 32: Map of Vintage Distribution Materials



Another distribution integrity risk is pipes operating at standard (utilization) low pressure. Gas needs to reach each customer with enough flow rate and pressure to fuel equipment and appliances while staying below the maximum operating pressure for each segment within the system.

The standard pressure system operates at 7" water column ("WC") (about a ¼ psig) and does not require a pressure regulator for each customer's service. The challenges of operating a standard pressure system are the dynamic flow and pressure changes due to varying customer demand within a narrow pressure operating range.

This system struggles to operate at rated pressures on extreme cold weather days, respond to customer demand changes, etc.—and requires accurate and timely pressure control to meet deliverability requirements. If the rated pressure is not maintained and drops below 7" WC, customers may experience heating and other appliance problems due to low gas pressure.

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Other factors that can contribute to low gas pressure are:

- Standard-pressure portions of the system, with largely vintage materials, which are susceptible to fluid infiltration from the ground. This fluid can travel through the system, including to customers' meters.
- In freezing temperatures, this fluid may seal the orifices of the meter and/or regulator and interrupt gas flow. This poses a risk to customers during the heating season. Furthermore, removal of this fluid requires maintenance of documented 'drip' points on the standard-pressure system with additional costs for removing/pumping the fluids.

The Company's 1,725 vintage miles cover all but approximately 80 miles of the standard-pressure system. Therefore, the plan is to add the 80 miles of standard low-pressure pipe into the vintage remediation goals, to be discussed in further sections.

Finally, the standard pressure system requires additional regulation facilities that could be retired with the elimination of this portion of the system.

1. DISTRIBUTION ASSET MANAGEMENT

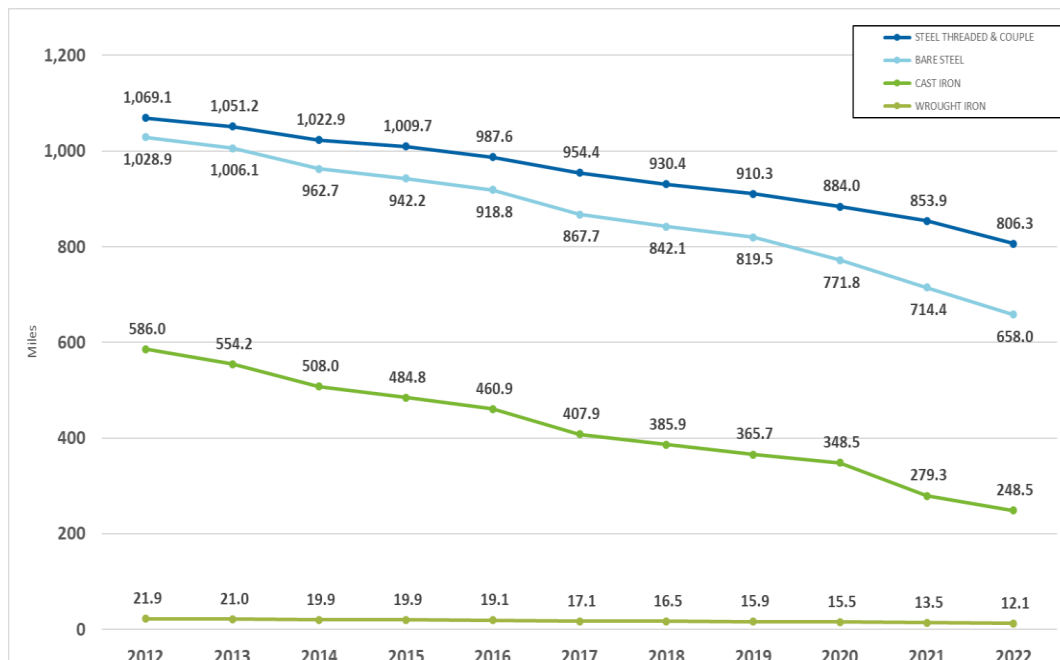
Overview of the Current Main and Service Remediation Program (i.e., EIRP)

The *Pipeline Inspection, Protection, Enforcement, and Safety Act* ("PIPES") of 2006, Public Law No: 109-468, mandated that PHMSA, within the U.S. Department of Transportation, prescribes standards for *Distribution Pipeline Integrity Management Programs* ("DIMPs").

Federal DIMP rules were subsequently established under Subpart P of the U.S. Code of Federal Regulations, Title 49, Part 192. The Company's current replacement program (part of Consumers Energy's DIMP to remediate at-risk cast iron, bare steel, and threaded and coupled steel) is the EIRP.

The EIRP was launched in mid-2012, with the first full program year in 2013. Since inception, the program has remediated 231 miles of cast iron, 265 miles of bare steel, 119 miles of threaded and coupled steel, 5 miles of wrought iron, 1 mile of x-trube, 19 miles TOD, 38 miles of Low Frequency Electric Resistance Welded ("LFRW"), for a total of 702 miles, as outlined in [Table 4](#).

Figure 33: Vintage Miles of Main Remaining by Material Type



Natural Gas Delivery Plan

Figure 33 above shows the miles of historic Vintage Material remaining on the system based on data submitted on and supplemental data to the Distribution DOT annual report for that year.

Bare steel TOD is included in the Bare Steel. This figure shows 1,725 total miles of SP/MP Vintage and HP Vintage main remaining on the system at the time of the 2022 DOT Report submittal, and is represented by the first two bars in Figure 34 (Remaining EIRP Program Retirement Miles).

Table 4: Miles Remediated Under EIRP

Year	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
	Miles remediated in EIRP Program											
Cast Iron	5.3	29.9	28.7	32.9	23.1	24.0	13.3	9.3	13.9	50.6	23.0	254
Threaded & Coupled	1.0	6.0	10.3	11.0	17.1	14.2	11.2	9.6	19.8	14.9	4.2	119.3
Bare Steel	5.0	16.9	12.9	25.1	25.8	21.7	14.0	14.0	26.6	46.4	56.6	265.0
Wrought Iron	0.0	0.2	0.8	2.7	0.3	0.8	0.0	0.0	0.0	0.4	0.0	5.2
X-trube	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9
Copper	0.0	0.2	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.6
TOD	0.0	0.0	0.0	3.8	1.0	0.0	3.6	1.6	2.3	6.7		18.9
LFERW	17.0	8.0	3.6	2.5	2.5	2.6	1.4	0.8	0.0	0.0	0.0	38.4

The numbers in Table 4 above do not include miles remediated as part of other programs, such as Asset Relocation, which is relocation or replacement work completed due to municipality needs.

The data is specific to the EIRP Program and is based on the EIRP Annual Performance report data. The totals may not sum to the individual years due to rounding.

Figure 34 shown below shows a breakdown of the remaining EIRP program miles by material, pressure class, and expected Other Program impact as of 2/7/2022.

Natural Gas Delivery Plan

Figure 34: Remaining EIRP Program Retirement Miles

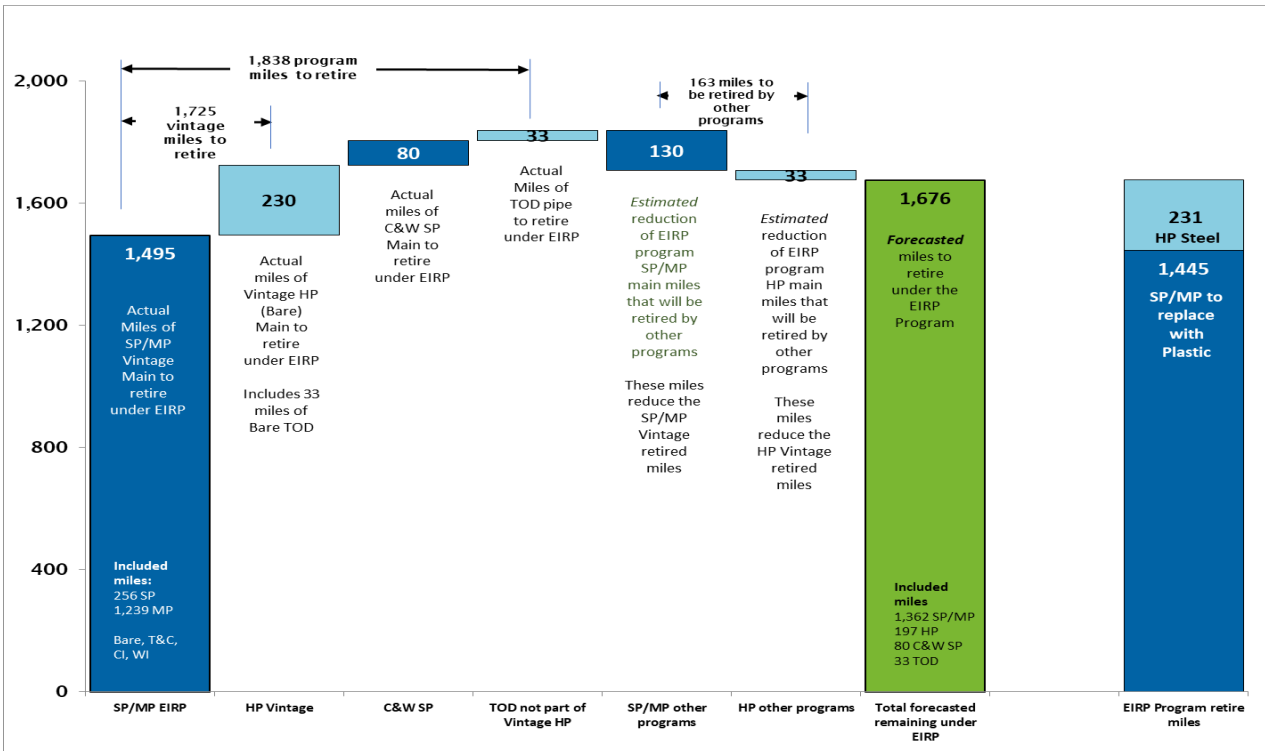
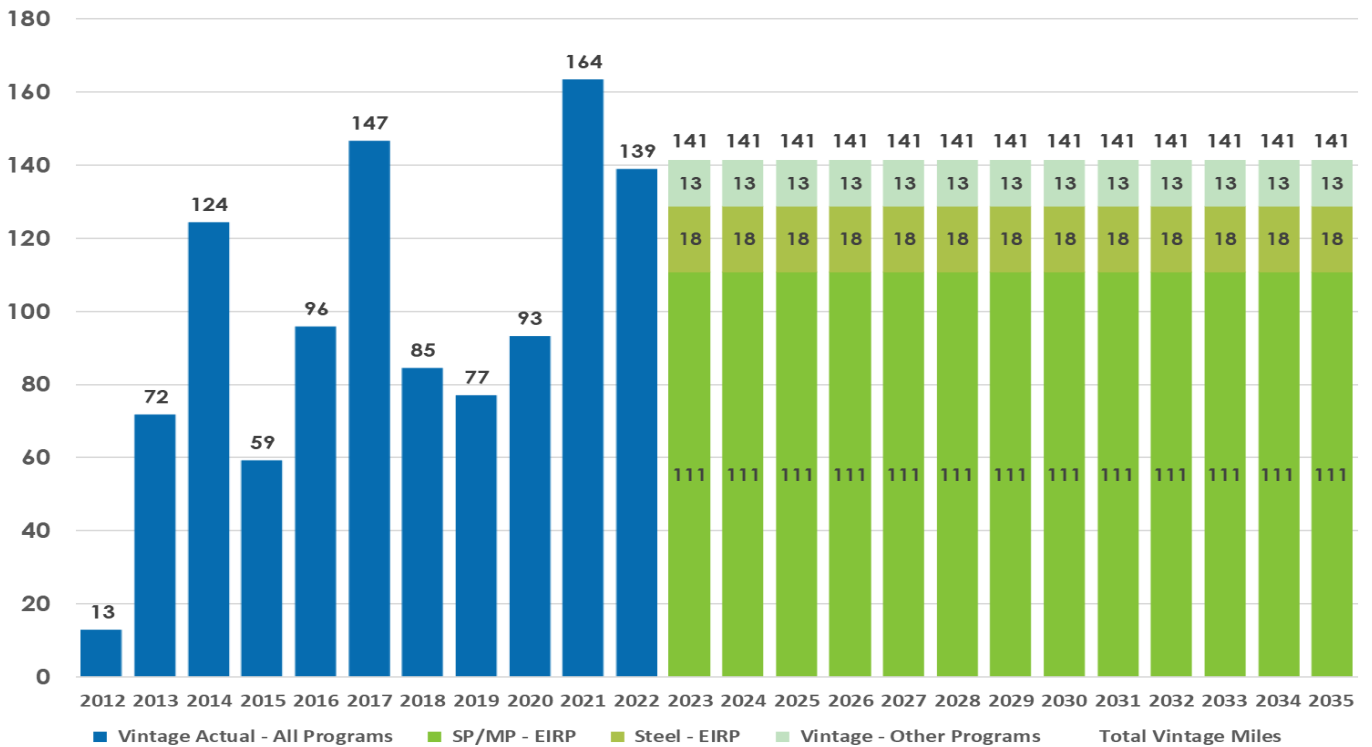


Figure 35 represents the historic 2012-2021 vintage miles retired by all programs and illustrates the new plan for the 1,838 remaining miles to retire from 2023-2035.

Figure 35: Retired Vintage Miles for All Programs



Retired pipe refers to the amount of existing vintage pipe on the system needing to be replaced. Installed pipe refers to the amount of new pipe needed to be installed to replace the existing retired pipe.

Figure 36 represents the forecasted installed miles based on the 2023-2035 retirement plan identified above in Figure 35.

Figure 36: Forecasted Installed Miles through the EIRP



2. OVERVIEW OF DISTRIBUTION SERVICES AND VINTAGE SERVICE REPLACEMENT PROGRAM

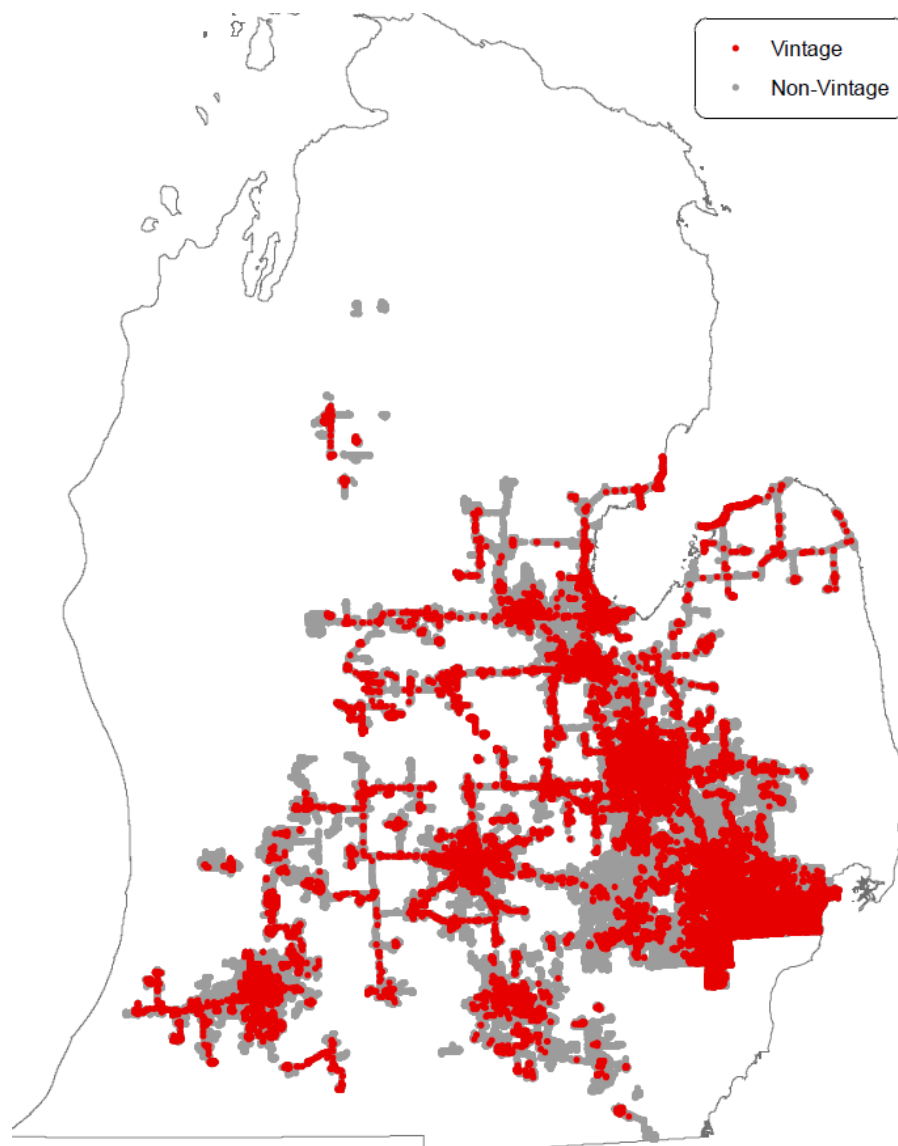
The Consumers Energy distribution system includes approximately 1.6 million service lines that connect the distribution mains to homes and businesses. Service lines can contain at-risk materials.

- As of December 31, 2022, the system contains approximately 100,015 copper services, or 6.2% of all services and, in a much smaller quantity, the system also contains 7,034 bare steel services.
- The Company’s VSR Program will also replace services for which the material is unknown.

Current vintage services are dispersed evenly across the system, as mapped in Figure 37. (See [Reference 2](#) in this section for the citation source.)

Natural Gas Delivery Plan

Figure 37: Map of Copper and Bare Steel Services



Consumers Energy launched a VSR Program in 2017. This program, as well as other programs that replace mains and services, remediated approximately 11,500 services in 2017; 13,200 services in 2018; 11,700 services in 2019; 9,500 services in 2020; 7,900 services in 2021, and 10,411 in 2022.

It is projected to remediate 7,400 services in 2023 with an increasing pace for the future.

Similar to vintage main replacement, to align service line replacements with the 2035 vintage main goal, the Company has **streamlined planning across all vintage remediation programs and leveraged construction efficiencies** to minimize customer impact.

Vintage services are replaced across multiple programs. The Company has categorized vintage services to forecast the quantities to be replaced by program.

Natural Gas Delivery Plan

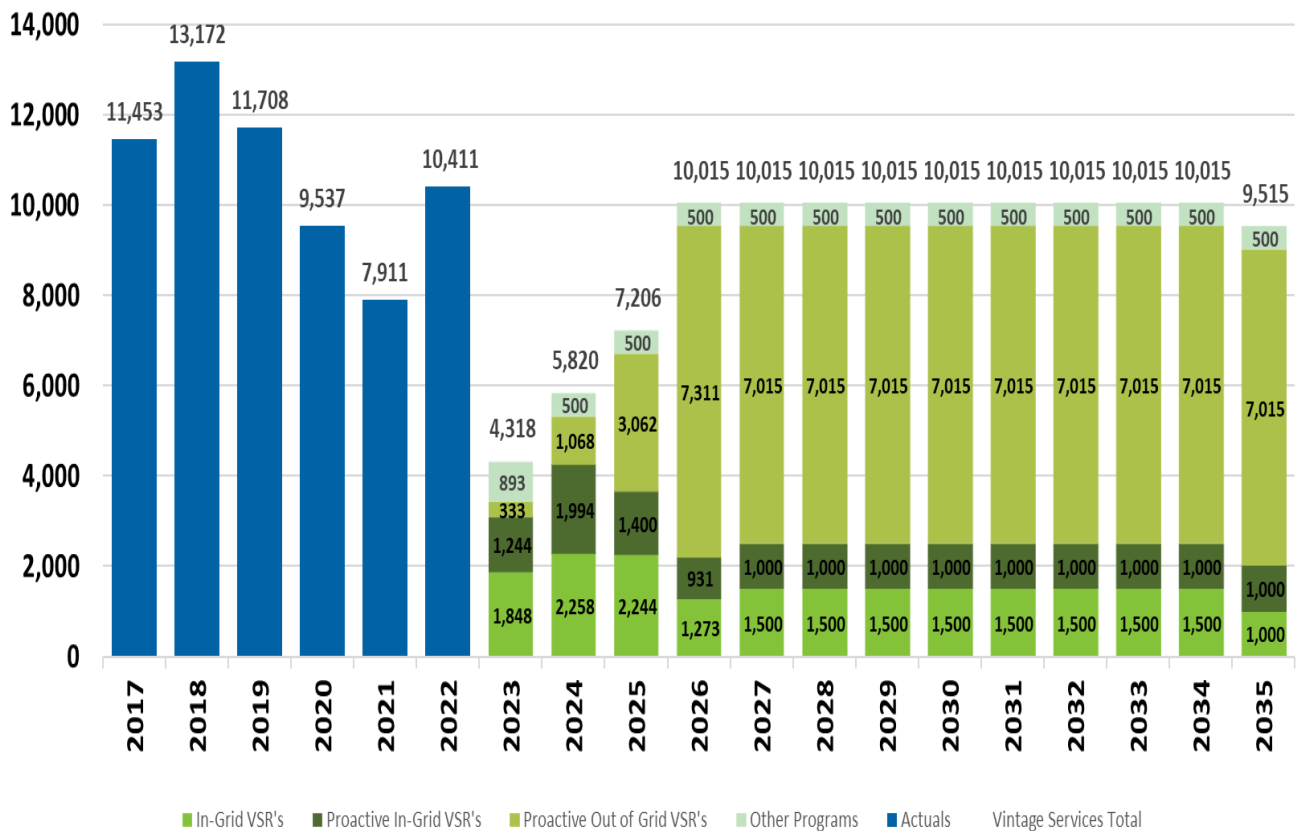
Within an EIRP project, vintage services are classified into two groups, In-Grid VSRs and Proactive In-Grid VSRs.

- In-Grid VSRs are vintage services attached to a vintage main.
- Proactive In-Grid VSR's are vintage services attached to a non-vintage main. Proactive Out-of-Grid VSR's are vintage services located outside of an EIRP project.

These services could be replaced by various programs including VSR, Civic, Leak, etc.

Figure 38 below shows the forecasted yearly targets by category.

Figure 38: Remediation Plan by Category for Vintage Services



3. MAINTAIN PACE OF VINTAGE MATERIAL REMEDIATION

To reduce risk, improve reliability, and reduce methane emissions, Consumers Energy accelerated the remediation of all vintage materials.

In an effort to balance safety and reliability with affordability, the Company collaborated with external stakeholders and decided to make the miles and services of vintage materials remediation level over the future years and extended the program end date from 2030 to 2035.

Benefits to Customers of Vintage Material Remediation

- A target of 2035 still positions the Company to remove risk from assets and helps ensure the safety of customers and the public while balancing with affordability.
- Maximizing the customer experience by replacing mains and services using the grid approach, where possible, for efficiencies and less disruptions to customer property by reducing project mobilization and demobilization to the same or nearby neighborhoods.
- Remediating vintage materials also drastically reduces methane emissions. Methane studies estimate that cast iron pipes leak almost 23 times more methane than plastic pipes, while unprotected steel leaks almost 10 times more.
- Improving local coordination with municipalities to better align the timing of Company-planned project work with public works projects.
- Improving customer safety and reliability by more rapidly eliminating the higher-risk vintage main pipe and services from the system.
- Improving system efficiency due to higher operating pressure and reduction of standard pressure on the system.
- Lowering gas losses and reducing methane emissions into the atmosphere.
- Reducing O&M costs for leak repair and survey as provided in the annual EIRP Performance Report.

4. FUTURE INFRASTRUCTURE RISK REDUCTION PROGRAM CONSIDERATIONS

Consumers Energy is in the process of replacing our high-risk vintage mains and services as discussed earlier in the Natural Gas Delivery Plan.

As a next step, Consumers Energy has begun identifying the next areas of high-risk after completion of the vintage material replacements. Currently under consideration are the following higher risk areas.

Services

- Consumers has approximately 9,000 vintage service stubs made of Copper, Bare Steel, and X-Trube Steel on the system. Consumers Energy would replace these services to eliminate vintage stubs. The service stubs are a result of historical maintenance where a service was not retired or replaced due to limited access to the main.
- Replacement of metallic services that are currently not cathodically protected, as the cost of replacement of that service with plastic would be more economical than the cost to add cathodic protection.
- X-Trube services are of 1950-1960s vintage. X-Trube is protective-coated thin wall steel pipe. This material has the highest leak rate. Consumers Energy has approximately 100,000 X-Trube services on the system. Consumer energy would replace these services, similar to the replacement of other vintage materials.

