Northern Natural Gas
A BERKSHIRE HATHAWAY ENERGY COMPANY

December 2021

ASSET MODERNIZATION

The purpose of this communication is to describe, validate and update the Asset Modernization investment that Northern has made and will continue to make to ensure the safety and reliability of its system, as well as comply with applicable regulatory requirements. By the end of 2021, Northern is expected to have completed $913 million of Asset Modernization investment from the beginning of the program. Over the next ten years, Northern is expected to invest another $1.9 billion, for a total overall investment of over $2.8 billion in Asset Modernization since program inception. As the system continues to age, Northern will continue to execute the Asset Modernization program.

The Asset Modernization program is intended to significantly reduce the reliability risk inherent in Northern's vintage facilities and the integrity risks that have plagued other operators. Northern classifies its Asset Modernization projects into five broad project classifications: (1) Pipeline Assessment; (2) Compression Replacement; (3) LNG Equipment Replacement; (4) Underground Storage Integrity; and (5) Vintage Pipeline Replacement.

The program impacts Northern's operations and maintenance (O&M) expenses as well. While some of the projects result in a reduction to O&M, the net impact is an increase to O&M expenses. The primary O&M cost driver of Asset Modernization is the Pipeline Assessment category, which causes substantial increases to Northern's costs of in-line inspections due to the increased mileage of inspectable pipeline and increased inspection requirements to comply with updated pipeline safety laws and regulations.

Facilities of equivalent capacity are installed to replace the capacity of retired pipeline and compressor units. Incremental capacity is not generally created through these replacements; however, Northern has and will continue to pursue efficiencies through project coordination with expansion open seasons.

Background

The Northern pipeline system was built in phases, beginning in the 1930s, with system expansions developed to meet customer needs. Northern currently operates approximately 14,500 miles of pipeline and 55 compressor stations. Approximately 85% of the pipeline mileage was installed prior to the first enactment of federal pipeline safety standards in 1968. Significant expansion facilities were installed in the 1940s, 1950s and 1960s, and the utility and reliability of these expansions has been maintained with robust equipment analysis, equipment maintenance programs and proactive parts management. While these facilities are still dependable, they have a finite life, and vendor/product support is no longer available for older equipment as equipment manufacturers move to support newer technology.

Northern has been working to maintain and modernize its system for many years, repairing and replacing components of its transmission and storage plant to ensure continued reliability. Examples of Northern's modernization efforts over the last six years include replacing compressor units at the Farmington, Minnesota; Beatrice, Nebraska; Ogden, Iowa; Mullinville, Kansas; and Bushton, Kansas compressor stations. Additionally, Northern has replaced the molecular sieve vessels at the Garner, Iowa, and Wrenshall, Minnesota, liquefied natural gas (LNG) storage facilities; abandoned the A-mainlines from Palmyra to South Sioux City, Nebraska, and Bushton, Kansas to Ogden, Iowa. Furthermore, in the last six years, Northern has completed pipeline modifications to make more than 1700 miles of large-diameter pipe inspectable, increasing the number of miles modified per year from 164 miles in 2016 to 488 miles in 2021. While these efforts have maintained the reliability of Northern's system, Northern must continue to implement broader replacement programs for specific Asset Modernization needs.

Asset Modernization as a category was created to capture and characterize the significant increase in costs related to the modernization projects. Northern's Asset Modernization program was designed using FERC's policy statement on Cost Recovery Mechanisms for Modernization of Natural Gas Facilities, and it necessarily represents a significant expansion of Northern's historical maintenance and upgrade programs due to the age of the system and updated safety laws and regulations. The costs are captured in the following budget summary categories:

- Pipeline Assessment
- Compression Replacement
- LNG Equipment Replacement
- Underground Storage Integrity
- Vintage Pipeline Replacement

Northern must continue with this Asset Modernization effort to ensure its industry-leading service reliability will not suffer due to increased outage quantities and duration, as well as to comply with increased legal and regulatory requirements as further discussed below. In addition, Asset Modernization is required to ensure continued pipeline integrity and avoid unacceptable pipeline incidents. The industry in general, including distribution utilities, have undertaken similar modernization efforts to replace vintage facilities such as cast-iron pipelines, which pose similar threats to service reliability and public safety.

Capital Expenditures Summary

Northern is completing $283.3 million of Asset Modernization projects in 2021 and plans Asset Modernization projects totaling $1.9 billion from 2022 through 2031.

Asset Modernization does not completely replace all vintage facilities on the Northern system, as a majority of the approximately 14,500 miles of pipeline and 185 compressor units will continue to be maintained through more traditional means. The Asset Modernization program only addresses facilities and systems at the end of their useful lives or where replacement or inspections are required by federal regulations.

