



nationalgrid

Utility Thermal Energy Network Pilot

Revised Stage 2 Proposal for Troy

Case 22-M-0429

Niagara Mohawk Power Corporation d/b/a National Grid

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1 Glossary

A&G – Administrative and General Overhead Expenses

ADA – Americans with Disabilities Act of 1990

AFUDC – Allowances for Funds Used During Construction

Alienation Legislation – Act authorizing the city of Troy to lease sub-surface park land property referred to as Riverfront Park” 9993-A (April 29, 2022)

ASHP – air-source heat pump

BAU – business-as-usual

BMS – building management system

BTU – British thermal unit

CGP – Construction General Permit

CLCPA – Climate Leadership and Community Protection Act

CNI – Critical Network Infrastructure

COD – Capital Overheads

Commission or PSC – New York State Public Service Commission

Cost Contributions – Any incentives, grants, co-funding, tax credits or other third-party contributions that could be used to fund the project

CSS – combined sewer system

DAC – disadvantaged community

DEC – New York State Department of Environmental Conservation

DHW – domestic hot water

DOAS – dedicated outdoor air system

DOE – Department of Energy

DPS – New York State Department of Public Service

DR – dimension ratio

DX – direct expansion

EM&V – Evaluation, Measurement, & Verification

eNOI – electronic Notice of Intent

ETS – Energy Transfer Station

FAQ – frequently asked questions

FEAF – Full Environmental Assessment Form

ft or ' – foot

ft² or sq ft – square foot

ERV – Energy Recovery Ventilation

FTE – full-time employee

GHG – greenhouse gas

gpm – gallons per minute

GSHP – ground-source heat pump

Guidance Order – "Order Providing Guidance on Development of Utility Thermal Energy Network Pilot Projects" issued by the Commission on September 14, 2023 in Case 22-M-0429

HDPE – high-density polyethylene

HEFPA – Home Energy Fair Practices Act

hp – horsepower

HRC – Troy Housing & Review Committee

HVAC – heating, ventilation, and air-conditioning

in or " – inch

I&R – Instrumentation and Regulation

IFB – Issue for Bid

Initiating Order – "Order on Developing Thermal Energy Networks Pursuant to the Utility Thermal Energy Network and Jobs Act" Issued by the Commission on September 15, 2022 in Case 22-M-0429

IT – Information Technology

ITC – Investment Tax Credit

January 9 UTEN Pilot Proposal – January 9, 2023 Troy UTEN Proposal Commission filing

LCCA – lifecycle cost analysis

lf – linear feet

LMTD – log mean temperature difference

LOI – Letter of Intent

M – million

MBH – thousand BTUs per hour

MS4 – Municipal Separate Storm Sewer System

NIST – National Institute of Standards and Technology

NMPC *or* the Company – Niagara Mohawk Power Corporation d/b/a National Grid

NOI – Notice of Intent

NYS – New York State

NYSDOT – New York State Department of Transportation

NYSERDA – New York State Energy Research and Development Authority

O&M – Operations and Maintenance

OGS – Office of General Services

OSHA – Occupational Safety and Health Administration

PG – propylene glycol

PILOT – Payment in Lieu of Tax Agreement

PLA – Project Labor Agreement

psi – pounds per square inch

Revised Stage 2 Proposal – This Utility Thermal Energy Network Pilot Revised Stage 2 Proposal for Troy

RFP – Request for Proposal

SCADA – Supervisory Control and Data Acquisition

sf – square foot (area)

SHX – Sewer Heat Exchange

SPDES – Stormwater Pollution Discharge Elimination System

SWPPP – Stormwater Pollution Prevention Plan

TEN – Thermal Energy Network

Troy LDC – Troy Local Development Corporation

Transfer fluid – fluid in UDS piping to convey thermal energy, consisting of 25% PG and 75% water

Stage 1 Troy UTEN Pilot Filing – Final Troy UTEN Pilot Proposal submitted to the Commission on December 15, 2023 in Case 22-M-0429

Stage 2 Troy UTEN Filing – “Utility Thermal Energy Network Pilot Stage 2 Proposal for Troy” submitted to the Commission on July 9, 2025 in Case 22-M-0429

Troy UTEN Pilot, UTEN Pilot or Pilot– the project

UDS – Utility Distribution System

USACE – United States Army Corps of Engineers

UTEN– Utility Thermal Energy Network

UTENJA – Utility Thermal Energy Network and Jobs Act

VRF – variable refrigerant flow

WACC – weighted average cost of capital

WSHP – water-source heat pump

WWHP – water-to-water heat pump

ZBA – Troy Zoning Board of Appeals

2 Executive Summary

Niagara Mohawk Power Corporation d/b/a National Grid (“NMPC” or the “Company”) submits this revised Stage 2 Filing (“Revised Stage 2 Proposal”) for its Utility Thermal Energy Network (“UTEN”) Pilot Project in Troy, New York (“Troy UTEN Pilot” or the “Pilot”), in compliance with the guidance of the New York Public Service Commission (“PSC” or “Commission”) under the Utility Thermal Energy Network and Jobs Act (“UTENJA”). This filing provides an update to the information provided in the Company’s July 9, 2025 Stage 2 filing made with the Commission (“Stage 2 Troy UTEN Filing”), which included a design overview of the Troy UTEN Pilot, a Customer Protection Plan, workforce development initiatives, and performance metrics.

Since the Company submitted its Stage 2 Troy UTEN Filing to the Commission, there has been a change in the ownership structure of the borefield which will serve as the primary thermal resource. Originally, the borefield was to be constructed, owned, and operated by Troy Local Development Corporation (“Troy LDC”). However, NMPC and Troy LDC have since decided that the pilot project can be executed more effectively if NMPC constructs, owns and operates the borefield. Under the revised arrangement, Troy LDC will lease the municipal land from the City of Troy and sublease it to NMPC, enabling NMPC to construct and operate the borefield. This change was undertaken to streamline project design and construction, reduce capital costs by eliminating redundant infrastructure, and qualify the project for the federal investment tax credit available for geothermal heat pump equipment and infrastructure that requires common ownership of all system components. Centralizing ownership under NMPC also improves operational control and manages risks related to having different owners of the borefield and the Energy Center and distribution network by ensuring consistent maintenance, coordinated

emergency response, and long-term project continuity. Additionally, this structure simplifies regulatory approvals and leverages NMPC's experience in constructing and managing large-scale utility assets. This filing reflects the updated scope and includes revised engineering designs, complete project cost estimates, schedule, cost recovery mechanisms, customer bill impact analysis, participant thermal fee structure, and a Lifecycle Cost Analysis ("LCCA"). It also provides the Customer Protection Plan, workforce development initiatives, and performance metrics also previously submitted with the Company's Stage 2 Troy UTEN Filing.

The proposed Troy UTEN Pilot project aims to establish a utility-scale thermal energy network ("TEN") in the Central Troy Historic District. This area, one of the most perfectly preserved 19th-century downtowns in the United States, has seen substantial investment in recent years, as the City seeks to revitalize the downtown area while preserving the historic character. The Troy UTEN Pilot is designed to demonstrate the feasibility, benefits, and replicability of utility-owned thermal energy networks in urban environments, particularly in an urban environment with an aged building stock and congested underground utility system. Observed results of the Troy UTEN Pilot project's implementation will inform the industry as to the applicability of UTENs as part of an electrification strategy for clusters of historic buildings. Other primary objectives of the Troy UTEN Pilot are to demonstrate the viability of utility-managed thermal networks, provide sustainable heating and cooling to NMPC customers, and support the region's economic and residential growth with clean energy. The project also aims to reduce greenhouse gas emissions and alleviate pressure on the electric grid by offering a more efficient alternative to individual building electrification.

Among the innovative aspects of the Troy UTEN Pilot is its integration of a utility-scale TEN within a dense, historic urban core, which presents unique engineering and logistical

challenges. The project features advanced underground distribution piping designed to minimize disruptions to existing infrastructure and the surrounding community. Additionally, it leverages modern heat pump technology and a centralized Energy Center to efficiently deliver heating and cooling, setting a precedent for similar initiatives in other historic cities striving for decarbonization and economic revitalization. Furthermore, the project will provide revenue for the City of Troy through leasing land used for the network infrastructure, ensuring direct financial benefits to the local community.

The project will utilize a geothermal borefield as its primary thermal energy resource. The geothermal borefield will be installed on land owned by the City of Troy. Following the construction of the borefield, the City plans to install new park facilities and equipment such as recreational equipment for adults and children, landscaping, and public seating. This project allows NMPC and the City of Troy to cooperatively explore the benefits of collocating infrastructure on public owned land that includes designated parkland, a unique value prospect that is afforded to subsurface facilities such as geothermal borefields. In addition to the borefield, the system includes a centralized Energy Center owned by NMPC that will house pumps, valving and accessories, and supplemental heating sources, enabling efficient energy transfer. The Utility Distribution System (“UDS”) is designed as a one-pipe ambient loop that delivers thermal energy to a diverse mix of residential, office, and commercial buildings.

The customer portfolio for the project includes six buildings, serving approximately 100 end-use customers and 264,000 square feet of space. These buildings include multiuse residential/commercial buildings with apartments, offices, and restaurants, a historic music hall, and an arts center. Most of the buildings are at least 100 years old; the oldest building first opened in 1865 as a department store.

From an engineering perspective, project design has reached a 90% design completion and decision-quality level of completion for the borefield, Energy Center, and Utility Distribution System. Customer connections and retrofits have also reached a 90%, decision-quality level of completion. The restoration of the area where the borefield will be installed is at 50% design completion due to pending review from the City of Troy and permit applicability confirmation review internally by NMPC. The design includes detailed plans for the Thermal Energy Resource, Energy Center, UDS, and customer connections. The system incorporates two air-to-water heat pumps to manage thermal drift and balance peak load demands on the system. Connections for a backup generator are included to ensure service continuity during power outages. The distribution infrastructure has been oversized to accommodate future expansion, maximizing long-term value and minimizing the need for future upgrades to below grade infrastructure, which would be extremely difficult due to space constraints.