Mains

- Replacement of metallic mains that are currently not cathodically protected, as the cost of replacement of that main with plastic would be more economical than the cost to add cathodic protection. Cathodic protection did not begin until about 1970, but Consumers Energy has been installing Coated and Wrapped (C&W) main since the 1950s. These mains therefore were used for up to 20 years without cathodic protection. C&W unprotected pipe within the date range above and additionally currently cathodically unprotected pipe would be evaluated and criteria developed to determine the focus area.
- As of December 31, 2022, there are 522 miles of Transmission Operated by Distribution (TOD) main on Consumers Energy’s system. The EIRP is forecasting replacement of 80 miles of the 522 remaining TOD miles by 2035. The remaining TOD miles, approximately 442 miles, must be replaced to lower the SMYS below 20%, which addresses MAOP concerns and reduces operating costs.

5. RECOMMENDATION FOR REGULATOR STATIONS, ODORIZERS, AND STANDS

Currently, the Company operates and maintains approximately 690 regulator stations, 1,200 regulator stands, and 100 odorizers as of December 31, 2022. These are important assets on the distribution system, where natural gas pressure is regulated for safe delivery to customers. Regulator *stations* include 2” and larger pipe that feeds a distribution region, and Regulator *stands* include 1” regulator units that feed smaller distribution systems.

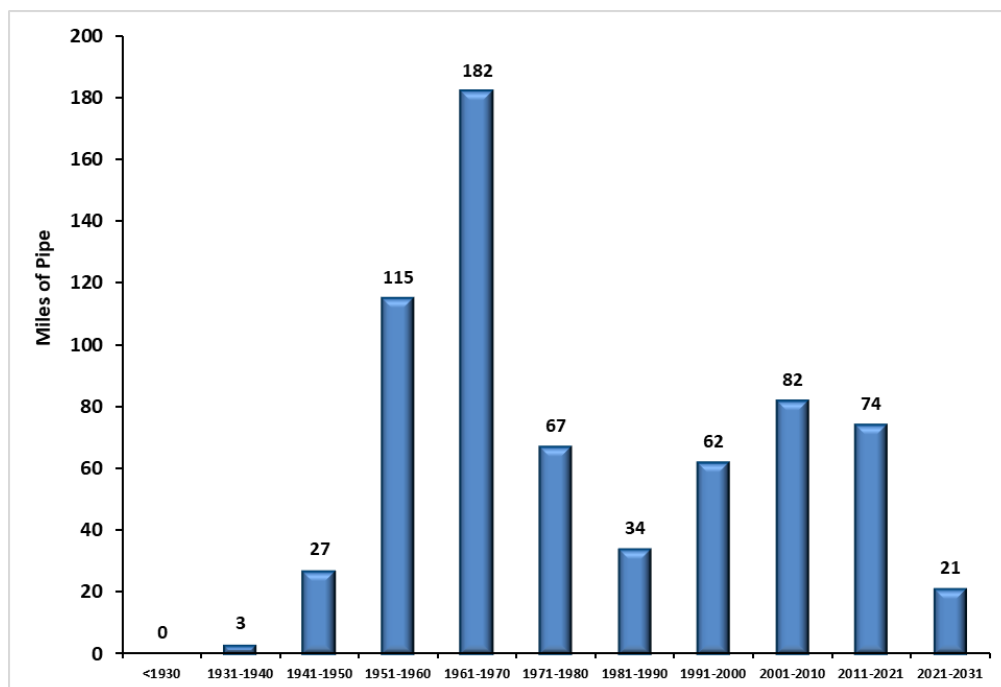
Regulator Stations

Regulator stations reduce pressure supplied from a higher-pressure system.

Investments made into regulator stations improve safety and maintain the integrity of the asset. These investments include over-pressure protection and SCADA monitoring equipment. Approximately half of the regulator stations were installed before 1971, as shown in Figure 39. (See [Reference 4](#) in this section for citation source.)

The 10-year goal for the regulator station fleet is to ensure 60% of all regulator stations are not in service longer than 50 years.

Figure 39: Distribution of Regulator Station in Service Dates



Natural Gas Delivery Plan

A reasonable expectation of life span for a regulator station is approximately 50 years. To maintain an average lifespan of 50 years across the fleet of regulator stations, the Company must rebuild 8-12 stations per year at an average cost of \$3 million per regulator station while retiring four standard pressure serving regulator stations. This equates to an average program cost of approximately \$30 million per year in station rebuilds.

Adding more distribution systems monitoring through SCADA, particularly at regulator stations and odorizers requires technology updates, including upgrades to the SCADA historian and monitoring systems. These enhancements allow for additional data points to be monitored along with additional storage for that data. See the [Technology – Digital Approach](#) section for additional discussion on SCADA monitoring.

Odorizers

Odorizers are assets that add odor to the downstream gas system, which is a critical safety element required by code.

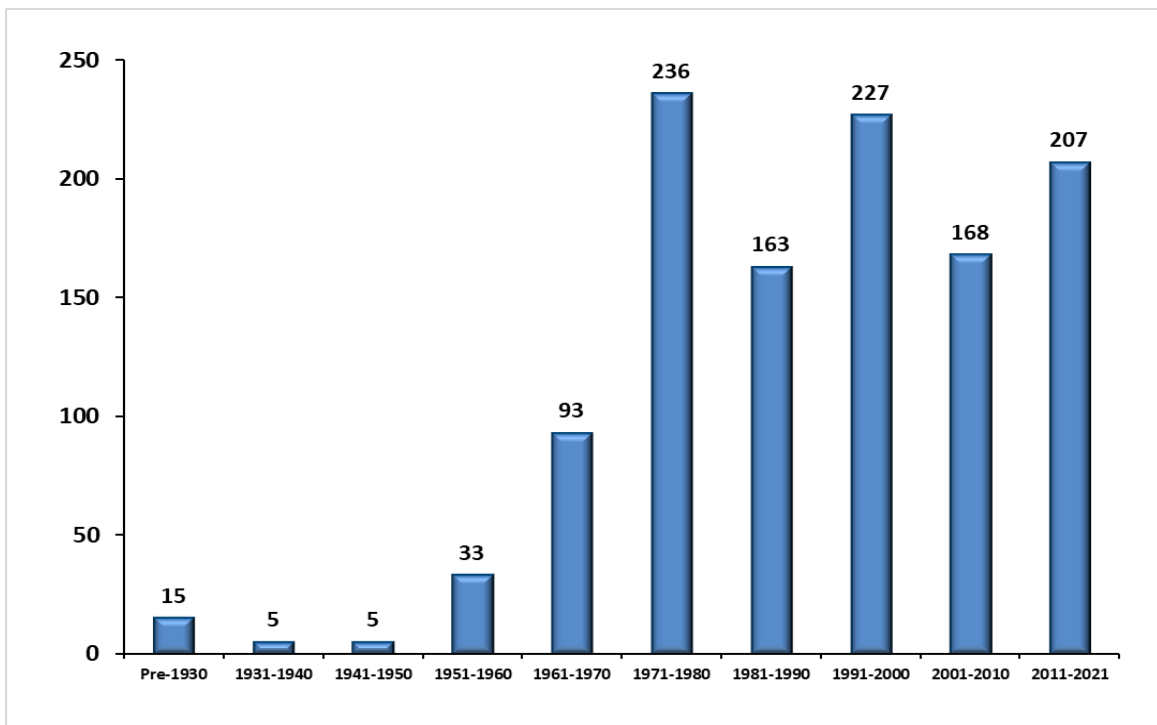
Odorizers are co-located at city gates and transmission valve sites, as required to comply with MGSS 192.625 requirements, and deliver a potent smell so that someone with a normal sense of smell can detect a gas leak. The year-over-year goal for the odorizer fleet is to ensure odorizer pumps are 30 years old or less, and that any exceptions are planned for replacement.

Currently, all odorizer pumps in the system are less than 30 years in service, reflecting a 100% compliance. The Plan allows for one odorizer station to be rebuilt per year independent of a city gate rebuild. This is a stable and reasonable trend that should continue for the next 10 years, maintaining all pump in-service dates less than 30 years.

Regulator Stands

Approximately 12.6% of the regulator stands were installed before 1971, as shown in Figure 40 (see [Reference 4](#) in this section for citation source.)

Figure 40: Distribution of Regulator Stands Age Distribution



Due to the age of regulator stands, the Company will be continuing to invest in these assets comparable to historical years.

6. LEAK REMEDIATION

Consumers Energy uses the following methods to identify leaks and maintain safety.

- Regular leak surveys are conducted to identify and remediate potentially hazardous gas leaks.
- As discussed above, a potent odorant chemical is delivered to the system through odorizers. This odorant can allow customers and other third parties to identify gas leaks before they become hazardous.

Once the Company is notified of a potential leak, the goal is to respond within 30 minutes and complete a leak analysis to determine the appropriate leak classification for repair scheduling.

Employee and public safety are Consumers Energy’s primary concerns. Factors used in the analysis include:

- Gas concentration readings
- Distance of the leak from the outside of a building
- Potential that gas could migrate into a building

Leak repair scheduling is required per code – Michigan Gas Safety Code 192.703, 192.709, 192.711 and Michigan rules 318 and 327.

Minimum requirements for distribution system leak survey programs outlined in 49 C.F.R 192 are:

- At least once each calendar year, at intervals not exceeding 15 months, a leak survey using leak detecting equipment must be performed in business districts at all locations. This provides an opportunity to locate gas leaks (e.g., gas, electric, and water system manholes and sidewalk/pavement cracks).
- Outside of business districts, leak surveys must be performed at least every five years. For cathodically unprotected distribution lines, leak surveys must be conducted every three years.

The Company is reviewing PHMSA publication proposing advanced leak detection requirements (*NPRM Leak Detection and Repair*). This publication outlines proposed requirements for advanced leak detection equipment, enhanced leak detection practices, increased leak survey frequency, and defined repair timing for all leaks that could alter the minimum requirements outlined in the section.

Table 5 provides an explanation of how the Company classifies leaks on the gas system, with Table 6 and Figure 41 providing additional classification details for above and below grade leaks, respectively.

Table 5: Leak Classification at Consumers Energy

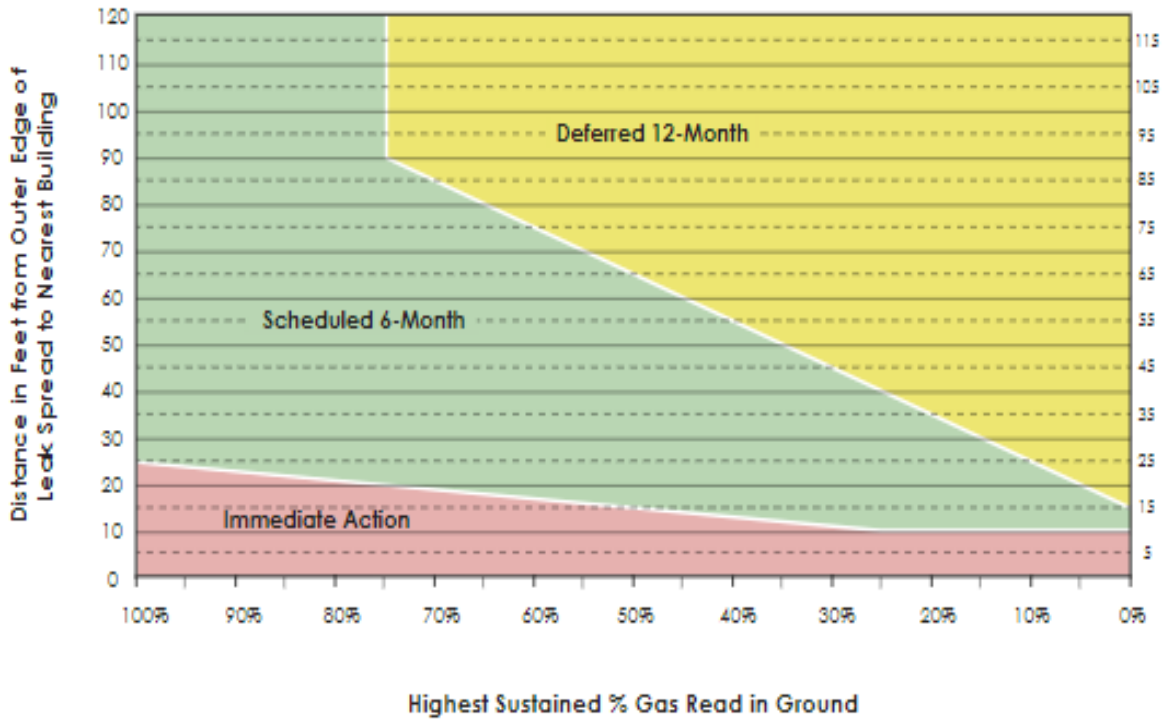
Leak Classification and Evaluation of Leak Severity and Prioritization of Repairs	
Leak Classification	Definition
Immediate Action	<ul style="list-style-type: none"> • Repair immediately (temporary or permanent repair) OR • Take corrective action to reduce the hazardous condition to a level which the leak can be reclassified as a Scheduled Action
Scheduled Action	<ul style="list-style-type: none"> • Repair or investigate the leak within the specified timeframe: <ul style="list-style-type: none"> ○ Distribution - 4 months ○ T&S – 4 months • A documented classification is required for each re-investigation. • Permanent repair must be completed within the specified timeframe. <ul style="list-style-type: none"> ○ Distribution – Within one year of the leak being found ○ T&S – As soon as feasible, based on re-investigation, ongoing review of system outages, and upcoming projects
Deferred Action	<ul style="list-style-type: none"> • Re-investigate the leak within one year of the date the leak was found. • A documented classification is required for each re-investigation. • If deferred again, re-investigate within a year from the new date.

Table 6: Above Grade Leak Classification (Distribution)

Field Conditions Found	Classify Leak As
<ul style="list-style-type: none"> • Gas leak on transmission operated by distribution ($\geq 20\%$ SMYS), OR • Blows soap off leak area, OR • Leak can be heard, OR • Gas detector read 4% (100% LEL) or greater within 3’ of leak source, OR • Gas is entering or about to enter building(s), OR • Regulator is leaking 	Immediate Action – Immediate corrective action, repair, or replace
<ul style="list-style-type: none"> • Soap bubbles grow and break quickly, or leak holds a bubble, OR • Gas detector read less than 4% (100% LEL) within 3’ of leak source, AND Gas has not and will not enter building(s) 	Scheduled Action – 6-month repair or re-investigation
<ul style="list-style-type: none"> • Fish egg bubbles or small slow bubbles, OR • Would not generate additional leak calls, AND Gas has not and will not enter building(s) 	Deferred Action – 12-month

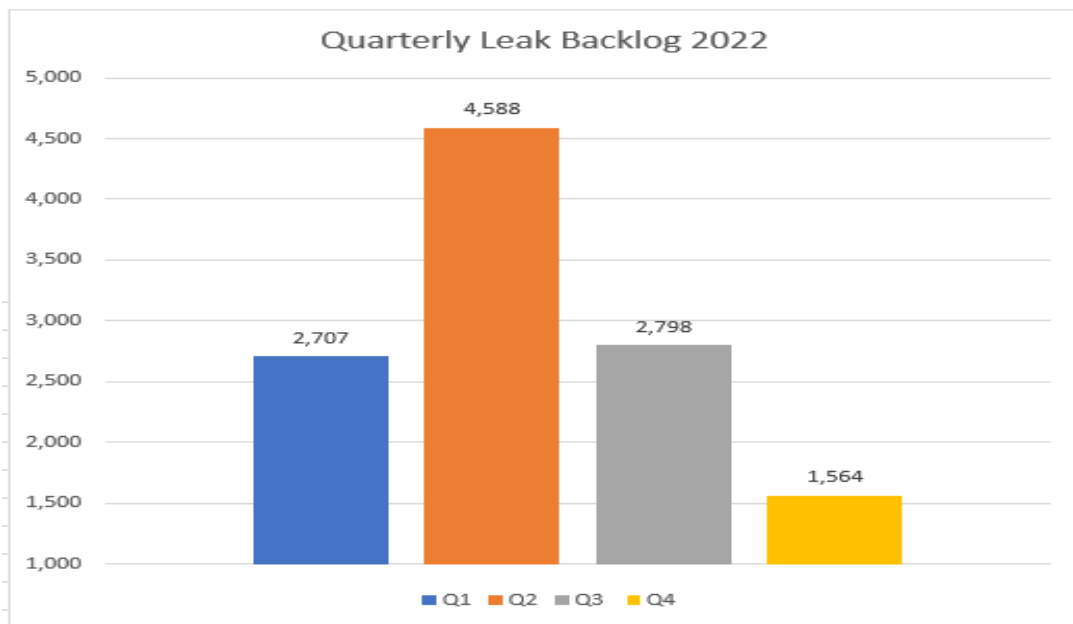
Natural Gas Delivery Plan

Figure 41: Below Grade Leak Classification (Distribution)



As of December 2022, the Company has approximately 1,564 total active leaks, which is a decrease of 1,150 leaks from 2021 with 2022 quarterly leak backlog progress shown in Figure 42.

Figure 42: Quarterly Leak Backlog in 2022



To balance our pace and prioritization of system needs with affordability, the Company will continue to prioritize and remediate across all programs, such as the leak renewal and vintage material programs, to reduce overall risk.

7. AUGMENTATION

As the Company experiences periods of high customer demand during cold temperatures, areas are identified on the distribution system that have a need to address low delivery pressure or service losses to customers.

System augmentation projects are designed and constructed to enhance capacity and maintain service to customers in these areas.

Examples of large augmentation projects currently planned for 2024 and 2025 include:

- Connecting the existing medium pressure distribution system to a new outlet at the Orion city gate requires construction of approximately 1100 feet of six-inch medium pressure plastic main. The connection to the new outlet enhances capacity and resilience in an area where growth could create low pressure conditions. This project is planned for completion by November 2024.
- A project is planned to install approximately 1700 feet of four-inch plastic medium pressure main on Rives Junction Road and 1300 feet of two-inch medium pressure plastic main on Parnall Road in the Jackson area to construct a looped gas supply in order to reduce risks of low pressure. The project is planned for construction during 2026.
- A new two-inch station is planned for construction during 2024 at Freeman and Dale roads in Midland to build permanent replacements for temporary facilities that were installed in place of infrastructure that was damaged during flooding. The new station will provide additional supply from the north of Midland and improve the existing infrastructure.
- A project is planned to install approximately 1100 feet of six-inch plastic medium pressure main on Belsay Rd and connect with existing two-inch medium pressure main on Burton Estates Drive east of Flint. This project will address low pressure conditions experienced during the winter of 2022-2023 in this area. Construction is planned to occur during 2025 for this project.
- The Beaverton Shaffer Road east of Alamando project involves the construction of 5800 feet of 12-inch steel high pressure main that will be constructed parallel to existing six-inch high pressure main out of the Coleman Beaverton city gate station. This capacity expansion will improve delivery pressure in an area of growing demand. This project is planned for construction during 2025.
- The Crooked Lake Road - Latson Road project will construct 3,000 feet of six-inch medium pressure plastic main to create a looped system near the end of two existing distribution main systems. This augment project will improve deliverability by creating a back feed and increase the system pressure. The resilience of the system will also be enhanced by the looped system. This project is planned for construction during 2024.
- The Galesburg - Celery & River Street project will construct a 6,900 feet of eight-inch-high pressure steel main from the Galesburg city gate outlet to Comstock Avenue & Celery Street in the Kalamazoo area. This will create a looped system from the Galesburg city gate high pressure outlet, increase the delivery pressure and reduce the risk of customer outages due to damage or failure. This project is planned for construction during 2024.

8. MAOP COMPLIANCE PROJECTS

Compliance with federal pipeline operator safety standards support the Company's goal of providing safe and reliable natural gas service to customers.

Various distribution line segments are being evaluated for compliance with MAOP standards contained in 49 CFR 192.

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Specifically, regulation 49 CFR 192.619 requires the Company to operate gas distribution line segments in a manner consistent with maximum allowable operating pressures, and regulation 49 CFR 192.624 requires the Company to have a plan to reconfirm pressure test records and remediate line segments for which the Company does not have pressure test records that meet PHMSA's expectations for traceable, verifiable, and complete documentation. Compliance milestones related to MAOP projects include a requirement to complete all actions required by 49 CFR 192.624 on 50% of the pipeline mileage subject to MAOP reconfirmation requirements by July 3, 2028, and complete all actions required by 49 CFR 192.624 on 100% of the pipeline mileage subject to MAOP reconfirmation requirements by July 2, 2035.

In addition to the work being done by the Company to evaluate compliance with MAOP standards, the Company has received notice from the staff of the Michigan Public Service Commission that Line 1080, which serves customers to the west of Kalamazoo, needs to be operated at a lower pressure to comply with 49 CFR 192.619. Options to remediate the pressure on this line segment have been reviewed by the Company, and pipeline modifications are planned for construction during 2025 and 2026.

To fully comply with the regulations described above, the Company is developing replacement project plans for line segments that require action to comply with the requirements of 49 CFR 192. Sixteen projects, representing approximately 18.5 miles of distribution main have been identified to date, and these are listed in the following Table 7:

Table 7: MAOP Compliance Projects

Line Segment	Estimated Capital Cost (\$)	Length (miles)	Expected Pipe Size	Construction Complete Year
Line 1002c	197,683,160	8.50	24"	2032
Line 1002f Macomb ITC Corridor	1,446,658	0.07	24"	2025
Line 1006 11 Mile Dequindre - David Givens Rd	4,950,000	0.33	24"	2032
Line 1006 11 Mile Mound to RR St.	9,301,478	0.5	24"	2027
Line 1006 Groebel Dr to Mound Rd	4,650,134	0.31	24"	2026
Line 1009 11 Mile - Little Mack to RS22	6,000,330	0.5	12"	2027
Line 1009 Huron Park to I94	4,800,228	0.5	12"	2024
Line 1009/1009c I94 to Little Mack, 10 Mile to 11 Mile	18,361,007	1.53	12"	2025
Line 1009c 9 Mile to 10 Mile	15,600,671	1.3	12"	2026
Line 1020 Greenfield Rd	454,566	0.038	12"	2025
Line 1022	51,338,588	4.00	16"	2027
Line 1022f Vermontville	209,454	0.038	8"	2025
Line 1026f Mt Hope	11,990,265	0.759	8"	2026
Line 1026i MSU PP	847,662	0.133	8"	2026
Line 1041 Lapeer Rd	49,293,562	4.1	12"	2027
Line 1080 Dual Main	74,975,000	6.7	12"	2027
Line 1087b E Isabella Rd	6,479,207	0.54	12"	2025
Line 1090n	284,197	0.028	8"	2025
Line 1093 Shattuck Rd	25,798,900	1.72	12"	2026

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The Line 1080 project completed survey and field investigations during 2022.

Project planning and city gate facility upgrades are planned for 2023. Project milestones during 2024 include acquisition of real estate, completion of construction plans, delivery of long lead time materials, and issuing requests for construction bids.

Construction contracts are expected to be executed early in 2025 so that actual construction will take place during 2025 and 2026. The Company is planning to improve upon resilience concerns that currently exist with this line segment due to limited sources of supply. This will be achieved by constructing a 6.7-mile parallel main to the existing main. Other alternatives to develop loops of main in that area to create connections to additional city gates to provide additional supply locations and improve resilience are expected to be excessive in terms of the cost to construct versus the overall resilience risk reduction.

The Line 1009 Huron Park to I-94 project is also in progress. Activities to be completed during 2023 include survey and project design for a half-mile main replacement. Project construction is planned for 2024. This replacement will ensure that this line segment is in compliance with 49 CFR 192.624.

The table above reflects projects that have been confirmed during 2022 and 2023 to require main construction to achieve compliance with 49 CFR 192. Additional line segments are currently being reviewed to determine if additional main construction projects will be required.

9. CUSTOMER METERING

The Company routinely purchases meters, regulators, and related equipment. Meters and related equipment are used in serving new business connections, for the Routine Meter Exchange Program (an MPSC requirement), service renewal meter move-outs, and for normal replacement of obsolete or broken meters.

The Company currently uses temperature-compensated diaphragm (regulated and top connect) meters, rotary meters, and also purchases gas meter communication modules, gas electronic volume corrector units, and testing equipment.