Budget Summary Categories

Pipeline Assessment

On October 1, 2019, the Pipeline and Hazardous Materials Safety Administration (PHMSA) issued the first of a three-part final rule titled the Safety of Gas Transmission Pipelines: MAOP Reconfirmation, Expansion of Assessment Requirements and Other Related Amendments (Mega Rule). The rule focuses primarily on reconfirming maximum allowable operating pressures and expanding assessment requirements to include the newly defined moderate consequence areas. The rule expands pipeline integrity assessment requirements by defining moderate consequence areas and requiring integrity assessments. The rule requires MAOP reconfirmation in high consequence areas, moderate consequence areas, and Class 3 locations that operate at or above 30% specified minimum yield strength.

The Pipeline Assessment category captures significant capital expenditures driven by the need to modernize infrastructure for the purpose of accommodating the internal inspection of pipelines and to comply with increased requirements imposed by new and updated pipeline safety laws and regulations. The costs for pipeline assessments fall into two major categories:

(1) Pipeline modification projects on Class 3 pipeline segments that are operating above 30% specified minimum yield strength not previously assessed with in-line inspection tools to meet requirements of the Mega Rule.

(2) Pipeline modifications to increase the percent of the system that is in-line inspection capable with the focus on large-diameter pipelines (greater than 16-inch-diameter) and pipelines operating above 30% of their specified minimum yield strength in areas outside of high consequence areas, and to assist with meeting existing PHMSA MAOP Regulations and other regulations.

As shown in Exhibit No. 1, Northern plans to invest $689.7 million in Pipeline Assessment projects during the next 10 years. The large-diameter pipeline modifications are anticipated to be largely complete by 2030 and all projects mandated by the Mega Rule will be completed by 2035. Northern will provide additional information on the total cost for the large-diameter and Mega Rule projects by the end of January 2022.

These projects will have a significant O&M expense impact that materializes as a result of subsequent in-line inspections, tool data verification excavations and repair work associated with the inspections. These costs are not included in the capital portion of the work required to make the modifications, and are extremely variable based on the line length, tool technology required and results of the inspection. Expenses associated with the inspections will be recurring, normally five to 10 years in frequency, depending on the condition of the line and regulatory requirement.

Northern's in-line inspection costs associated with the high-consequence area program, which started in 2003, averaged $15.0 million/year between 2003 and 2009. However, with

the increased regulatory requirements to comply with the Mega Rule, Northern anticipates in-line inspection costs to average $46.7 million per year between 2021 and 2027, representing a 67% increase.

Compression Replacement

The Compression Replacement category represents the costs to replace vintage compression units throughout the system, with the priority placed on units based on vintage, criticality to pipeline operations, historical reliability concerns and outlook for future maintainability. The program also pertains to critical compression support auxiliary equipment and infrastructure.

Northern has 102 compression units between 50 and 74 years old. As these facilities reach obsolescence, parts become more difficult – if not impossible – to obtain. In fact, Northern has had to manufacture many of its own replacement parts for obsolete units. Unexpected failures can lead to longer outages while parts are located or fabricated, negatively impacting service to customers. Northern's compression maintenance costs have increased substantially as a consequence of an aging fleet of compressor units.

To fulfill customer commitments, it is paramount that Northern's compression fleet maintain high reliability. With over half of these units reaching 80-years old and some surpassing 90-years old in the next 20 years, a replacement program has been implemented that will mitigate short- and long-term customer reliability risks.

The current Asset Modernization plan includes replacement of up to 45 units over the next ten years. This represents 44% of the 102 vintage compression units and approximately 25% of Northern's 183 total compression units. Eight units have been replaced under this program since 2016.

The units targeted for modernization are spread across Northern's system and are included in both the field and market areas. As a result, many units on the main trunks of the system have replacement plans in the near-term or have already been replaced. Vintage units along the main corridor of Northern's pipeline system at Bushton, Kansas; Mullinville, Kansas; Beatrice, Nebraska; Ogden, Iowa; and Farmington, Minnesota, have been or will be replaced in the near-term to ensure continued reliable service to customers and the public.

Specifically, the Beatrice, Nebraska; Mullinville, Kansas; and Bushton, Kansas, units were replaced in 2016, 2019 and 2020 respectively, to eliminate the last three General Electric LM 1500 units on the Northern system. These obsolete units were becoming increasingly unreliable and difficult to effectively repair, were nearing the end of their useful life for critical rotating components, and were only supported by one service entity in the industry.

