



# Asset Modernization Program 2024 Update

# Pipeline Assessment



# Pipeline Assessment



The Pipeline Assessment program increases the percent of in-line inspectable pipeline mileage and brings Northern Natural Gas closer to industry standards and Pipeline and Hazardous Materials Safety Administration expectations.

- Projects typically include:
  - Installation of inspection tool launcher and receiver facilities
  - Installing tees with guide bars to prevent inspection tools from becoming stuck in the pipeline
  - Replacing plug and gate valves with full-bore valves to allow tool passage
  - Replacing pipe where two internal pipeline diameters create a “lip” that will interfere with inspection tool passage
- These projects require substantial planning and often construction of temporary pipeline bypasses to ensure pipeline outages do not significantly impact customers



Inspection tool receiver installation

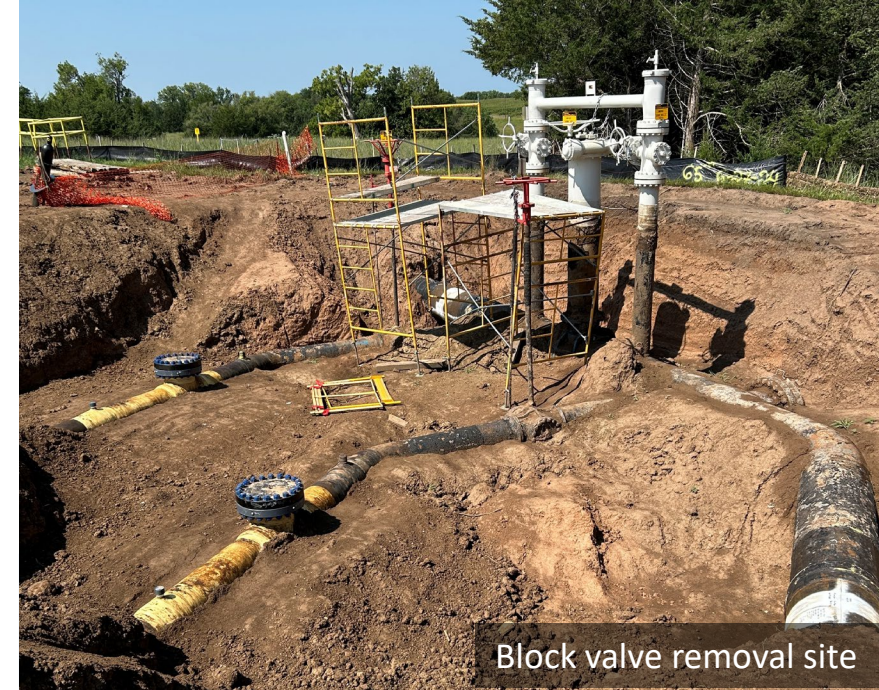
# In-line Inspection Modification Project



- One of six in-line inspection modification projects completed in 2024
- Allows assessment of 54-miles of 30-inch-diameter pipeline between Clifton, Kansas, and Beatrice, Nebraska
- Required pipeline modifications at 13 sites, including replacing 1,500 feet of 26-inch-diameter pipeline under the Little Blue River in Kansas



Line stop fitting (left) to temporarily manage gas flow during block valve removal (right).



Block valve removal site



Inspection tool launcher installation

# In-line Inspection Modification Project



- Allows assessment of 20 miles of 16-inch-diameter pipeline in New Mexico
- Required pipeline modifications at eight sites



10-inch tee replacement



Replacing 450 feet of pipeline in a gas processing facility

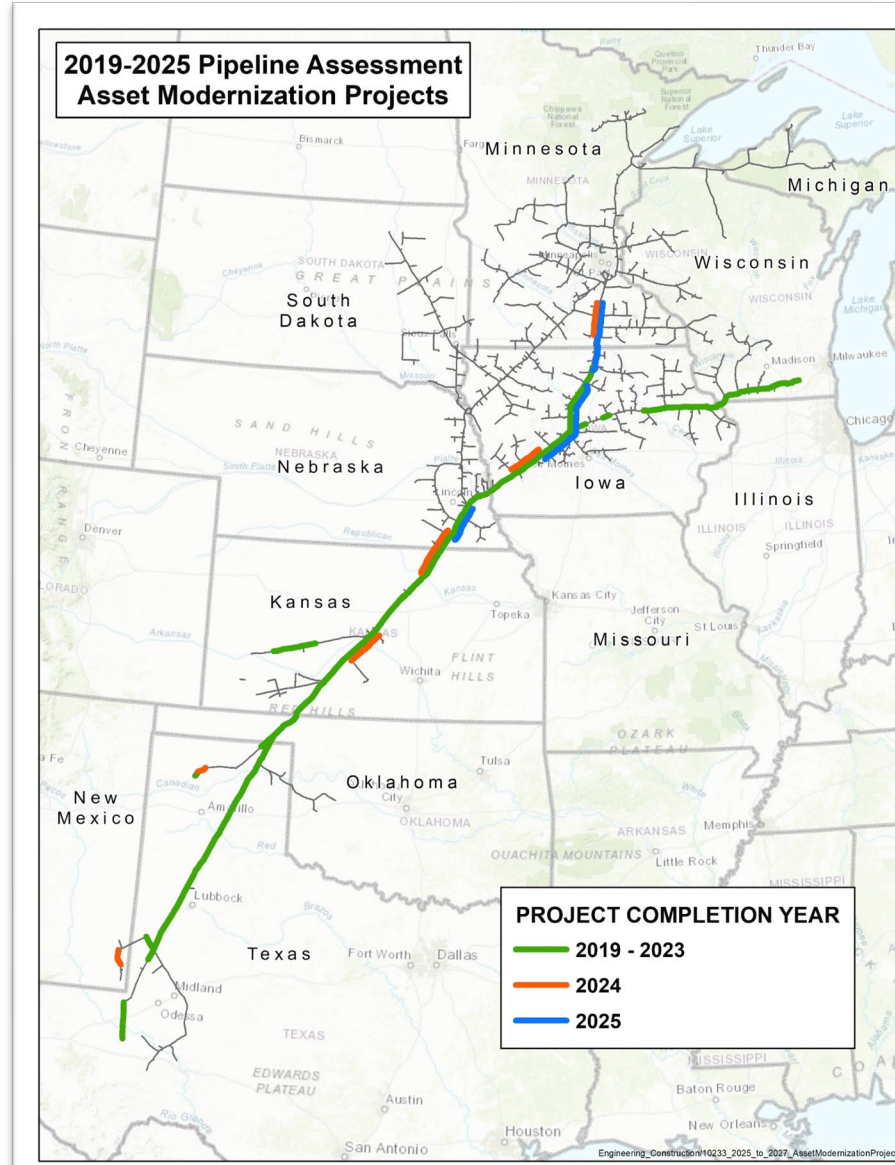


# Pipeline Assessment: Upcoming Projects



In 2025, Northern plans to complete five projects, increasing inspectable large-diameter-pipeline mileage by 226 miles, making 79% of the large-diameter pipeline system inspectable.