The level of equipment purchased annually varies depending upon needs of the business. To better explain the timeline:

- Between 2015 and 2019, Consumers Energy installed Itron 100G ERT Gas Communication Modules (“GCM”) on approximately 700,000 combination electric/gas customer meters as part of the Advanced Metering Infrastructure (“AMI”) also known as the Smart Energy Program and on the remaining 1.1 million gas only customer meters as part of the Gas Automated Meter Reading (“AMR”) project.
- In, 2020, Consumers Energy received end-of-life sales letters for the 100G ERT gas communication module (PIL-20-1207) and all gas diaphragm meters (PIL-20-1247) from Itron indicating that these devices would no longer be available for purchase beginning March 31, 2021. On December 3, 2020, an update to PIL-20-1207 was issued by Itron stating that the 100G ERT module sales will continue until further notice in response to customer requests for additional time for technology transition planning. Consumers Energy will continue to purchase the 100G module while evaluating evolving AMI/AMR technologies. The Itron gas diaphragm meters are no longer available for purchase.
- From October 2020 through Q1 2021, Consumers Energy conducted an evaluation of available gas meters and data collection technologies available in the market to determine if there is a vendor-agnostic metering, communication, and data technology solution available that will facilitate a switch from diaphragm gas meters to a solid-state solution. The determination was made that an acceptable vendor-agnostic solution is not currently available. With that determination, the Company has decided to make the top connect diaphragm meter the standard for new business and meter replacements through 2024, as meter, communication, and data collection technologies continue to evolve.

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The Itron announcement regarding the end of life for their diaphragm meter product line impacts approximately 1,600,000 installed regulated diaphragm (“RM”) customer meters. These meters have a different connection method as compared to the top connect (“TC”) diaphragm meter and will require a meter stand re-build to accept a TC meter. Therefore, the Company has implemented a Meter Bypass effort with the following current plan:

- In 2020, the Company began converting RM meters to TC meters on existing customer installations requiring a meter stand rebuild. As part of the conversion, a gas meter bypass has been added to the meter stand.
- In 2021, meter bypass stands for new business customers started to be installed. The meter bypass provides several benefits, including:

Safety

- Reduced number of appliance light-ups
- Less entering customers’ homes

Improved Customer Experience

- Reduction in interruptions of customers’ service

O&M Cost Savings

- Reductions in re-light calls (Field, Call Center)
- Reduction in time needed to exchange a meter

- In 2022 and 2023, the Company is investigating various scenarios, including projected costs and schedule, for conversion of all RM meter stands to TC meter stands. The conversion will require a new TC meter be purchased to replace the RM meter. The Company will continue to evaluate changes in metering technology to incorporate the migration of customers to gas smart meters into the scenarios evaluated.

The new meter stands will accept the industry standard top connect meter and will enable the Company to improve multi-meter installation designs by allowing the installation of one master regulator to serve multiple meters.

Installation of TC meter stands will also provide the opportunity for future gas smart meter technology upgrades with minimal field changes. The different types of meters, including an example of a residential gas smart meter (Itron Intellis Ultrasonic Meter (USM)), are shown in Figure 43.

Figure 43: Meter Types



Regulated Meter (RM)

Top Connect (TC) Meter

Top Connect (TC) Meter w/Bypass

Itron Intellis USM

10. NEW BUSINESS

The New Business Program consists of the capital costs of adding infrastructure to serve new commercial, industrial, and residential customers.

The program costs include the cost of installing mains, services, regulators and the cost of meter stands to serve new customers. These projects are required in response to customer requests for new gas service.

Customers who request service share in the construction costs with the Company based on the appropriate tariffs approved by the MPSC.

Between the years 2018 and 2022, the Company has connected 40,462 new gas services to its gas distribution system.

During 2019, the Company installed 8,223 services. In 2020, service installations declined by approximately 12% to a level of 7,236 service installations. In 2021, service installations rebounded somewhat to grow 8.6% to a level of 7,861. Service installations then declined by 1.8% to 7,719 services installed in 2022.

These historical service installation counts are included in the new business service connection chart shown in Figure 45.

The Company has installed 413.9 miles of new natural gas main for the time period of 2018 through 2022. During 2019, the Company installed 91.3 miles of main. In 2020, new business main installations declined by approximately 32.5% to a level of 61.6 miles of main, then declined again in 2021 by 14.3% to a level of 52.8 miles of main. During 2022 the installation of new business mains increased by 34.8% to 71.2 miles.

The Company uses forecasting data from multiple sources to forecast and plan for new business growth.

Based on recent analysis of housing market data, the Company believes that service connection volumes for 2020 through 2022 represent activity levels that are negatively impacted by numerous factors since the onset of the COVID-19 pandemic. This includes periods of construction labor constraints, inflated lumber prices, shortages in electrical transformer supply, and increasing mortgage interest rates.

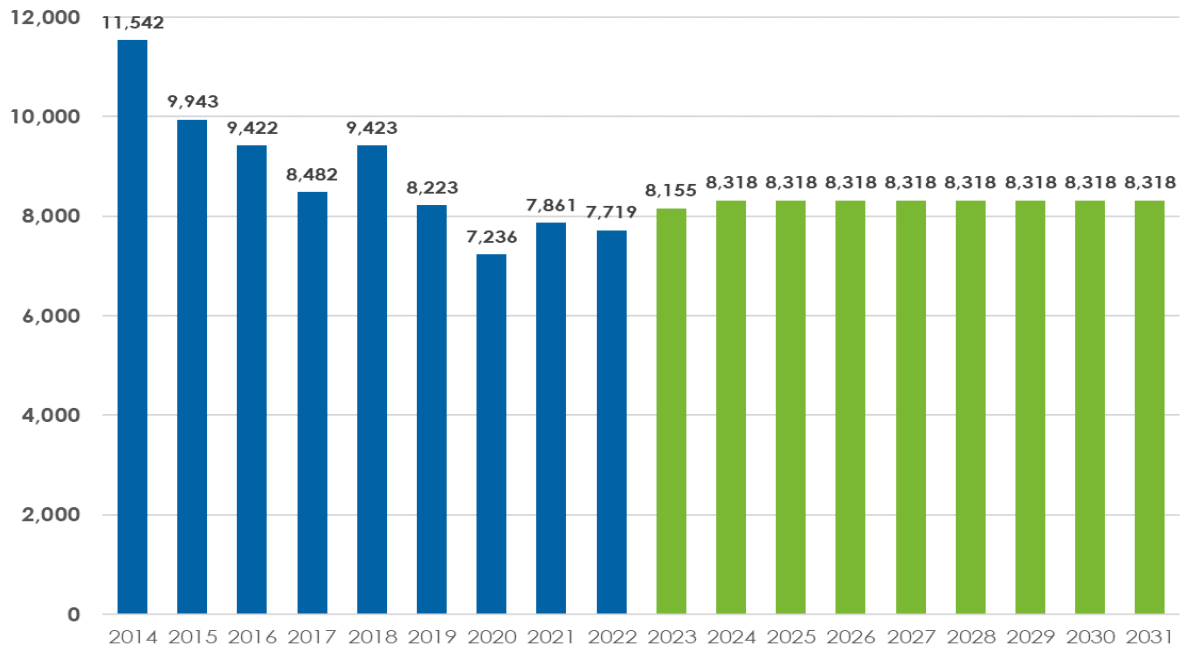
The Company reasonably expects annual connection volumes to exceed 2019 actual connection volumes in 2024 through 2031, as shown below in Figure 44.

Housing starts economic indicator projections provided by S&P Global Market Intelligence in July 2023 (Michigan forecast) and the National Association of Home Builders in August 2023 (U.S. forecast) both support projections of housing construction activity starting in 2024 that exceeds actual 2019 experience.

The Company believes that housing start indicators can be useful for forecasting, but the analysis of new service connections should not rely solely on projected housing start indicators.

For example, in 2020 the Michigan housing start economic indicator increased 1.3% while new service connection counts actually decreased by 12.0%; in 2021 housing starts increased 11.5% while new service connection counts increased 8.6% from 2020; in 2022 housing starts decreased 8.8% while new service connection counts decreased only 1.8%.

Figure 44: New Business (Number of Service Connections)



The Large New Business Program includes new customer connection projects where the estimated infrastructure cost exceeds \$500,000, we are planning to enter a facilities agreement for unpredictable operations, or we deem it necessary for special tracking and project management and therefore included in a separate program.

Projects are generally created under this program when the requesting customer has signed a contract with the Company locking in the load requirements and revenue expectations.

Projects that are currently under construction during 2023 include a 4.0 mile extension of 4” high pressure steel main to provide natural gas service to a new renewable natural gas facility near Saranac, and a 1.8 mile extension of 8” high pressure steel main to provide natural gas service to a new battery manufacturing facility in Lansing.

These projects are projected to be complete before the end of September 2023. Currently there are no additional new projects planned for this program for 2023 through 2025. However, new requests for load can come in at any time, meaning the Company may add projects to this program as customer requests materialize.

11. ASSET RELOCATION CIVIC IMPROVEMENT

According to the 2023 Report Card for Michigan’s Infrastructure, which has been published by the Michigan Section of the American Society of Civil Engineers (or “ASCE”), Michigan has been making progress in reversing underinvestment in the state’s infrastructure.

State and Federal funding sources have included \$3.5 billion in bond funding from the *Rebuilding Michigan Program* and \$4.7 billion from the *Building Michigan Together* plan. The 2021 Bipartisan Infrastructure Law will also provide \$11 billion to address needed infrastructure projects.

Natural Gas Delivery Plan

The ASCE’s 2023 Michigan Infrastructure Report Card assessment shows modest improvement in the overall grade from a D+ in the 2018 report card to a C- in the 2023 report card. Roads and Stormwater infrastructure grades have improved from a D- in 2018 to a D in 2023.

Civic Improvement Relocation projects frequently involve replacement of vintage mains and services, avoids third party damage to non-vintage facilities, and reduces the potential for leaks when infrastructure contractors are working around vintage main.

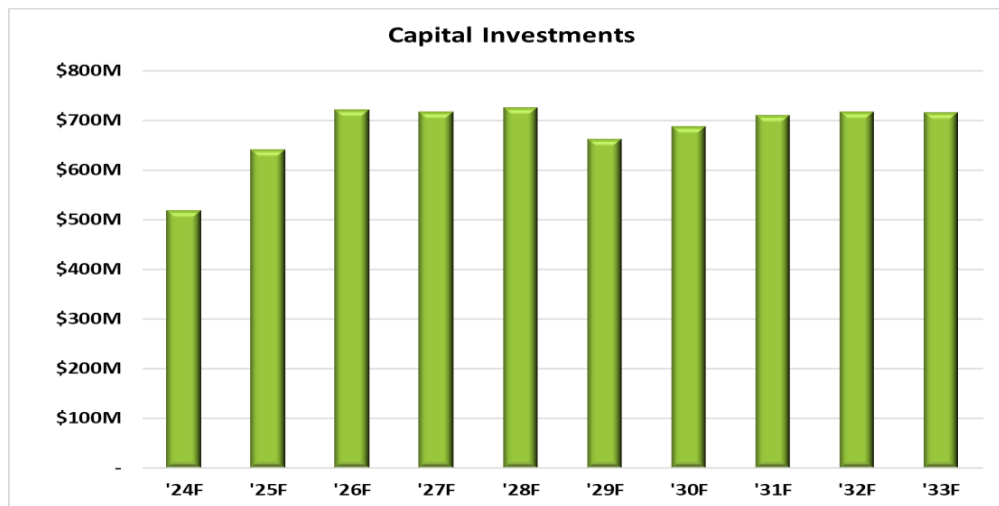
The annual replacement of vintage mains and services are documented as part of Attachment 9 *Non-EIRP Distribution Main Replacement Project Metrics*, which is included in the Company’s enhanced infrastructure replacement annual reports.

12. DISTRIBUTION ASSET FINANCIALS

Consumers Energy’s largest capital increase is due to vintage material remediation. The Company believes it can lower remediation costs through economies of scale and work management improvements. With the extension of the EIRP and VSR programs to 2035, the Company expects the total main and services remediation to cost approximately \$5.6 billion.

The capital investment plan for the entire distribution asset class is shown in Figure 45.

Figure 45: Distribution Capital Investment Plan



Overall, this investment plan for the distribution asset class aligns with the objectives by **reducing asset risk** that is closest to the customer (safe), ensuring the **system is able to deliver gas as required** (reliable), **balancing the pace of system improvements** to preserve customer affordability (affordable), and **reducing the amount of emissions** in this system, which equates to more than one-third of the Company’s methane emissions (clean).

13. REFERENCES

1. PHMSA reported figures (March 2023)
2. GIS database visualized through Power BI
3. DIMP database visualized through Power BI
4. GIS database
5. Active leak register - GIS database combined against active leaks and mapped on Power BI
6. [Gas Distribution Pipeline Inventory Reports](#)

V. Operational Capabilities

As Consumers Energy moves forward with the Plan, there will be intentional actions by the Company in the areas of people, process, and technology for each of the asset areas to successfully achieve the 10-year objectives, goals, and outcomes.

A. People – Talent and Workforce Approach

From a people perspective, the Company is focused on how to safely deliver for customers by ensuring Consumers Energy has the right people, with the right skills, at the right place and time.

- To make sure these commitments are met, the Company is placing a **strong focus on hiring skilled trade workers and engineers, and creating a diverse, equitable and inclusive employee experience** to ensure the Company is attracting and retaining the most qualified candidates.
- To prepare for the skills of today and tomorrow, Consumers Energy has developed a full-scale Gas City Training Village that allows the Company to train coworkers through real-time, hands-on situations and continue relentless focus on making safety the top priority.
- To prioritize asset protection, the Company will need enhanced and evolving cybersecurity skills as technology becomes more integrated with assets. Then as customer expectations shift to on demand- expert advisement and more personalized experience, the Company will need a workforce skilled in leveraging the power of data, and empathy, to meet customer needs.
 - A variety of new skills will be needed to deliver on business plans over the next 10 years. This framework will provide a means to build these skillsets at scale, including developing current and adding new, coworkers with different talents.
 - The knowledge, skills, and abilities required are key determinants in the quality and timeliness of service that customers receive. The Company’s ability to deliver what customers expect—such as reliable and safe energy delivery, on-time completion of service orders, energy savings, accurate billing and easy-to-navigate Web site and mobile applications—depends upon having the right talent in the right job at the right time.
- This framework will facilitate the matching of coworkers, capabilities, and qualifications to the requirements of the business to minimize the risk and costs of turnover. More than 1400 coworkers inspect, maintain, and build our natural gas system in particular. Consumers Energy also developed a competitive Michigan workforce of approximately 500 coworkers that is focused specifically on the construction of our natural gas infrastructure.

The Company continues to evolve its processes to ensure it has an effective talent pipeline, diverse candidate pools, and support of the diversity, equity, and inclusion goals for gas delivery co-workers, as the following shows:

1. Creating the Talent Pipeline

The Company is taking the following steps to attract, retain, and grow its people:

a. Career Awareness Activities

- **Michigan Career Quests:** There are 10 MI Career Quest events held throughout the State each year. These day-long events provide hands-on career exploration for high school students. Consumers Energy is a sponsor and has a prominent presence. Thousands of students participate in each session, with the largest in Southeast Michigan hosting more than 10,000 high schoolers.

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- **Careers in Energy Week:** Each year the third week of October is declared to be *Careers in Energy Week* by the Governor. The Company makes a concerted effort to promote skilled trades, engineering, renewables, and IT career fields within energy via a series of tours, events, school career fairs, social media contests and campaigns, and public relations activities.
- **Talent Ambassadors (Formerly Education Champions):** Nearly 450 employees raise their hand each year to support local school district career fairs, mock interviews, and to speak with classes about careers in energy, their personal experience and career pathway. In 2023, we launched the usage of our Energy Education Trailer for career awareness purposes. The trailer is a hands-on activity-filled display of various careers within the energy industry, including virtual reality experiences, safety, head-to-head trivia, and energy efficiency displays.
- **Summer Youth Energy Academies:** The Company expanded in 2022 to add Pontiac and Flint to the two summer youth employment programs started in 2021 in Jackson and Grand Rapids. This 6-week academy provides participants with exposure to energy careers while gaining pre-employment essential skills. Intentional efforts to build networks with diverse partners and communities resulted in over 50% of students from historically underrepresented populations. Each student leaves the program with a career pathway plan including next steps.
- **Elementary School Energy Safety and Careers Presentations:** Beginning in 2022, the Company offers these hands-on, one-hour presentations for 4th and 5th graders in partnership with the union, UWUA, representing our frontline gas and electric workforce. We have identified the top 10 most diverse school districts in our service territory as the highest priority to deploy these important workshops. In 2022, we reached 1500 students across 21 schools. The workshops cover basic safety for both gas and electric.
- **Detroit Area Pre-College Engineering Program (DAPCEP)** is a Detroit area pre-college engineering program designed to increase the number of historically underrepresented students pursuing STEM Careers. Every summer the Company sponsors a cohort of students and our Business Employee Resource Groups (BERGs) have served as program mentors.
- **Project SEARCH** focuses on high school students with cognitive disabilities. The program provides work experience and mentoring to the students while they complete their senior year at our headquarters in Jackson. Consumers Energy was honored, along with six other Michigan Project SEARCH sites, with the employment outcome awards for the 2021-2022 year. The graduating class resulted in 83% of students obtaining employment in the community after their experience. Consumers Energy is entering the 6th year of partnership with the Jackson County Intermediate School District. Since its inception, 44 students have participated and graduated from Consumers Energy's program and our company is welcoming 10 new interns for the 2023-2024 school year.
- **Inside Track Webinars** This new popular webinar is focused on promoting energy careers to diverse job seekers. Held three times in 2022, over 1000 people joined in the one-hour session to learn about our career pathways, school partners, application processes, decoding our job postings, and increasing their employability at Consumers Energy.

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b. Training and Education

- **Veteran’s Gas Bootcamp:** In partnership with UWUA trade school, Power for America (P4A), the Utility Military Assistance Program: Michigan Gas Boot Camp (UMAP-MI) openly recruits current Michigan National Guard members, Reservists and Honorably Discharged military veterans. The program is designed to provide the requisite skills and knowledge an individual will need for a successful career within the gas utility sector. Successful completers are employed with Consumers Energy as entry-level Gas Lines Construction Laborers. To date, Consumers Energy has employed 201 Veterans as a result of the Gas Bootcamp.
- **Energy Industry Fundamentals:** Through the Michigan Energy Workforce Development Consortium, we partner with Career Technical Education centers and high schools (Hartland, Boyne City, Oakland South and Oakland North, Holt, Jackson Public, Jackson Northwest, Western High school) to deliver the national certification course, *Energy Industry Fundamentals*. This course is also offered as a part of college energy programs at Lansing Community College, Jackson College, MIAT, and Henry Ford Community College. High School students can dually enroll to earn college credit. An online version at Jackson College is also available as of Fall 2020. We promote it as a precursor for many job roles and a primer for our college level school-to-work programs. Each year more than 250 students enroll in the course statewide.
- **Jackson College Energy Systems Program:** As the college located in our Headquarters’ hometown of Jackson, Consumers Energy partners with Jackson College to provide education for multitude of job roles including gas delivery technicians, planners, and schedulers. Their two- and four-year degree programs in Energy Systems were developed in partnership with the Company and are continually updated to meet our needs. The high school energy programs and summer intern programs will serve as a natural pipeline of diverse students for the Jackson College programs. The Company will also be offering paid internships for Jackson College students.

c. Resources

- **Michigan Energy Workforce Development Consortium:** The Company works with other utilities and provides leadership for MEWDC. This organization is made up of more than 50 partners from education, government, workforce development, and community-based agencies to strategize, plan, and execute activities that increase the available diverse qualified workforce including: periodic workforce demand planning surveys, creating, and maintaining standards for CTE programs in energy, forming college partnerships, promoting energy career awareness, and engaging with diverse communities.
- **State Apprenticeship Expansion (SAE) Grant Funding:** Most recently MEWDC was awarded a \$1.1 million grant (\$134k coming to CE) to recruit and train more women, racial or ethnic minorities, and veterans into skilled trade positions.
- **Going Pro Grant:** In addition, the Company receives between \$400-500k per year in grant funding to support technical training for our operations, maintenance, and construction workforce through the State Going Pro grant program—ensuring that our new apprentices have access to high quality state of the art training.

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d. Diversity, Equity, and Inclusion in the Talent Pipeline

- **Intern Recruiting:** Annually engages in over 50 on-campus recruiting and networking events connecting students to various internal business departments. Partner with various internal Intern Councils to identify workforce needs, schedule recruiting activities, screen, and select company interns. In an average year, the Company vets over 5,000 qualified intern candidates to fill roughly 100-150 positions.
- **Targeted Campus Organizations:** In support of the campus recruitment, the Company will deliberately partner with diverse student organizations in effort to ensure maximum exposure of our intern and career opportunities. Some of the most prominent student organization partners include: Society of Women's Engineers (SWE); National Society of Black Engineers (NSBE); Society of Asian Scientist and Engineers (SASE); and Society of Hispanic Professional Engineers (SHPE). In addition, the Company works directly with several on campus diversity programs or multi-cultural student support offices to ensure opportunities are reach the less prominent organizations.
- **Intern Experience:** During the summer internships, the Company leads several engagement opportunities with the interns to foster a positive experience. Annually, Consumers Energy hosts an intern luncheon experience designed to develop a deeper understanding of our business and build affinity. At the end of each internship, the Company gathers intern rating documents from supervisors to use in the vetting process for return internship or fulltime offers.
- **Professional Organizations:** In support of the core business needs and benchmarking studies, the Company continuously seek partnerships to improve our employee diversity. The goal is to infuse high quality diverse applicants into all our external job postings. These deliberate efforts include a paid partnership with Professional Diversity Network (PDN) to participate in six diverse organization career fairs in 2021 and post all of vacancies on over 30 partner network careers sites reaching over 500,000 diverse jobseekers. Also, the Company maintains an annual partnership with MI Talent Connect that reposts all our job vacancies on more than three hundred local diverse job boards.
- **Corporate Giving Partnership:** Collaboration with Corporate Giving gives the Outreach Team the ability to connect with recipient organizations to support our workforce needs. A great example of this is the Consumers Energy Foundation's support for the MSU CoRE Program, which is dedicated to supporting first- and second-year Engineering students and inspiring them to stay in the field. This partnership provides a unique opportunity to meet, mentor, and support this student body that traditionally has a high attrition rate of female and minority students.
- **National Women in Construction (NAWIC) Relationship:** Over the past five years, the Company has maintained a strong working relationship with NAWIC to help promote our opportunities to their membership. Over the past two years, Consumers Energy has shared every external gas construction vacancy posting with NAWIC. This relationship with NAWIC has also provided several diverse supplier contract bids.
- **Targeted Career Fairs:** Annually, the Company supports more than two dozen career fair events focused on racial/ethnic minorities, females, veterans, and individuals with disabilities. The Company partners with our Business Employee Resource Groups and People and Culture to support these external career fair events.

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- **Virtual Engagement:** In 2019, the Company began using virtual career fair platforms to provide more opportunities to reach targeted audiences. This augmentation plan allowed the Company to seamlessly transition to full remote career fair and networking with targeted jobseekers in our current remote environment.
- **Career Bootcamps for Hiring Success:** The Company is creating a pipeline to become an employer of choice for underrepresented communities in high demand occupations. These bootcamps are designed to springboard you to a successful career. In partnership with trade schools and the Utility Military Assistance Program, our Michigan Gas Boot Camp (UMAP-MI) openly recruits current Michigan National Guard members, Reservists and Honorably Discharged military veterans. The program is designed to provide the requisite skills and knowledge an individual will need for a successful career within the gas utility sector. Successful completers are employed with Consumers Energy as entry-level Gas Lines Construction Laborers.

2. Diversity, Equity and Inclusion in the Entire Talent Life Cycle

To quantify this work, Consumers Energy has several DE&I Movement Stands that include multi-year goals in the areas of culture, talent, philanthropy, and supplier diversity. Our stands support our strategy, are aligned with our Executive DE&I Council, and represent measurable aspirations.

Consumers Energy’s Culture Stand: “We work in our company and our communities to value people of all backgrounds.”

Embedding DE&I into the Company’s culture focuses on educating our coworkers and leaders, including companywide DE&I awareness training, and highlighting opportunities where all coworkers can contribute to creating an inclusive environment.

- **DE&I Awareness Training:** In 2021, the Company launched a from-the-top learning model for our employees, starting with company leaders and achieved 100% unconscious bias training completion for anyone with a direct report. In 2022, we moved to all coworkers in our commitment to 100% completed DE&I awareness training. This course is setting common expectations and norms about all things DE&I. By training all employees in core DE&I concepts—such as the role unconscious bias plays in our personal and professional relationships and decision-making— we are building a solid foundation that makes DE&I an integral part of the customer, community, and coworker experience.
- **Business Employee Resource Groups (BERG):** The Company has 2,000+ co-workers, more than 20% of our workforce, engaged in our Business Employee Resource Groups where each embrace differences to improve working relationships and deliver better results for customers, communities, and coworkers. All seven BERGs are employee-led, raising new initiatives that will lead to a greater sense of belonging for all. Recent ideas that evolved internal policies include: A world-class parental leave policy that expands to six months for birthing parents and four months for non-birthing. Similarly, expanding domestic partner benefits for all co-workers. This is not only designed to better protect LGBTQ employees and their dependents but also seniors and other unique scenarios where these benefits are essential. The Company also evolved our paid holiday policy, once capturing only major federal holidays but now includes two floating Inclusive Holidays, chosen by the employee, examples include Juneteenth, Hanukkah, or Ramadan.