Environmentally, the Troy UTEN Pilot is expected to eliminate approximately 4,000 metric tons of CO₂ equivalent emissions over the pilot period when compared to the baseline scenario and aligns with the goals of the Climate Leadership and Community Protection Act (“CLCPA”). The project also promotes workforce development and labor peace through union engagement, training programs, and adherence to prevailing wage standards.

Financially, this filing includes detailed Construction (\$77.9 M) and Operations and Maintenance (“O&M”) (\$13.01 M) cost estimates, developed using risk-based contingency analysis. NMPC proposes to recover total project costs of \$90.91 million amortized over ten years via surcharges to gas and electric customers, partially offset by thermal energy fees from Pilot participants. The project may also qualify for federal tax credits under the Inflation Reduction Act which could be worth up to 40% of eligible project costs, although these have not

been included in the cost estimates due to uncertainty surrounding the status, application, and availability of the tax credits to the equipment types in the project.

To ensure transparency and promote community involvement, NMPC has developed a comprehensive Customer Protection Plan. This includes proactive engagement strategies, customer agreements, and shadow billing to compare costs with traditional systems. Outreach efforts include a dedicated website, hotline, mailings, and concepts for an educational display at the Energy Center to inform the public of the operational status of the system.

NMPC seeks approval to proceed to Stage 3a of the Pilot. Upon approval, the Company will finalize construction plans and execute Customer Agreements needed to proceed to Stage 3b. Once the Company is able to proceed to Stage 3b, it will issue a construction Request For Proposal (“RFP”), select a contractor, and begin construction. The project schedule is based on the assumption that Commission approval to advance to Stage 3a is received by July 2026, construction commences in 2027, and the Troy UTEN is commissioned and placed in service in October 2028 in time for the 2028-2029 winter heating season.

3 Introduction

On July 5, 2022, Governor Hochul signed into law the Utility Thermal Energy Network and Jobs Act, which was enacted to remove the barriers to utility development of thermal energy networks and provide jobs to transitioning gas utility workers. UTENJA authorizes and requires the Commission to develop a regulatory structure for utility thermal energy networks that “scales affordable and accessible building electrification, protects customers, and balances the role of

incumbent monopoly utilities with other market and public actors.”¹ UTENJA also authorized and directed the seven largest utilities to submit to the Commission at least one and up to five UTEN project pilot proposals, with at least one in a disadvantaged community (“DAC”).²

Subsequently, on October 7, 2022 and January 9, 2023, NMPC made its “Utility Thermal Energy Network Pilot Proposals Compliance Filing and its “Utility Thermal Energy Network Pilot Proposals,” respectively in accordance with the Commission’s *Order On Developing Thermal Energy Networks Pursuant to the Utility Thermal Energy Network and Jobs Act* Issued on September 15, 2022 (“Initiating Order”) in Case 22-M-0429. In its January 9, 2023 submittal, NMPC proposed two pilot projects both of which were previously evaluated in scoping studies under New York State Energy Research and Development Authority (“NYSERDA”) PON 4614. One of NMPC’s proposed projects was the Troy UTEN Pilot.³

NMPC filed a supplemental or Stage 1 proposal entitled “Final Utility Thermal Energy Network Pilot Project Proposal for Troy, New York” (“Stage 1 Troy UTEN Pilot Filing”) with the Commission on December 15, 2023, in compliance with the Commission’s *Order Providing Guidance on Development of Utility Thermal Energy Network Pilot Projects* issued and effective on September 14, 2023 in Case 22-M-0429 (“Guidance Order”).⁴ The Stage 1 Troy UTEN Pilot Filing supplemented the Company’s January 9 UTEN Pilot Proposal and included the required

¹ See Utility Thermal Energy Network and Jobs Act, Pub. L. No. 117-169, § 50161, 136 Stat. 1818 (2022), as codified in PSL §66-t (Article 4).

² *Id.*

³ Case 22-M-0429, Proceeding on Motion of the Commission to Implement the Utility Thermal Energy Network and Jobs Act, *Niagara Mohawk Power Company d/b/a National Grid Utility Thermal Energy Network Pilot Proposal* (Jan. 9, 2023)

⁴ Case 22-M-0429, Proceeding on Motion of the Commission to Implement the Utility Thermal Energy Network and Jobs Act, *Final Utility Thermal Energy Network Pilot Project Proposal for Troy, New York* (Dec. 15, 2023).

Stage 1 elements detailing the Troy UTEN Pilot scope, feasibility, and stakeholder engagement as set forth in the Guidance Order. Stage 1 deliverables provided in the Stage 1 Troy UTEN Pilot Filing included preliminary cost estimates, timelines, potential barriers and risks, and steps to address them. It also included a Preliminary Customer Protection Plan with required customer engagement activities and a Customer Agreement template. Additionally, the proposal included elements required by the Commission’s Guidance Order, such as the project description, potential energy users, engineering design, safety, reliability, resiliency aspects, plans for energy efficiency upgrades, and a comparative analysis of the cost and benefits of electrification through the pilot versus other forms of building electrification.

On April 9, 2024, the New York Department of Public Service issued a Compliance Letter finding the Company’s Stage 1 Troy UTEN Pilot Filing to be compliant with the Guidance Order. The Compliance Letter provided the Company approval to advance to Stage 2: Pilot Project Engineering Design and Customer Protection Plan and submit a Stage 2 filing within 9 months as was outlined in the Guidance Order. NMPC progressed the Troy UTEN Pilot to 30% design completion and was proceeding towards 60% design before requesting an extension in January 2025 to submit the Troy Stage 2 Filing by August 29, 2025. The need for an extension was due to the need for development of a thermal energy resource agreement (“Thermal Energy Resource Agreement”) and thermal energy resource fee with Troy LDC (“Thermal Energy Resource Fee”) and the requirement to update cost estimates and develop customer bill impacts based on the 90% engineering design for the Thermal Energy Resource and final engineering design for the Energy Center and UDS. The PSC granted the Company an extension to file its Stage 2 proposal by July 9, 2025. On July 9, 2025, NMPC submitted an initial Stage 2 Filing, which included the project metrics, customer protection plan, benefits, key learnings, lessons

learned to date, and workforce development. Engineering design, cost estimate information for NMPC's portion of the project, and energy modeling were near completion on July 9, 2025, but key financial components including LCCA, total pilot project cost estimates, revenue requirements and bill impacts that were contingent upon the Company and Troy LDC reaching agreement on the Thermal Energy Resource Agreement and the associated Thermal Energy Resource Fee had not been agreed to.

Since submitting the Stage 2 Troy UTEN Filing to the PSC on July 9, 2025, the Company and Troy LDC maintained an active dialogue focused on further developing and negotiating the final terms of the Thermal Energy Resource Fee and Thermal Energy Resource Agreement, which would serve as the primary source of revenue for Troy LDC's financing of the borefield construction and for providing ongoing operations, maintenance, and reporting obligations for the borefield. In August 2025, after months of intensive negotiation, the parties mutually agreed that there remained significant uncertainties around both Troy LDC's financing capabilities and some reliability risks involving the operation and maintenance of the borefield under the bifurcated ownership model. Specifically, given that Troy LDC is a municipal non-profit corporation that does not have taxation powers or other sources of revenue, the accessibility of project financing from traditional and even non-traditional sources of funding was significantly limited, if not altogether, unavailable. In addition, the proposed operating model for the borefield would require Troy LDC to contract out all operations and maintenance to a third-party firm, which the parties recognized would pose substantial risk and potential disruption of stable system operations and maintenance over the life of the UTEN. As a result, NMPC and Troy LDC redefined their roles and responsibilities whereby Troy LDC would lease from the City of Troy and then sublease the property for the borefield to NMPC and enable the project to move forward

with its supplemental Stage 2 submission to the Commission. Having completed these critical items, the Company has finalized all necessary materials to provide the PSC with decision-quality information sufficient to determine the Projects' merit to advance to Stage 3a. New information provided in this Revised Stage 2 Proposal includes (1) detailed engineering design, (2) energy modeling results, (3) cost estimates, (4) construction schedule, (5) cost recovery, revenue requirements and bill impacts, (6) shadow billing, and (7) LCCA and GHG reduction impacts.

This Revised Stage 2 Proposal also again includes the customer protection plan and describes the proposed workforce development and labor agreements necessary for implementing the pilot project. If approved to move to Stage 3, the Company will then continue developing additional necessary documents integral to implementation of the Pilot, such as emergency plans, a damage prevention program, and identification of the training and qualification programs and activities required to ensure the system's integrity.

4 Pilot Site Context

Troy, New York, located on the eastern bank of the Hudson River, has a rich industrial and architectural legacy that continues to shape its urban identity. Originally inhabited by the Mohican people and later settled by the Dutch in the 17th century, Troy was officially incorporated as a city in 1816. Its strategic location near the Erie and Champlain canals made it a key hub for trade and transportation during the early 19th century. The City rose to national prominence during the Industrial Revolution, becoming a major center for ironworks and textile manufacturing. Troy earned the nickname "Collar City" due to its leadership in detachable shirt collar production, and its industrial wealth fueled the construction of ornate churches, civic

buildings, and educational institutions - many of which still define the City's historic district today.

However, like many post-industrial cities in the Northeast, Troy experienced significant economic decline in the mid-20th century. The collapse of the domestic manufacturing sector, combined with suburbanization and disinvestment in urban cores, led to widespread job losses, population decline, and deterioration of the city's historic building stock. Major employers closed or relocated their businesses, and the city's once-thriving downtown experienced decades of economic stagnation. Infrastructure aged without reinvestment, and many historic properties fell into disrepair due to lack of resources for maintenance or adaptive reuse. Despite these challenges, Troy retained its architectural character and cultural identity, laying the groundwork for future revitalization.