The Ogden, Iowa, early 1950s vintage horizontal reciprocating compressor units, replaced in 2021, were also obsolete and becoming unreliable. These units were generally unsupported within the industry and most pipeline companies in North America replaced vintage horizontal compressors years ago, although Northern was able to extract several

years of additional life out of the units before replacing them through its robust maintenance program and by machining obsolete parts, as needed.

In addition to maintenance and reliability concerns, vintage units also require replacement to comply with more rigorous environmental regulations. For example, the Farmington, Minnesota, early 1960s vintage reciprocating Unit Nos. 1-5 were replaced in 2021, as the station would otherwise fail to meet current emissions limits set by the Minnesota Pollution Control Agency.

As shown in Exhibit No. 1, Northern plans to invest $516.8 million in Compression Replacement projects during the next 10 years. This is up from the previous plan of $287.6 million, as Northern will begin to replace at least two units per year. The incremental investment will allow Northern to replace units and critical auxiliary equipment at a rate necessary to largely avoid relying on units greater than 90-years old. Failure to make this strategic investment now would result in Northern continuing to operate almost 60 units beyond 75 years old and over 40 units beyond 90 years old by 2050. This would present significant reliability risk to Northern's customers, as equipment of this vintage would be very difficult to maintain, repair, and overhaul given end of useful life of critical components not normally or easily replaced, obsolescence of spare parts, and lack of industry service options. This level of investment will also be necessary to allow Northern to continue to modernize its compression fleet to ensure any future federal or state emissions compliance mandates can be achieved in a timely fashion. This program will continue beyond the 10-year outlook as compressor units age and are replaced.

When legacy reciprocating units are replaced with modern turbines, recurring overhaul expenses can be reduced as modern turbines are exchanged and capitalized instead of overhauled as with reciprocating units. For example, compression replacement projects completed between 2016 and 2021 at Bushton and Mullinville, Kansas; Beatrice, Nebraska; Ogden, Iowa; and Farmington, Minnesota, have reduced the 10-year overhaul program budget by approximately $5 million. Incremental overhaul reductions are anticipated as the replacement program continues in the next 10 years, but savings are contingent upon the type of replacement compression units. In cases where modern reciprocating compression is more suited than turbines for replacement compression to meet system conditions, there would be no expected reduction in overhaul expenses.

LNG Replacement

Northern operates peak shaving LNG facilities at Wrenshall, Minnesota, and Garner, Iowa. The Wrenshall LNG station was installed in 1974, and the Garner LNG station was installed in 1977. 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. The liquefaction equipment can replace vaporized storage gas 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, to support 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.

This category represents the cost to replace major equipment components at the LNG plants. LNG plant operations also involve significant electrical and electronic control equipment. Electrical system modernization increases the safety and reliability of station motor control centers and electrical power distribution to critical vaporization and liquefaction equipment.

The original facilities were installed in the 1970's, and as a result, much of the equipment has reached the end of its life. Northern has historically maintained older equipment and replaced parts or subsystems versus wholesale replacements. However, in recent years, routine maintenance projects have proven insufficient, and Northern began replacing larger systems or pieces of equipment out of necessity. This equipment either displayed integrity concerns or required replacement due to obsolescence and unavailability of parts.

As shown in Exhibit No. 1, Northern plans to invest $53.4 million in LNG Replacement projects during the next 10 years. These projects are expected to continue intermittently beyond the 10-year outlook to maintain system reliability.

These projects are not expected to have any measurable impact to O&M expense, as the new equipment will require similar maintenance activities as the existing equipment.

Underground Storage Integrity

The Underground Storage Integrity category includes projects to ensure compliance with a new PHMSA rule. In 2020, the Safety of Natural Gas Underground Storage Final Rule became effective. This rule gave PHMSA new jurisdiction over the underground storage field wells and reservoirs. The new regulations incorporated new industry standards into the pipeline safety regulation that operators are required to implement, including American Petroleum Institute API- Recommended Practice 1171- Functional Integrity of Natural Gas Storage in Depleted Hydrocarbon and Aquifer Reservoirs. In order to comply with the regulations, Northern revised its reservoir integrity management plan to include new operating procedures and engineering standards and also created the Underground Storage Integrity capital expenditure program.

Under its reservoir integrity management plan required per this rulemaking, Northern will complete additional observation and natural gas withdrawal wells in the Redfield, Iowa, underground storage field. Additionally, Northern will establish and maintain an undisturbed buffer zone around the storage field to further ensure field integrity. Northern completed the installation of one withdrawal well in 2020.

As shown in Exhibit No. 1, Northern plans to invest $30.8 million in Underground Storage Integrity projects during the next 10-year plan years. These projects are expected to

continue beyond the 10-year outlook as additional withdrawal well replacements or observation wells are needed.