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- DE&I Champion Program:** A program made up of union employees and exempt, their mission: Create safe spaces and assist the workforce in embedding DEI into everything we do, at all levels, by promoting an inclusive environment and restorative approach through training, coaching and supporting the workforce one on one, in teams and through inclusive leadership. The program works to advance belonging by leading grassroots communication efforts and action-oriented opportunities for involvement, identifying, and addressing gaps through problem-solving, and providing continuous DE&I learning opportunities. Today they lead our companywide DE&I awareness training for all employees. Peer-to-peer conversations, especially within our union family, are a critical step in setting common expectations and norms for all while building a solid foundation that makes DE&I an integral part of our company.
- Conversations About Race and Social Justice:** The Company invited all coworkers to companywide conversations through all-hands townhalls and offering safe, monthly DE&I & Well-Being Office Hours where any employee can seek 1:1 time. We enhance the experience by inviting external speakers, experts in the justice space, to grow our learning journey through unique perspectives. We're focused on inspiring difficult conversations, working through discomfort and embracing our differences as strengths to deliver better results for our customers, communities, and coworkers.
- Well-Being Consultants:** With the workforce pressures due to the COVID-19 pandemic, we implemented Well-Being Consultants who lead well-being initiatives throughout the company by identifying and addressing needs of our co-workers and provide continuous opportunities to engage in well-being efforts throughout the organization and beyond (retirees and spouses). The goal is to empower our employees to thrive in each pillar of well-being by creating a culture where the healthy choice becomes the valued and easy choice.

Our Talent Stand: We expect every future and current employee to have equitable opportunity to succeed.

As one of Michigan's largest employers, the Company is building a world-class, inclusive workforce to be a better reflection of our community.

Building a diverse, equitable, and inclusive workforce relies on the ability to attract and retain diverse talent. That attraction starts with a strategic talent sourcing strategy that focuses on recruiting in areas representative of all demographics, allowing us to build diverse, qualified candidate pools.

Creating a diverse and inclusive workforce expands beyond strategic sourcing to the processes used for the employee lifecycle (e.g., hiring, promoting, developing, and succession planning).

- 100% Diverse Hiring Committees and Candidate Slates:** The Company expects every future and current co-worker to have an equitable opportunity to succeed. The practices include 100% diverse hiring committees and candidate slates for every position posted. Further, the hiring training includes the best hiring practices for our managers, including strategies to mitigate unconscious bias.
- Summer Youth Energy Academies:** Within the communities where the Company's employees live and work, there are 450+ Talent Ambassadors inspiring K-12 students to become future co-workers—thus building our Talent Pipeline in the communities we serve for future generations. Our 6-week Summer Youth Academy provides participants exposure to energy careers while gaining pre-employment essential skills. The program will continue to expand with a focus placed on urban core cities with a high percentage of students from underrepresented populations.

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Our Supplier Diversity Stand: A vibrant and diverse supplier network increases competition, strengthens innovation, and ultimately benefits our customers' pocketbooks.

The Company continues maturing in diverse supplier programs by building a framework that enables high quality, long-term success. The Company knows that supplier diversity contributes to operational excellence and touches the E, the S, and the G in a sustainable supply chain. Together, Consumers Energy is a force of change.

- **Expanding our reach:** The Company is in this to spark innovation and drive economic prosperity. That's why it actively engages with diverse-supplier organizations nationally and in Michigan. Together the Company connects, supports and develops minority-, women-, LGBTQ-, disability-, and veteran-owned suppliers. Diverse suppliers are encouraged to create a business profile on our "Become a Supplier" website. We share our values and prefer suppliers who hold similar commitments. This is good for our co-workers, good for our customers' bills and good for future generations. Our program will continue to expand our diverse supplier network, strengthen supplier relationships and encourage our suppliers to support other diverse suppliers.

Our Philanthropy Stand: Consumers Energy creates equitable, sustainable change to support social justice initiatives throughout Michigan and the communities we serve.

The Company has been giving back to Michigan for more than 135 years, and since 1990 we have been helping local communities grow and thrive through the Consumers Energy Foundation. The Foundation invests in three key areas – our People, the Planet, and Michigan's prosperity.

Our investment in these key areas is grounded in our commitment to DE&I. The Foundation supports organizations working to advance racial and ethnic justice and striving to further equity for women, veterans, the LGBTQIA+ community, people with mental and physical disabilities, and people living below the Asset Limited, Income Constrained, Employed (ALICE) threshold.

As a force of change, the Company and the Foundation have committed to deploy \$15 million by the end of 2023 to create equitable, sustainable change by supporting social justice initiatives throughout Michigan.

- **Signature Awards:** Each year, the Consumers Energy Foundation makes signature grant allocations of \$500,000 each (totaling \$1.5 million). These signature grant allocations are referred to as the People Awards, the Planet Awards and the Prosperity Awards. Each grant round provided up to \$250,000 to two or more Michigan nonprofit organizations striving to make a positive impact aligned with the corresponding priority area.
- **Supporting DE&I in Local Communities:** In 2022, the Foundation launched an initiative to award \$100,000 to five community foundations actively engaged in DE&I efforts in their local communities. Each community foundation received \$20,000 to support this important work. Based on the success of this program, the Foundation doubled its investment in 2023 by awarding \$200,000 to ten community foundations across the State. The Foundation recognizes that these community foundations are trusted leaders, partners, and advocates in their communities, and we know that this collaboration will result in localized, meaningful impact. **BERG Grant Program:** Each year, the Foundation allocates \$10,000 in grant funding to each Business Employee Resource Group (BERG). These grant dollars are used to support nonprofit organizations that align with the mission and values of our Foundation and BERGs. This program started in 2021 to give BERGs a voice in our philanthropy, expand our reach to nonprofits, and support programs and projects that align with our DE&I priorities.

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The **Executive DE&I Council**, chaired by the Company’s CEO, is driving organizational change by tracking progress with measurable Action Plans, designed within the DE&I Movement Stands framework.

The Council includes every channel represented by our Senior Vice Presidents and includes a measurable glidepath through 2028. The Council tracks measures for each DE&I Movement Stand.

The following table has been previously and is annually presented and reviewed with the Board of Directors (“Board”). The Board actively engages and challenges progress, explores thinking, and ensures the appropriate resources are applied.

Table 8 CE DE&I Movement Stands

Our Movement Stand	2022 Measurement	2023	2028
Culture: The Company includes and values people of all backgrounds in the company and culture	+2 increase from 2021 score on DE&I Index	+2 over YE	93
Talent: Every current and future coworker has an equitable opportunity to succeed	Engineering roles at/above labor market availability: 49%	54%	79%
	Operational roles at/above labor market availability: 53%	58%	63%
Philanthropy: The Company creates equitable, sustainable change to support social justice initiatives throughout Michigan	\$5 million	\$15M	\$40M
Supplier Diversity: The Company will double its spending with diverse suppliers to achieve 1st quartile	11.90%	14%	1st Quartile

3. Company Brand

The Company makes intentional efforts to ensure that our customers, stockholders, current and future co-workers, and the energy industry are aware of our progress to embed DEI in everything Consumers Energy does.

The Company strategically participates in employer branding opportunities by sharing its successes in social media, on the Company website, and participates in sponsorships and speaking engagements at conferences and events.

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It publishes the *DE&I Annual Proxy Statement*. Recognition of the Company's impact in 2021-2022 includes these awards:

- 2023 Secretary of Defense Employer Support Freedom Award
- 2023 Black Enterprise Best Companies for Diversity
- 2023 MVAA Gold Level Employer
- 2023 ESG Pro Patria Award
- 2023 REDI Index – Top Faith Friendly Company
- 2022 Forbes Best Employer for Women
- 2022 3BL Media 100 Best Corporate Citizens out of the Russell 1000 Index
- 2022 VETS Index 4-Star Award
- 2022 Ranked DiversityInc #10 Company for Philanthropy
- 2022 National Organization on Disability Leading Disability Employer
- 2022 Ranked DiversityInc #1 Top Utility Companies for Employee Resource Groups
- 2022 Scored Human Rights Campaign 90% on the Corporate Equality Index
- 2022 Newsweek America's Most Responsible Companies
- 2022 Ranked Forbes #2 Utility for Best Employers for Diversity
- 2021 Military Times Best for Vets: Employers List

Considering all these efforts, the Company is confident it will have the talented workforce necessary to execute this Plan successfully.

B. Process – Operating System Approach

The Company is committed to operational excellence. At Consumers Energy this means achieving a state of performance that enables the Company to deliver on its purpose.

Through application of Lean principles (The CE Way), work management enhancements, and the Gas Safety Management System, the Company is transforming how it operates to improve performance, the customer experience, identify opportunities to increase efficiencies in the business, and minimize risks.

1. THE CE WAY

In 2016, Consumers Energy began its Lean journey, The CE Way, to provide the best value for customers through a culture of continuous improvement. This is the adaption of the Company's lessons learned in manufacturing and other industries applied to design, construction, and operations of utility assets to continuously improve safety, quality, cost, delivery, and morale.

Early in the journey, the Company created a large footprint across the organization by exposing employees Company-wide to the CE Way, while building a strong motivation to improve safety, quality, cost, delivery, and morale.

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- In 2017, the Company launched the 4 Basic Plays (Visual Management, Operating Reviews, Problem Solving, and Standard Work) as a prioritized approach for leaders to begin implementing the CE Way. Since that time, the Company has added Waste Elimination to the Basic Play toolkit available to all employees.

Through these basic plays, the Consumers Energy has established a strong capability for delivering value to customers and allowing the Company to sustain breakthrough performance.

Consumers Energy's purpose of 'CMS Energy: World Class Performance Delivering Hometown Service' means ensuring the Company delivers safely, reliably, affordably, and with the highest quality. Examples of performance improvements can be seen across the organization because of the Company's Lean journey.

The CE Way Basic Plays depend upon one another and are implemented together to achieve maximum effectiveness in delivering for customers.

2. WORK MANAGEMENT

As part of the overall operational excellence process, **work management is a key to the successful execution of this plan.** Part of transforming the workforce is within distribution remediation and that will include changing to a zone-based model.

As stated in the [Distribution Asset Plan](#) section, remediation projects can range in size from several hundred feet to a few miles. In 2021, the Company began using a grid-based approach to complete projects, grouping areas of distribution mains and services together based on collective risk.

The grid approach is focused on completing all vintage pipe and service work in an identified geographic area benefiting from the economies of scale that can be achieved with larger projects such as fewer construction yards, increased productivity, and improved coordination with local communities all resulting in a better customer experience during construction activities.

The Company will continue to use the grid approach where feasible. In areas with low concentrations of vintage materials, high pressure steel, and TOD pipe, it will be necessary for the Company to use the segment approach (smaller projects) to complete remediation projects.

a. Enterprise Contractor Oversight

Enterprise Contractor Oversight ("ECO") is a key initiative for the effective oversight of contracted work for higher risk (level 3 & 4) activities.

ECO provides a framework for governance, performance monitoring, and controls of contractor work across the entire Consumers Energy enterprise; including gas, electric and project management. The goals of the ECO are to:

- Design and implement a Center of Excellence ("CoE") covering all aspects of Contractor Oversight.
- Implement risk-based standardized contractor prequalification processes, procedures, and tracking metrics.
- Develop remote inspection capability allowing for oversight of all contractor operations.
- Create standardized contractor performance metrics paired with common contracts, in line with Consumers Energy's Safety Culture.

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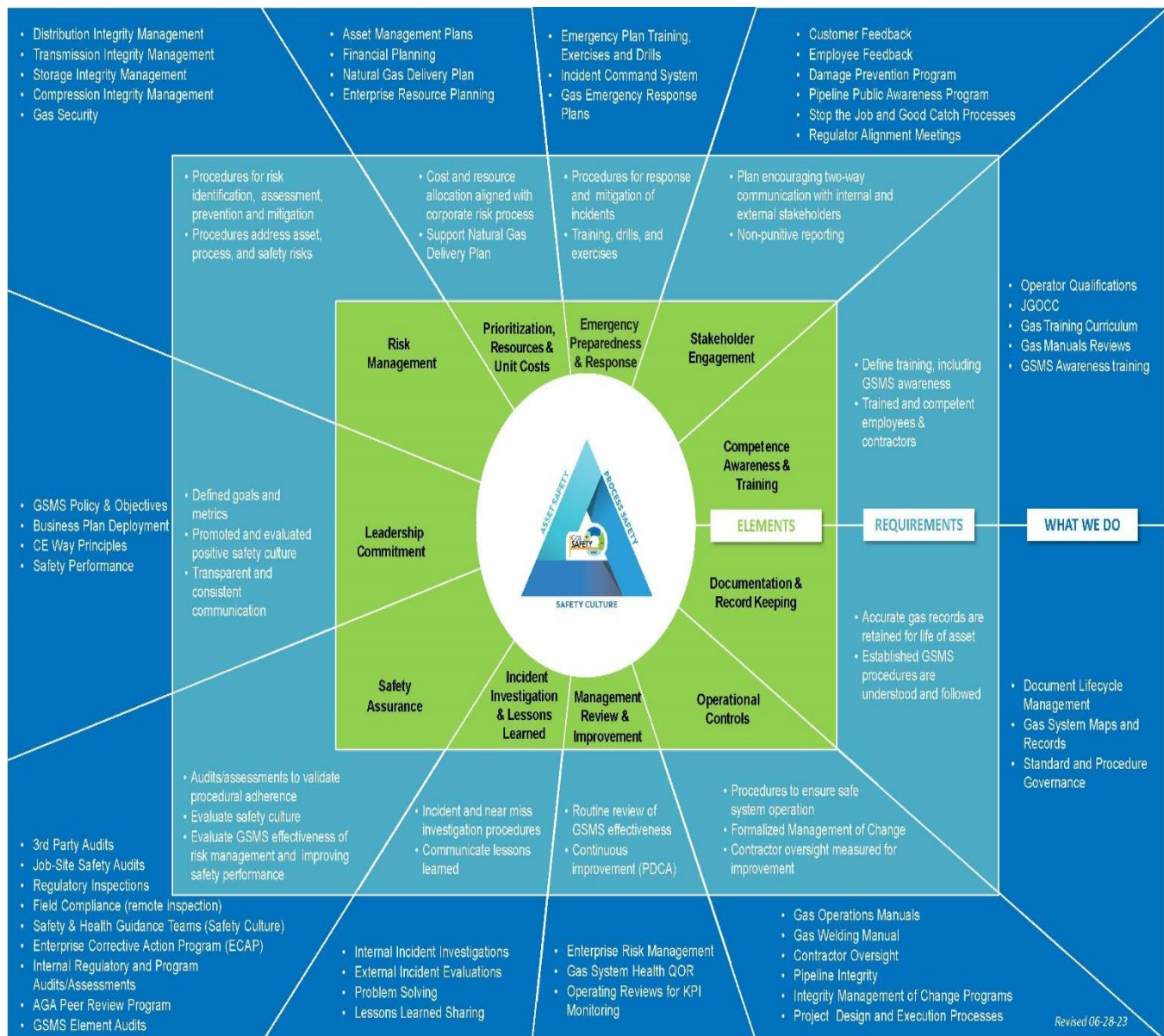
3. GAS SAFETY MANAGEMENT SYSTEM (GSMS)

In support of Consumer Energy’s focus on safety, the Company is in continuous improvement of the Gas Safety Management System (GSMS), identifying and mitigating risks related to the operation of the gas system. GSMS is the Company’s approach to conforming to the requirements of API RP 1173. The elements included in the GSMS are referenced in Figure 46.

The Company’s policy for the GSMS states “Consumers Energy employees and contractors will comply with regulations and adhere to and continuously improve all Company natural gas policies and procedures to improve gas system safety for Michigan and our co-workers.”

In alignment with the policy statement, a corrective action process and feedback system and documentation and records processes are essential to the maintaining the GSMS. The following sections highlight plans to support these processes and systems.

Figure 46: Overview of Gas Safety Management System



b. Enterprise Corrective Action Program (“ECAP”)

The ECAP provides an enterprise standard and governance, supported by an auditable, electronic system of record (DevonWay). This enables reporting of potential and identified non-conformance events and issues. This process supports primarily, the Safety Assurance element outlined in our GSMS program in accordance with API RP 1173.

A dedicated ECAP team, supports an industry benchmarked CAPA process outlined in the ECAP standard as follows:

1. *Issue Identification* – System, Asset and Process Safety issues/findings and/or events
2. *Evaluation of Issue* – Risk ranking (impact and severity) in the context of Safety, Regulatory Compliance, Financial, Environmental and Reputation.
3. *Detailed Investigation* – Utilizing a systematic methodology to identify root cause(s) so corrective action plans address more than just symptoms, but systemic issues.
4. *Implementation* – Corrective Actions planned, approved, assigned and implemented as designed.
5. *Verification* – Confirmation with objective evidence that the issue has been adequately addressed and risk mitigated/eliminated.
6. *Effectiveness/Sustainability Review* – A periodic assessment post verification that recurrence of original issue is no longer present, and actions once implemented are sustained.

Performing this standard CAPA process has enabled the organization to prioritize identified issues commensurate with the evaluated incoming risk, enabling the organization to work on the right issues in a timely manner. This has resulted in a year over year decrease in non-compliance violations and enterprise risk on the system.

c. Sewer /Cross bore Program

Consumers Energy has become aware of the possibility that in the process of directional boring of gas lines, since the practice began in 1976, the Company or its contractors may have inadvertently bored through sewer laterals. Over time, this can cause sewers to clog, and when the sewer lines are cleared the gas lines could be damaged. This impingement is commonly referred to as a ‘cross bore’ and can pose major risks to customer safety.

Using historical data and sewer contractor knowledge, in 2015, the Company built a risk-based approach, as part of the Company’s Distribution Integrity Management Program, to identify potential higher-risk areas for crossbores, such as schools, churches, hospitals, and other areas of regular high-volume customer gathering. The Company’s legacy program addressed these high-risk areas by retroactively returning to these areas to perform sewer locates and eliminate any found crossbores. This legacy program was completed in 2021.

With the completion of the legacy program, the program shifted from areas of high-consequence to areas of high probability. The Company is currently developing a risk model of already identified and repaired crossbores, areas where sewers are shallow, and other key variables that will indicate high cross bore probability.

d. Operations Compliance Programs

Operational Compliance consists of two main focus areas, risk-based assessments and field compliance. Both focus areas use the ECAP six-phased approach to problem solving, management action plans, and effectiveness reviews to implement sustained improvements.

- A Risk Based Assessment is a programmatic evaluation of operational areas within the Company's gas engineering and operations areas governed by 49 CFR 191, 49 CFR 192, 49 CFR 199, and the applicable state-added rules in the Michigan Gas Safety Standards. Identification of these risks is necessary to create effective risk mitigation as well as prevention and correction of non-conformances through ECAP investigation, implementation, and verification activities.
- The Field Compliance Program, within gas operations, provides in-person field oversight of operations, maintenance, and construction activities being performed by Union and contractor employees. The documented field compliance findings are trended and evaluated for recurrence, and repeated findings are considered for formal problem solving and risk mitigation.

e. Gas Documentation & Records

Effective documentation and accurate records reduce gas system risk by increasing accuracy, accessibility, and resource efficiency related to the content.

A multiple year effort continues to ensure gas documentation, referred to as Gas Standard Work, is sufficient, usable, and meets the requirements of the CE Way Standard Work Basic Play. This effort will provide frontline workers with the standard work documentation they need to ensure work is done safely, efficiently, and in a way that demonstrates to regulators that we adhere to the Gas Code.

The Gas Technical Information Excellence (GTIE) program was developed to “ensure the gas technical records and information are accurate, complete, and accessible, making employees more efficient while increasing confidence in public safety.” GTIE is aligned with the Company's Corporate Information Governance organization and adopted the Association of Records Managers and Administrators (“ARMA”) *Generally Accepted Record Keeping Principles*, to define and execute enhanced governance of gas technical records and information.

The GTIE Program has evolved and matured the gas organization by setting requirements that promote consistent activities., resulting in accurate, complete, and accessible technical records. Through this evolution, the GTIE Council has accomplished its objectives. Starting in 2023, the processes and procedures will be embedded into the gas business standard work with monitoring for ongoing adherence.

4. GAS DAMAGE PREVENTION STRATEGY

The Company's vision for Damage Prevention is to provide World Class Performance in damage prevention through reducing and preventing excavation damages to the gas distribution system in support of employee and public safety.

Damages are caused by home/business owners or excavators digging around Consumers Energy gas distribution assets.

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The primary causes of damages are due to:

- Excavation practices not sufficient (failure to hand dig, failure to maintain marks, improper backfilling).
- One call practices not sufficient (failure to call MISS DIG, working outside of valid ticket window).
- Locating practices not sufficient (mismarked facilities, record errors, system issues).

Consumers Energy's goal is to achieve 1st quartile ranking by 2030. Strategies to achieve the goal include creating, stabilizing, and continuously improving critical programs that support both the homeowner and excavating community in alignment with industry best practices.

A series of field programs have been deployed in support of the 3rd party excavating community including:

- Proactive outreach program – outreach program to assist the excavating community proactively including coaching and training, locating assistance.
- Repeat damager program – step escalation program targeted to mitigate the highest risk excavators.
- No call damager program – coaching and enforcement program to mitigate the highest risk excavators not properly utilizing one call processes.

In 2023, a dedicated gas distribution only work force was established to improve on timeliness, accuracy and excavator communications on projects. Overall, the results have exceeded target conditions including major improvements in timeliness as including a greater than 75% improvement in accuracy related damages and 20% decrease in overall damages in the area of implementation.

The Company is also planning to engage in discussions with repeat third-party damagers and collaborate with regulatory stakeholders, to continue to improve in this area.

Key considerations in the strategy are focused on behavioral change, including a combination of trust, relationships, and accountability.

5. LOST AND UNACCOUNTED FOR GAS

a. Overview of Lost and Unaccounted for Gas

Lost and Unaccounted for (“LAUF”) Gas is the difference between the total measured transmission and distribution pipeline system gas volumes received less gas volumes delivered.

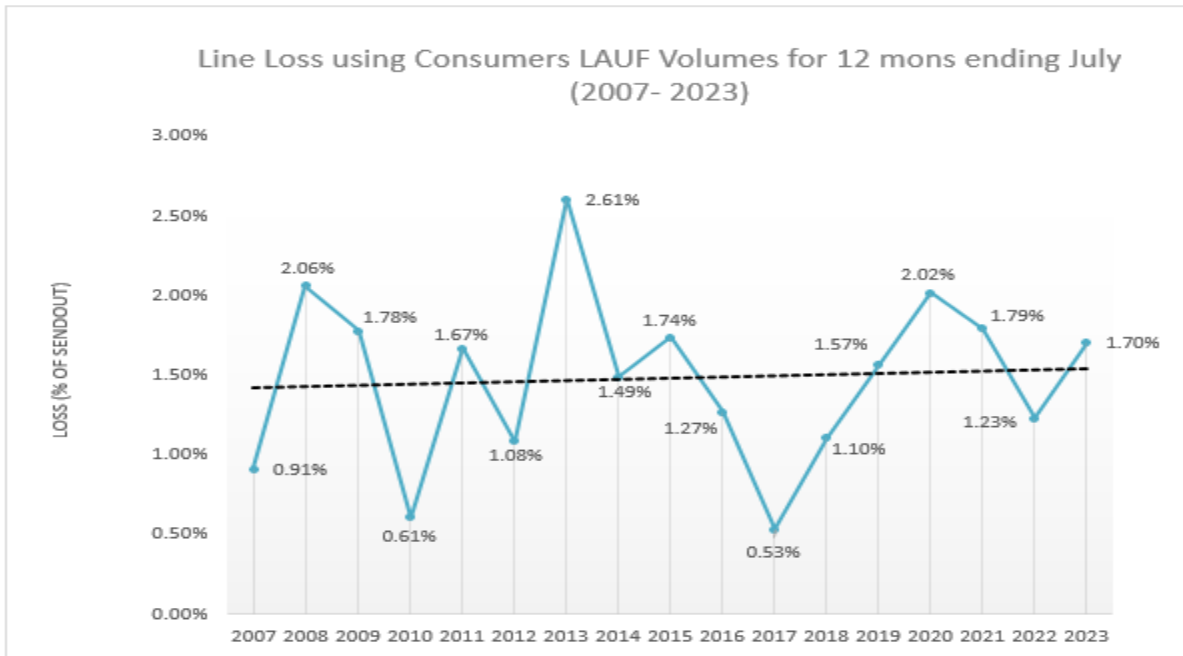
A ‘loss’ occurs whenever the measured receipts are greater than the deliveries of the pipeline system. Conversely, a ‘gain’ occurs whenever the measured deliveries are greater than the measured receipts. Factors that contribute to gas losses and gains are described in section b.

$$LAUF = (Total\ Measured\ Input\ Volumes - Total\ Measured\ Output\ Volumes)$$

The Company calculates LAUF annually, based on 12 months ending July 31. This is the percentage used for reporting purposes. There is a natural variability in the yearly data due to factors such as weather and load distribution.