Year	Inspectable Mileage Added	In-line Inspectable percent of Northern's large-diameter system
2024	208	75%
2023	234	72%
2022	342	67%
2021	494	62%
2020	300	53%
2019	308	47%



# In-line Inspection Results



- In-line inspections reveal damage and defects such as dents, deformations, metal loss, and cracks
- In 2024, Northern completed in-line inspections on approximately 980 miles of pipeline
- Inspections revealed 370 sites that needed to be evaluated further through pipeline excavations, with 150 sites needing immediate repairs (typically reinforcement sleeves)
- These evaluations and timely repairs are critical for maintaining system reliability



Excavation to evaluate anomalies and remediate pipeline damage as needed



Pipeline anomalies (discovered with in-line inspection tools) being reinforced with sleeves

# Compression Replacement



# Compression Replacement



- In addition to replacing vintage compressor units, related auxiliary equipment and infrastructure are also being addressed. Projects are prioritized based on unit vintage, criticality to pipeline operations, historical reliability concerns, and outlook for future maintainability
- Northern has 94 compression units between 50 and 75 years old. The current plan includes replacement of approximately 45 units over the next ten years, 25% of Northern's 181 total compression units

## Completed Projects

Replacement Year	Location	Vintage	Number of Units	Unit Type
2024	Garner, Iowa	1978	1	York 455B (Electric)
2023	Paullina, Iowa	1947	5	Ingersoll Rand 82KVG (Reciprocating)
2022	Brownfield, Texas	1968	1	General Electric Frame 3 Model F (Turbine)
2022	Ogden, Iowa	1951-1953	4	Cooper Bessemer 26-H (Reciprocating)
2022	Spraberry, Texas	1953	2	Ingersoll Rand 412KVG (Reciprocating)
2021	Farmington, Minnesota	1961-1965	5	Ingersoll Rand 616KVT x Qty. 2 Ingersoll Rand 48KVS x Qty. 3 (Reciprocating)
2020	Bushton, Kansas	1968	1	General Electric LM-1500 (Turbine)
2019	Mullinville, Kansas	1968	1	General Electric LM-1500 (Turbine)
2016	Beatrice, Nebraska	1972	1	General Electric LM-1500 (Turbine)



Early 1950s-vintage horizontal reciprocating compressor units at Ogden, Iowa. Northern replaced these units in 2022.

# Compression Replacement



## Difficulties maintaining vintage units include:

- Obsolescence of spare parts
- Lack of industry service options
- Diminishing quality support of vintage units
- End of life being reached on major unit subcomponents that are not normally replaced or available
- Compliance with current air permits and environmental regulations



Original compressor part (left, temporarily welded for reproduction process) was fractured into pieces. Northern was able to reverse engineer and manufacture the component (right) when a replacement was not available.

# Brownfield, Texas, Compressor Turbine Exchange



- To extend the life of vintage compressor station units, Northern completes a “turbine exchange” where the used turbine is removed and a refurbished turbine is installed in its place
- At the Brownfield, Texas, station, turbine exchanges would be completed every ~5 years. This exchange was completed in 2018
- Older turbines take ~12 weeks to overhaul in-place, or ~2 weeks to exchange with a fully refurbished spare turbine
- Modern turbines can be exchanged within a 3-day outage
- Northern has assembled in-house shops with technology and expertise to manufacture parts and refurbish spare units



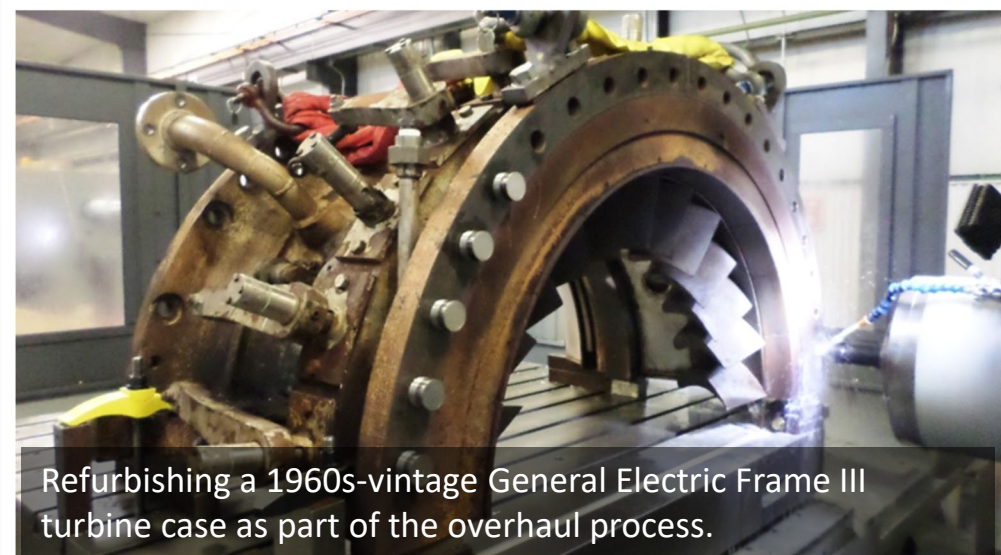
The original building was not constructed to accommodate turbine removal, so the unit had to be removed through the roof.



# Brownfield Compressor Parts Manufacturing



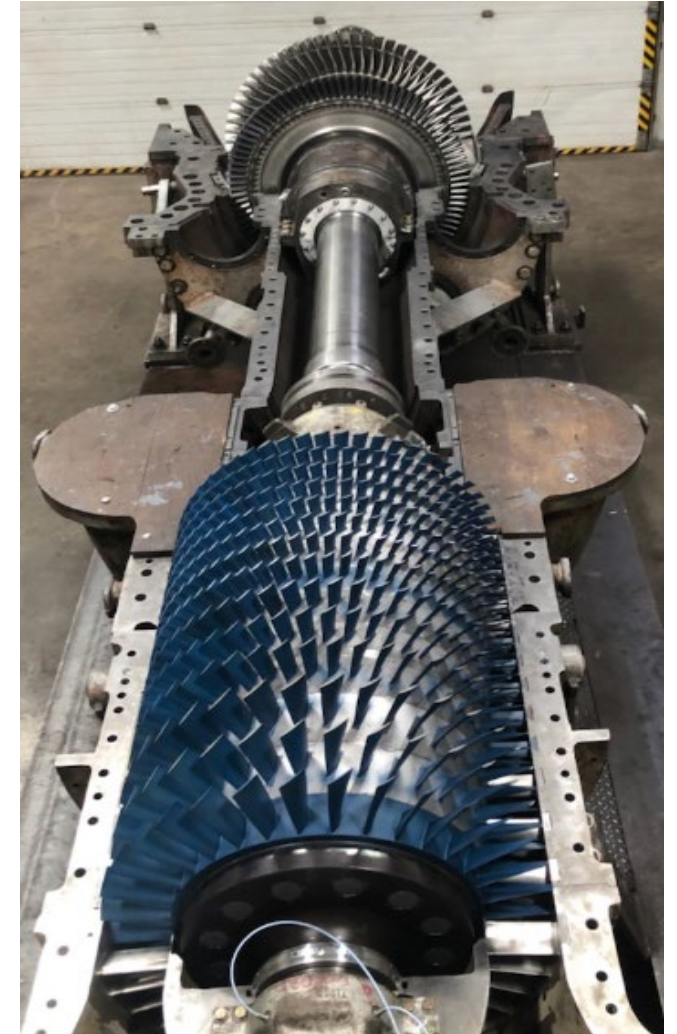
Zeiss Coordinate Measuring Machine shown measuring a compressor component for in-house reproduction.



Refurbishing a 1960s-vintage General Electric Frame III turbine case as part of the overhaul process.



GE Frame III turbine being rebuilt at Northern's facility.