The new wells will slightly increase storage O&M expense in order to maintain the new facilities.

Vintage Pipeline Replacement

The Vintage Pipeline Replacement projects will replace existing aged pipelines by abandoning mechanically coupled and acetylene-welded mainlines and branch lines and installing facilities to replace the associated capacity. To date, Northern has abandoned approximately 530 miles of vintage large-diameter pipeline as part of this program, with an additional 430 miles planned for abandonment within the next five years.

Mechanically coupled pipeline joint technology, originating in 1891, and acetylene-welded pipeline technology, initially used for pipeline construction in 1911, were historically used in natural gas pipeline applications but were largely discontinued by 1940. These mechanical couples were also used in the initial construction of Northern's system. By 1933, most cross-country pipelines were being constructed with the superior-strength electric resistance arc-welded girth joints, as mechanically coupled and acetylene-welded joints are subject to failure from ground movement and can frequently leak natural gas. Furthermore, these joint types are not compatible with modern pipeline integrity assessment methods; they cannot be inspected with in-line inspection tools nor hydrostatically tested without incurring significant quantities of leaks. Additionally, much of this pipe is uncoated and is therefore susceptible to external corrosion.

While Northern has successfully operated these facilities for nearly 90 years, these pipelines have reached the end of their useful life. As shown in Exhibit No. 1, Northern plans to invest $653.8 million in Vintage Pipeline Replacement projects during the next 10 years. This program is anticipated to continue approximately 15 years, with large-diameter mainlines being replaced within the next five years and the program's focus shifting to branch lines and ultimately small-diameter pipelines. The total program cost is currently estimated at $948.7 million. Updates on the total will be provided as out-year projects are more fully defined.

In addition to increasing system reliability, the Vintage Pipeline Replacement category is also creating additional system efficiencies. For example, with the additional compression installed at the Beatrice, Nebraska, compressor station in 2021 to replace the capacity reduction associated with adjacent pipeline retirement, there is an expected $0.7 million decrease in compressor fuel expense due to the resulting system optimization that reduced the need for compressor use at the Palmyra, Nebraska, compressor station.

Conclusion

In summary, Northern will invest approximately $1.9 billion over the next 10 years to modernize the pipeline, compression, underground storage and LNG facilities as described above, resulting in improvements to system integrity, reliability, efficiency and public safety.