As shown in the chart in Figure 47, the overall trend shows an average loss of 1.48%. Through general rate cases the Company recovers LAUF expenses based on a five-year average of line losses, based upon current cost of gas.

Figure 47: LAUF Historical Reporting



b. Factors Contributing to Gas Loss

There are many factors that can contribute to gas losses or gains. The most common factors are related to equipment, measurement accuracy, theft, and leaks.

- Equipment issues can be incorrect sizing, condition, and location of meters and meter components.
- Incorrect calibration of meters and/or transmitters, data interface, and communication errors between systems can also cause inaccuracies.
- Other factors are inaccurate estimates of lost gas during venting of gas or when damages to the system occur, and stolen gas.

c. Plan for LAUF Monitoring and Control Improvements

1. Smart Energy and Gas AMR

With the completion of the AMI and Gas AMR projects, the Company will be able to incorporate the use of monthly calendar reads for the calculation of delivered gas to sales customers, reducing the impact of cycle billed reads. This will mitigate the unbilled volumes that are inherent in the lag between meter reads and customer billing.

2. Gas Quality and Measurement Improvement Projects

Pressure, temperature, and gas quality are the contributors to accurate measurement calculations. To increase measurement accuracy for volume, heat content, specific gravity, pressure, and temperature effects, the Company plans to replace 230 orifice meters, which range in age from 50 to 65 years old, using highly accurate ultrasonic meters (“USM”) and install 20 additional gas chromatographs across the state over the next 15 years.

3. Increase Utilization of Flow-Cal Enterprise Gas Automation Software

Gas system segmentation within the Flow-Cal system includes installation of boundary meters to enable system segmentation and tracking of LAUF by zones (segments). Further refinement into zones results in improved LAUF tracking and issue identification.

4. Infrastructure Improvements

The age and materials of the distribution system affects LAUF. Natural deteriorations in vintage materials causes corrosion and cracking in piping which results in leaks across the system. Replacement of vintage materials and other aged assets should reduce gas loss over time.

C. Technology – Digital Approach

Digital capabilities are essential to optimizing compression and storage assets, modernizing the distribution and transmission systems, incorporating predictive and condition-based maintenance, transforming work management, and ensuring physical and cybersecurity of assets.

Consumers Energy’s pragmatic digital approach is evolving to support:

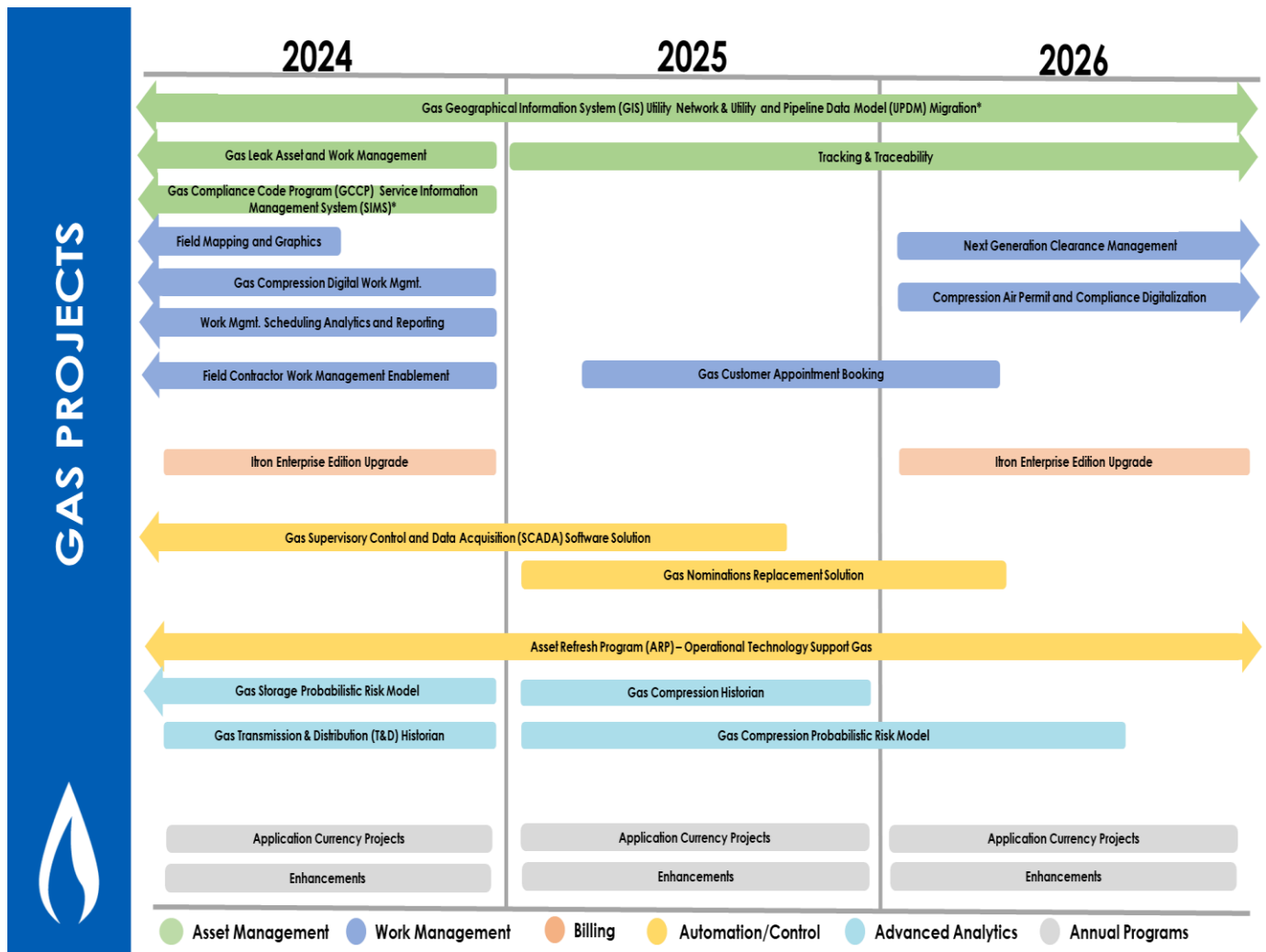
- Faster delivery with new practices such as adopting agile frameworks.
- ‘Democratization’ of digital skills and expectations.
- A move to cloud solutions where and when appropriate.
- Data as an asset and deployment of larger-scale analytics.
- Deployment of a consistent asset management system/framework.
- Deployment of integrated control systems for system automation.
- Continuous operational improvements through automation.
- A commitment to ensure digital investments do not introduce unnecessary risk to the Company or its customers, and to protect sensitive data and critical infrastructure from cyber threats.
- Evaluating current strategic platforms to ensure they are fully leveraged/optimized, and implementing enhancements as needed to provide new functionality for emergent business and customer value.
- Evaluating new platforms that can further enhance the Company’s capabilities. This is in alignment with API RP 1173, “11.2 – Management shall also periodically evaluate new technology that may enhance pipeline safety.”

1. INVESTMENTS IN DIGITAL CAPABILITIES

The Plan includes digital investments in the following areas: asset management, work management, system automation and control, security and privacy, and advanced analytics.

An overview of digital projects over the next few years is shown below in Figure 48.

Figure 48: Overview of Consumers Energy Digital Projects



- a. **Asset management** investments include the ability to store, manage, and track Company gas assets in a consistent manner to ensure visibility and transparency as part of asset life cycle management and predictive maintenance practices (see [Advanced Analytics](#) below).
- Projects include the transformation of the enterprise gas GIS system to the new industry standard Utility Pipeline Data Model, and implementation of the Utility Network extension to merge the transmission and distribution into one data model.
 - This will allow simpler analysis of TOD assets, enforce a higher level of data integrity, develop geospatial insight on a more granular asset level, and more accurately define how each part of a utility system is connected.
 - In driving to a single source for the geospatial location of Company gas assets, Consumers Energy has begun migration of gas service records into GIS.
 - Completing this effort will create a single source for distribution asset location, simplify processes, reduce opportunities for inconsistencies in data sources, enhance the Company’s ability to interrogate and improve the data, and increase Public Safety.

Natural Gas Delivery Plan

- Extending the implementation of ProjectWise for Gas Distribution assets will facilitate a management of change process for gas engineering design and gas system configuration changes—increasing public and employee safety and regulatory compliance with complete and accurate records that are easily accessible and searchable.
- The Company has implemented Advanced Methane Detection using Picarro technology and is being used to help prioritize and plan for the accelerated pace of vintage material remediation, perform risk-based surveying in the compliance leak surveying process, and help measure emissions from distribution pipelines to aid in achieving methane reduction initiatives.

For risk-based surveying in the compliance leak surveying process:

- The Company is conducting a systematic multi-year rollout, with consideration of the volume of leaks expected in comparison to conventional methods and the subsequent remediations.
- To realize the efficiencies gained through Advanced Methane Detection, a project to move from an asset-based to a grid-based compliance leak surveying system is being planned.

The Company currently uses asset-based compliance leak survey to perform compliance leak survey. It is a method whereby individual assets are surveyed based on the compliance due date regardless of where the asset is located within the gas system.

Grid-based compliance leak survey is performed in quarter-mile sections. The survey will include all in-scope assets within a quarter-mile section at the same time. The cadence for returning to perform compliance leak survey in that area again is based on the asset makeup within that area. The frequency is determined by the compliance schedule of the asset makeup within that area.

Data is the foundation for predictive maintenance. The Company will require live digitized records and performance of all assets to enable predictive calculations and a potential future state of machine learning.

- The Company must digitize current maintenance records into a centralized database and electronically log maintenance activities to uncover correlations between asset health and driving factors.
 - Additional functionality and analytics are needed from the Company's foundational information systems, including more reliable and advanced SCADA and SCADA Historian systems. These are necessary to streamline data access and to allow for more timely and accessible operational analytics that will enable better asset management, troubleshooting, and support.
- b. Work management** and field service management solutions provide electronic capabilities for work forecasting, resource and work planning, work scheduling, dispatch, field execution and closure, tracking performance and work trends, and reacting/responding to emergencies.

The technologies provide more accurate and timely information for field and office employees.

- Advanced fleet telematics will enable and enhance the visibility of crew and work location, create opportunities to improve crew and work dispatching.
- Modern technology tools are also required for work groups that still use paper forms, including the Gas Measurement, Regulation, and Pipeline & Storage and Gas Construction. Enabling contractors with an electronic work management system also supports improved accuracy and timeliness of work. Fully digitizing the work management experience also supports improved customer service by providing real-time work status.

Natural Gas Delivery Plan

- Improved field mapping and graphics functionality enables better visibility of maps and drawings in the field including the ability for field redlines/edits to ensure records are accurate.
 - Advanced planning and scheduling work management features will lead to efficient work assignment to field employees and other resources for improved customer service.
 - The Company will continue to enhance its current foundational work management systems in support of related business improvements. Periodic maintenance of technology assets is key for supportability in the field. Application currency for critical systems ensures that applications can perform in emergency and field scenarios.
- c. **SCADA** is comprised of software and hardware components used to monitor, analyze, and control real-time data from field devices on the gas system. Field data from measuring devices (sensors, valves, meters, etc.) is collected using a Remote Terminal Unit (“RTU”) and then relayed to Gas Control where software is used to display for operators to analyze and interact with.

- **Gas Control Software**

The current gas SCADA software solution, called Citect, was originally implemented in 2000.

- While the solution has been maintained since its implementation, the Company's gas system has outgrown the current capabilities. As the solution ages, increased effort is required to address obsolete application and database software architecture, and enhancements to the system are limited.
- To address the capability gaps, custom interim fixes and integrations have been developed where each requires maintenance and support. This environment adds complexity and cost to solution upgrades and troubleshooting issues.
- The current gas SCADA solution will limit the ability to invest in digital solutions for increased system health monitoring and preventative maintenance capabilities due to the inherent complexity to integrate these future capabilities.
- The investment in a more advanced gas SCADA software system will enable:
 - a. Integration with GIS for system control reliability.
 - b. Gas system visibility and transparency.
 - c. Deployment of RCVs integrated with the gas SCADA system.
 - d. The future ability to control and perform remote shut-off to preserve safety and reliability of the gas system.

Replacement of the gas SCADA Citect software is planned to be completed in 2025.

- **Remote Terminal Unit (RTU) Solution**

The current RTU solution, called SixNet, was completely implemented by 2006.

The SixNet hardware and software required to program and operate the RTUs are no longer being updated or supported by the original equipment manufacturer (“OEM”).

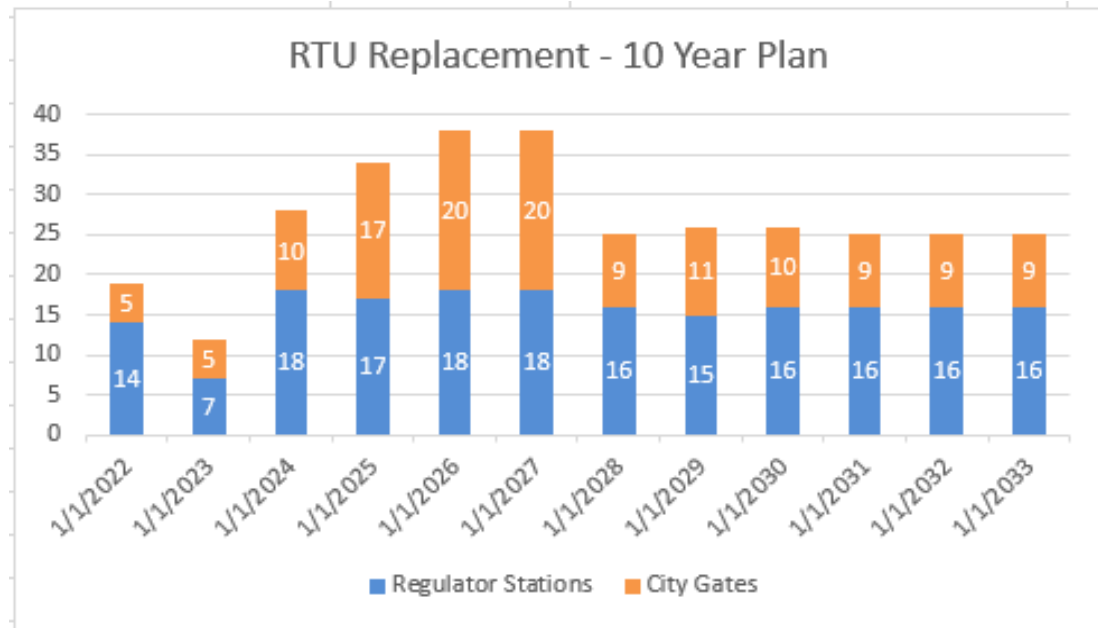
- New RTU models and associated hardware produced by the OEM is not backward compatible with the software/hardware configurations currently running on all Consumers Energy Gas RTUs.

Natural Gas Delivery Plan

- The current SCADA architecture needs to be updated to ensure the long-term viability of the monitoring and control functions necessary for the safe operation of Consumers Energy’s pipeline system.

The plan is to replace the existing SixNet RTU platform with a new platform with the plan shown in Figure 49.

Figure 49: The 10 Year RTU Replacement Plan



- d. **Security and privacy** investments secure key Company assets, including physical locations with card access.

Transitioning from a lock-and-key system at the Company’s city gates to card access will centralize access control and enhance security. The system is capable of both single-factor authentication (card only) and two-factor authentication (card and code).

- Currently the Company deploys two-factor authentication in only the most sensitive physical areas (generally North American Electric Reliability Corporation (“NERC”)/Critical Infrastructure Protection (“CIP”) medium assets). The Company will evaluate two-factor authentication for gas facilities over time, as security and regulatory requirements mature.
- Card access management is a single, centralized system and process for the Company. All employees receive basic access to major buildings with specialized access granted through a workflow approval process. Access is monitored through the Company’s 24 x 7 Security Command Center. Processes are in place to deactivate badges immediately upon notification of separation from the Company and automatically when not used for specific periods of time.
- Modernizing and standardizing the gas SCADA network at the Company’s gas compressor stations and controls rooms to mitigate cyber security vulnerabilities and allow the Company to fully comply with API requirements to provide a secure gas system that meets Customer needs.
- Continued implementation of security infrastructure to enable more visibility and protection of critical infrastructure, including but not limited to, perimeter fencing, security cameras, and two-way audio.

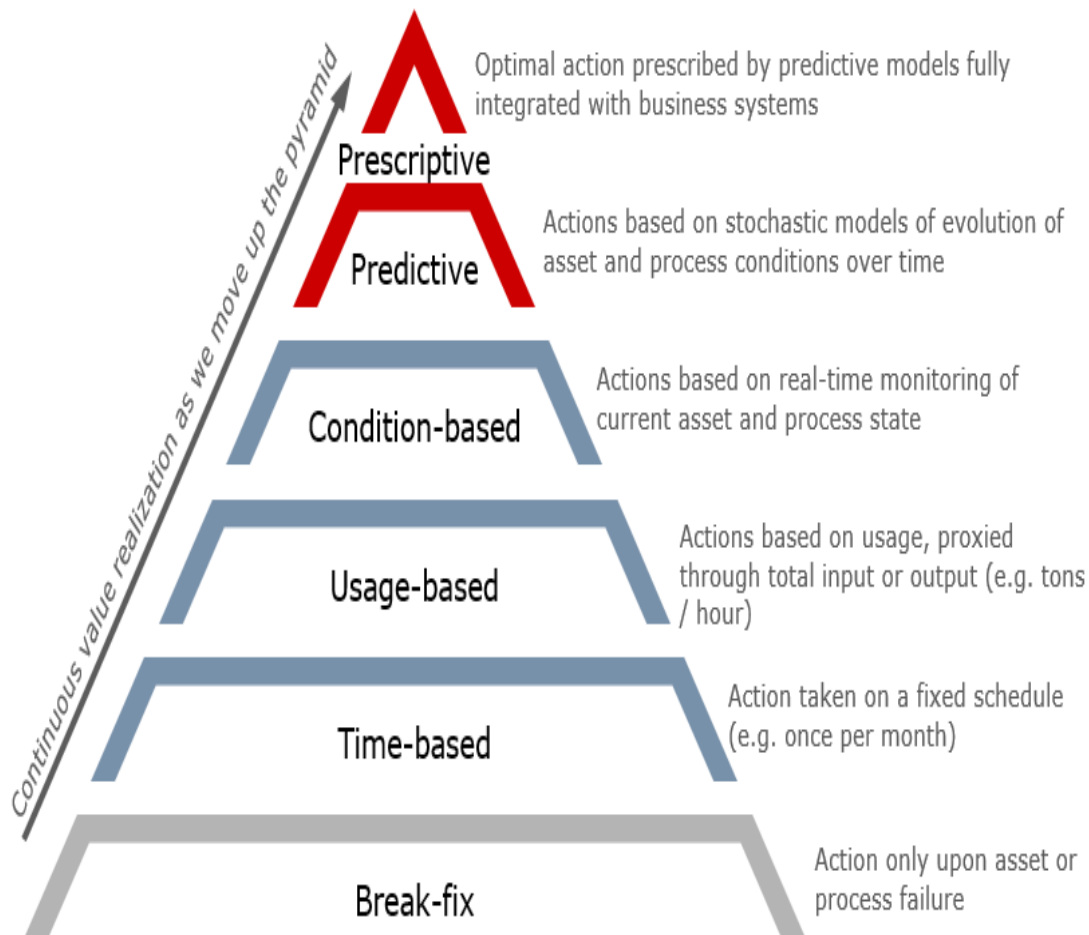
Natural Gas Delivery Plan

- e. **Advanced analytics** investments include data collection, standardization, and analytical model frameworks.

The Company will transition from its existing indexed risk model with probabilistic risk models as described above in Risk Management.

- Consumers Energy plans to apply advanced statistical and predictive modeling tools and techniques for deriving insights from gas system data. Such projects will enable damage prevention predictive analytics and customer-level load profiling and predictive models with propensity ranking for future gas DR programs.
- Integrating operational gas system data to a consolidated data repository will strengthen operational reporting and analytical capabilities. For example, customer value modeling efforts revealed the need to also invest in a repeatable capability for rapid system configuration modeling to run scenarios as future supply states and customer demand evolve.
- The Company’s current maintenance practices vary among assets. Compressor units currently use a mix of usage-based and time-based maintenance for large parts. This means parts are replaced based on throughput or time since last replacement. Select smaller parts use a break-fix approach. The plan is to move maintenance practices toward predictive or prescriptive levels. Figure 50 illustrates such an approach.

Figure 50: Maintenance Practices Pyramid



2. FOUNDATIONAL TECHNOLOGY INVESTMENTS

Supporting digital capabilities for gas are foundational investments that create the technology platforms, tools, processes, and frameworks that enable business outcomes through project delivery.

The investments are organized by capabilities as follows:

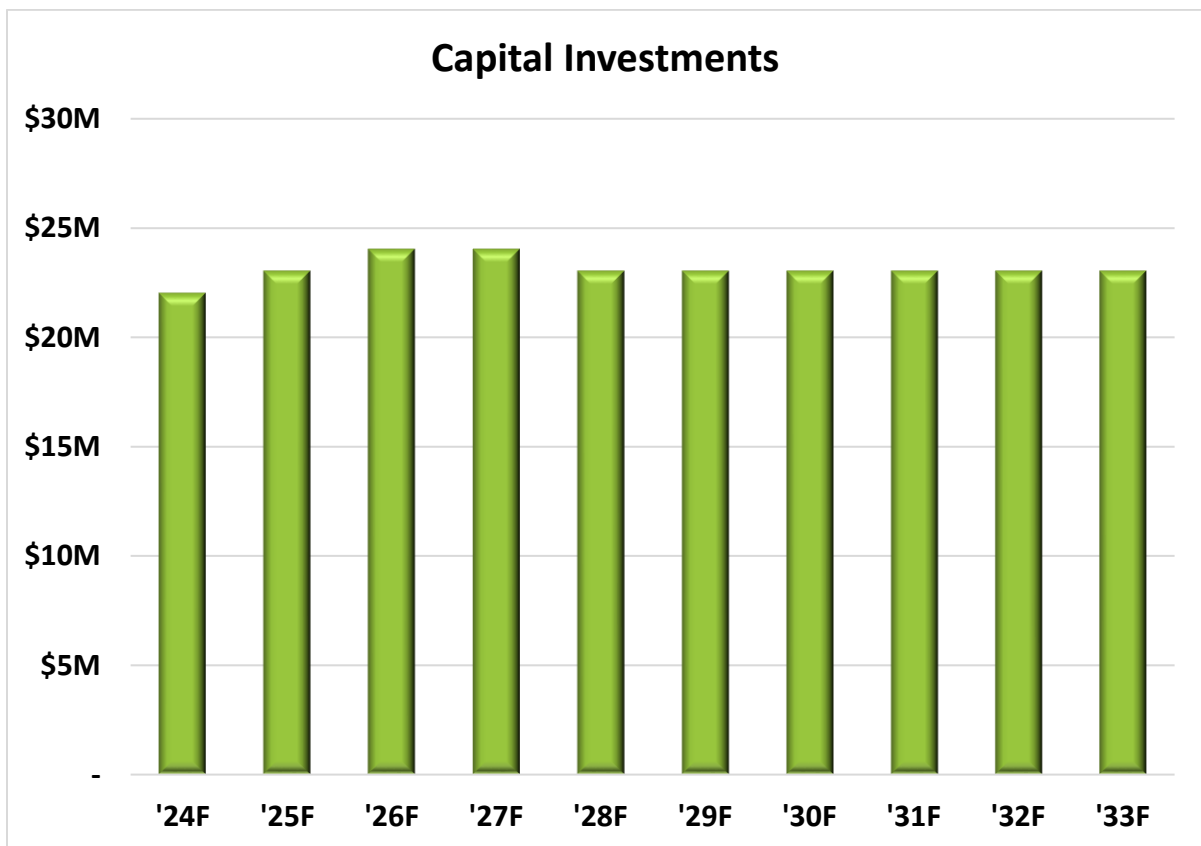
- Data and analytics – Accurately manage and collect data, integrate it seamlessly across systems and applications, and create insights to inform and enable business outcomes and decisions.
- Data management and governance – Manage data as an asset through data life cycle process (create, update, and delete) for master data management.
- Data integration (Application Programming Interface Fabric) – Integrate data across platforms, systems and applications with a re-usable framework to increase speed of delivery for new integrations, and to avoid costs associated with point-to-point integrations.
- Work automation with artificial intelligence – Automate routine, repetitive tasks through software to improve efficiency and productivity. This includes low-code/no-code application platforms that enable employees across the Company to build simple applications to automate their business processes.
- Cloud platform enablement – Manage scalable solutions, platforms, and technical infrastructure remotely over the Internet to flex capacity with Company needs and demands. Consumers Energy has already been using cloud solutions by adopting Software as a Service (“SaaS”) and Platform as a Service (“PaaS”) offerings.
 - EWN Services Operator Qualifications for tracking and renewals of employee’s qualifications, ARCOS solution for employee schedules and callout, ESRI’s ArcGIS Online for creation of focused mapping and analysis solutions, ServiceNow, Office 365, and SAP SuccessFactors are examples of SaaS solutions that have been implemented.
 - Azure DevOps is an example of a PaaS solution used by developers to manage their software development lifecycle.
- Use of Cloud technologies to leverage artificial intelligence and machine learning at-scale – Integrate data and run advanced analytics at scale using leading machine learning and artificial intelligence frameworks.
 - As an example, in Electric, the Company is beginning to use Infrastructure as a Service (“IaaS”), along with machine learning, to train an analytics model that will help improve Estimated Time of Restoration (“ETR”).
- Electronic content management – Manage enterprise content/data consistently to enable digital document management for retention, compliance, and privacy.
- IT Infrastructure and Communications Technology – This technology is critical to successful operation of business applications, providing a strong backbone required for supporting 24 x 7 Operations. Consumers Energy plans to continue investment in best-in-class infrastructure and communications to support Operations.
 - Infrastructure technologies are the backbone networks for running business applications and are planned to be kept up to date for performance and security of modern applications. The technology is key to manage data, voice and multimedia communications through a reliable and redundant network infrastructure with robust frameworks to protect physical and cybersecurity assets.