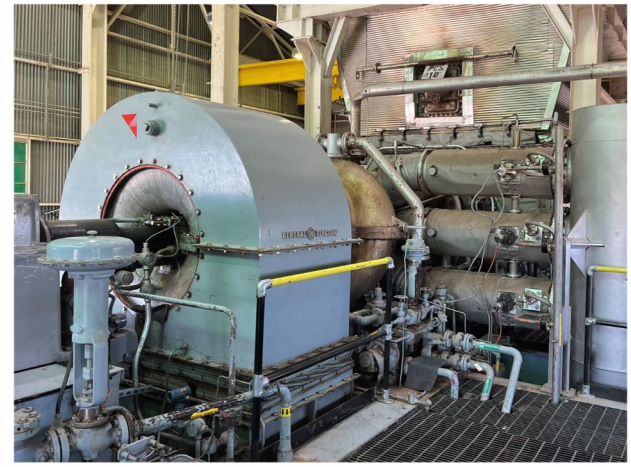
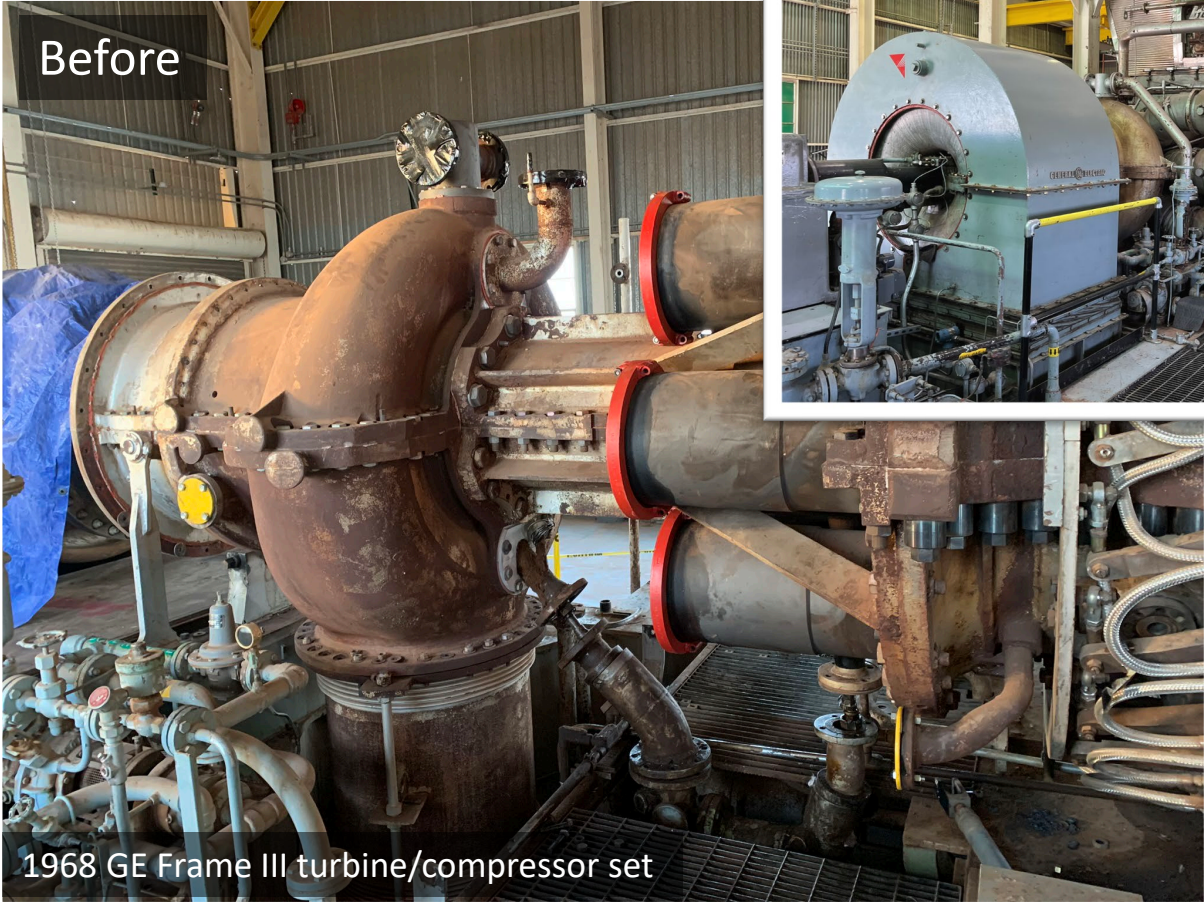
# Brownfield Compression Replacement



- In 2022, Northern replaced the 1968-vintage General Electric 9,300-horsepower Frame III turbine compressor with a Solar<sup>®</sup> Mars 15,900-ISO-horsepower turbine compressor
- The Brownfield station turbine operates nearly continuously and generates approximately 20% of the pipeline capacity in the area
- Station reliability is critical to meeting customer demand
- New piping configuration enabled system flexibility



# Brownfield Compression Replacement



Northern salvaged critical spare parts from the vintage unit, including rotors, casings, and turbine wheels that are not generally available within the industry. These parts will extend the service life of nine additional similar turbines.

# Farmington, Minnesota, Compression Replacement



- In 2021, Northern replaced five 1960s-vintage compressor units with three turbine-driven compressors
- In addition to maintenance and reliability concerns, vintage units also required replacement to comply with more rigorous environmental regulations
- Without replacing compression, Farmington station would otherwise fail to meet current emissions limits mandated by the Minnesota Pollution Control Agency



Excavation for mainline connections



New compressor building frame



Electrical terminations



Installation work

# Farmington Compression Replacement



The original compressor building (left photo) housed the 1960s-vintage compression. The new auxiliary and compressor buildings (right photo) house three new compressor units as well as an existing Solar<sup>®</sup> Taurus 60 unit which was upgraded as part of this project.

# Farmington Compression Replacement



Solar® Taurus 60, Centaur 40 and Saturn 20 (right) turbine compressor sets replaced three Ingersoll Rand KVS engines (left) and two KVT engines (all 1961-1965 vintage).

# Bushton, Kansas, Compression Replacement



Northern is starting a multiphase project to modernize the Bushton, Kansas, compressor station.

- In 2025, Northern will install approximately 3,000 feet of 30-inch-diameter mainline in preparation for new station suction and discharge headers
- These mainline modifications will provide system flexibility and alleviate a potential bottleneck in emergency situations
- In 2026, Northern will install two 11,150-ISO-horsepower Solar® Taurus 70 turbine compressor sets, replacing six 1960s-vintage units:
  - Three Ingersoll Rand 412KVS engines (2000-horsepower each)
  - One Ingersoll Rand 616KVT engine (4000-horsepower)
  - Two Ingersoll Rand 616KVR engines (5500-horsepower each)
- In 2027, Northern plans to replace three 1950s-vintage Worthington SUTC-8 engines (2000-horsepower each)



Ingersoll Rand 616KVT



Ingersoll Rand 412KVS

# Compression Replacement: Upcoming Projects



In addition to the Bushton station modifications in 2025, Northern will replace:

- Four 1960s-vintage Worthington ML-7 units at the North Branch, Minnesota, compressor station
- Three 1950s-vintage Clark TLA-6 and two 1960s vintage Allison 501KB units at the Ventura, Iowa, compressor station
- One 1960s-vintage General Electric Frame III turbine unit at the Claude, Texas, compressor station