Exhibit 1
Asset Modernization Project Detail

Project Description	2021	2022	2023	2024	2025 - 2031	10-year 2022 - 2031	Regulatory Authority
Pipeline Assessments							
Ventura-Faribault B-MCA		101,905			16,617,147		Prior Notice
Ventura-Faribault C-MCA					15,878,411		Prior Notice
Ventura-Faribault D-MCA				7,312,348			Blanket
Replace Anamosa-CLS					910,035		Blanket
Stillwater-MCA	123,694	4,800,620					Blanket
Replace Worthington-CLS					275,153		Blanket
Cambridge 2nd Mods-CLS					255,905		Blanket
Huron-MCA	40,638	1,412,348					Blanket
Lady Smith BL-MCA			2,739,042				Blanket
Replace Morris-CLS					867,228		Blanket
Galena-Janesville-MCA	92,543	4,375,848					Blanket
Waterloo-Dubuque-MCA	25,000	9,921,922	6,007,402				Prior Notice
Replace Cedar Falls-CLS					241,362		Blanket
Replace Sauk City BL-CLS					963,587		Blanket
Replace Viola-MCA	2,239,988						Blanket
Palmyra-Oakland C-MCA	102,216	5,414	5,986	6,619	17,139,637		Prior Notice
Palmyra-Oakland D-MCA	25,000	9,090,791					Blanket
Ogden-Vent C-MCA			20,051,860				Prior Notice
Ogden-Vent D-MCA					6,230,485		Blanket
Oakland-Ogden B-MCA					18,095,409		Prior Notice
Oakland-Ogden C-MCA	151,010						Blanket
MNB95101 Tie-Over-MCA			168,119				Blanket
Beloit-MCA				3,522,593			Blanket
Blaine-MCA			753,597				Blanket
Replace Coon Rapids-CLS					289,076		Blanket
Essar-MCA				906,155			Blanket
Grand Rapids-MCA			3,209,796				Blanket
Replace Ham Lake-CLS					1,927,174		Blanket
Replace Little Falls-CLS					289,076		Blanket
Onawa-MCA			557,521				Blanket
OPPD BL-MCA				637,928			Blanket
Paynesville-MCA			1,888,995				Blanket
White Bear-MCA			1,321,933				Blanket
Yankton 2nd-MCA				3,578,000			Blanket
GCCO to Brownfield ILI Mods	22,830	2,703,667					Blanket
Brownfield-Plainview ILI Mods	5,044,997						Blanket
Beatrice-Palmyra D-MCA	73,059	7,722	8,539	9,441	9,799,149		Blanket
Beatrice-Palmyra E-MCA	71,702	7,579	10,076,548				Blanket
Tescott-Clifton E-MCA	28,132	4,107,464					Blanket
Sid Richardson-Hobbs-MCA				8,921,817			Blanket
Odgen-Redfield C-MCA	25,501				3,850,409		Blanket
Ogden-Redfield B-MCA	25,501				4,811,410		Blanket
Madison-MCA					4,190,311		Blanket
Dumas-Sunray-MCA	21,350	4,723,218					Blanket
Tomah 6-inch					1,008,718		Blanket
Rockford-MCA					2,464,915		Blanket
Buffalo-MCA	359,063						Blanket
Wisconsin Dells					505,172		Blanket
Hudson-MCA	71,960	747,103					Blanket
Replace MP 7.5-8 Monona					504,359		Blanket
Replace Class 3 Anamosa					504,359		Blanket
Replace Platteville					504,359		Blanket
Aberdeen 12-inch-MCA					14,407,087		Prior Notice
Terra Chemical-MCA	1,667,352						Blanket
Watkins-MCA			588,334				Blanket
Jesup-MCA				1,361,799			Blanket
Little Falls					1,008,718		Blanket
Albany					504,359		Blanket
Monroe-MCA				614,581			Blanket
Princeton Tie-over ILI Mods					3,838,067		Blanket
Arlington 4-inch					3,838,067		Blanket
Lytton-MCA				1,552,657			Blanket
Morris-MCA				5,254,111			Blanket
Bloomer-MCA				2,050,288			Blanket
Grinnell-MCA				9,140,735			Blanket
NGPL Interconnect-MCA					4,302,352		Blanket
St Michael 2nd-MCA					526,349		Blanket
Iowa Falls-MCA					4,201,997		Blanket
Hancock-MCA					1,057,123		Blanket
Marshall-MCA					521,959		Blanket
Paynesville-MCA					3,225,041		Blanket
Sioux City 1A 6-inch					454,801		Blanket
Replace Albany					478,986		Blanket
Grand Rapids 8-inch					4,797,584		Blanket
Alexandria 2nd-MCA					3,353,231		Blanket
Andrews-MCA					7,734,440		Blanket
Virginia					2,890,762		Blanket
Kermit-MCA					4,775,260		Blanket
Hobbs-Plains-MCA					606,865		Blanket
Yankton-MCA					606,865		Blanket
NGPL IC-MCA					3,279,070		Blanket
Waterloo BL-MCA					2,118,005		Blanket
Decorah BL-MCA					3,034,324		Blanket
Mason City BL-MCA					606,865		Blanket
Rosemount Jct-St Paul-MCA					3,034,324		Blanket
Lacrosse BL-MCA					4,980,451		Blanket
Flint Hills-MCA					3,034,324		Blanket
Shamrock-MCA					7,054,450		Blanket
Waverly BL-MCA					6,283,995		Blanket
Willmar BL-MCA					4,080,687		Blanket
Sheldon Power Plant-MCA					3,034,324		Blanket

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Asset Modernization Project Detail