In recent decades, Troy has experienced a resurgence driven by historic preservation, reinvestment in infrastructure, and a growing creative economy. Also, institutions like Rensselaer Polytechnic Institute, the oldest technological university in the English-speaking world, continue to anchor the city's innovation ecosystem. Today, Troy's revitalization is marked by a blend of preserved 19th-century architecture and modern urban development, making it a model for adaptive reuse and sustainable growth.

The Troy UTEN Pilot builds on this legacy by introducing a sustainable, networked thermal energy system that supports the electrification of historic buildings while preserving their architectural integrity. As a central infrastructure investment, the UTEN system will serve as a clean heating anchor for the revitalized historic district, demonstrating how modern energy solutions can be integrated into legacy urban environments. This project not only advances the

city's climate and energy goals but also reinforces Troy's identity as a place where history, innovation, and sustainability converge.

5 Pilot Design

NMPC selected the Troy UTEN Pilot for its ability to provide learnings about the development of viable UTEN deployment models that can be utilized in similar urban environments across New York State ("NYS"). The primary Thermal Energy Resource for the Troy UTEN Pilot will be a geothermal borefield which will be constructed, owned, maintained and operated by NMPC on City of Troy land leased from Troy LDC. To deliver thermal energy to customers, NMPC will construct a single-pipe, ambient temperature Utility Distribution System ("UDS"). Depending on the season, the UDS will transfer thermal energy to or withdraw thermal energy from the borefield. NMPC will construct an Energy Center on River Street which will contain pumps to control flow through the UDS, an air separator, an expansion tank, buffer tanks, and other hydronic equipment responsible for the safe and reliable delivery of thermal energy to UTEN customers. On the roof of the Energy Center, NMPC will install two (2) air source heat pumps ("ASHPs") which will serve as back-up Thermal Energy Resources for the UDS. At the time of this Revised Stage 2 Proposal, NMPC is proposing to install five (5) customer connections to connect six (6) properties to the Troy UTEN Pilot. The proposed customer buildings are historical buildings with varied usage types including mixed-use commercial and residential, a concert venue, and educational space.

While Troy LDC will not own the borefield, they will lease the parkland from the City of Troy upon which the borefield will be installed, as well as the land on which the Energy Center will be located. This collaborative relationship demonstrates a model for city-owned property to generate revenue for a municipality as part of a UTEN project, showcasing how public assets can

be utilized for community benefit, as well as testing the efficacy of utilizing public property for geothermal resources while allowing for beneficial community use for recreation and events. This approach avoids overdevelopment of above-ground real estate and maintains access to the borefield when necessary, exploring how to add value and utility to single-use municipal properties like public parkland.

The Troy UTEN Pilot will focus entirely on retrofit work on historic buildings. This will serve as a valuable case study on how a UTEN project can help decarbonize and electrify the heating, ventilation, and air-conditioning (“HVAC”) systems of older historic buildings in a dense urban area. Of the six buildings connecting to the Troy UTEN Network, only one is less than 100 years old. Many similar downtown districts across different cities in New York State are undergoing revitalization efforts, and the Troy UTEN pilot can inform the redevelopment and decarbonization of these areas, helping to prove the effectiveness of a UTEN as a component of urban historic revitalization. See Appendix A for the Troy Savings Bank Music Hall Letter of Support, showing the interest and willingness of these historical buildings to contribute to modern decarbonization efforts.

The site layout below illustrates the scope of the Troy UTEN Pilot. A full pilot design drawings set, including specifications, is provided as Appendix B. In addition, a detailed Basis of Design Report and accompanying Energy Models are provided as Appendix C.

Figure 1: Site Layout



5.1 Energy Modeling

All buildings were modeled individually using the DesignBuilder user interface for EnergyPlus whole building simulation engine. EnergyPlus is a building simulation engine developed and maintained by the United States Department of Energy (“DOE”). Since all buildings already exist, modeling was conducted to match what was known about real-world conditions of the buildings based on site visits, photos, existing drawings, satellite imagery, and conversations with building owners and facilities staff. The following approach was used:

- Building geometry was created based on available data on the building footprint, number of floors, and space type usage;
- Assumptions for construction materials were applied based on site observations and building age;
- 8,760 hourly simulations were performed using Albany, NY weather, which includes heating, cooling, domestic hot water loads, and TMYx weather files, which represent typical weather patterns from 2005-2021;
- Building energy usage was reconciled to historic utility bills; and
- Building model was updated with any changes currently underway or planned for the near future, as communicated by building owner.

The total modeled connected load on the system is 7,055 MBH (thousand BTUs per hour), or 588 tons of heating load, and 410 tons of cooling load. The system has a heating dominant annual energy balance.

5.2 Thermal Energy Resource

The City of Troy owns Riverfront Park, a four-acre parcel between Front Street and the Hudson River. The City will lease this land to Troy LDC that will sublease it to NMPC for the construction and operation of the vertical closed-loop geothermal borefield. The borefield will total 200 boreholes at 650 feet deep, connected to the UDS via two manifold vaults. The boreholes will act as a heat exchanger to transfer thermal energy between the fluid in the piping and the surrounding ground. The borefield is designed to meet a peak heating load of 6,500 MBH and peak cooling load of 550 tons. Borefield design requires an annual thermal balance so that the ground temperature neither increases nor decreases in the long term. The connected building loads on the system are heating dominant, meaning that the borefield would progressively get cooler if serving the system on its own. Therefore, two air-to-water heat pumps at the Energy Center, that each are capable of supplying 1,278 MBH during summer conditions, provide supplemental heating to the system to maintain a thermal balance for the longevity of the system.

A valve vault will house a diverting valve, to divert flow from the UDS main to the borefield. All borefield flow will be powered by the pumps in the Energy Center, mitigating the need for pumps closer to the borefield which contributes to the resilience of the system since the borefield is in an area considered a flood plain.

5.3 Comparison to Alternate Thermal Energy Resources

To evaluate alternatives to the use of a geothermal borefield as the thermal resource for the UTEN, available resources in Troy, NY were considered. There are no wastewater treatment plants or data centers nearby, and little available real estate for a large central plant with multiple

pieces of equipment. Some alternative thermal resource options include tying into the untreated wastewater system for sewer heat exchange, using air source equipment to temper fluid temperatures, or using the Hudson River, as analyzed below.

5.3.1 Alternative 1: Sewer Heat Exchange (“SHX”)

This option would be sized to match the same heating and cooling loads as the current system. The connection to the thermal resource would need to be installed in the city streets, which are already very congested with utilities. The City of Troy currently has a combined sewer system (“CSS”), meaning that the stormwater and wastewater collect in the same system with the fluid interface considered wastewater. Locations to connect a sewer heat exchanger would need to be identified within the project area. A submersible pump would be installed for pumping the fluid through the SHX and back to the wastewater system at the connection location, with possible locations at a sewer regulator or at an installed holding tank. Without a holding tank, the thermal resource would not be dispatchable as it would be dependent on the real-time flow of the wastewater. One potential location satisfying these criteria would be the 48” sewer interceptor line owned by Rensselaer County that runs parallel to the Hudson River. To access that resource, a wastewater diversion station would have to be constructed with a wet well, pumping, and specialized heat exchangers sized to provide energy to the loop. Such a facility would have to be located very close to the riverbank within the park, and in a flood plain, which is not desired by the city or county. Based on the proximity to the river and the issues with siting and construction of such a facility, it is an inferior alternative compared to the geothermal borefield.

5.3.2 Alternative 2: Air-to-Water Thermal Network

This reduced efficiency option would be sized to match the same heating and cooling loads as the current system but would be less efficient due to hot ambient temperatures in the summer when heat needs to be rejected and cold ambient temperatures in the winter when heat needs to be absorbed. This alternative would require much more rooftop or exposed area than the designed Energy Center on which to mount ASHP equipment because the entire load of the system would be on the units. Therefore, using an air-to-water thermal network was dismissed as an infeasible alternative to the geothermal borefield.