Clark TLA-6, Ventura



Ventura compressor building



General Electric Frame III, Claude



Clark TLA-6, Ventura



Allison 501KB, Ventura

# LNG Equipment Replacement



# LNG Equipment Replacement



- Northern operates peak shaving liquefied natural gas (LNG) facilities at Wrenshall, Minnesota, and Garner, Iowa
- These cryogenic facilities each have 2.1 billion cubic feet of LNG storage and can vaporize the stored liquefied gas into useable pipeline gas at a total rate of 300,000 Mcf/day through three vaporization trains
- Liquefaction equipment can replace vaporized storage gas with LNG production at a rate of 12,000-17,000 Mcf/day
- The LNG facilities are used as operational storage to support the delivery of hourly peaking volumes, the simultaneous receipt and delivery of transportation quantities, and to balance line pack on Northern's system
- While vaporization ensures contractual deliveries are not jeopardized, the resultant system flexibility has also proven routinely critical for customer reliability in winter



Garner LNG facility - vaporizer

# Garner, Iowa, LNG Facility Modernization



- The Garner LNG station was installed in 1977
- Despite significant maintenance efforts, much of the equipment had reached the end of its life and had integrity concerns or parts that were obsolete and unavailable
- To ensure reliability of this critical facility, Northern completed significant upgrades and modernization projects between 2022 and 2024

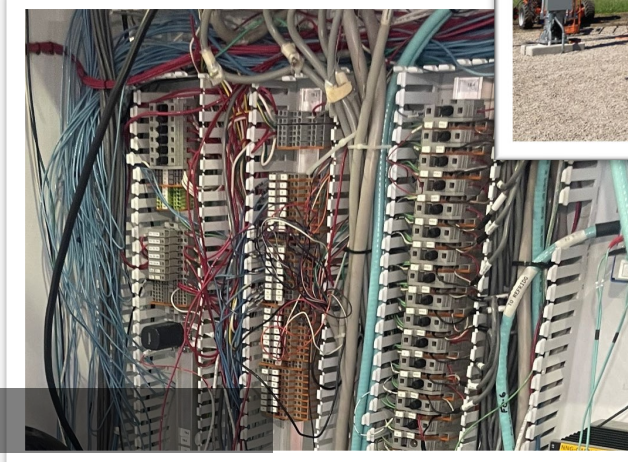


2024 cold box installation at the Garner LNG facility

# Garner LNG Facility Modernization



- In 2022, Northern replaced the 480-volt motor control center, which was original to the facility
  - The new equipment also brought the facility into full compliance with the latest version of the National Electric Code
  - The project scope included replacing the 480-volt transformer, motor control center, distribution panels and wiring to the end devices
  - Electrical system modernization increased the safety and reliability of station motor control centers and electrical power distribution to critical vaporization and liquefaction equipment
- In 2023, Northern replaced the 69kV electrical service, vintage transformers, switchgear and breakers, as well as the 4160v motor control center



# Garner LNG Facility Modernization



In 2024, as part of its Compression Replacement program, Northern replaced the original electric-driven refrigeration compressor with a Solar® Taurus 60 turbine refrigeration driver and compressor.

- Replacing the vintage electric equipment with gas-driven equipment improved reliability and reduced maintenance and electric utility costs
- Two buildings were constructed to house the new turbine and compressor as well as the new motor control center, power distribution system and control panels
- The original LNG cold box (heat exchanger) was replaced with new equipment including piping and related instrumentation
- Vaporizer emission stacks were replaced to comply with environmental permitting requirements



# Wrenshall, Minnesota, LNG Facility Modernization

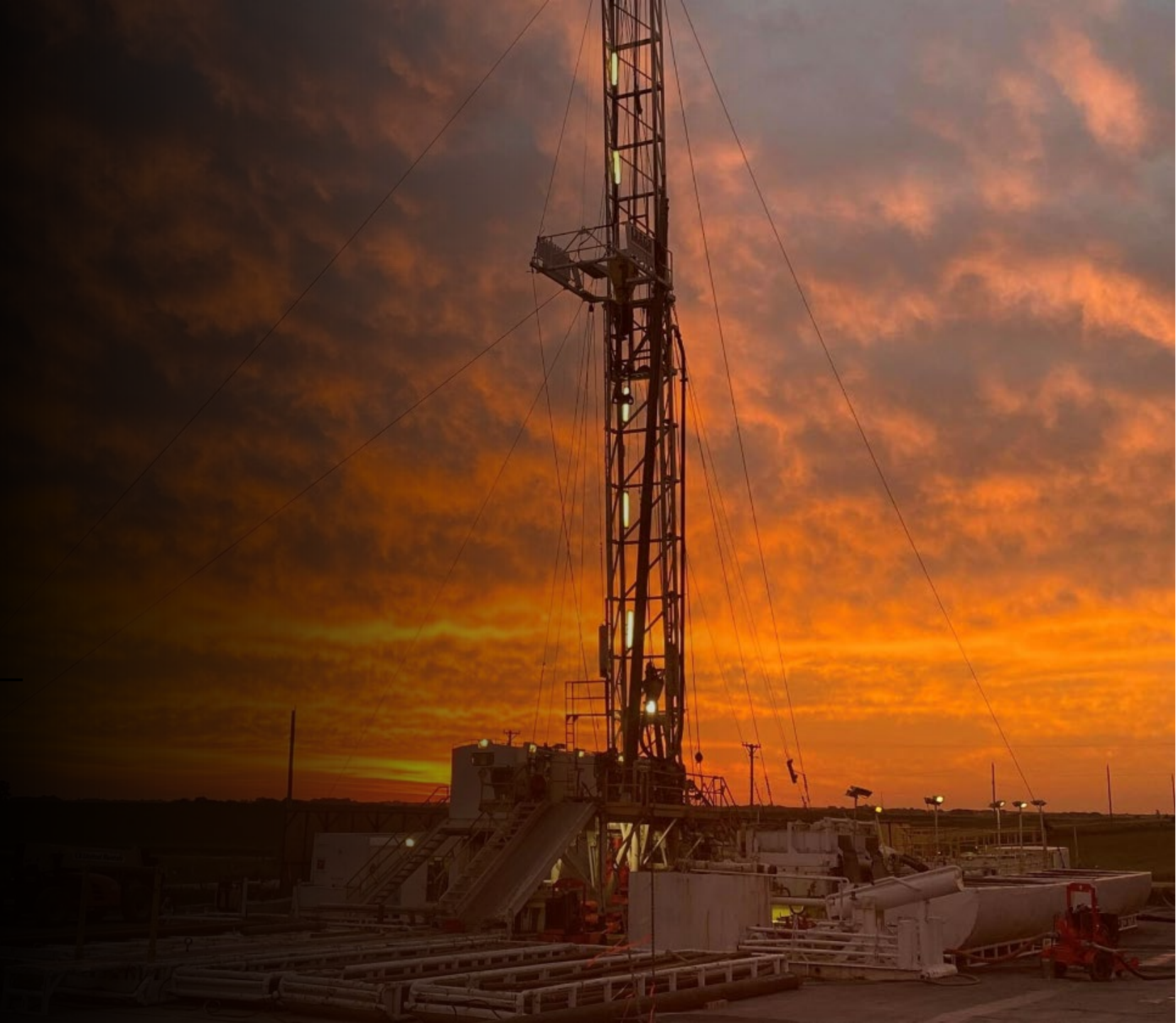


As with the Garner LNG facility, Wrenshall LNG facility equipment is also due for replacement due to integrity concerns and obsolescence

- In 2025, Northern will start the LNG vaporizer replacement project
  - The project scope is to replace all three of Wrenshall's direct-fired, submerged combustion LNG vaporizers
  - The 1975-vintage vaporizers are original to the facility and have exceeded the manufacturer's expected service life by nearly 20 years
  - Replacement will reduce maintenance costs and improve vaporizer reliability
- In 2026, the current 5,900-gallon liquid nitrogen storage tank and associated vaporizer, both original to the facility, are scheduled to be replaced
  - Nitrogen is used throughout the facility but is also part of the liquefaction process
  - The new storage tank will have updated safety equipment and a larger capacity vaporizer to better serve the facility