Natural Gas Delivery Plan

- Support for multiple networking communication options for field operations and back-office personnel, including updates for truck connectivity, virtual private networking, mobile phone connections, and others.
- Communication and collaboration technology like Microsoft Office365 provide additional channels for supporting field operations.
- Field communication via 800 MHz radio provides dedicated mission critical connectivity between dispatch and field operations. "The Company recently migrated to the Michigan Public Safety Communications System to improve coverage and reduce costs.

Figure 51 shows forecasted capital investments for this digital implementation into the gas system and will support many gas projects and programs.

Figure 51: Digital (IT) Capital Investment Plan



Equally as important as new digital investments in technology as an integral element of the Plan, is the ability to properly maintain technology assets after implementation.

Prudent technology asset management and replacement programs, system monitoring, timely upgrades, and continuous system patching to mitigate cyberthreats are necessary Information Technology (“IT”) O&M expenditures required to sustain business operations and provide the experiences customers expect.

NOTE: More information on Digital, including a corresponding financial summary, is available in the Company’s *Digital Three-Year Plan*.

3. RISK MANAGEMENT

To manage system risk, the Company uses risk models.

Currently, the Company uses multiple indexed risk models for the different asset areas, which are used throughout the gas utility industry. These models have changing risk factor weightings on an annual basis that affect project planning and resource requirements.

- The Company is moving to an upgraded version of the transmission indexed model that will rely on a more consistent definition of risk.
- As part of the transformation, the Company is also going to use an upgraded probabilistic risk evaluation tool—and leverage it for learnings in transmission prior to potentially using this same type of new risk model for the other assets (i.e., storage, compression, and distribution).

The industry is shifting from relative index risk models toward probabilistic risk models, which is why the Company is planning to transition from the current transmission indexed model to a probabilistic model.

PHMSA defines probabilistic as a model with inputs that are quantities or probability distributions, with outputs that can be expressed as probability distributions. Model logic attempts to adhere to laws of probability.

Figure 52 contrasts an indexed model to a probabilistic model and shows why a probabilistic model is favorable to an indexed model for complex gas systems.

Figure 52: Contrast of Potential Risk Model Upgrades

	Upgraded Indexed Model <i>(as of 2021)</i>	New Probabilistic Model
Description	<ul style="list-style-type: none"> • Output is a unit-less index score • Based on 8 threat categories informed by 100+ underlying variables • Produces single risk score that has standard risk definition (i.e. no longer has changing factor weights) 	<ul style="list-style-type: none"> • Output can be expressed as probability • Outputs incorporate probability distributions • Inputs as many high-quality data factors as possible but self solves to simplify and remove poor quality variables
Benefits	<ul style="list-style-type: none"> • Reduced variance compared to current indexed model (omits changing weighting factors) • Consistent definition of risk (i.e. consistent factor weightings) • Expanded set of underlying inputs 	<ul style="list-style-type: none"> • Industry-leading and easy to interpret • Reduced variance compared to current indexed model (omits changing weighting factors) • Enables easier business case development through simpler risk-\$ tradeoffs • Allow for more informed, data-driven decisions • Would enable comparison across any assets that also use probabilistic model
Disadvantages	<ul style="list-style-type: none"> • Score is difficult to interpret and therefore does not allow for instant business case calculations • Difficult to compare magnitude of risk between various asset classes / risk models • Still subjective 	<ul style="list-style-type: none"> • Learning curve for both industry & organization • Sizeable investment required • Perception of increased complexity • Need to completely overhaul existing system • Lose ability to compare against past risk results
Delivery Implications	<ul style="list-style-type: none"> • Need to continue using existing model until 2021 • Need to better understand exactly how it works & if additional data collection is needed • Need to develop methodology to incorporate into business cases and compare results to system-wide priorities 	<ul style="list-style-type: none"> • Need to design, develop and test extensively • Will need an interim plan between launch of new model and existing model • Need to develop best practices on how frequently to run and how often we can allow our plans to change because of the model • Requires organization-wide training on interpretation of risk results and how to use in business case calculations

Based on the model contrast above, the Company plans to evolve to a probabilistic risk model. The approach was to start with the transmission system in 2021, and then migrate to other assets over time.

VI. Initiatives

A. Gas System Decarbonization

Consumers Energy is implementing industry-leading plans to reduce greenhouse gas emissions created by its natural gas operations. This includes modernizing its natural gas system to achieve net zero methane emissions from its operations by 2030.

In addition, the Company is also looking beyond emissions in its system and operations to protect the planet. A deliberate, clean energy transition of the gas business can help the environment by providing clean heat—while continuing to safely deliver affordable energy to customers in a cold-weather climate, like Michigan.

Therefore, Consumers Energy is continuing to lead Michigan’s clean energy transformation by looking beyond its own operations to help customers and suppliers reduce their greenhouse gas emissions, especially those generated from natural gas sources.

- In 2022, the Company committed to achieve net zero greenhouse gas emissions from the entire natural gas production and delivery system, including customers and suppliers, by 2050.
- To support this goal, the Company will work with customers to reduce their emissions in 2030 by 20 percent.

This new goal supports Michigan’s MI Healthy Climate Plan to achieve net zero carbon emissions by 2050, including an interim State target of reducing emissions from space heating 17% by 2030.

Additionally, Federal Executive Order (“EO”) 14008 of January 27, 2021, commits the United States to a broad action plan addressing climate change. This EO directs federal agencies to prioritize projects that reduce emissions of toxic substances and greenhouse gases from existing and abandoned infrastructure, and to coordinate investments to achieve substantial reductions of methane emissions from the oil and gas sector as quickly as possible.

Consumers Energy will remain agile and adjust as needed to accommodate policy as it evolves both on a federal and state level.

The U.S. Environmental Protection Agency (EPA) tracks greenhouse gas emissions in three categories:

- **Scope 1:** Direct emissions from sources that are owned or controlled. At our Company, these are emissions produced in the process of generating and supplying energy for customers, such as carbon emissions from burning methane or fugitive methane emissions from our natural gas delivery system. The Company’s goal to reduce Scope 1 emissions is “methane net zero by 2030.”
- **Scope 2:** Indirect emissions associated with the purchase of energy for any end use. These emissions may arise from the energy we purchase and use at our facilities and comprise only a fraction of the emissions linked to our company.
- **Scope 3:** Emissions are from sources not owned or directly controlled but related to our activities. These include all emissions traced to natural gas we purchase and activities by customers and suppliers, primarily from end uses like burning natural gas to heat homes and businesses. The Company’s goal to reduce Scope 3 emissions is “net zero carbon emissions by 2050.”

Natural Gas Delivery Plan

1. METHANE NET-ZERO GOAL

Consumers Energy recognizes the role methane plays as a greenhouse gas emission, and that methane’s impact as a greenhouse gas is notably more significant than that of carbon dioxide, with a short-term global warming potential that is approximately 100 times greater.

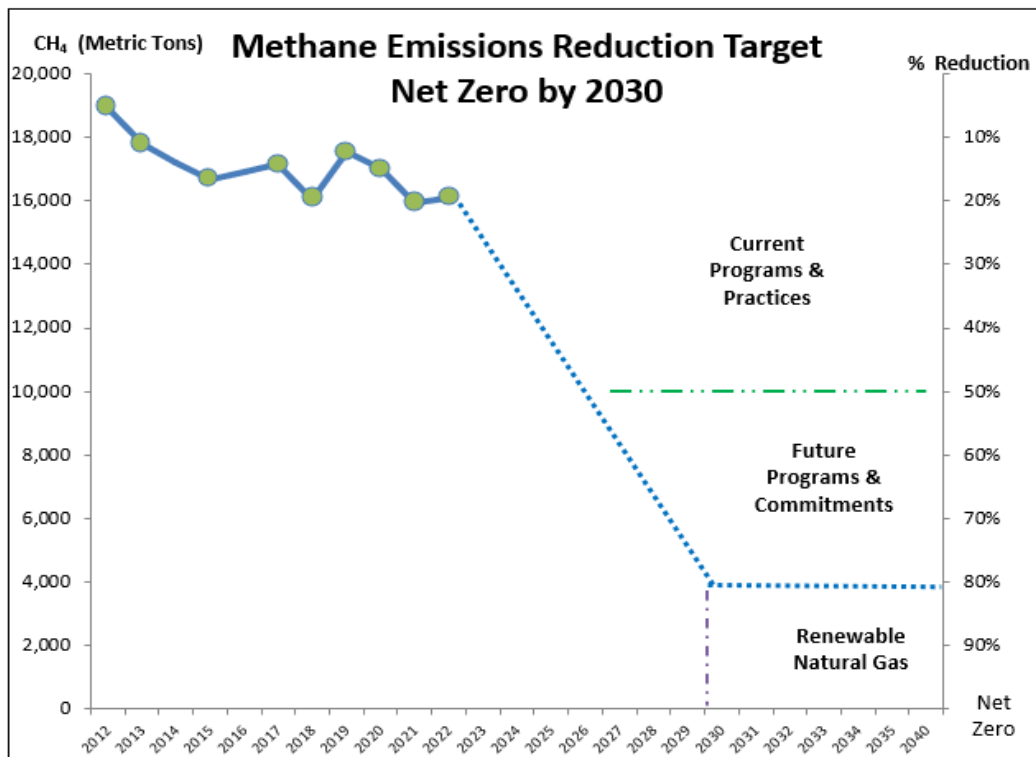
This means that removing methane early in our decarbonization journey has an even greater benefit to the environment. Even over longer time horizons, methane’s global warming potential remains 25 times that of carbon dioxide. Since 2012, Consumers Energy has already reduced its methane emissions from its natural gas delivery system by approximately 15%. In 2019, Consumers Energy committed to achieving an 80% reduction in methane emissions as part of our effort to reach Net Zero methane by 2030.

The methane net-zero plan seeks an 80% reduction of methane emissions by 2030 through the following near-term measures:

- Distribution main leaks: replacing vintage pipe (cast iron and unprotected steel).
- Distribution services leaks: replacing vintage pipe (copper and bare steel).
- Storage: Wellhead component leaks (plug and abandon program).
- Compression blowdown vent emissions: reducing natural gas venting frequency/duration.
- Transmission blowdown emissions: increase utilization of temporary compression to reduce quantity of natural gas being vented.

As shown below in Figure 53, procurement of RNG is expected to cover the remaining 20% methane emissions to achieve net zero for the delivery system. See [Renewable Natural Gas](#) below for further discussion.

Figure 53: Net Zero Methane Goal: Emission Reduction and Renewable Natural Gas Offset



Natural Gas Delivery Plan

In 2022, Consumers Energy’s annual methane emissions from known sources were 16,101 metric tons. The total reduction from baseline to date is estimated at 2,809 metric tons.

In 2022, the Company adjusted its 2012 methane emissions baseline from 14,384 metric tons to 18,910 metric tons to include previous unavailable emissions data shown below. Adjustment to the baseline does not impact the net zero goal and is only used to measure progress with a draft chart shown in Figure 54.

Figure 54: Methane Emissions for Natural Gas System



2. NET ZERO CARBON EMISSIONS GOAL BY 2050

In March 2022, Consumers Energy committed to net zero emissions from sources not owned or directly controlled but related to our activities. These include all emissions traced to natural gas purchases and activities by customers and suppliers, like those associated with burning natural gas to heat homes and businesses.

Reaching ‘net zero’ will require Consumers Energy to balance many diverse emission reduction opportunities with safe, reliable, and affordable energy delivery.

It will also require working partnerships with stakeholders across the state to ensure a decarbonized gas system can continue to meet the needs of customers, communities, and businesses.

In 2021, Consumers Energy worked with industry leading consultants to better understand the most affordable and resilient State-wide economy decarbonization plan that achieves net zero carbon emissions by 2050.

This analysis incorporates both the Company’s electric and gas utilities with an ‘energy agnostic’ approach. It was determined that limiting the scope of analysis to the Consumers Energy service territory would improperly exclude constraining factors like electric vehicle demand on the grid and would not take advantage of geographic and logistical efficiencies throughout the State.

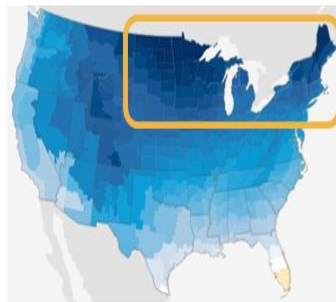
Therefore, the analysis assessed the United States approach and differences as shown in Figure 55 below, and then was performed on a state-wide basis. It was found that the Great Lakes region has unique characteristics that suggest certain technology combinations will be more advantageous than others in achieving a low carbon future.

Figure 55: U.S. Decarbonization Potential by Region

U.S. Regions with relevant conditions similar to Michigan

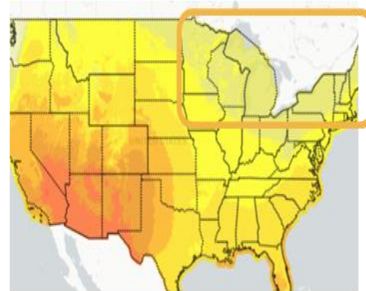
Cold winter climate

Avg. min. January temperature



Limited available renewables

Solar



As states across the US move towards full decarbonization, almost all levers will need to be pulled in every state:

- Electrification, powered by renewables
- Fossil natural gas with CCUS
- Zero-carbon gas (e.g., hydrogen, biogas)

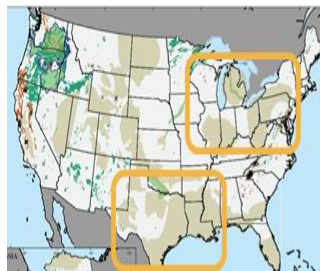
States with **warmer climates and better renewables potential** will likely have more building electrification powered by solar and wind compared to Michigan

States with cold climates and limited renewables that lack Michigan’s sequestration resources, may build higher cost renewables, rely more heavily on imports (e.g., hydro imports from Canada to New England), or build nuclear

Customer mix and building stock will also influence the cost and viability of electrification across regions

States like Ohio, Pennsylvania, Indiana, etc. may end up relying more heavily on natural gas with sequestration, similar to Michigan

High carbon sequestration potential¹



Wind²



1. Image provided for illustrative purposes. Does not represent carbon sequestration assumptions used in decarbonization scenario modeling

2. Despite relatively high potential for offshore wind, siting challenges constrain development

Source: National Oceanic and Atmospheric Administration, climate.gov; US Dept. of Energy, National Renewable Energy Lab, RE Atlas; US Geologic Survey, “Geologic Carbon Storage Potential in the United States;”

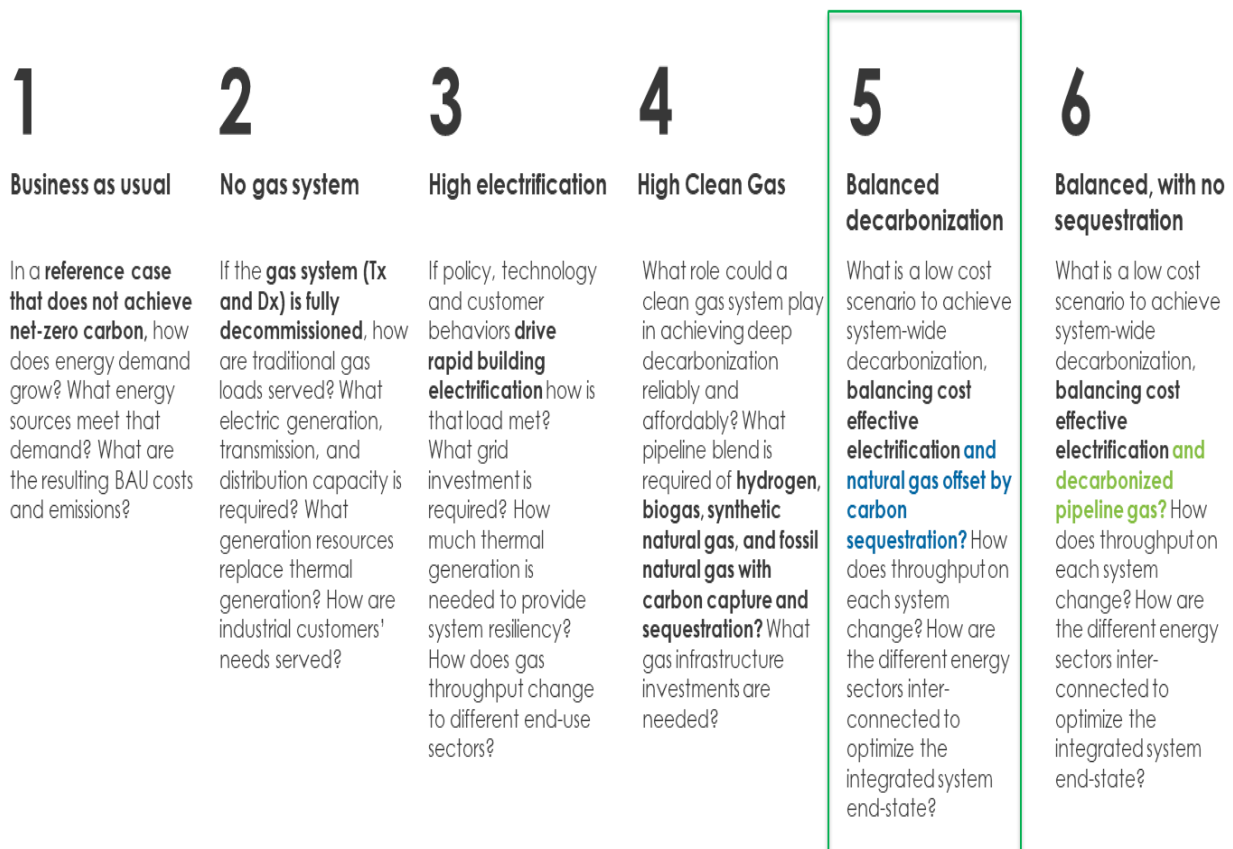
Natural Gas Delivery Plan

The modelling analysis used these regional attributes to understand the most cost-effective energy supply to meet the energy demand of the State, including full electrification of the passenger vehicle sector, while simultaneously achieving net zero emissions by 2050.

The analysis was completed for six different scenarios, shown below in Figure 56. Important assumptions are noted here across three specific scenarios.

- **The business-as-usual** scenario is used as a reference point and assumes no progress in energy decarbonization.
- The **no gas system** scenario was assessed to understand the cost of meeting energy demand, in the absence of the gas system, meaning all current uses of gas, including industrial processes and electric generation would require alternative energy supplies like hydrogen or electrification. This scenario also demonstrates the value the current gas system provides to the state’s overall decarbonization costs.
- **The high electrification** scenario assumes all end uses are electrified except for natural gas electric generators, meaning the majority of the compression and transmission system would remain, while the majority of the gas distribution system would be retired.

Figure 56: Decarbonization Scenarios



The key conclusion from modelling was that a **balanced combination of multiple technologies is the most cost-effective means of achieving economy-wide decarbonization by 2050**. The diversity in a balanced combination of multiple technologies not only increases resiliency, but also increases optionality across the system, lowering risk of not achieving carbon neutrality.

Natural Gas Delivery Plan

In all scenarios, electric load increases due primarily to electric vehicle deployment and some space heating electrification. As coal plants are retired, gas generation with carbon capture grows to meet increasing load.

Renewables are an increasingly important part of Michigan’s energy supply, but controllable energy, like long duration energy storage will be needed for maintaining a reliable energy supply. Decarbonized natural gas generation via RNG, hydrogen and/or carbon capture show near-term economic pathways to investigate further.

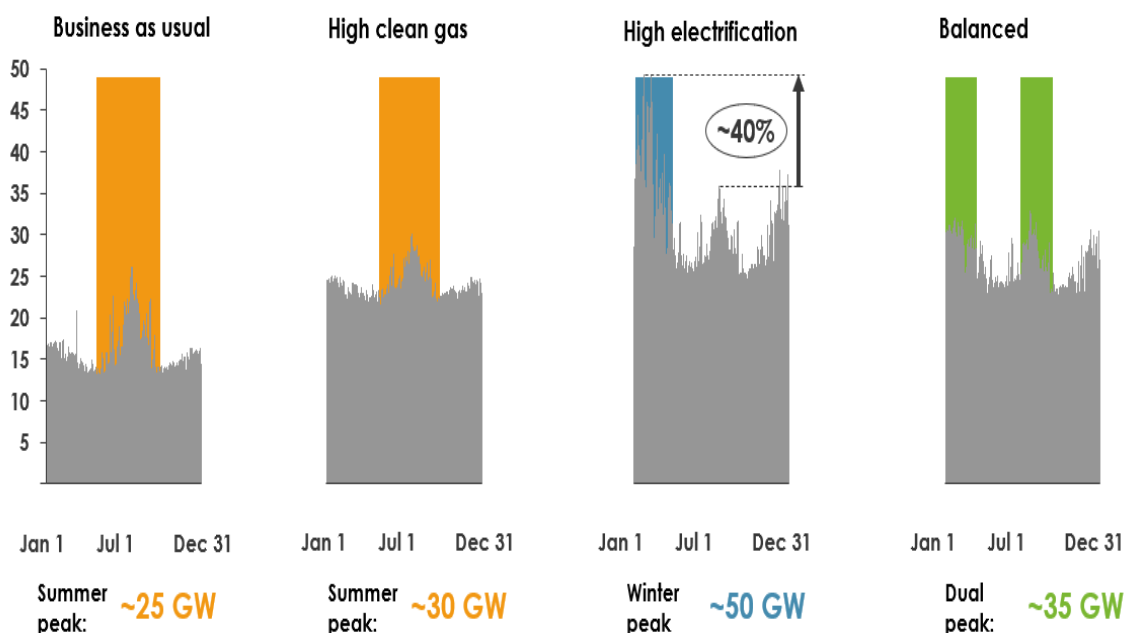
Other important conclusions show:

- The gas distribution system enables cost effective, reliable hybrid home heating in Michigan winters.
- The gas transmission system is needed to supply natural gas to electric generators.
- Carbon sequestration is needed to cost effectively achieve durable decarbonization, specifically to support electric generation, and synthetic gas and hydrogen production.
- Clean fuels such as RNG and hydrogen provide system resiliency, diversification, and energy for hard to electrify end uses.
- Electrification potential was constrained by costs associated with additional transmission and generation infrastructure necessary to meet winter peaking electric demand, however, highly efficient technologies such as geothermal may reduce peak season demand shown below in Figure 65 at an affordable cost.