5.3.3 Alternative 3: Hudson River Heat Exchanger

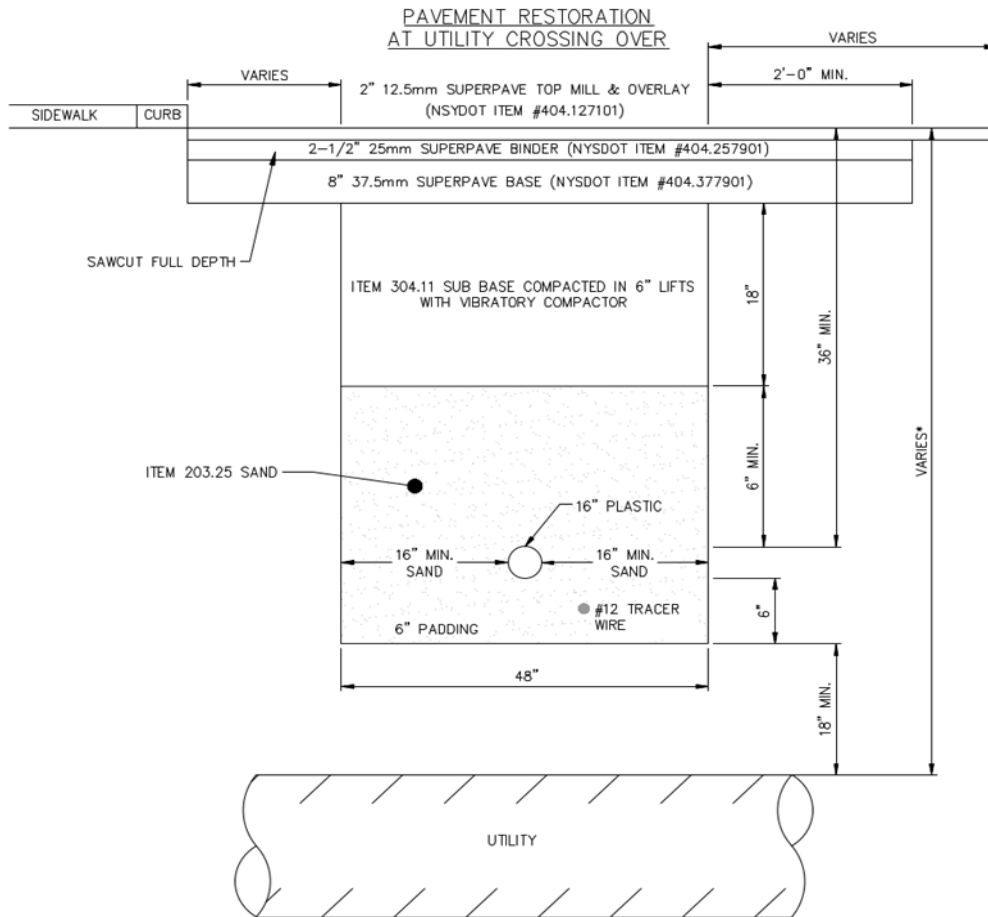
The third option would be technically feasible but comes with a number of challenges. A river heat exchanger would be closed loop so as not to exchange fluid with the river, but would transfer thermal energy, changing the river 1-2°F in the immediate vicinity of the heat exchanger. The system would need to be designed for different temperatures than the UTEN is currently designed for, due to the fact that winter river temperatures hover near 32°F, and to extract heat from the river the UTEN working fluid would then need to be around 28°F. The Hudson River is a federal and state navigable waterway as regulated by the US Army Corps of Engineers (“USACE”) and the New York State Department of Environmental Conservation (“DEC”). In addition, NYS Office of General Services (“OGS”) is responsible for the management of State lands underwater. There are permits and approvals that would likely be required from each of these agencies. Additionally, the potential impact to the federal and state endangered species of fish in the river would need to be addressed – both the shortnose sturgeon and the Atlantic sturgeon inhabit this area of the river. A study would need to be completed to show this potential

impact. These various studies, permits, and approvals would make for an onerous process. Therefore, using a Hudson River heat exchanger as the thermal resource was dismissed as an inferior alternative to the geothermal borefield.

5.4 Utility Distribution System

The Troy UTEN Pilot is designed as a one-pipe system. The UDS is classified as an “ambient loop” because it operates at temperatures similar to the average ambient air temperature. An ambient loop integrates a thermal resource as a heat source/sink and storage to maintain the loop fluid temperature at a constant ambient temperature in the long term. If the system is unbalanced and the loop temperature changes over time, the efficiencies of the connected equipment will change in response. With a one pipe system, customers will pull fluid from and return fluid to the same pipe. The design supply temperature range of the UDS is between 35-40°F in the winter and 75°F to 85°F in the summer. The temperature is primarily moderated by the geothermal borefield and then as needed by the air-to-water heat pumps to maintain borefield temperatures within design parameters. A typical installation is shown in the pipe trench detail below.

Figure 2: Pipe Trench Detail



The UDS relies on a one pipe layout. All piping will be installed with tracer wire. The material of the UDS is PE4710 uninsulated high-density polyethylene (“HDPE”), with a wall thickness of dimension ratio (“DR”) DR11. The UDS will be installed via direct burial. Connections will generally be fusion welded, with mechanical union connections used when joining pipes that cross under utilities. Mechanically restrained joints are used at every change of direction fitting to eliminate the need for thrust blocks. Most utility coordination is done using 22- or 45-degree mechanical fittings, with a minimum of 1 ft clearance to existing pipe. The 16” main circulates fluid from the Energy Center, to and through the borefield, to the connections to customer energy transfer station, and back to the Energy Center.

The transfer fluid conveyed by the UDS will be a heat source and/or sink for the water-source heat pump (“WSHP”)-based systems installed in customers’ buildings. The transfer fluid will be a 25% propylene glycol (“PG”), 75% water mixture. Since the design return temperature may be as low as 30°F, this glycol mixture prevents the fluid from freezing and the pipe from bursting if the fluid temperature drops below 32°F. While a 25% PG mixture provides freeze protection down to 14°F, it is unlikely that the fluid will ever get that cold, however a PG mixture of a lower concentration can result in insufficient corrosion inhibitor performance, reduced biological stability, and can void manufacturer corrosion warranties. Therefore, the 25% concentration was used per industry best practice. The system will be filled with approximately 30,000 gal of transfer fluid and will circulate 500 gpm of transfer fluid during minimum flow conditions and 1,800 gpm during design flow conditions. The system will operate at 12 psi on average with a maximum allowable operating pressure (“MAOP”) of 150 psi. The total length of piping main is approximately 3,000 linear feet.

The 16” pipe is sized to allow for additional customer connections to the UTEN in the future. Future-sizing the pipe was incorporated into the design to avoid unnecessary costs to the system later to upsize the pipes. The majority of the UDS installation costs are associated with excavation, installation, backfill, and restoration. Larger diameter pipe which allows for system expansion is only marginally more expensive than the smaller diameter pipe that would be needed to meet the immediate system needs. Therefore, it is more economically prudent to only excavate and restore for the purpose of pipe installation once.

Work within the streets will require removal of existing curbs, restoration of the pavement from the road centerline to the curb, and reinstallation of curbs. All road crossings will be normal to the flow of traffic. The vast majority of the work will occur within city streets and will be

managed under a City of Troy road cut permit. All work will be in accordance with the City of Troy's road cut permit standards. State Route 4 in downtown Troy runs one-way on 3rd Street and 4th Street. NYS DOT has indicated that only the northbound lane (4th St) is considered a state road and therefore coordination with DOT is not required for the installation work on 3rd Street.

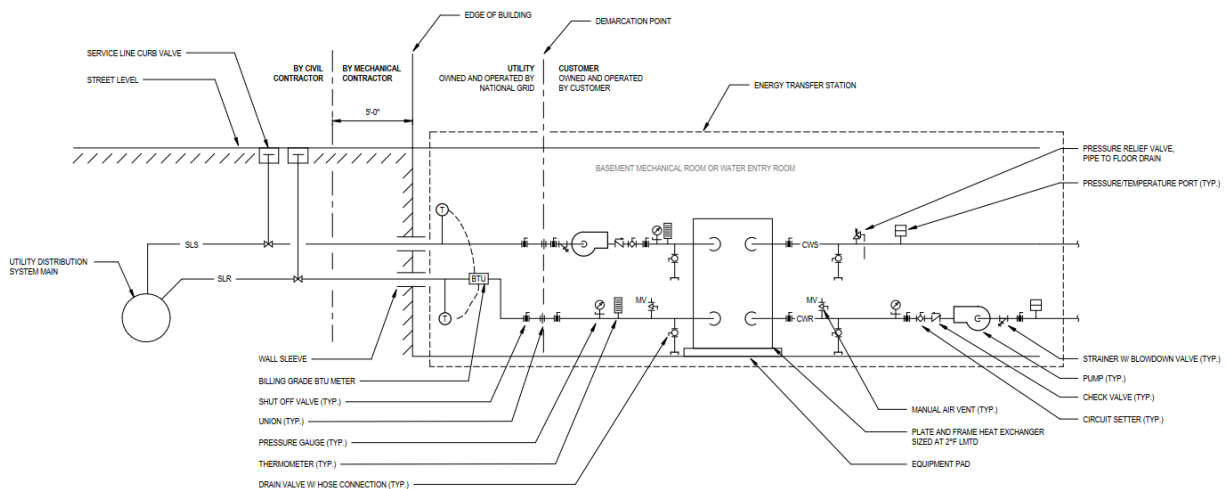
Thermal expansion is not anticipated to pose a concern for the direct buried HDPE piping. It is expected that thermal expansion will occur at a typical rate of 1" per 100 ft of pipe per 10°F of temperature change. At a lower extreme operating temperature of 30°F and an upper temperature of 80°F, the pipe could expand linearly up to 5" per 100 ft of pipe. As the pipe is direct buried and utilizes mechanically restrained fittings instead of thrust blocks, there are very few anchor points in the system. The majority of the piping will be allowed to shift a few inches in any given direction. The minimum bend radius for HDPE is 25D, which would equate to a radius of 400" (33 ft). At that radius each 20 ft section of pipe can safely deflect as much as 24" without concerns for increased pipe stress. At points in the system that are anchored, such as utility valves, utility entry locations, and the Front St retaining wall, the location of anchors will be coordinated to ensure that piping is not anchored at two points and is allowed to move.

Design details of the pipe routing, including coordination with existing surveyed utilities, and depth of pipe can be found in the drawings in Appendix B. The UDS will be buried at a nominal depth of 5 ft to top of pipe. A minimum clearance to other utilities of 1 ft is used throughout the coordination process. At each customer connection, a pair of supply and return service lines will be run from the distribution main to the building. The service lines will be made of HDPE and are sized at 6" or 8" depending on the building load being served.

5.5 Energy Transfer Station(s)

Within each connected building, an Energy Transfer Station (“ETS”) will be installed. The ETS is a multipurpose system component and will be standardized for almost all customer connections. The main goals achieved by the ETS, as designed, are to represent the point of demarcation between utility-owned and customer-owned equipment, to isolate the utility system from the building system, and to act as a hub for the collection of useful system performance data. To draw an analogy to the gas system, the ETS can be viewed in the same light as the gas meter. The point of demarcation, shown in the image below, is located at the outlet of the Company owned shut off valve on the supply service line and at the inlet of the Company owned shut off valve on the return service line. All equipment and infrastructure leading up to the point of demarcation on the UDS side will be owned and operated by NMPC. All equipment and infrastructure past the point of demarcation will be owned and operated by the customer. Figure 3 below depicts a typical customer connection and illustrates the point of demarcation between NMPC infrastructure and customer-owned equipment.