# Underground Storage Integrity



# Underground Storage Integrity



- The Underground Storage Integrity category includes projects to ensure compliance with the 2020 PHMSA Safety of Natural Gas Underground Storage Final Rule
- To comply with the regulations, Northern revised its reservoir integrity management plan to include new operating procedures and engineering standards and created the Underground Storage Integrity program
- As part of this program, Northern drilled five additional observation and storage wells in the Redfield, Iowa, underground storage field to monitor gas pressure in non-storage strata and replace aging wells that lack physical integrity
  - An additional injection/withdrawal well is planned for 2026
- In 2025, Northern will complete the Cunningham, Kansas, storage facility northeast containment system to prevent migration of storage gas beyond the limits of the field, akin to the existing north extension area containment system
  - The scope includes the installation of a water injection well, an observation well and conversion of an existing well to function as a water extraction well



Workover rig

# Underground Storage Integrity

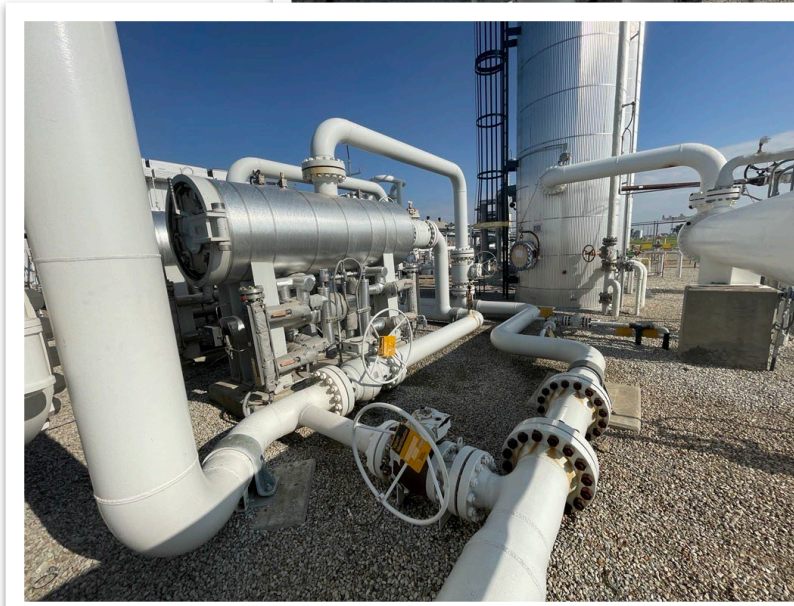


Northern continues project planning to support 2026-2027 completion of a natural gas dehydration and hydrogen sulfide treatment facility in Lyons, Kansas.

- The project will add a natural gas dehydration and hydrogen sulfide treatment facility to the Lyons underground storage system, with construction anticipated in 2026 and 2027
- Currently, Northern performs dehydration and hydrogen sulfide treatment on the storage gas at a facility in Bushton, Kansas, 16 miles away
- Northern has maintained the 1974-vintage facility in Bushton, but maintenance efforts and costs have increased substantially in recent years, and the facility experiences frequent outages
- A new facility in Lyons will optimize gas treatment at the withdrawal point of the storage field, similar to Northern's other underground storage facilities



Bushton treater facility



# Vintage Pipeline Abandonment



# Vintage Pipeline Abandonment



Mechanically coupled and acetylene-welded pipeline technology were used for early pipeline construction but were largely discontinued by 1940.

## Concerns with mechanically coupled and acetylene-welded joints:

- Subject to failure from ground movement and can be leak-prone
- Not compatible with pipeline integrity assessment methods as the pipelines cannot be inspected with in-line inspection tools nor hydrostatically tested
- Much of this pipe is uncoated and is therefore susceptible to external corrosion



Modern pipeline welding



Pumpkin being welded to reinforce a mechanical couple



Vintage mechanically coupled pipeline



Pipeline corrosion



Cracked acetylene weld

# Vintage Pipeline Abandonment

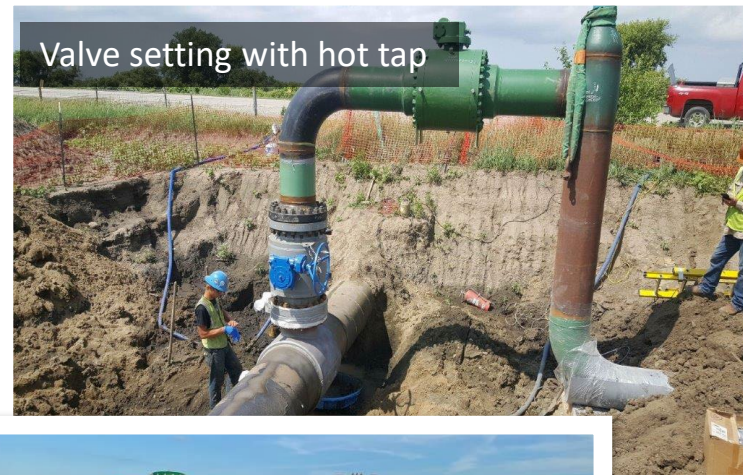


- Removing a pipeline from service and replacing lost capacity are two of the last components of a multiphase project. Prior to pipeline abandonment, necessary projects include:

- Modifying town border stations and compressor stations to remove connections to the vintage pipeline and adding connections to newly constructed pipelines and potentially other adjacent pipelines
- Removing tie-over connections between the vintage and adjacent pipelines
- Relocating or removing farm taps
- Installing cathodic protection to maintain pipeline integrity

- Projects are phased in multiple years to minimize system disruption

- Following abandonment, the vintage line is removed as practical, considering safety, operational and environmental concerns



# South Sioux City to Sioux Falls A-line Abandonment



Pipeline ready to be placed in ditch

- Northern abandoned the 79-mile, 1932-vintage mainline between South Sioux City, Nebraska, and Sioux Falls, South Dakota, in 2022
- To replace capacity, Northern installed an 82-mile, 12-inch-diameter pipeline
- Ancillary projects included:
  - Installing in-line inspection tool launcher and receiver facilities
  - Connecting new mainline to nine branch lines
  - Modifying four town border stations
  - Installing 10 mainline block valves
  - Relocating or removing 61 farm taps
  - Modifying cathodic protection systems