Project Description	2021	2022	2023	2024	2025 - 2031	10-year 2022 - 2031	Regulatory Authority
Lake City BL-MCA					963,587		Blanket
Springfield 2nd BL-MCA					3,034,324		Blanket
Blair/Cargill BL-MCA					3,034,324		Blanket
Yankton 2nd BL-MCA					606,865		Blanket
Yankton 2nd BL-MCA					5,848,507		Blanket
Pipestone BL-MCA					1,014,029		Blanket
Bristow BL-MCA					4,033,157		Blanket
Osage BL-MCA					1,011,441		Blanket
Hampton BL-MCA					2,890,762		Blanket
Clarksville BL-MCA					2,408,968		Blanket
Tama BL-MCA					4,310,875		Blanket
Independence BL-MCA					2,408,968		Blanket
Harlan Loop-MCA					2,408,968		Blanket
Manchester BL-MCA					2,408,968		Blanket
Otter Creek BL-MCA					1,445,381		Blanket
Granite Falls BL-MCA					1,445,381		Blanket
Hanna Mining BL-MCA					481,794		Blanket
St Michael BL-MCA					3,838,067		Blanket
Dayton 2nd BL-MCA					1,445,381		Blanket
Mora BL-MCA					2,512,268		Blanket
Springfield BL-MCA					9,086,418		Blanket
Luverne BL-MCA					1,011,441		Blanket
Windom BL-MCA					1,517,162		Blanket
Sherburn TBS #2 BL-MCA					4,080,687		Blanket
Minorca Taconite BL-MCA	1,972,965						Blanket
Brookings BL-MCA					2,022,883		Blanket
Oakland-Ogden C-MCA	8,962,844						Blanket
Austin TBS Replacement	264,597	226,949					Blanket
Carlton CS Receiver					761,174		Blanket
Viola Replacement					4,043,331		Blanket
Pipeline Assessment MCA					20,013,913		Blanket
Oakland-Ogden D-MCA				7,593,656			Blanket
Columbus 2nd ILI Mods					6,297,831		Blanket
Harlan BL-MCA				1,184,945			Blanket
Onawa-MCA			537,486				Blanket
Austin MN #1 TBS	491,143						Blanket
Oakland-Ogden C-MCA	385,802						Blanket
Plainview to Claude ILI Mods	1,829,516						Blanket
Ogden-Waterloo D	2,774,852						Blanket
Galena	189,727						Blanket
Galena-Janesville	258,623						Blanket
Ogden-Vent B					22,469,138		Prior Notice
Pampa-Beaver ILI Mods	2,820,081						Blanket
Claude-Pampa ILI Mods	4,327,666						Blanket
Mullinville-Macksville C ILI Mods	5,791,793						Blanket
Mullinville-Macksville D ILI Mods					9,149,348		Blanket
Mullinville-Macksville E ILI Mods					6,005,413		Blanket
Macksville-Bushton B ILI Mods	6,961,375						Blanket
Macksville-Bushton D ILI Mods	78,944	8,734,451					Blanket
Macksville-Bushton E ILI Mods	11,083				8,240,025		Blanket
Clifton-Beatrice B ILI Mods	6,494,551						Blanket
Clifton-Beatrice D ILI Mods					18,476,143		Prior Notice
Clifton-Beatrice E ILI Mods		8,128,679					Blanket
Hemphill Loop					8,656,541		Blanket
Albert to Bushton ILI Mods					8,040,093		Blanket
Esperanza					3,161,847		Blanket
Waconia-Mound 2nd			530,826				Blanket
Mullinville to Dodge City			2,816,144				Blanket
Redfield - New I/W Well					443,797		Blanket
Redfield - New I/W Well					130,756		Blanket
Fowler-Mullinville ILI Mods	61,717	6,524	7,215	7,977	7,757,293		Blanket
Sublette-Fowler ILI Mods	64,342	6,801	7,520	8,315	12,176,332		Blanket
Kalvesta-Burdette ILI Mods	35,436	5,517,467					Blanket
Cedar Rapids ILI Mods					4,633,863		Blanket
Hemphill #2 Loop ILI Mods					4,694,548		Blanket
Hemphill CO #2 Loop ILI Mods					7,652,568		Blanket
Shamrock Loop ILI Mods					4,979,373		Blanket
Jayhawk Plant ILI Mods					3,682,904		Blanket
Mullinville Mods					6,216,728		Blanket
Valero Interconnect Mods					508,490		Blanket
Trans Pecos Lateral Mods					762,735		Blanket
Pampa-Beaver ILI Mods	1,884,539						Blanket
Ames 2nd ILI Mods					2,984,230		Blanket
SSC-Paullina C ILI Mods					19,577,714		Prior Notice
Clifton-Beatrice Launcher	436,500						Blanket
Pampa-Beaver ILI Mods	1,098,467						Blanket
Palmyra-Oakland B					5,873,315		Blanket
Palmyra-Oakland B					1,853,132		Blanket
Palmyra-Oakland B					1,701,236		Blanket
Viola					2,944,556		Blanket
Pipeline Assessment					18,033,759		Blanket
Mathers Ranch-Hemhill					3,551,186		Blanket
Shamrock GL Loop ILI Mods					3,530,493		Blanket
Shamrock GL Loop ILI Mods					4,034,849		Blanket
Holcomb-Kalvesta B					9,849,211		Blanket
CF BL Receiver	1,341,627						Blanket
CF BL Launcher	1,640,414						Blanket
Other		169,514					
Subtotal: Pipeline Assessments	**60,390,140**	**64,795,986**	**51,276,863**	**53,663,965**	**519,952,049**	**689,688,863**	
Compression Replacement							
Waterloo MCC Replacement			905,192				2.55(a)
Alexandria MCC		783,281					2.55(a)

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Asset Modernization Project Detail