Figure 3: Energy Transfer Station



To achieve isolation of the UDS from the building's internal system(s), the supply and return services that run from the distribution mains to the customer buildings will be routed through plate and frame heat exchangers. The heat exchangers will be sized for a 2°F approach temperature and a design pressure drop of 10 psi. Building circulation pumps will be located on the customer side of the heat exchanger to circulate water through the building's distribution system.

A variety of sensors and gauges will be installed at the ETS to determine system performance and to measure customer energy usage. Flow meters and thermocouples will be installed to measure the flow rate and temperature delta between the supply and return service lines. This information can be used to determine the energy extracted or added to the UDS by each customer. Pressure gauges will record the pressure within the service lines and the building side piping.

5.6 Energy Center

The Company will construct a standalone building on City of Troy land. The building will act as the Energy Center for the Troy UTEN Pilot. The Energy Center will be located on River Street in downtown Troy. Figure 4 below shows a rendering of the Energy Center.

Figure 4: Rendering of proposed Energy Center



5.6.1 Building Design

The three facades of this new building will be finished with a brick veneer and limestone block at the grade level. Using these finishes will help pick up materials, tones, and patterns of surrounding structures in the Historic City District of Troy.

A storefront system and an entry door will be situated along River Street with insulated tinted privacy glazing. This will create the ‘base’ of the overall facade as well as a sense of entry and street presence. The ‘body’ of the building (middle level) will be comprised of 4 custom arched windows. The top level will be distinguished through the use of four shorter arched windows and brick soldier coursing. The brick facade will have a relief pattern to pay homage to the many architectural styles and characteristics seen throughout the City of Troy.

An Americans with Disabilities Act of 1990 (“ADA”) compliant toilet room will be situated inside the building under the stair landing. An information technology (“IT”) closet will be next to the toilet room. Access to the roof will be provided via a combination of a concrete poured steel pan stair and prefabricated/engineered ships ladder. A roof hatch/access panel will be provided at the roof level.

An insulated hollow metal double door and frame will be provided off the back side of the facade oriented towards Front Street. All interior walls will be finished off with 5/8” Type “x” gypsum wall board and painted. Rubber vinyl wall bases will be provided at the base of each interior gypsum finish. Vinyl faced acoustical ceiling tile and aluminum grid will be provided at the ceiling of the toilet room along with standard toilet room accessories such as mirror, soap dispenser, paper towel dispenser, sanitary napkin disposal, ADA grab bar, and hand sink. Panic devices and standard exterior door hardware with keying coordinated with tenant will be provided at both exterior doors. The building envelope will be insulated to meet the latest prescriptive energy code at the foundation, walls, and roof.

5.6.2 Civil Design

Civil design includes an erosion and sediment control plan for construction activities as well as a site grading and drainage plan. Subsurface utilities entering the Energy Center include potable water, sanitary, storm, and underground electrical.

5.6.3 General HVAC and Plumbing

A water-to-air heat pump with waterside economizer, connected to the UTEN, will condition the Energy Center. The heat pump will bring in conditioned fresh air to the space while it is

occupied. An exhaust fan will remove the code-required exhaust from the toilet room while it is occupied. A wall mounted ductless mini split will provide cooling to the IT closet. The outdoor condensing unit will be mounted on the roof.

A new water service will be required as well as a connection into the nearest sanitary line. The water service will provide makeup water to the UTEN system and domestic cold water for the sink and toilet. An instantaneous point of use electric water heater will be installed to provide domestic hot water to the sink. Two floor drains will be installed to provide drainage for the Energy Center in case of a leak, system flush, or other event. A floor drain will also be installed in the toilet room. A roof drain will be installed per code to allow for proper drainage.

5.6.4 Pipe Materials

Where the UDS approaches and enters the Energy Center, the pipe is HDPE. Once the pipe enters the building, there will be a transition to carbon steel. Just before the UDS leaves the Energy Center it will transition back to HDPE. Inside the Energy Center, the piping will be schedule 40 carbon steel piping with welded joints and flanged connections to valves and pipe.

5.6.5 Pumps

The Energy Center will house distribution loop pumps to provide flow throughout the UDS. These in-line pumps will be sized for three pumps at 67%, for n+1 redundancy, at 20 hp and 1,200 gallons per minute (“gpm”) each. Pumps will have variable frequency drives to provide part-load operation and to meet energy code. Minimum flow for the system will be approximately 500 gpm. Air separators are provided in the main suction line and suction diffusers with integral strainers are located at each pump. Changes in transfer fluid temperature

will result in changes in system volume; to accommodate these changes, an expansion tank will be installed. Much of the increased fluid volume due to thermal expansion is offset by increased HDPE pipe diameter due to thermal expansion, so the required expansion tank is smaller than it would be in a system with all steel piping.

The roof of the Energy Center will house two auxiliary air-to-water heat pumps used to balance the thermal loads of the UTEN. The heat pumps will operate during the cooling months to inject heat into the UDS to counteract the uneven heating and cooling demand of the connected buildings on the ground heat exchanger. Each unit is rated at 1278 MBH and will operate with 25% PG as the working fluid with a delta T of 10°F. Since the peak loads on a system are often the limiting factor of how much space can be served, the air-to-water heat pumps extend the utility of the system by providing capacity to meet peak heating loads in excess of the capacity that the borefield can provide.

The first floor of the Energy Center will house two inline pumps to circulate water between the UDS and the air-to-water heat pumps. Each pump is paired with one heat pump and is sized at 15 hp and 525 gpm. The pumps would operate in tandem with the heat pumps and would be provided with variable frequency drives to allow variable operation and meet energy code.

5.6.6 Electrical

A new electrical service will be required at the Energy Center. This will provide power for the pumps, auxiliary heat pumps, water heater, controls, lighting, and system accessories. The service will be 208V from the underground electric system in the area.

5.6.7 Instrumentation and Controls

The UTEN will use a Supervisory Control and Data Acquisition (“SCADA”) control system to monitor, analyze, and control operations. The SCADA system will be connected to National Grid gas operations through the private commercial Verizon network. An additional set of controls will be installed for monitoring and collection of data related to the Evaluation, Measurement, & Verification (“EM&V”) plan, will be read-only in nature, and will not share any components with the supervisory system.

5.6.8 Physical Security and Safety

The Energy Center will be connected to the Company’s digital network, facilitating standard security features of a facility of this kind which will include card reader door access and security cameras.

5.7 Customer Portfolio

The customers identified for the Pilot constitute a mix of multifamily residential and commercial customers as summarized below.

- Building 1
 - 7 floors
 - Total of 76,000 ft²: 13,000 ft² commercial and 63,000 ft² residential
 - 90 tons cooling / 1,100 MBH heating
- Building 2
 - 24,000 ft²
 - All commercial: performance space and offices
 - 83 tons cooling / 2,600 MBH heating

- Building 3
 - 5 floors
 - Total of 54,000 ft² of commercial space
 - 60 tons cooling / 900 MBH heating
- Building 4
 - 4 floors + basement
 - Currently 33,000 ft² of commercial space
 - Plans to renovate to total 58,000 ft² mixed use residential and commercial space, which is the building use case represented in the provided energy modeling
 - 115 tons cooling / 1,600 MBH heating
- Building 5
 - Two adjacent buildings on the property, one has 2 floors + partial basement and the other has 3 floors + basement. They are metered as one building.
 - Total of 27,000 ft² of mixed use commercial and residential space
 - 32 tons cooling/ 325 MBH heating
- Building 6
 - 5 floors
 - Total of 25,000 ft² of commercial space
 - 30 tons cooling / 530 MBH heating

Table 1: Customer Portfolio

Customer Name	Customer Type	Customer Building Area (ft ²)	End Use Customers Served ⁵ (Res/Com)		Heating Load (MBH)	Cooling Load (tons)
			Res	Com		
Building 1	Residential/Commercial	76,000	52	5	1,100	90
Building 2	Commercial	24,000	-	1	2,600	83
Building 3	Commercial	54,000	-	15	900	60
Building 4	Residential/Commercial	58,000	7	5	1,600	115
Building 5	Residential/Commercial	27,000	8	2	325	32
Building 6	Commercial	25,000	1	5	530	30
Total		264,000	68	33	7,055	410

5.8 Customer Retrofit Design

The existing conditions and conversion strategies for each building planned to be connected to the Troy UTEN Pilot are detailed below. For certain buildings, NMPC experienced unique challenges that required thoughtful solutions. These challenges are described below as well. NMPC is proposing that the costs to retrofit these buildings be recovered as part of the NMPC UTEN Pilot costs. The cost of retrofitting these buildings is described in Section 9.1. The mechanism by which NMPC proposes to recover these costs is described in Section 9.8.

⁵ The number of customers served depends on the customer type (i.e., single family home = 1 customer served, multi-family residential with n apartments = n customers served, commercial building with n businesses = n customers served).

5.8.1 Building 1

Building 1 is a 76,000 square foot, mixed-use, seven story, commercial building located on Broadway. The building currently has restaurants on the first floor, apartments on floors 2-4, and office space on floor 5-7. Renovations are underway to convert the office spaces to apartments.

5.8.1.1 Existing Conditions

The building is currently conditioned through water source heat pumps. The water distribution loop is conditioned by a natural gas fired boiler in the basement and a cooling tower on the upper roof. Six pumps are located in the basement boiler room. Two pumps serve the building distribution loop. A 5-hp pump serves the building loop connection to the condenser loop via a plate and frame heat exchanger. The condenser loop is served by a 15-hp pump connecting the heat exchanger to the rooftop Baltimore Air Coil cooling tower located on the upper roof of the building. Two 2-hp pumps serve as connection between the building loop and the boiler. The pumps connecting the building loop to the boiler and heat exchanger operate in their respective heating and cooling seasons.