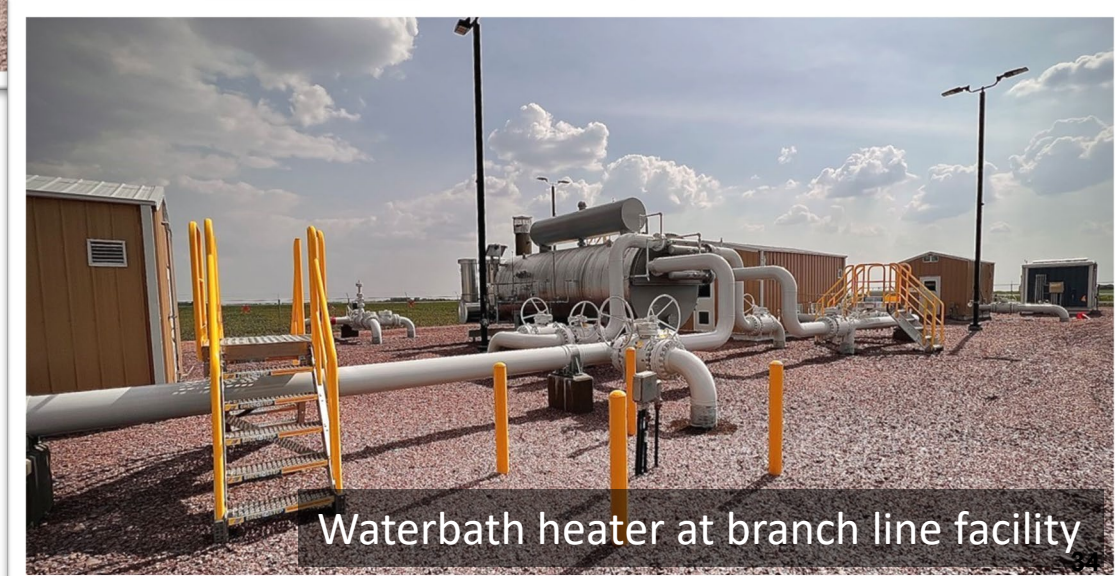
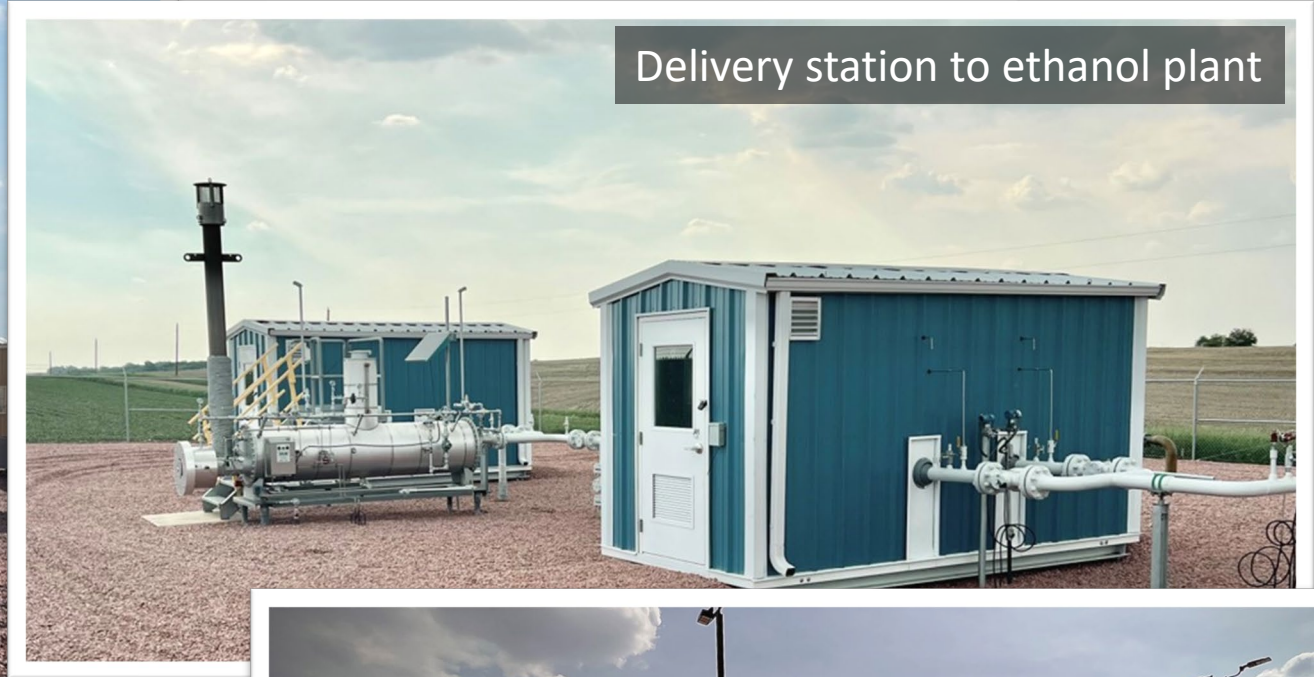
Trenching for pipeline installation

# South Sioux City to Sioux Falls A-line Abandonment Missouri River Horizontal Directional Drill



Horizontal directional drill

# South Sioux City to Sioux Falls A-line Abandonment Facility Installation



# Ogden-to-Ventura A-line Abandonment



- Northern abandoned 85 miles of 1931-vintage, 20-inch-diameter mainline between Ogden, Iowa, and Ventura, Iowa, in 2023
- To replace capacity, Northern constructed 1.6 miles of 30-inch-diameter pipeline
- Ancillary projects included:
  - Removing pipeline tie-overs and block valves at seven sites
  - Disconnecting the vintage line from seven branch lines
  - Modifying approximately 17 town border stations
  - Modifying two compressor stations
  - Removing or relocating ~59 farm taps
  - Installation of cathodic protection