Project Description	2021	2022	2023	2024	2025 - 2031	10-year 2022 - 2031	Regulatory Authority
Claude Turbine MCC			638,601				2.55(a)
Garner LNG MCC			5,129,942				2.55(a)
Hubbard MCC		492,847					2.55(a)
LaCrescent 4160 MCC Replacement		997,505					2.55(a)
LaCrescent 480 MCC Replacement		184,944					2.55(a)
Mullinville Compressor Unit 27	284,513						2.55(b)
Bushton Compressor Unit 33	276,195						2.55(b)
Ogden Horizontal Compression Replacement	25,479,144						2.55(b)
Paullina 1-5 Replacement Compression	1,460,963	25,865,681					2.55(b)
Spraberry 6-10 Replacement Compression				30,096,187			2.55(b)
Brownfield 1 Replacement Compression	4,541,955	24,199,045					2.55(b)
Macksville 1-4 Replacement Compression					59,856,444		2.55(b)
Bushton 26-31 Replacement Compression					60,918,314		2.55(b)
Farmington Horsepower Replacement	21,955,610						2.55(b)
Beatrice 24-25 Replacement Compression					60,701,482		2.55(b)
Beaver 19-21 Replacement Compression					60,415,254		2.55(b)
Spraberry Unit 15 Installation	8,517,381	3,490,850					2.55(b)
Wrenshall Replacement Compression					60,291,285		2.55(b)
North Branch 1-4 Replacement Compression					60,424,669		2.55(b)
Clifton 27-29 Replacement Compression					30,255,307		2.55(b)
Bushton 23-25 Replacement Compression					30,308,951		2.55(b)
Spraberry Unit 15 Installation		875,421					2.55(b)
Subtotal: Compression Replacement	**62,515,761**	**56,889,574**	**6,673,735**	**30,096,187**	**423,171,706**	**516,831,202**	
LNG Replacement							
Garner LNG MCC Power Distribution	2,581,032	799,235					2.55(a)
Wrenshall Vap Replacements				1,039,385	15,030,229		2.55(b)
Garner Replace Cold Box	60,169	1,254,191	5,195,613				2.55(b)
Garner LNG Refrigeration Compressor/Motor Replacement			30,117,238				Prior Notice
Subtotal: LNG Replacement	**2,641,201**	**2,053,426**	**35,312,851**	**1,039,385**	**15,030,229**	**53,435,891**	
Underground Storage Integrity							
Redfield - Broderick 16		4,891,209					Prior Notice
Redfield - New I/W Well				4,994,946			Prior Notice
Redfield - New I/W Well					5,300,151		Prior Notice
Redfield - New I/W Well					4,987,576		Prior Notice
Redfield - New I/W Well					5,283,261		Prior Notice
Redfield - New I/W Well					5,371,081		Prior Notice
Subtotal: Underground Storage Integrity		**4,891,209**		**4,994,946**	**20,942,069**	**30,828,224**	
Vintage Pipeline Replacement							
Palmyra to Ogden Abandonment	44,627	76,939					
Bushton to Clifton Abandonment	2,052,542						FERC 7(b)/(c)
Auburn BL Abandonment	39,430	676,301					FERC 7(b)/(c)
Council Bluffs Abandonment	4,000,806						Prior Notice
Clifton to Palmyra Abandonment	26,350,081	2,951,102					Blanket
South Sioux City to Sioux Falls Abandonment	71,607,227	67,793,458	2,403,503				FERC 7(b)/(c)
Des Moines BL Abandonment	3,591,819	968,542	39,887,572	94,724			FERC 7(b)/(c)
Lake City Abandonment	10,756,621	18,747,620					FERC 7(b)/(c)
Ogden to Ventura Abandonment	10,790,502	876,185	33,546,824		12,448,466		Prior Notice
Ventura to Farmington Abandonment	1,373,244	24,688,477	13,877,266	44,599,153	32,211,494		FERC 7(b)/(c)
Mullinville to Sublette Abandonment		1,798,331	3,001,782	2,826,390	13,382,454		FERC 7(b)/(c)
Copeland, Kansas Branch Line	11,531,342						FERC 7(b)/(c)
Fowler, Kansas Branch Line	4,514,182	1,263,505					Blanket
Meade, Kansas Branch Line	4,729,485						Blanket
Pawnee Branch Line Repair	438,753						Blanket
Plains, Kansas Branch Line Replacement	5,702,805						Blanket
Rest Block Installation	541,423						Blanket
2" Vintage Pipe Replacement							Blanket
Ashgrove Vintage Pipe Replacement					10,813,385		Blanket
Columbus Vintage Pipe Replacement					16,423,546		Prior Notice
Fort Dodge Vintage Pipe Replacement					6,255,354		Blanket
HDI Yankton Vintage Pipe Replacement					5,142,473		Blanket
Mankato Vintage Pipe Replacement					36,646,954		Prior Notice
Austin Vintage Pipe Replacement					24,021,359		Prior Notice
Beemer Vintage Pipe Replacement					14,137,755		Prior Notice
New Ulm Vintage Pipe Replacement					28,417,304		Prior Notice
Belle Plaine Vintage Pipe Replacement					6,204,397		Blanket
Blair Vintage Pipe Replacement					22,558,067		Prior Notice
Pipeline Abandonment					1,637,890		Blanket
Britt Vintage Pipe Replacement					3,733,435		Blanket
Schuyler Vintage Pipe Replacement					12,506,494		Blanket
Wayne Vintage Pipe Replacement					16,142,673		Prior Notice
Worthington Vintage Pipe Replacement					22,852,864		Prior Notice
Yankton Vintage Pipe Replacement					37,437,202		Prior Notice
Small-diameter Vintage Pipe Replacement					70,814,011		
Subtotal: Vintage Pipeline Replacement	**158,064,889**	**119,840,460**	**92,716,947**	**47,520,267**	**393,787,577**	**653,865,251**	
Asset Modernization Total	**283,611,991**	**248,470,655**	**185,980,396**	**137,314,750**	**1,372,883,630**	**1,944,649,431**	