As shown below in Figure 57, analysis indicates that in a highly electrified decarbonized future scenario, building electrification can drive winter peaks as high as 40% higher than summer peaks. In this scenario, the most economic form of clean electric base load generation to support building electrification would come from natural gas generators fitted with carbon capture.

Hybridized electric + gas space heating, as represented within the ‘balanced scenario’ can mitigate a peak shift to winter, reducing the need for investment in electric generation and transmission by ~\$20-25B compared to a high electrification scenario.

Figure 57: Potential Electric Peak Load Impacts by Scenario



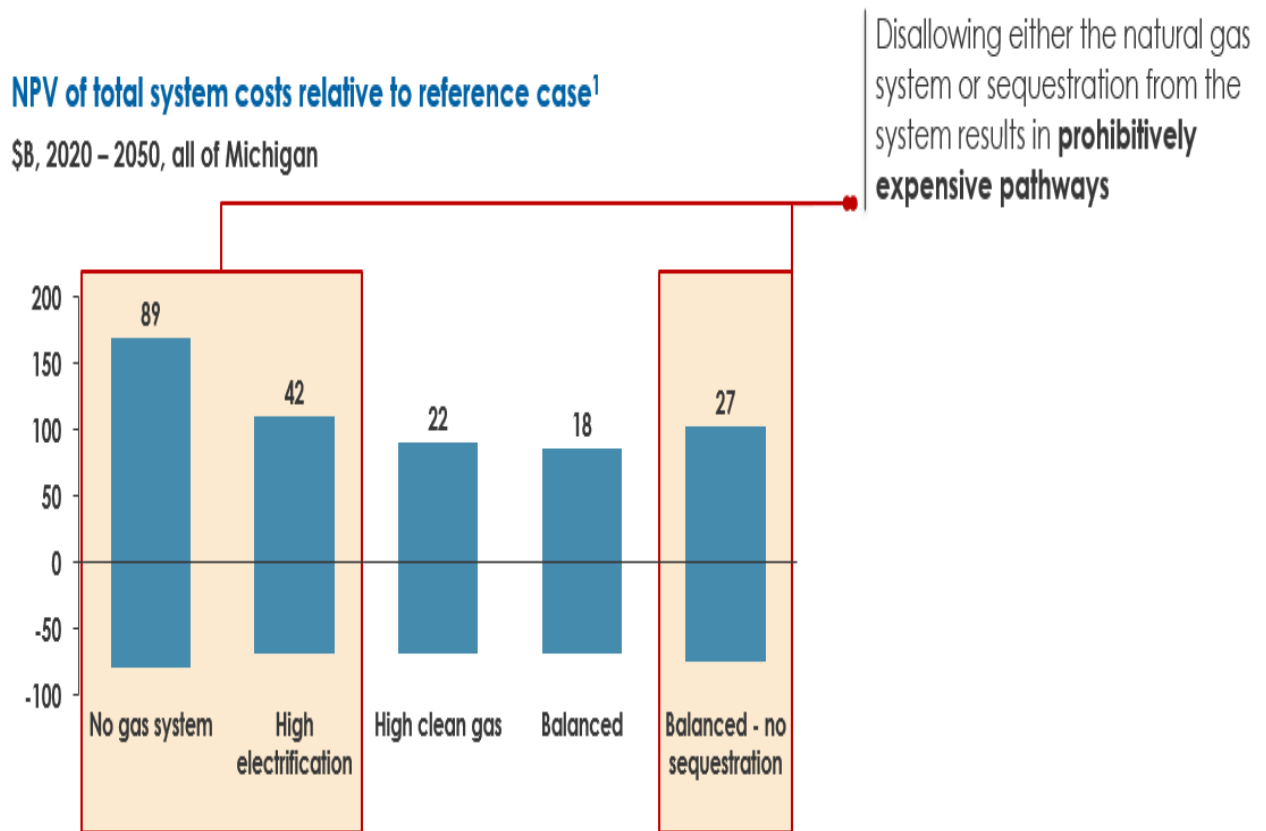
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Additionally, ~20% less electric generation capacity is required in the ‘balanced scenario’ than in a high electrification scenario, which helps mitigate cost increases.

Total energy system costs include all costs associated with energy in Michigan, including feedstock and commodities; electricity generation, storage, and fuel production technologies; energy delivery infrastructure; carbon capture and sequestration; demand-side technologies (e.g., appliances and vehicles, EE investments, etc.).

In each decarbonization scenario, there is a societal cost impact to Michigan as shown below in Figure 58, with the ‘balanced scenario’ being the lowest societal cost pathway to meet carbon neutrality by 2050.

Figure 58: Potential Cost Impacts to Michigan by Scenario



1. Gas infrastructure costs based on high-level initial assessment. Granular data on Michigan-system pipeline inventory can be used to develop more detailed estimates.

As shown in Figure 59, RNG (“biogas”) is seen as a foundational technology that best prepares the Company for any likely decarbonized future scenario including high electrification, high clean gas, and a balanced approach. This is because RNG is cost effective in reducing carbon, mature technology, and requires no incremental investment in the existing infrastructure.

While technologies like electrification and carbon capture play a role in a decarbonized future, analysis shows the balanced combination of multiple technologies such as energy waste reduction (EWR), RNG, carbon capture, hydrogen, and electrification will all be needed to cost effectively meet the State’s 2050 net zero goal.

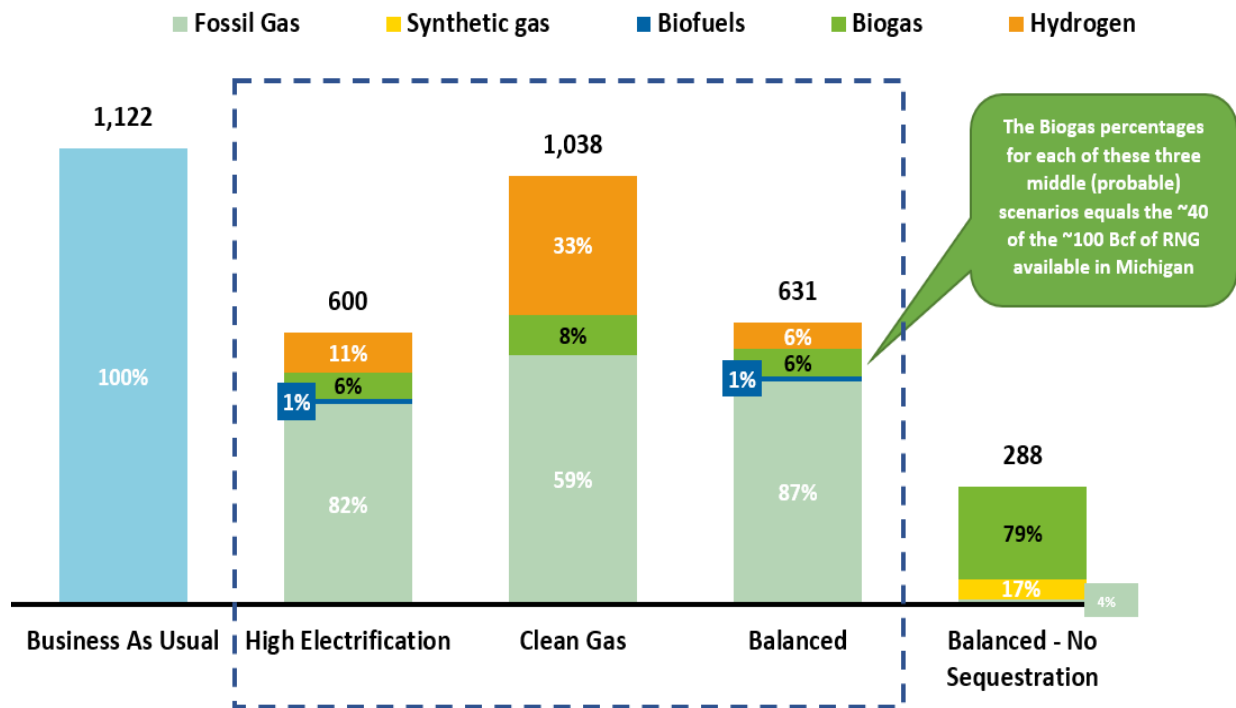
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None of these pathways alone are viable to achieving the State’s 2050 net zero ambitions.

Accordingly, it is important the most cost-effective technologies are implemented now while investigating how to incorporate other pathways for the future.

RNG resources are available today and require no modification to the existing infrastructure, making it more cost-effective than other approaches. For this reason, the Company intends to offer an RNG voluntary product to customers that provides the State with progress towards our shared environmental goals over time.

Figure 59: Potential Michigan Gas Pipeline Composition in 2050 by Scenario



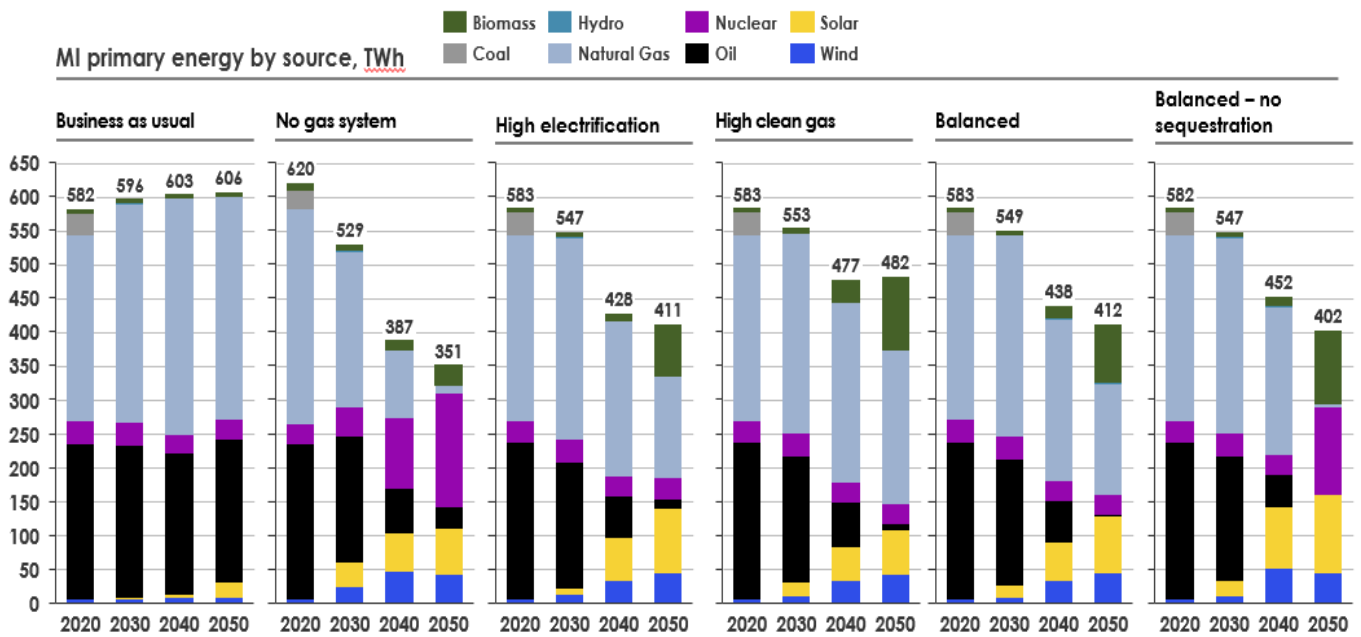
In all likely scenarios (high electrification, high clean gas, balanced), modeling shows natural gas generation as the least-cost, carbon neutral energy supply able to meet demand.

In the absence of a gas system or carbon-neutral natural gas generation, new nuclear generation would be necessary to support demand by 2050 as shown in Figure 60 on the next page.

NOTE: This analysis is Michigan-wide and does not necessarily reflect the Company’s expected energy supply.

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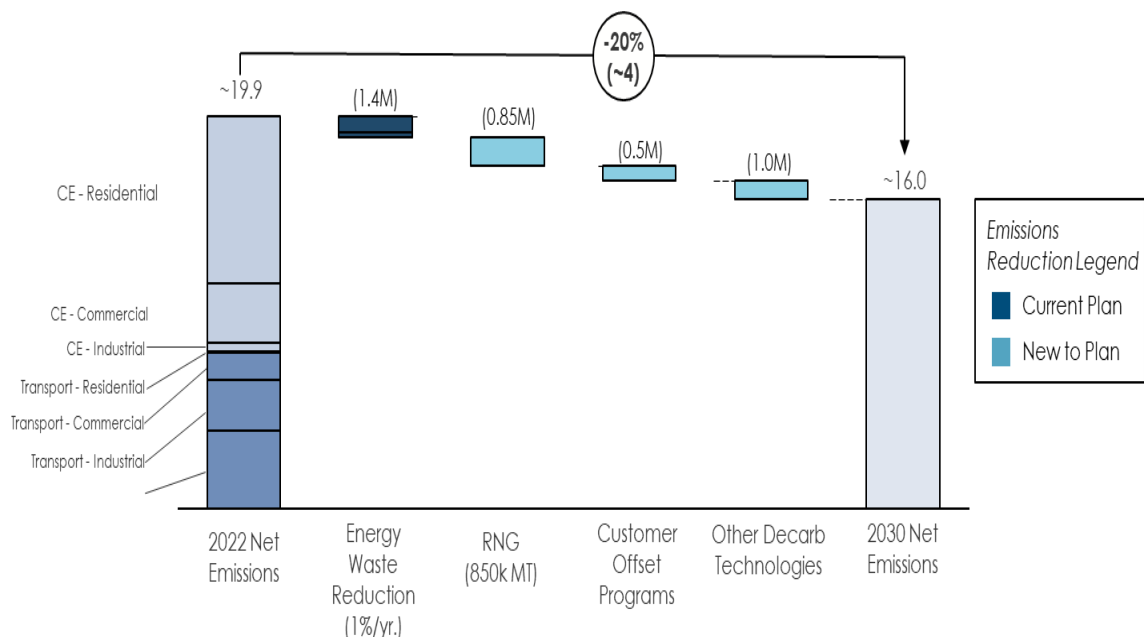
Figure 60: Potential Primary Energy Sources by Decarbonization Scenario



Overall, to support Michigan’s decarbonization goal and meet carbon neutrality by 2050, Consumers Energy has set an interim goal to work with our customers to help them achieve a 20% reduction in Scope 3 emissions by 2030.

The plan to achieve this reduction is shown below in Figure 61, which illustrates that EWR, RNG, carbon offsets, and new emerging decarbonization technologies are all necessary pathways to contribute to achieving this 20% reduction by 2030, which was baselined in 2022, as part of the overall glidepath to the 2050 net zero goal.

Figure 61: Potential Gas Customer Decarbonization Pathways to Achieve 20% Reduction to 2030



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All these potential decarbonization pathways are shown as follows:

a. MI CLEAN AIR VOLUNTARY PROGRAM

In February 2022, the MI Clean Air Program³ was approved to provide a voluntary offering for customers to offset the emissions tied to natural gas use via the use of forestry carbon offsets sourced in Michigan. In April 2023, the Company filed an expansion of this Program to include RNG as a clean fuel alternative for full-service natural gas customers.

- **Carbon Offsets**

A carbon offset reduces emissions of greenhouse gases made in a separate location. In other words, a reduction in emissions is made in one location to compensate for emissions in a different location, effectively negating the effects of the remaining emission, when applied at the same scale. Accordingly, this Program will provide customers the option to offset the carbon impact of the conventional natural gas used at their location.

The Company will supply offsets from an in-state forestry project located in the upper peninsula. Limiting the volume of deforestation through this project promotes clean air, preserves wildlife habitats, and clean carbon storage.

b. RENEWABLE NATURAL GAS (RNG)

RNG is pipeline quality gas that is low-carbon or carbon-negative and can be used in existing pipelines and end uses.

RNG is created by capturing methane from the decomposition of organic matter through anaerobic digestion. This decomposition can occur in wastes associated with food, animals, landfills, wastewater and forest residues. This methane would otherwise be vented into the atmosphere.

This captured gas is called **biogas** and must be further refined to meet pipeline quality specifications necessary for pipeline injection and customer end use. Once purified to meet pipeline quality standards, the gas is called **RNG** and is chemically identical to fossil natural gas.

RNG feedstocks and waste gas are consistently available and can be converted into renewable energy on demand, making it a valuable renewable energy source. RNG can also support other environmental goals, including reduced nutrient run-off and improved water quality, organic waste management and diversion, groundwater protection, and displacement of fossil fuels.

Emission benefits are quantified using the industry standard Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation (“GREET”) model, resulting in a lifecycle Carbon Intensity (“CI”) score.

- A CI score is the total measure of greenhouse gas emissions associated with producing, distributing, and using a fuel, reflected in grams of Carbon Dioxide equivalents (“CO₂e”) per megajoule (“MJ”) of energy.

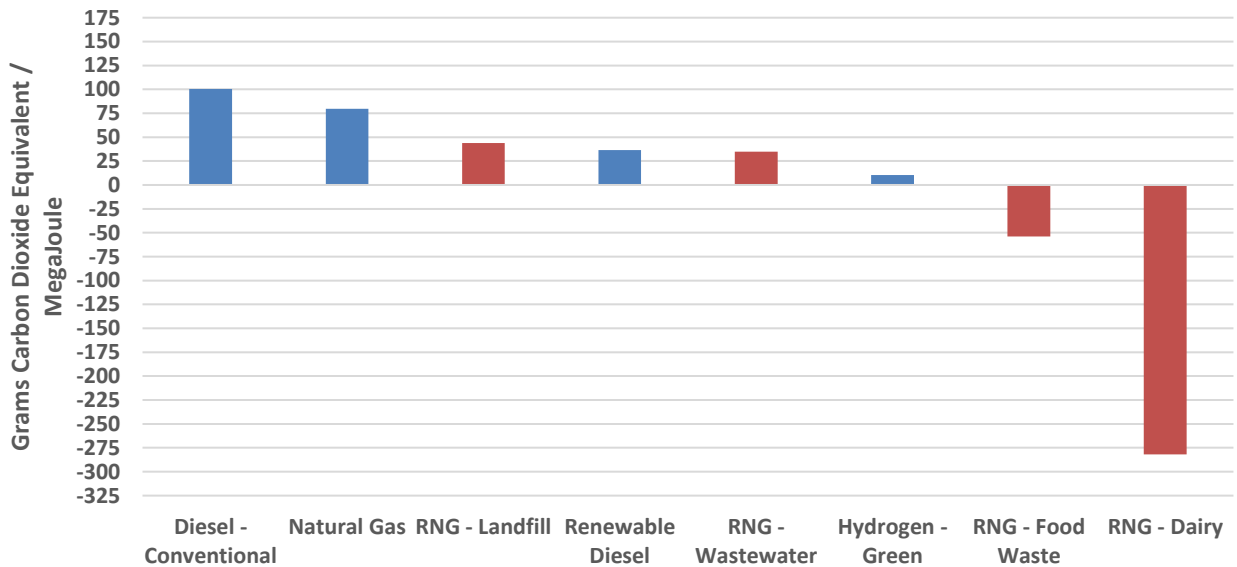
After including all RNG process emissions from capturing methane, upgrading it, transporting it, and burning it, the benefit of avoided methane emission to atmosphere is still significantly greater than the total of those lifecycle emissions.

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Figure 62 shows the average CI score per feedstock, using the GREET model, as certified by the California Air Resources Board in 2023¹, depicting the common fuels alongside various RNG supplies.

The lower the CI score, the more cost effective it is to reduce emissions. This is because with a carbon negative fuel, only a small portion of RNG needs to be blended to achieve carbon neutrality. For this reason, animal manure based RNG is preferred because it has the lowest carbon intensity of any feedstock.

Figure 62: Various Alternative Fuel Carbon Intensities



RNG produced from animal waste will supply the Company’s Voluntary Renewable Natural Gas Program, which will deliver approximately 125,000 tons of carbon dioxide equivalents abatement potential annually. RNG is scheduled to be first produced in 2025.

- In support of Public Acts 53 and 166, which require the Michigan Public Service Commission (MPSC) to develop a low carbon energy infrastructure enhancement and development grant program for the purposes of planning, developing, designing, acquiring, or constructing low carbon energy facilities, two (2) grants were awarded to Consumers Energy for RNG projects at Swislane and TDI Farms.

All RNG supply is intended to be available to full-service natural gas customers as a clean fuel alternative to natural gas through the MI Clean Air Program. As described, RNG based on animal waste is the most cost-effective clean fuel alternative to reduce emissions.

Consumers Energy continues to seek opportunities with farms to help bring clean fuel to the State of Michigan. Any farm can potentially contribute to Consumers’ natural gas supply as Renewable Natural Gas. Consumers Energy sees RNG as an opportunity to reduce emissions and improve the environment in Michigan, while supporting local farms.

c. ENERGY WASTE REDUCTION

Energy Waste Reduction (i.e., Energy Efficiency) reduces energy waste, lowers bills and reduces emissions. See below in *Energy Waste Reduction* for discussion on energy efficiency and demand response programs.

d. EMERGING TECHNOLOGIES

Emerging technologies: Potential pathways to meeting net zero emissions by 2050 include using hydrogen to produce energy, capturing and sequestering carbon emissions from natural gas combustion, and using hybrid natural gas and electric heat pump systems to heat homes and businesses.

- **Hydrogen**

Hydrogen has the greatest energy-to-weight ratio of any fuel due to its lack of carbon-based elements. Additionally, hydrogen is an ideal fuel when it comes to emissions as it contains no carbon or sulfur when combusted. Modelling results show hydrogen is most optimally used as a replacement fuel for high heat end use processes that are difficult to electrify.

Currently, most forms of industrial scale hydrogen are derived through a process known as *steam methane reforming*. Despite its hydrogen generation, carbon dioxide is emitted through the process.

Electrolysis is a technology that uses electric energy to break apart the water molecule into hydrogen and oxygen, leaving no emissions. When powered by a renewable energy source, such as hydro, wind or solar, electrolysis produces a truly carbon-neutral form of energy.

It is important to note that hydrogen and natural gas are *not* completely interchangeable as a usable fuel at existing pressures and flow rates. However, given advantages tied to dispatch, storage, and carbon neutrality, hydrogen is being assessed by the energy industry to determine its potential as a clean energy pathway for the future natural gas system.

Hydrogen's zero carbon footprint along with its energy content characteristics make it an important pathway that targets hard to abate high heat processes such as industrial drying, compression, and long-haul transport. The Company's initial focus on Hydrogen is to support customers who currently use hydrogen and wish to reduce emissions associated with its production.

- **Electrification**

Electrification is the conversion of energy for end uses from natural gas to electricity.

The carbon benefit to electrification is the elimination of emissions tied to natural gas combustion. Modelling shows the most cost-effective means of electrifying residential end uses is with hybrid heating. Hybrid heating combines the heat content of natural gas with the efficiency of a heat pump. In this context, heat pumps would be used as much as possible; however, during the coldest winter months, natural gas furnaces would still be used to mitigate winter peak electric load.

As part of the recent Electric Rate Case settlement, Consumers Energy is piloting electric air source heat pumps to better understand performance in the Michigan specific region with a goal to install 2,000 heat pumps by 2025.

- **Geothermal**

Geothermal energy is the most efficient form of energy yet high up-front costs remain a barrier to its development.

Geothermal uses ground sourced heat pumps for heating and cooling, providing the highest coefficient of performance “(COP)” during the most difficult conditions. Accordingly, the technology also the lowest total energy throughout the year, which is critical during seasons of peak energy demand (i.e., winter and summer). This technology could produce the greatest societal benefit, both in terms of avoided emissions and in terms of avoided cost.

Although ground sourced heat pumps can be installed on individual homes, Consumers Energy is investigating the concept of ‘network geothermal’, which uses wasted energy from those on the network and the earth to heat homes and water. Investigation includes what characteristics, geology and infrastructure is needed to make this an affordable option for customers in the future.

- **Carbon Capture**

Michigan is unique in that its geology provides large scale potential for underground carbon sequestration. Although not well understood at this time, carbon capture, sequestration and storage remain a key technology to achieve a net zero emissions future.

Accordingly, Consumers Energy is investigating what a CO2 transport system could look like using dedicated pipelines for permanent underground sequestration.

3. REFERENCES

1. *Properties of Hydrogen*, 2001. College of the Desert.
2. *Renewable natural gas*. Retrieved from <https://www.enbridgegas.com/sustainability/renewable-natural-gas>
3. *MI Clean Air Annual Report 2022: 0688y000007xITdAAI (force.com)*
4. *LCFS Pathway Certified Carbon Intensities | California Air Resources Board*

B. Energy Waste Reduction (EWR)

Natural Gas EWR programs play a role in decarbonizing the gas system; reducing the amount of energy consumed reduces Scope 3 methane emissions.