Pipe lowering

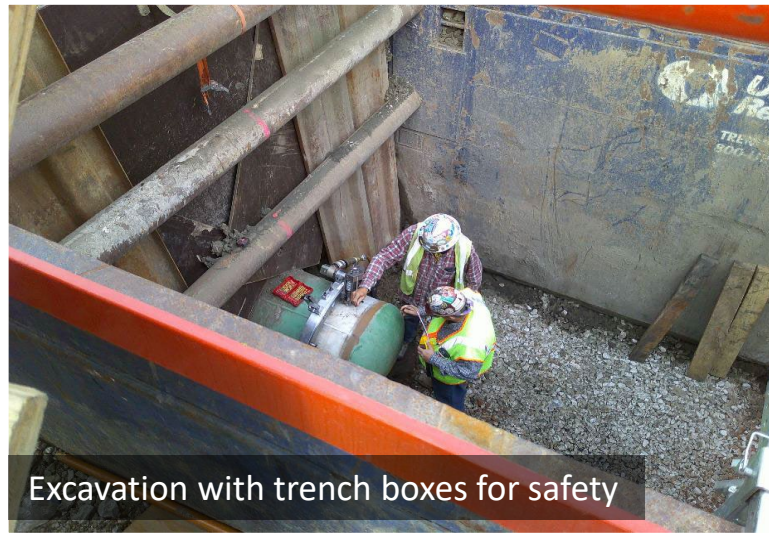


Pipe bending

# Ogden-to-Ventura A-line Abandonment



Pipe lowering



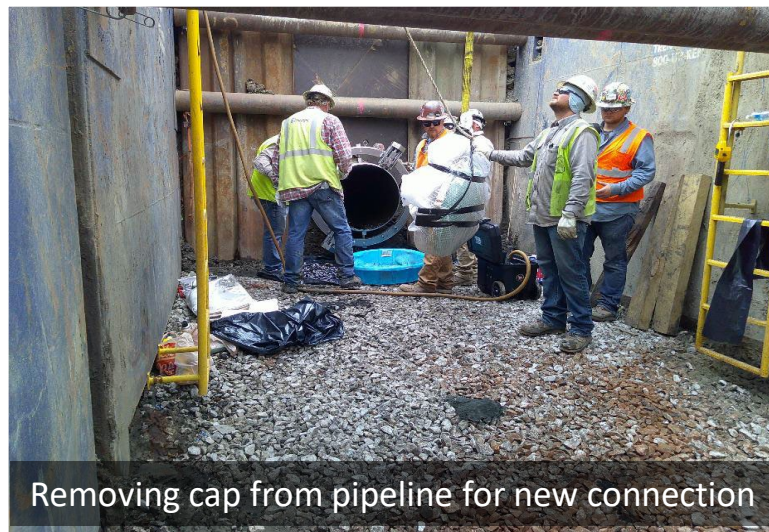
Excavation with trench boxes for safety



Soil being restored



Positioning fabricated pipe



Removing cap from pipeline for new connection



Restoration in progress

# Ventura-to-Farmington A-line Abandonment



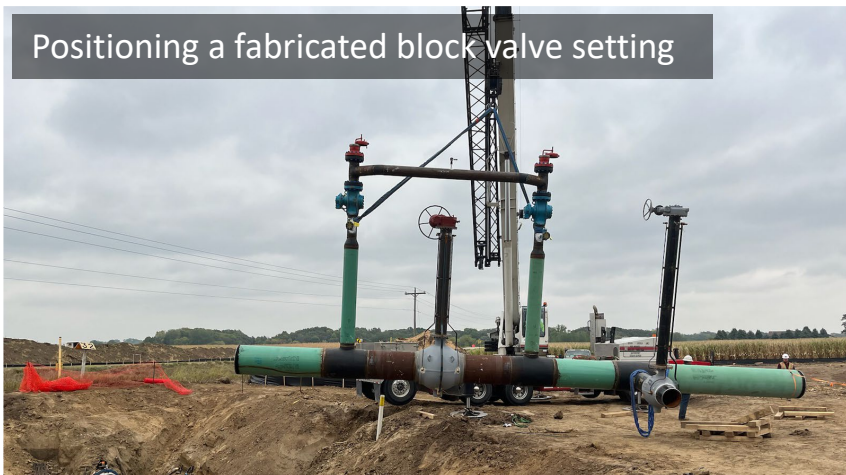
Northern commenced engineering and design work to support the 2028 abandonment of 131-miles of 1931-vintage, 16-inch-diameter mainline between Ventura, Iowa, and Farmington, Minnesota. In addition to constructing seven miles of 30-inch-diameter pipeline and 10 miles of 36-inch-diameter pipeline, ancillary projects include:

- Removal of pipeline tie-overs and block valves at 12 sites
- Modifications to 19 town border stations
- Modifications to two compressor stations
- Removal or relocation of ~113 farm taps
- Modification of cathodic protection systems



Line stop fitting with bypass to temporarily maintain gas flow

Positioning a fabricated block valve setting



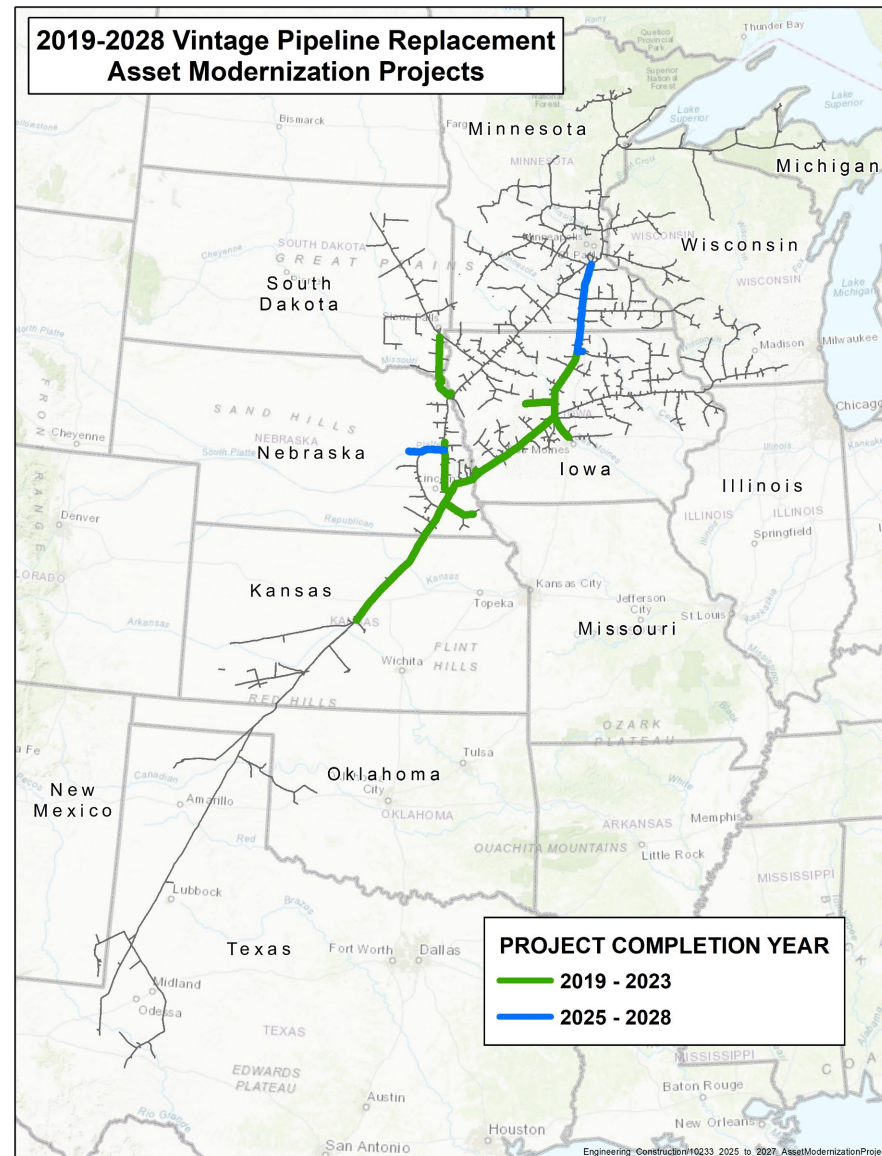
Segment of pipe cut for installation



# Vintage Pipeline Abandonment: Upcoming Projects



- Prior to the Asset Modernization program, Northern's system had ~900 miles of acetylene-welded and mechanically coupled large-diameter mainlines
- In 2028, Northern anticipates abandoning the last of the major, large-diameter, mechanically coupled and acetylene-welded mainlines: 131-miles of 16-inch-diameter mainline between Ventura, Iowa and Farmington, Minnesota
- In 2025, Northern will abandon six miles of the 1931-vintage Mason City, Iowa, branch line and will install 2.7 miles of 10-inch-diameter pipeline
- In 2026, Northern will replace the remaining seven miles of the 10-inch-diameter, 1932-vintage Columbus, Nebraska, branch line