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Alexandria MCC
Stillwater MCA
Hudson MCA
Huron MCA
Ventura Faribault B MCA
Austin TBS Replacement Project
LaCrescent 4160 MCC Replacement
LaCrescent 480 MCC Replacement
Paullina 1-5 Replacement Compression
Garner LNG MCC Power Distribution
South Sioux City to Sioux Falls Abandonment
Galena Janesville MCA
Lake City Abandonment
Waterloo Dubuque MCA
Hubbard MCC
Redfield - Broderick 16
Auburn BL Abandonment
Palmyra Oakland D MCA
Kalvesta Burdette ILI Mods
Clifton Beatrice E ILI Mods
Fowler Kansas Branch Line
Tescott Clifton E MCA
Dumas Sunray MCA
Macksville Bushton D ILI Mods
Brownfield 1 Replacement Compression
GCCO to Brownfield ILI Mods
Spraberry Unit 15 Installation

ND MN MI WI SD WY NE IA IL CO KS MO KY OK NM TX AR MS AL LA TN

Compression Replacement
LNG Replacement
Underground Storage PHMSA
Pipeline Assessments Non-Regulatory
Vintage Pipeline Replacement
NNG Pipeline

0 25 50 100 150 200 250 Miles

-Privileged and Confidential For Settlement Purposes Only

-Subject to change based on industry events, including new or amended laws or regulations; changes to Northern's and its customers' priorities or plans; system expansions and other needs of Northern's customers.

2022 Asset Modernization Projects

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Northern Natural Gas
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Grand Rapids MCA
MNB95101 Tie Over MCA
Lady Smith BL MCA
Paynesville MCA
Garner LNG Refrigeration Compressor/Motor Replacement
Garner Replace Cold Box
Watkins MCA
Blaine MCA
White Bear MCA
Waconia Mound 2nd
Ogden Vent C MCA
Garner LNG MCC
Waterloo MCC Replacement
Onawa MCA
Ogden to Ventura Abandonment
Des Moines BL Abandonment
Beatrice Palmyra E MCA
Mullinville to Dodge City
Mullinville Macksville E ILI Mods
Claude Turbine MCC

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AL
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LA

- Compression Replacement
- LNG Replacement
- Underground Storage PHMSA
- Pipeline Assessments Non-Regulatory
- Vintage Pipeline Replacement
- NNG Pipeline

0 25 50 100 150 200 250 Miles

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2023 Asset Modernization Projects

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Northern Natural Gas
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Essar MCA
Wrenshall Vap Replacements
Morris MCA
Bloomer MCA
Ventura Faribault D MCA
Ventura to Farmington Abandonment
Beloit MCA
Yankton 2nd MCA
Lytton MCA
Jesup MCA
Monroe MCA
OPPD BL MCA
Grinnell MCA
Palmyra Oakland C MCA
Redfield - New I/W Well
Harlan BL MCA
Oakland Ogden D MCA
Fowler Mullinville ILI Mods
Sublette Fowler ILI Mods
Beatrice Palmyra D MCA
Sid Richardson Hobbs MCA
Spraberry 6-10 Replacement Compression

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Compression Replacement
LNG Replacement
Underground Storage PHMSA
Pipeline Assessments Non-Regulatory
Vintage Pipeline Replacement
NNG Pipeline

0 25 50 100 150 200 250 Miles

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2024 Asset Modernization Projects

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Northern Natural Gas
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