Consumers Energy filed its 2022-2025 EWR Plan Filing in August of 2021, and it was settled on March 17, 2022. The Company has also requested approval of its 2024-2025 EWR plan in our August 1, 2023, application in case number U-21321².

In developing the portfolio of EWR programs from 2022 through 2025, Consumers Energy looked for ways to meet its 1% natural gas corporate savings goals by building on the success of its existing EWR programs, refining them to optimize energy savings opportunities, while also expanding opportunities to capture new sources of energy savings.

Consumers Energy built the EWR portfolio by compiling existing program measures into a comprehensive list. To identify eligible electric and natural gas measures to apply energy savings, Consumers Energy uses the Michigan Energy Measures Database (MEMD), developed in conjunction with MPSC staff and other energy stakeholders specifically for the Michigan market. Consumers Energy iteratively adjusted participation and incentive levels as needed to balance the plan and arrive at a reasonable mix of cost-effective programs that meet its goals.

Taken together, the portfolio of EWR programs outlined in this Plan continue Consumers Energy’s history of offering a diverse portfolio of cost-effective, flexible, and inclusive program choices, incentive options, and educational opportunities for every customer class. Consumers Energy’s program offerings are summarized in Table 9.

Table 9: 2022–2025 Program Summary

Program Name	Markets Served	Program Offerings
Residential EWR Portfolio		
Appliance Recycling	All residential electric customers	<ul style="list-style-type: none"> Incentive and environmentally responsible, free pick up of older, inefficient refrigerators, freezers, and small appliances
Energy Dashboard	All residential customers	<ul style="list-style-type: none"> Web-based platform that provides customers with information about their energy use and tips to manage their consumption and save energy
ENERGY STAR Appliances	All residential customers	<ul style="list-style-type: none"> Prescriptive rebates and upstream incentives for qualifying ENERGY STAR–certified appliances purchased through a Consumers Energy retail partner
ENERGY STAR Lighting	All Consumers Energy customers	<ul style="list-style-type: none"> Upstream incentives for qualifying high-efficiency LED lighting measures purchased through a Consumers Energy retail partner
Home Energy Analysis	Residential customers in in single-family homes and in dual fuel and electric-only territories	<ul style="list-style-type: none"> Walk-through or virtual home inspection and installation of free energy-saving measures Customized report with energy-saving tips and recommendations Walk-through or virtual home inspection specifically targeting electric energy-saving opportunities for customers in Consumers Energy’s electric-only territory and installation of free, electric energy-saving measures

² On August 1, 2023 the Company filed its 2024 to 2025 EWR Plan available on the MPSC website here: <https://mi-psc.force.com/sfc/servlet.shepherd/version/download/0688y000008yCJ8AAM>. In this filing the Company used the process noted above and proposed gas EWR program investment of \$95.5 million in 2024 and \$95.1 million in 2025 to achieve 1% of sales gas targets each year. The Company also proposed adjustments to its mix of programs, bundling some of the program offerings and removing residential lighting given changes in lighting standards.

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Program Name	Markets Served	Program Offerings
Home Energy Report	Residential customers in single-family homes	<ul style="list-style-type: none"> Personalized household reports, sent by mail, and email with individual energy usage tips and program recommendations
Home Performance with ENERGY STAR	Residential customers in single-family homes	<ul style="list-style-type: none"> Comprehensive home assessments performed by Building Performance Institute (BPI)-certified contractor Diagnostic testing and visual inspection for energy-efficiency upgrades and health and safety issues Comprehensive final report that uses energy modeling software to inform customers of available energy savings, upgrade costs, and payback associated with recommended improvements
HVAC and Water Heating	Residential customers in single-family homes	<ul style="list-style-type: none"> Prescriptive rebates for customers and midstream rebates for equipment distributors for the purchase and installation of high-efficiency heating, cooling, and hot water technologies Support to HVAC contractors, including account management representation, training, educational materials, and marketing collateral Web-based Find a contractor tool
Income-Qualified Energy Assistance	Residential low-income customers in single-family homes	<ul style="list-style-type: none"> Free walk-through or virtual home inspection/assessment with direct install measures tailored to customer’s fuel type (dual fuel, natural gas-only or electric-only) Home weatherization assistance, installation of energy-efficient measures, and education about how to conserve energy and manage utility costs Focus on installation of premium measures Collaboration with community partners to provide maximum and coordinated benefit to income-qualified customers
Income-Qualified Multifamily	Residential low-income customers in multifamily housing	<ul style="list-style-type: none"> Direct, no-cost installation of energy-saving devices in individual tenant units and common areas Educational materials explaining the program’s energy and money saving benefits Prescriptive and custom incentives (offered at a higher rate than those in the Market-Rate Multi-family program) for property owners to install energy-saving equipment in individual units and common areas
Insulation and Windows	All residential customers	<ul style="list-style-type: none"> Financial incentives for qualified energy-saving windows and home insulation
Marketplace	All residential customers	<ul style="list-style-type: none"> Instant rebates for customers who purchase qualifying products through Consumers Energy’s online store
Market-Rate Multifamily	Residential & commercial multifamily property owners	<ul style="list-style-type: none"> Turnkey services for residents to reduce energy use in their living units through the direct installation of energy-saving devices at no cost to the property owners or tenants Educational materials explaining the program’s energy and money saving benefits Prescriptive and custom incentives for property owners to install energy-saving equipment in individual units and common areas

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Program Name	Markets Served	Program Offerings
Residential Agriculture	Agriculture customers	<ul style="list-style-type: none"> Incentives for energy-saving measures in retrofit and major renovation projects
New Home Construction	Residential builders	<ul style="list-style-type: none"> Incentives for builders who construct new homes to ENERGY STAR standards or achieve a minimum Home Energy Rating System (HERS) score Builder training on high performance building practices and how to promote the value of energy-efficient homes
Think! Energy	Early elementary to high school students and community groups	<ul style="list-style-type: none"> In-class or virtual EWR presentations and educational content for teachers and community groups Free energy-saving take-home kit including low-cost energy-efficiency measures and educational content
Business EWR Portfolio		
Comprehensive Business Solutions (Custom, Prescriptive, Segment Offerings, and New Construction)	All business customers	<ul style="list-style-type: none"> Rebates ranging from 20% to 40% of the incremental cost of high-efficiency electric and natural gas equipment Analysis, performance-based incentives, and technical assistance for large commercial and industrial customers who install high-efficiency equipment or process improvements not covered in the prescriptive program Segment offerings for business customers including information on energy use and assistance with identifying EWR opportunities, ENERGY STAR benchmarking, building assessments, gap analysis, and audits—also supports a holistic approach by consolidating measures employed in multiple business segments and initiatives, including Agriculture, Network Lighting Controls, ENERGY STAR programs, Industrial Energy programs, New Construction, and Smart Buildings
Small Business Solutions	Small business customers	<ul style="list-style-type: none"> On-site energy assessments with limited direct installation measures and a report of the measures installed, product recommendations, and tips on how to save more energy Installation of free measures including showerheads, faucet aerators, pre-rinse sprayers, pipe wrap, programmable and smart thermostats, and LEDs Installation of common lighting and refrigeration measures by participating trade allies Self-service, online marketplace that provides instant incentives for the purchase of qualifying energy-efficient products

The table below outlines the Company’s approved 2022-2025 EWR Plan natural gas savings targets.

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Table 10: Natural Gas Investments and Savings Compared to Targets

	2022 Actual	2023	2024	2025
Planned Investment, Natural Gas Programs	\$84,126,517	\$80,645,504	\$80,932,953	\$82,151,451
Annual Natural Gas Savings, Statutory Target (Mcf)	2,159,664	2,134,854	2,135,387	2,137,368
Annual Natural Gas Savings, Statutory Target	%0.75	0.75%	0.75%	0.75%
Annual Natural Gas Savings, Planned (Mcf)	3,174,283	3,228,854	3,252,414	3,313,370
Annual Natural Gas Savings, Planned (%)	1.1%	1.1%	1.1%	1.2%

The EWR Plan aims to:

- Exceed statutory savings targets and meet the increased resource acquisition goals tied to Company IRP commitments. Continue to support long-term market transformation.
- Contribute to the Company’s *Clean Energy Plan* goals to end coal use for electricity generation, reduce carbon emissions 60% from 2005 levels, and meet customer needs with 35% clean energy resources.
- Offer a diverse, cost-effective portfolio of programs that provide participation opportunities for all customers.
- Foster equity by:
 1. Significantly increasing the investment in EWR opportunities for low-income and hard-to-reach populations.
 2. Analyzing historic program participation to identify delivery gaps related to limited program access or other barriers among disadvantaged communities.
 3. Working collaboratively with stakeholders and evaluators to develop opportunities to collect and analyze customer demographic data to enable strategic marketing to and recruitment of diverse populations to its EWR programs.
 4. Actively working to increase its supplier diversity with a goal to double diverse supplier spending between 2019 and 2025.
 5. Continuing to work with EWR collaboratives and work groups such as the MPSC Energy Affordability and Accessibility and EWR Low Income work groups to identify gaps, priorities, and recommendations for increasing EWR opportunities among diverse communities.
- Realize opportunities through coordination with other providers of EWR services (such as DTE Energy).
- Provide programs that create customer value and engender high satisfaction.
- Facilitate adoption of next generation technologies and EWR services through a robust focus on research and development.
- Expand EWR infrastructure, contribute to Michigan’s economic growth, and increase supplier diversity through engagement, training, and collaboration with EWR equipment dealers, contractors and trade allies, non-governmental organizations, industry groups, and other program partners.
- Inform and educate customers to use energy more efficiently, using easy-to-access support and messaging that emphasizes comprehensive and deep energy savings.

The resulting Plan is a mix of proven EWR programs that have been successful in Michigan and elsewhere. Consumers Energy’s *2022–2025 EWR Plan* builds on past success, but acknowledges and accounts for a changing market, new opportunities, increased savings goals, and the Company commitment to a triple bottom line of people, planet, and prosperity.

VII. Financial Summary

A. Benefits of the Integrated System Plan

One of the most significant benefits of this integrated system plan is that Consumers Energy will continue to plan and allocate capital using a holistic view of the entire gas system to prioritize projects between asset classes, and the Company continues to analyze and communicate the trade-offs between the system’s many potential needs and projects.

The four objectives of the Plan (i.e., safe, reliable, affordable, and clean) are used to guide and prioritize future investment decisions. The Company allocates capital based on the most pressing needs of the system and in accordance with these objectives, enabling success in the 10-year outcomes.

B. Financial Profile

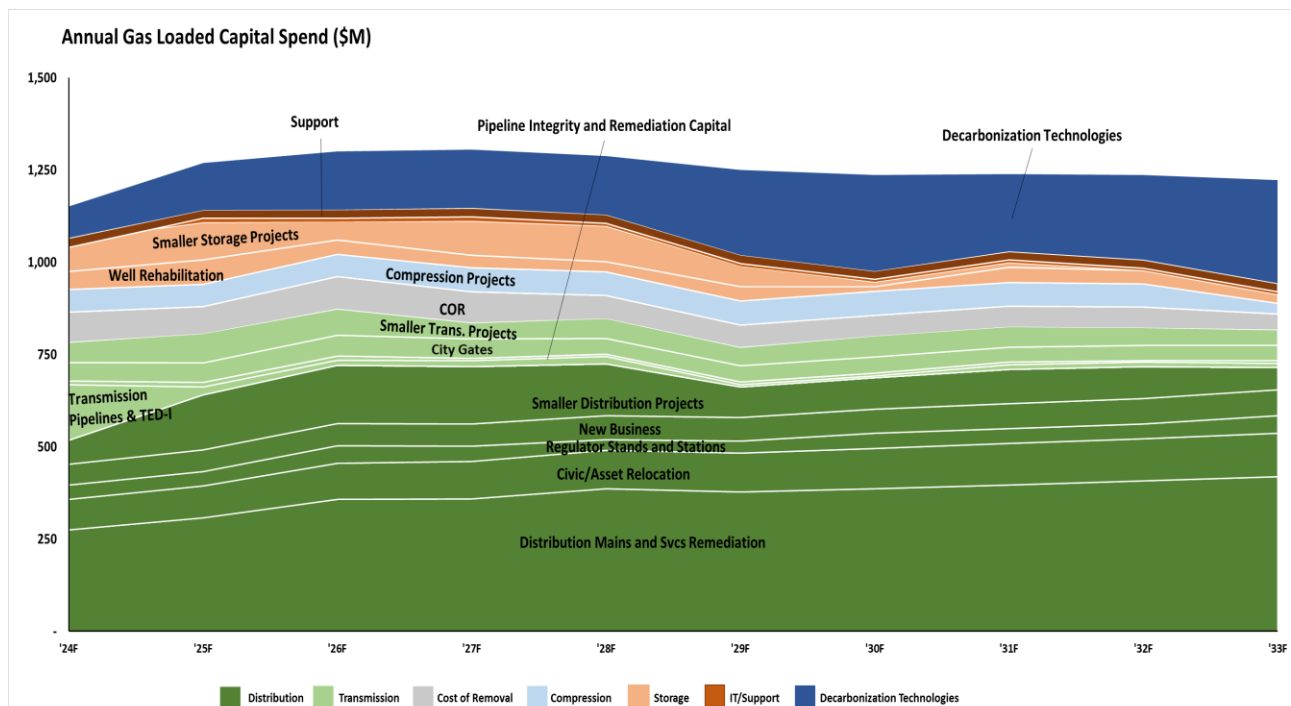
The integrated system plan bases funding decisions about capital projects to fund and the timing on entire system need.

By continuing to forecast the work over a rolling 10-year period, the Company can predictably plan and communicate investment in various portfolios over a longer time, while providing the agility necessary to modify future plans based on potential internal and external changes over time.

Overall, the total future capital spend will be approximately \$12.3 billion from 2023 to 2032, at an annual capital investment spend of approximately \$1.2 billion per year, enabling more predictability in the budget planning process, as seen in Figure 63.

This level of capital investment is consistent with recent past years with new potential investments for RNG and other possible decarbonization technologies to evolve the system in the future. The capital forecast will help achieve the safe, reliable, and clean objectives by enabling predictable customer bills while striving for competitive pricing with future gas commodity projections to support the affordability objective.

Figure 63: 2024 – 2033 Capital Plan



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Figure 64 shows that this capital investment will also result in an increase of O&M cost over the next five years with the O&M directly for these areas showing an increasing trend as it pertains to the gas asset O&M allocations.

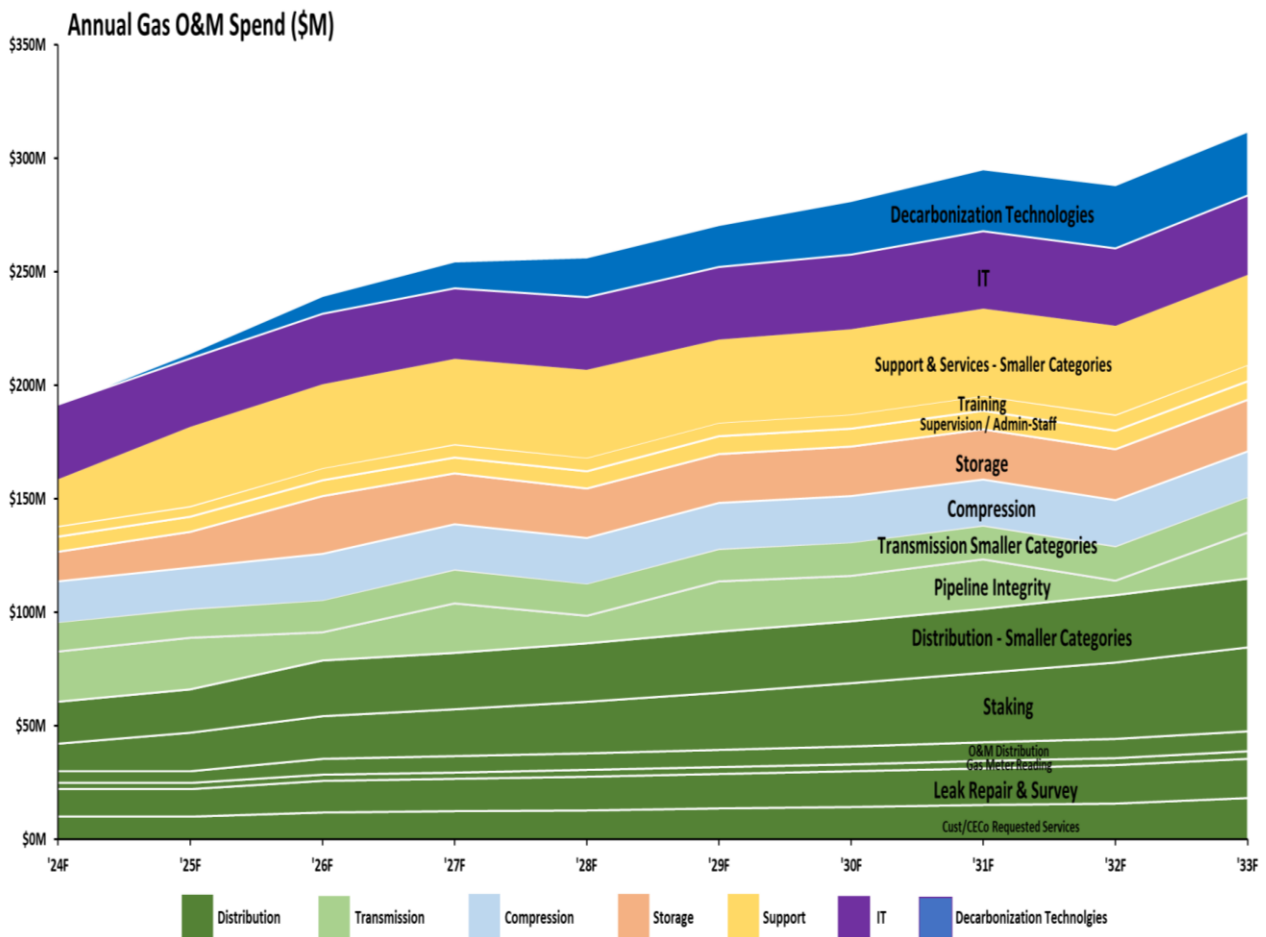
This additional cost is necessary as part of the capital investment in decarbonization projects along with the additional cost for compression assets to reach predictive maintenance levels, and the increase in pipeline and integrity work.

It is expected that the capital investments in the distribution assets area will support the cost of leak repair and survey but will remain steady and/or increase due to the continued aging of the system and anticipated enhanced regulatory requirements.

- Given the criticality of maintaining and securing technology assets after technology implementation, if a gap exists in the IT or other O&M available, the Company will prioritize operational support of its current technology assets over investing in new capabilities.
- Having the appropriate levels of IT and other O&M funding is an absolute pre-requisite for the Company to execute the necessary and prudent capital expenditures needed to achieve the desired outcomes identified in the Plan.

The Company’s IT O&M projections are calculated based on a comprehensive analysis of known and forecasted expenditures—providing an accurate and reasonable projection of future year IT O&M requirements.

Figure 64: 2024 – 2033 O&M Plan

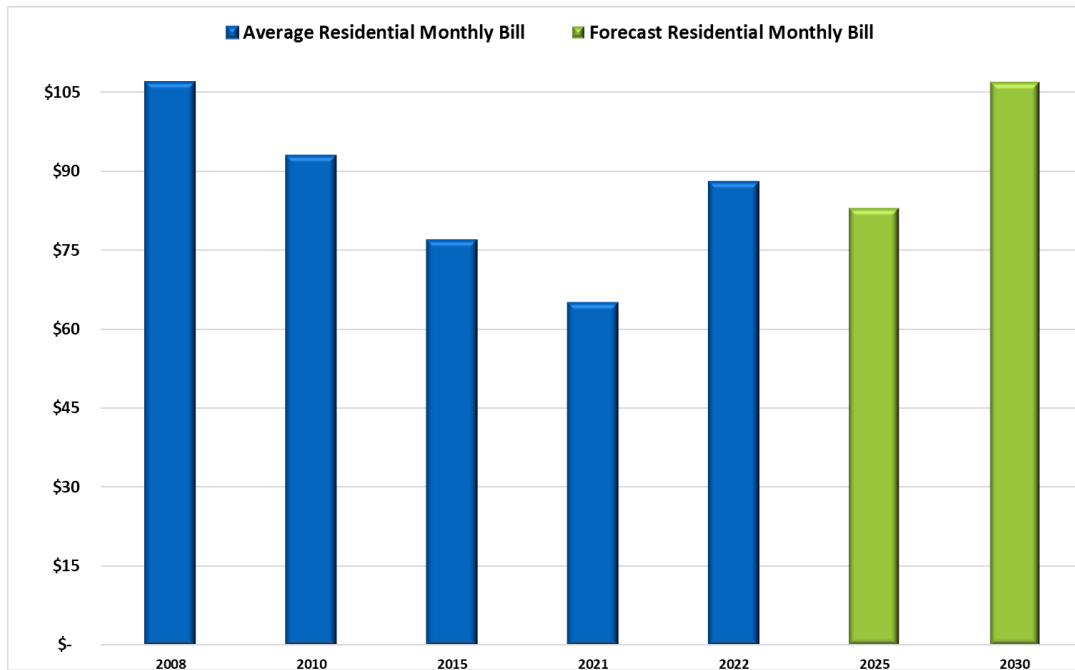


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As provided previously in the Plan, Figure 65 below shows that the average monthly bill has decreased significantly at over 5% per year over the last decade.

Figure 65 shows the history in blue and the forecast in green for the average monthly residential bill per year.

Figure 65: Average Monthly Residential Customer Bill History and Forecast



As shown in Figure 65 above, the average monthly bill decreased significantly at more than 5% per year through 2021, reflecting the Company’s gas supply strategy and system capital investments to maximize the value in lower gas commodity costs during this period. Over the same period, the Company increased capital investment spending by approximately 15% per year to the benefit of all customers.

The bill increase from 2021 to 2022 stems primarily from an increase in the gas commodity price last year, due to a spike in the natural gas market. However, Figure 65 shows the same average monthly bill forecast projections in 2025 and 2030 as the last version of this Plan.

This bill is forecasted to reduce from 2022 to 2025 and then the growth rate from 2025 will be an approximate compounded annual growth rate of approximately 5% each year through 2030, which is comparable to the bill amount to that of 2008. However, even if the average bill increases to a 2008 historical value by 2030, the average forecasted bill decreases from 2008 to 2030 in real dollars when considering inflation rates from 2008 to 2030, which helps maintain affordability for customers now and in the future. Consumers Energy recognizes that historical data isn’t always relevant to our customers, however, it does show the Company’s commitment to be at, or below, inflation over the years and works diligently to maintain value and affordability to its customers.

Going forward, the Company will continue to coordinate commodity costs with the long-term infrastructure investment requirements needed for a safe, reliable, and clean gas system while maintaining affordable and predictable customer bills. The Company will also continue to measure customer satisfaction and ensure the predictability of the capital work spend plan to help reduce the volatility of customers’ bills over time.

VIII. Closing

Consumers Energy has developed this 10-year Plan for the gas delivery system to ensure Michigan has a safe, reliable, affordable, and clean natural gas supply.

The Natural Gas Delivery Plan enables stakeholders to have confidence in the Company's commitments to:

- Enhance **safety** by prioritizing and lowering system risk throughout the gas delivery system.
- Deliver **reliable** supply to customers with prudent contingency planning.
- Provide **affordability** to customers through stable, competitive, and predictable energy value.
- Create a **cleaner** gas delivery system that reduces greenhouse gas emissions.

The Plan reflects a thorough analysis of the system, the natural gas commodity market, trends and practices across the industry, and regulatory and customer trends.

Consumers Energy routinely reviews the validity of the inputs and assumptions that led to the updating of this Plan, and will adjust in the future as appropriate, and continue to share the Company's vision with stakeholders across Michigan.

Appendix A

As a regulated gas utility company, Consumers Energy must adhere to many different state and federal compliance requirements.

To illustrate this requirement for the work described in the Plan, the following is a high-level, but not fully inclusive, list of requirements and industry standards or practices as an example:

- Code of Federal Regulations
 - 49 CFR Part 191 - Transportation of Natural and other Gas by Pipeline; Reports
 - 49 CFR Part 192 - Transportation of Natural and other Gas by Pipeline; Minimum Federal Safety Standards
 - 49 CFR Part 199 - Drug & Alcohol Testing
- Michigan Gas Safety Standards
- Michigan Technical Standards for Gas Service
- American Petroleum Institute
 - Standard 1164 – *Pipeline Control Systems Cybersecurity*
 - Recommended Practice 1171 - *Functional Integrity of Natural Gas Storage in Depleted Hydrocarbon Reservoirs and Aquifer Reservoirs*
 - Recommended Practice 1173 – *Pipeline Safety Management Systems*