# MAOP Reconfirmation



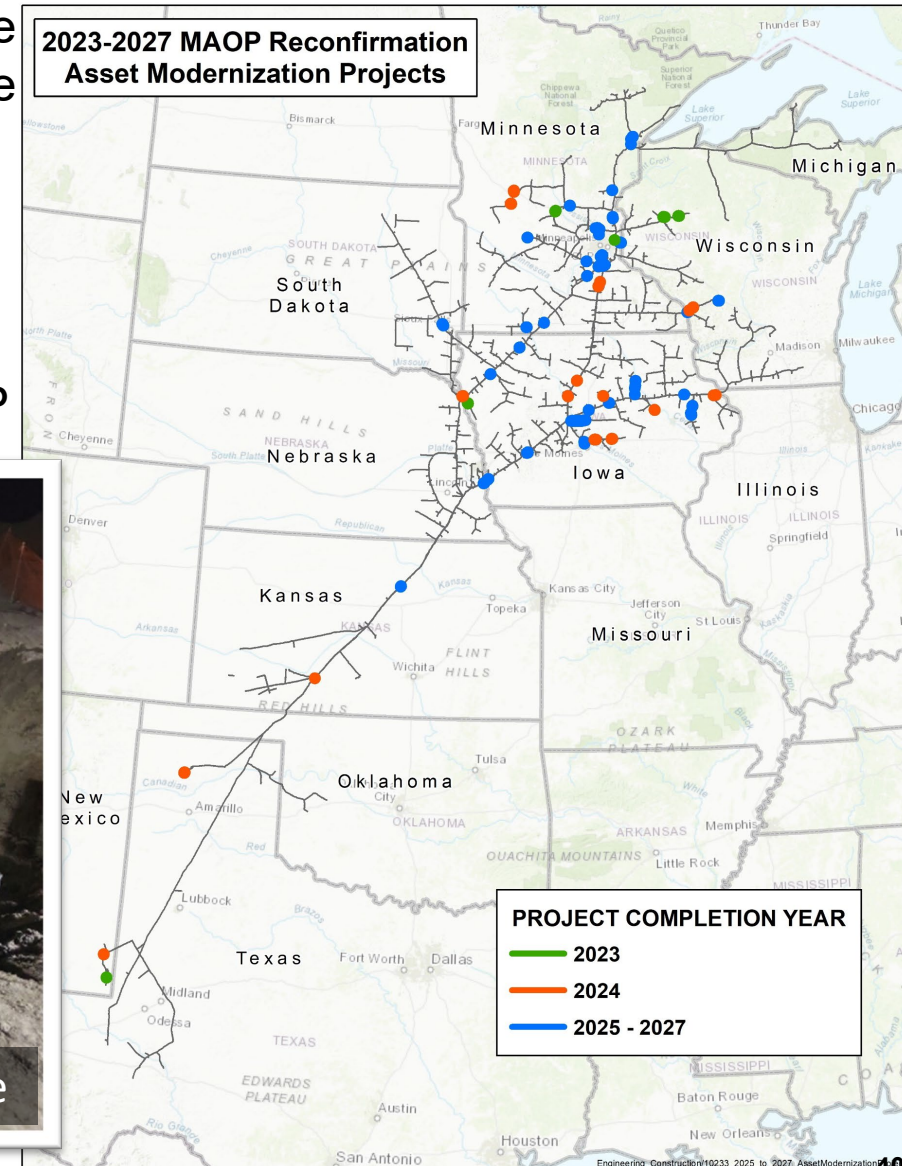
# MAOP Reconfirmation



- Since 2019, PHMSA requires MAOP reconfirmation in high consequence areas, moderate consequence areas, and Class 3 locations that operate at or above 30% specified minimum yield strength
- If no pressure test record exists for a pipeline, the MAOP must be reestablished - typically through a pressure test or pipe replacement
- Northern has approximately 603 miles of pipeline within areas of consequence, with 510 miles having adequate records to support MAOP
- Through 2024, Northern reestablished MAOP on 19 miles and plans to complete projects to reestablish MAOP on 26 miles in 2025
- The remaining 48 miles will be completed by 2034 per PHMSA rules



Pressure testing 30-inch-diameter pipe



# MAOP Reconfirmation



- Approximately 190 reconfirmation projects are planned between 2025 and 2034
- ~60% of the projects are to reconfirm the MAOP of less than 2,500 feet of pipe
- ~10% of the projects are for more than 1 mile of pipeline
- While pressure testing is the preferred option for reconfirmation, this is not always viable:
  - Vintage, mechanically coupled or acetylene-welded pipe will leak and is not suitable for hydrotests
  - In some locations, a failed pressure test would be difficult or dangerous to remediate (under interstates, wetlands, etc.)
  - Pressure testing can require a multi-week pipeline outage – in some cases, this will significantly impact customers
- Where appropriate, Northern utilizes project efficiencies, combining project scopes to remediate the MAOP records deficiencies



Meters and downstream piping missing pressure test records

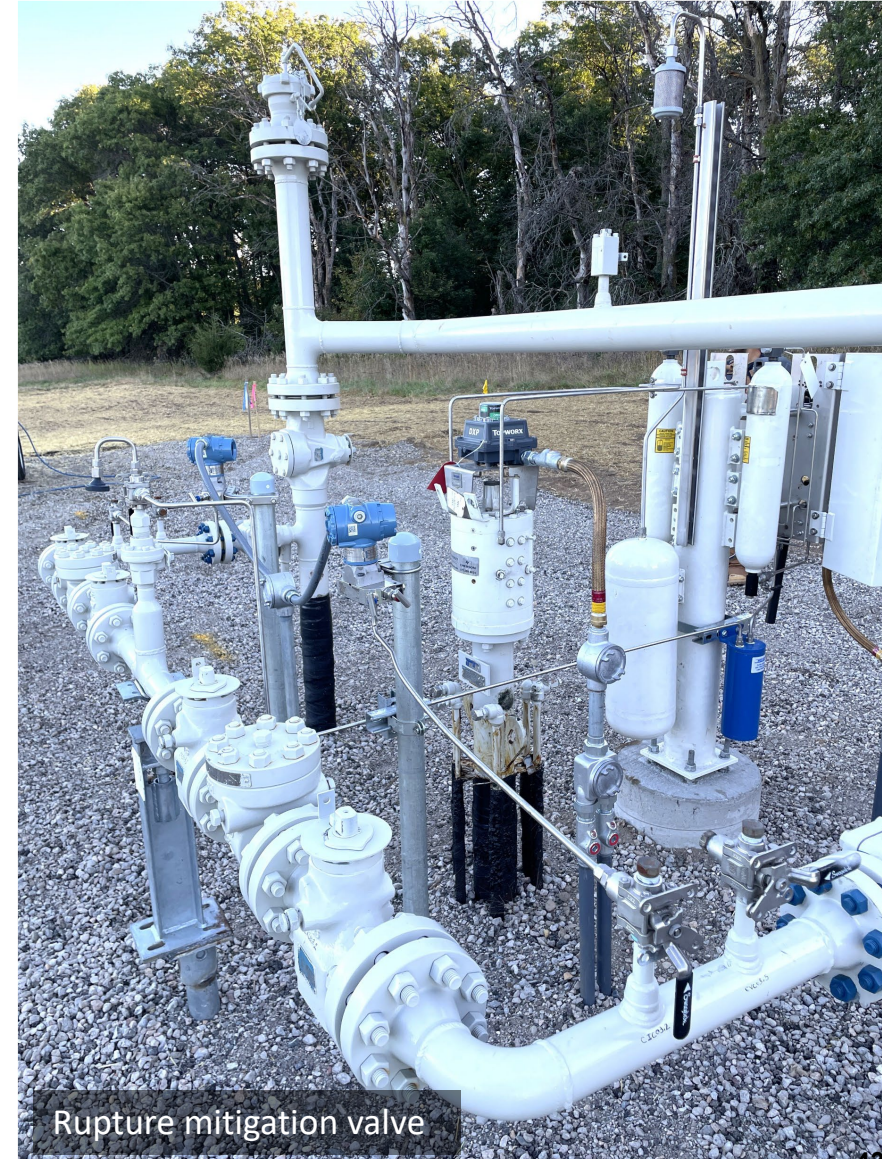
# Rupture Mitigation Valves



# Rupture Mitigation Valves



- PHMSA requires installation of rupture mitigation valves, such as an automatic shut-off valve (ASV) or a remote-control valve (RCV), to minimize the volume of gas released from a pipeline in the case of a pipeline rupture, helping to improve public safety and mitigate environmental consequences
- The Final Rule applies to pipelines greater than 6-inches in diameter, constructed after April 10, 2023
- Northern is assessing its recent pipeline construction to ensure compliance with the PHMSA rule and will install rupture mitigation valves or equivalent technologies as needed
- In 2024, Northern spent approximately \$5.0 million on projects to install RCVs on four existing pipelines and plans to spend an average of \$5.8 million per year through 2028



Rupture mitigation valve