Three natural gas fired domestic hot water heaters in the basement boiler room serve the building's first floor hot water loads. Domestic hot water on the second, third, and fourth floors is provided by electric water heaters with two hot water heaters per floor. In the ongoing conversion of floors five through seven from office space to apartments, the building owner will be providing electric water heaters to meet the updated domestic hot water load of the newly renovated spaces.

The restaurant kitchens on the first floor are served by gas-fired make-up air units that are to remain in service following the building retrofit. The seventh floor is served by ASHPs that will remain in service following the building retrofit.

5.8.1.2 Conversion Strategy

The building service line will connect to the UDS main on Broadway via the existing General Air heat exchanger sized for a log mean temperature difference (“LMTD”) of 5°F. Two 15-hp pumps serve the UDS connection to the heat exchanger. A BTU meter will be attached to the UDS connection to monitor the building’s thermal energy use.

The Building 1 HVAC retrofit will consist of connecting the building to the UDS loop, installation of a water-to-water heat pump, and removal of the boiler and cooling tower.

A 112-ton water-to-water heat pump (“WWHP”) will temper the incoming water temperature during heating. The WWHP will take incoming fluid from the UDS and will raise temperatures to reach the operating range for heating of the existing water source heat pumps in the building. Two 7.5-hp pumps will serve the connection between the WWHP and the building loop. Two 15-hp pumps will connect the building loop to the heat exchanger. The building distribution loop is served by the existing distribution pumps. The existing distribution piping will be utilized for the building distribution loop.

Domestic hot water for the first floor will be provided by a Lochinvar water source heat pump connected to the building distribution loop in the basement mechanical room. A 1-hp pump will serve the connection to the building loop. The building side of the domestic hot water loop will include two 120-gallon domestic hot water tanks installed alongside the heat pump in

the basement mechanical room. The hot water heater will be connected to the existing domestic hot water piping.

The domestic hot water load for the rest of the building will remain on electric water heaters. There is little to no existing documentation of building piping locations or of chases and shafts throughout the building, making it difficult to run new piping.

On an exterior wall, a set of lintels will be installed into the non-load bearing wall. The brickwork below the lintels will then be removed to allow for a wide opening in the wall. This opening will be used as a path of removal for all removed equipment in the basement scope of work. The opening will be utilized as a path of installation for all installed equipment in the basement scope of work. Temporary shoring and wall support at the opening will be used to prevent damage to the existing masonry & to maintain all Occupational Safety and Health Administration (“OSHA”) safety standards.

Following the installation of new equipment included in the basement scope of work, the wall will be infilled to match the previous conditions. The wall infill will allow for the routing of the 6” UDS main connections.

The building owner will provide an 800 A rated 42-pole electrical panel to which the WWHP, pumps and other mechanical and plumbing loads will be connected.

5.8.2 Building 2

Building 2 is a 24,000 square foot building located on 2nd Street. The space is used as a performing arts concert hall with an annex space attached for offices.

5.8.2.1 Existing Conditions

Building 2 has an existing steam boiler and water-cooled chiller with cooling tower. The building has cooling and mechanical ventilation in a limited number of spaces. The main performance hall currently has natural ventilation and no cooling.

5.8.2.2 Conversion Strategy

The building will connect to the UDS main on 2nd Street via a new plate and frame heat exchanger sized for an LMTD of 2°F with two pumps supplying 25% propylene glycol from the UDS. A BTU meter will be attached to the UDS connection to monitor the building thermal energy use.

Building 2 is undergoing renovations to modernize the existing HVAC system and provide cooling and mechanical ventilation to the entire building. This will include replacing the chiller and boiler with a water-to-water heat pump serving hot and chilled water coils on a dual temperature loop, as well as adding distributed water source heat pumps throughout the building on an ambient temperature loop. These HVAC retrofits will be completed by the owner.

The electrical work for Building 2 to support the HVAC retrofit will be completed by the owner.

5.8.3 Building 3

Building 3 is a 54,000 square foot, four story, commercial building located on 3rd Street in Troy, NY. The building is used as offices on the upper floors and a maker's space on the basement and first floor.

5.8.3.1 Existing Conditions

Building 3 is served by ducted water source heat pumps mounted in the ceiling throughout the building. The building heat pumps are supplied with tempered water that is modulated by a fluid cooler on the roof and natural gas fired condensing boilers in the penthouse mechanical room.

A dedicated outdoor air system unit is mounted on the roof and provides preconditioned air throughout the building for ventilation. A set of 1-hp pumps serve a 40% propylene glycol loop connecting the hydronic heating coil of the dedicated outdoor air system (“DOAS”) unit to a heat exchanger providing hot water from one of the boilers. A direct expansion (“DX”) cooling coil provides cooling for the DOAS. A set of 7.5-hp pumps serve the 40% propylene glycol condenser water loop connected to the heat exchanger and cooling tower, while a set of 15-hp pumps serve the building distribution loop. Two plate & frame heat exchangers are used to connect the DOAS coil loop and the condenser water loop to the building’s distribution loop. The building distribution loop piping is not currently insulated.

The domestic hot water load for the building is served by electric domestic hot water heaters that will remain in operation.

5.8.3.2 Conversion Strategy

The UDS connection will use the existing Alfa Laval plate and frame heat exchanger sized for a 2°F LMTD. The UDS connection will be served by two 15-hp pumps. The building distribution loop will be 25% propylene glycol connected to the existing heat exchanger. A BTU meter will be equipped to the UDS connection to monitor the building thermal energy use.

In addition to the UDS connection, the Building 3 retrofit will include decommissioning natural gas condensing boilers and cooling tower, and replacement of the dedicated outdoor air system unit. The pumps and heat exchanger serving the existing hydronic coil for the DOAS unit will also be removed.

The existing pumps serving the cooling tower condenser loop will be removed and replaced by the two 15-hp pumps serving the UDS connection.

A new DOAS unit with heating and cooling hydronic coils will replace the existing unit and connect to the existing ductwork to serve the ventilation load of the building. The coils will connect into the building distribution loop.

To meet the heating and cooling space loads at lower entering water temperatures, heat pumps throughout the basement, first, third, & fourth floors will be replaced with correctly sized water source heat pumps. There are a total of 31 heat pumps being replaced with 8 vertical mounted heat pumps on the basement level, and 23 horizontal ceiling mounted heat pumps replaced throughout the upper floors. The new heat pumps will connect to existing ductwork and piping serving the removed unit.

The HVAC retrofit scope will include providing insulation for the existing distribution loop piping throughout the building. The scope involves significant ceiling removal. The mechanical contractor will be required to verify all piping locations.

Existing power panels will be utilized to power the water source heat pumps. There is a total of 15 circuit breakers that will need to be upgraded to meet the power needs of the heat pumps, and 7 circuits that will be able to keep the existing breaker. Pumps P-2A and P-2B, EUH-1, and DOAS-1 will need to be field verified by the electrical contractor to find their power source. The

electrical contractor will determine if wire/conduit and breaker in panel can be re-used per the National Electric Code.

5.8.4 Building 4

Building 4, a four story, 60,000 square foot, commercial building located on River Street that is currently used for office space, an art studio, and an art gallery on the basement, first floor, and second floor levels. The third and fourth floors are currently vacant. The building owner plans to renovate the third and fourth floors to be used as short-term residential and art studio space in the future.

5.8.4.1 Existing Conditions

Building 4 employs various means of heating. A natural gas fired boiler located in the basement mechanical room supplies hot water to cabinet heaters and unit heaters in the basement, and to perimeter finned tube radiation in portions of the first and second floors. There is one air handling unit with a hot water coil serving part of the basement providing ventilation. The basement has no cooling and the majority of the basement has no ventilation.

The first and second floors are served by thirteen York packaged rooftop units, with natural gas fired heating and DX cooling. Two electric wall heaters serve two bathrooms on the first floor. The third and fourth floors are primarily unconditioned except for electric wall heaters serving the stairs and a mechanical closet space on the third floor. The third and fourth floors are currently unoccupied.

The building domestic hot water load, comprised mostly of bathroom and classroom sinks, is served by a natural gas fired water heater located in the basement boiler room.

5.8.4.2 Conversion Strategy

Connection to the UDS will consist of a Bell & Gossett plate and frame heat exchanger and two pairs of Armstrong pumps. The heat exchanger is sized for a 2.0°F LMTD and serves as hydronic separation of the 25% PG UDS and the 25% PG building loop. Two 20-hp pumps will serve the UDS connection to the heat exchanger. A BTU meter will be equipped to the UDS connection to monitor the building thermal energy use.

The new work design scope will include connecting the building to the UDS loop and indoor air quality improvements. As part of the building retrofit, the boiler, basement air handling units, rooftop packaged units, fin tube radiation, and basement unit heaters are to be removed.

Two 25-hp pumps will serve the 25% PG building loop supplying the water source heat pumps serving the Arts Center. The basement spaces are served by ceiling mounted horizontal water source heat pumps. Tempered fresh air is provided to the basement spaces through 6 ceiling mounted, ducted energy recovery ventilation (“ERV”) units. A WWHP will be housed in the basement janitorial room and connected to the PG building loop. The WWHP is used to increase the working fluid temperatures for the secondary hot water loop serving the existing cabinet unit heaters in the basement spaces, and the new fin tube radiation serving the first and second floor spaces. Two ¾-hp pumps will serve the distribution of the hot water loop connected to the WWHP.

The first and second floor spaces will be served by 13 Trane water source heat pump rooftop units served by the propylene glycol building loop. The rooftop units will connect into the existing building ductwork.

Future work plans are being developed by the building owner for the renovation of the third and fourth floors to be used as both residential and commercial spaces. The spaces would be

served by horizontal water source heat pumps connected to the 25% propylene glycol building loop, with tempered outdoor air for ventilation provided through ERVs.

Piping will be installed to serve the 25% PG building loop and UDS connection. The existing heating hot water piping will be connected to the WWHP and re-used to serve the cabinet unit heaters and finned tube radiation. Ductwork will be installed to serve the ERVs in the basement spaces and horizontal water source heat pumps throughout the building.

The existing domestic hot water heater in the basement boiler room is to be removed and replaced. Due to limited equipment options for water-to-water heat pump water heaters at small capacity, the new water heater will be a Rheem Commercial air sourced heat pump water heater. The air sourced hot water heater will be housed in the basement mechanical room and connect into the exiting domestic hot water piping.

A 90 A 3-pole breaker will be required to power the WWHP, which will be fed through the main distribution panel. The building owner will provide two electrical panels, where one panel will be fed from the other via feed through lugs for a total of 400 A and 84 poles. These panels will power the WSHPs, ERVs, pumps, and other mechanical and plumbing loads. Existing power panels will also be utilized to power the rooftop units and other mechanical loads. There is a total of 12 circuit breakers that will need to be upgraded to meet the power needs of the rooftop units, and 4 circuits that will keep the existing breaker.

5.8.5 Building 5 and Building 6

Building 5 is a 26,800 square foot commercial building and is adjacent to Building 6, a 25,000 square foot commercial building. The ground floors are used as a retail space while the upper floors are office in Building 6 and will be renovated to become apartments in Building 5.

They are described together because the UTEN will serve Building 5 and Building 6 with a single connection.

5.8.5.1 Existing Conditions

The buildings currently have a water source heat pump loop, the temperatures of which are modulated by a natural gas steam boiler and rooftop cooling tower. The owner is in the process of converting all spaces to water source heat pumps, so some rooms, namely in Building 6 currently have window ACs for cooling.

5.8.5.2 Conversion Strategy

One point of entry will serve the two buildings. The UDS service connections will enter Building 5 through the outside wall of the basement mechanical room and connect into the UDS main running along Front Street. The connection will include installing a new plate and frame heat exchanger sized for an LMTD of 2°F to connect the UDS and the building system. Two pumps will be installed to serve the UDS side of the connection. A BTU meter will be equipped to the UDS connection to monitor the building thermal energy use.

The owner of Buildings 5 and 6 is planning to convert the current system to be compatible with the UTEN system by installing WSHPs. These HVAC retrofits and electrical work will be completed by the owner.

5.9 Customer Instrumentation and Controls

Each building will have a BTU meter installed to monitor the thermal energy use of the building while connected to the UDS. A data collection system will be installed to fulfill the pilot

project data collection requirements. All data will be communicated to National Grid over a cellular network once a month. Temperature data will be collected at hourly intervals on the inlet and outlet of the heat exchanger, both on the UDS side and the customer side. A sample of the installed heat pumps' input electricity will be monitored.

5.10 Resilience and Reliability

The Troy UTEN system will be the primary source of space heating and space cooling for a number of end users in the downtown Troy area. Failure of the system to operate as intended could jeopardize health and safety, especially during periods of extreme weather. Interruption of these services can also disrupt business activities, leading to financial losses. With this in mind, the Troy UTEN was designed to be a reliable and resilient system, including multiple layers of engineering controls and risk mitigation to ensure the system remains functional during times of power outages and flood events. A main component of this was choosing a location for the Energy Center that is not in the flood plain. The diverting valve vault, which is in the flood plain, will have a rated enclosure on the control valve that is designed to withstand submersion, in the case that a flood event does occur. Additionally, electric service for the Energy Center will be from an underground electric service, which is more reliable and less susceptible to damage from weather events than an above-ground electric service would be. The spot network serving downtown Troy also provides reliability, and there are generators connections available for use in the unlikely event that there is a power outage.

5.11 Real Estate and Leases

5.11.1 Lease Agreements

NMPC has entered into a non-binding letter of intent (“LOI”) with Troy LDC and the City of Troy for Troy LDC to sublease City land to NMPC for the Energy Center and Borefield. The LOI outlines essential lease provisions for the Troy UTEN Project, which includes an initial sublease term of six years with four five-year renewal options. Because the borefield will be located on parkland, the City of Troy obtained special legislation authorizing it to discontinue as parklands and lease at fair market value for a term not to exceed thirty years, the subsurface lands for district geothermal wells and distribution lines (“Alienation Legislation”). See “Act authorizing the city of Troy to lease sub-surface park land property referred to as Riverfront Park” 9993-A (April 29, 2022). The lease will commence upon the Tenant's receipt of necessary approvals from the New York State Public Service Commission and other regulatory bodies. The LOI provides that in no event shall the Borefield Lease extend beyond the term limits in the Alienation Legislation. For the full text of the Alienation Legislation see Appendix D.

The LOI specifies two subleases. Sublease 1 encompasses approximately 2,184 square feet at 249 River Street, Troy, NY, designated for the construction of the Energy Center. Sublease 2 covers about 71,000 square feet at 255 Front Street, Troy, NY, intended for the borefield. The rent structure and sublease will require Troy City Council approval which will be sought by the City of Troy and Troy LDC if the Commission approves the Troy UTEN Pilot as the LOI is not binding on Troy LDC or the City of Troy. The LOI also provides for an annual administration charge to be paid in addition to the rental rate. For any of the extension term years, the rental rate structure is able to be redefined and be based on additional revenues collected by the Company if thermal energy becomes a commodity or environmental credit that

is sellable or tradeable in a competitive market and the Company collects additional revenue aside from charges and fees collected for the provision of thermal energy to the Company's UTEN customers. Any such rental rate structure revision will be subject to PSC approval and not effective unless and until the PSC grants such approval to the Company. Since the LOI is non-binding and requires further municipal approvals, the Company has no assurances that the Troy City Council will approve the sublease and/or the rental rate, administrative fees, and the 2.5% annual escalation as set forth in the LOI.

Upon expiration or termination of the leases, the Tenant is required to remove all borefield improvements in accordance with applicable legislation. The Tenant must also restore the Energy Center site to an unimproved condition, free of trash, rubble, and debris, within 12 months. The Landlord retains the right to elect ownership of the Improvements by providing written notice no later than six months prior to the lease expiration or within ten business days following an earlier termination.

The initial due diligence period is set for nine months from the effective date of the leases, with the option to extend for an additional nine months upon payment of \$25,000 on a non-refundable basis. During this due diligence period, the Tenant is permitted to conduct various studies, including environmental assessments, soil tests, and engineering studies. These assessments are necessary to secure all required federal, state, and local approvals for the project. The LOI with Troy LDC along with a Letter of Support from the City of Troy are provided herein as Appendix E.

5.11.2 Permanent Easements

No permanent easements will be required for the UTEN infrastructure within the public way. NMPC will rely on its existing franchise rights to place infrastructure within the public right of way, in accordance with its franchise rights.⁶

5.11.3 Temporary Access Agreements

Several temporary easement agreements will be required for construction laydown areas during construction of the UTEN system. If the project advances to Stage 3, NMPC will work with the City of Troy and private property owners to obtain temporary easement rights for construction laydown and staging areas.

5.12 Permits

5.12.1 NYSDEC Stormwater Permits

The project will disturb over one-acre of soil, therefore a Stormwater Pollution Prevention Plan (“SWPPP”) will be prepared. A SWPPP is a requirement of New York State Department of

⁶ Section 10 of the NY Transportation Corporation Law was amended by UTENJA to allow franchises for thermal energy within public ways and places as follows:

An electric corporation and a gas and electric corporation shall have power to generate, acquire and supply electricity or thermal energy for heat, cooling or power in cities, towns and villages within this state, and to light the streets, highways and public places thereof, and the public and private buildings therein; and to make, sell or lease all machines, instruments, apparatus and other equipments therefor, and for transmitting and distributing electricity or thermal energy, to lay, erect and construct suitable wires or other conductors, with the necessary poles, pipes, thermal energy networks or other fixtures in, on, over and under the streets, avenues, public parks and places in such cities, towns or villages, with the consent of the municipal authorities thereof, and in such manner and under such reasonable regulations, as they may prescribe. 3-a. An electric corporation and a gas corporation shall have power and authority to acquire such real estate as may be necessary for its corporate purposes and the right of way through any property in the manner prescribed by the eminent domain procedure law. 3-b. The construction, use and maintenance by an electric corporation of transmission, distribution and service lines and wires or thermal energy networks in, over or under any street, highway or public place and the construction, use and maintenance by a gas corporation of transmission, distribution and service pipes, conduits, ducts or other fixtures in, over or under any trees, highway or public place, as may be necessary for its corporate purposes, are hereby declared to be public uses and purposes.

Environmental Conservation (“DEC”) State Pollutant Discharge Elimination System (“SPDES”) General Permit for Stormwater Discharges from Construction Activities (Permit No. GP-0-25-001) (“Construction General Permit” or “CGP”), effective January 29, 2025 January 29, 2025 with an expiration date of January 28, 2030. The CGP authorizes stormwater discharges from construction-related activities to surface waters of the State. The SWPPP will be kept at the project site and shall be made available for review by applicable regulatory agencies, the Engineer, and Contractors upon request. Regulatory agencies that have jurisdiction over the project site may elect to review this SWPPP and if necessary, may notify the Owner that modifications to the SWPPP or site conditions are required.

The following documents must be maintained at the project site as of commencement of construction activities.

- All documentation necessary to demonstrate eligibility with this permit, including but not limited to:
 - NYSDEC SPDES GP-0-25-001
 - SWPPP
 - Signed SWPPP Preparer Form
 - Signed Owner/Operator Form
 - Electronic Notice of Intent (“eNOI”)
 - Letter of Authorization
 - Signed Contractor’s Certification Form(s)
 - Stormwater Construction Site Inspection Reports
 - Request to Disturb Greater than 5 Acres (if applicable)
 - Authorization to Disturb Greater than 5 Acres (if applicable)

The Project is also subject to the requirements of a regulated, traditional land use control Municipal Separate Storm Sewer System (“MS4”) in the City of Troy. The City of Troy will be provided with a copy of the SWPPP for review and sign off, prior to the filing of the Notice of Intent (“NOI”) with the DEC.

5.12.2 SEQRA Review

On September 5, 2024, the Troy City Council declared its intent to act as lead agency pursuant to the State Environmental Quality Review Act (“SEQRA”) in connection with the proposed Utility Thermal Energy Network, including certain improvements within Riverfront Park. A Full Environmental Assessment Form (“FEAF”) Part I was completed on behalf of the City by LaBella Associates, and the project was classified as a Type I action. The FEAF was later modified to include the proposed Energy Center. On May 5, 2025, the Troy City Council, acting as lead agency, adopted a resolution declaring that the project would not have any significant adverse impacts upon the environment.

5.12.3 City Planning Board, Zoning Board of Appeals, and Historic Review Committee Review

In March 2025, an application for Concept/Sketch and Site Plan was submitted to the Troy Planning Board for review of the proposed Energy Center. As the proposed building was located within a local historic district, the application was referred to the Troy Historic Review Committee (“HRC”). The proposed building was also referred to the Troy Zoning Board of Appeals (“ZBA”) for a variance of City of Troy Zoning, Land Use and Development Ordinance Section 285-45(D)(2), to permit an insufficient river view corridor between buildings.

After resubmitting revised plans, the HRC found at their May 13, 2025 meeting that all architectural review comments were satisfied. On June 4, 2025, the ZBA granted the requested area variance to allow a zero-foot setback between the proposed Energy Center and the adjacent building. The Planning Board granted final approval of the site plan at their August 19, 2025 meeting, with a stipulation that City staff review and approve the exterior lighting of the rear fixture's footcandles prior to obtaining a building permit.

5.12.4 Building Permits

Building permits will be required for the Energy Center, as well as for customer building retrofits. These will include, but not be limited to, general construction, mechanical, plumbing, electrical, structural, and foundational permits. These permits will be obtained by the contractor that is selected to perform the work. Building permit applications are typically processed in 3-4 months; NMPC does not anticipate any challenges in receiving the necessary permits to perform the work.

5.12.5 City of Troy Street Opening Permit

NMPC will obtain a street opening permit to perform in-street work, which will include test hole activities to confirm utility impacts and installation of the UDS system loop when the project is approved to advance to Stage 3 and the construction timeline is finalized.

5.13 Environmental

Located within the City of Troy along the Hudson River, the area has a long and varied land-use history, resulting in known and unknown legacy environmental impacts. Prior to leasing any

properties, NMPC will complete environmental due diligence, including Phase I and/or Phase II Environmental Site Assessments.

Construction of the Troy UTEN Pilot will require the removal of large quantities of soil within the borefield and along the underground piping route. Before construction begins, an evaluation of soil conditions throughout the work area will be conducted to accurately estimate soil reuse, donation, and/or disposal. This evaluation will also inform the development of an Excavated Materials Management Plan, which will guide active management of excavated materials and maximize efficiency through live loading during street work. An environmental inspector will be present during construction to address any unexpected subsurface conditions that differ from those identified during the soil evaluation.

Sediment and stormwater will be managed in accordance with the SWPPP (Section 5.12.1), and dewatering activities will follow water quality assessments performed at the time of construction.

6 Coordination with Troy LDC

6.1 Background

The Troy UTEN project originated with a NYSERDA-funded study carried out by Troy LDC and CHA Consulting, Inc. to assess the feasibility of implementing a TEN in the City of Troy. The study confirmed the technical viability and community interest in a TEN system. However, Troy LDC did not possess the financial capacity and the operational ability and expertise to independently construct and operate the full system. Following the passage of the UTENJA, Troy LDC teamed up with NMPC to advance the project from concept to implementation as described below.

6.2 Original Project Scope

With NMPC joining the Troy TEN project as a utility partner, the Troy UTEN system was scoped as a system that would be operated under a bifurcated business model, with responsibilities for different portions of the system delineated between the two entities. NMPC would be responsible for the construction, ownership, maintenance, and operation of the UDS and Energy Center and also would be responsible for construction of the customer connections and retrofits. Troy LDC would retain responsibility for the construction, ownership, maintenance, and operation of the geothermal borefield, the primary thermal energy resource for the Troy UTEN. Troy LDC also would play a critical role in facilitating borefield development, coordinating with participating customers, and supporting community outreach efforts. This model was envisioned to leverage the strengths of both entities—Troy LDC’s local presence and stakeholder relationships, and NMPC’s utility expertise and operational capacity—to deliver a scalable and replicable thermal energy network solution. In order to compensate Troy LDC for the exclusive rights to utilize the borefield, NMPC would pay Troy LDC a negotiated Thermal Energy Resource Fee.

6.3 Challenges with Bifurcated Ownership Model

During the Stage 2 design process, as NMPC and Troy LDC worked together to develop the Thermal Energy Resource Agreement, which would govern the relationship and determine responsibilities of each party in the bifurcated ownership and operation of the UTEN, it became clear that third-party ownership of the geothermal borefield by Troy LDC introduced unacceptable risks to the project’s viability. One of the primary issues was that Troy LDC, being a municipal nonprofit corporation, not a government entity with taxation powers or other revenue sources, faced limitations in securing traditional and non-traditional project financing.

Additionally, Troy LDC has no experience with operating complex utility-scale systems, yet the reliable service of all NMPC customers would hinge on their performance. This operational model required Troy LDC to contract out all operations and maintenance to a third-party firm, which introduced additional operational risks, and potential disruptions to stable system operations and maintenance during the life of the UTEN over which NMPC would have minimal control.

Further compounding these risks, Troy LDC would lack the financial resources and responsibility for operational or business risks and liability, meaning such risks and liability would ultimately be transferred to NMPC and, by extension, to its customer base. The uncertainty surrounding the magnitude of this financial and liability risk also made developing an accurate estimate of the Thermal Energy Resource Fee and negotiations of risks, liabilities, and indemnifications in the Thermal Energy Resource Agreement exceptionally difficult. As negotiations continued, it was evident that NMPC and Troy LDC would not reach final resolution in time to support the project's submission deadlines, necessitating reconsideration of the borefield's ownership structure and risk allocation.

6.4 New Project Scope

Recognizing the persistent challenges around financing availability, risk and liability allocation, and operational responsibility, NMPC and Troy LDC ultimately agreed to rescope the Troy UTEN Pilot to bring the entire UTEN system under NMPC's direct control. Under this revised configuration, NMPC will assume responsibility for the construction, ownership, operation, and maintenance of the borefield, integrating Troy LDC's borefield design with NMPC's UDS and Energy Center. Troy LDC, in turn, will transition to a landlord role, leasing the land from the City of Troy and subleasing it for both the Energy Center and the borefield to

NMPC. This relationship with Troy LDC will provide NMPC with permitting and community engagement support, while relieving Troy LDC of any construction and operational duties.

Risks associated with operations and maintenance of the system are also reduced under a single ownership model. With all operations being the responsibility of NMPC, the risk of depending on a third party for repairs and maintenance of the borefield upon which NMPC customers depend upon is eliminated, the chain of command and response procedure in any emergency situation is simplified, and the risk of being financially liable for operations and maintenance activities performed by Troy LDC are also eliminated.

For Troy LDC, as an entity with no taxation or revenue raising power, it was very difficult and risky to procure financing for a project which may not be approved for construction or that did not have some degree of certainty of when construction may commence. By adjusting the design to have the UTEN system operated under a single owner, it became possible to eliminate the borefield pumping station that would have been located in a City-owned garage space. In a single ownership model, NMPC will now own the pumps that control flow through the borefield, making it possible to upgrade the pump sizes in the Energy Center while adding a small valve vault to control flows, and reducing the overall cost of the system.

As an added benefit, by shifting the ownership model of the UTEN system from multiple owners to a single owner, the project now qualifies for the federal investment tax credit for geothermal heat pump equipment as currently drafted, thereby reducing the ultimate costs to all NMPC's ratepayers if the project is approved for construction and if the company determines the project is eligible for tax credits (See Section 9.6 for more information about the project's eligibility for the geothermal investment tax credit).

The collaborative relationship between NMPC, Troy LDC, and the City of Troy remains strong, as Troy LDC and the City will continue supporting the project through permitting assistance, construction facilitation, and future customer enrollment efforts. Ultimately, this approach offers the most effective path forward - enabling the submission of project documentation within a reasonable timeframe, while substantially mitigating operational risk to NMPC and its customers.

7 Metrics

As part of the Troy UTEN Pilot, the Company will have an EM&V program to collect useful data which may be used by the Company and others in the future to inform the design of future UTEN systems. The Company will collect and report data including, but not limited to, flow rates at inlets and outlets, temperature and storage volumes, pressure, electric consumption, and demand for customers and of utility owned infrastructure such as the Energy Center, Thermal Energy Resource and Utility Distribution System. Along with collecting data pertaining to the performance of the UTEN system, NMPC will obtain data to better understand the participating customers' experience both pre and post construction.

Safety, reliability, and resiliency are key features of any UTEN system to provide its customers with satisfactory service. The Company will ensure the UTEN system is operating reliably and will meet the standard of safety, reliability, and resiliency that gas and electric customers expect from a utility. To ensure the UTEN system is operating reliably within design conditions, the Company will monitor, analyze, and control the performance of the UTEN system using a SCADA system as well as monitoring through our Critical Network Infrastructure (“CNI”) applications and platforms.

The operations of the system at the Energy Center are controlled by a SCADA system that is tied into the existing gas system. To prevent co-mingling of data and to separate out the security and privacy requirements of operational equipment in contrast to the Pilot data collection, a redundant building management system (“BMS”) will be provided at the Energy Center to collect temperature, flow, and energy usage of the system as defined in the EM&V plan. Set forth below are details about the type of data to be collected via NMPC’s comprehensive EM&V plan.

Set forth below are bullets summarizing the data to be collected via NMPC’s comprehensive EM&V plan. The below list is not all encompassing. See Appendix F for all metrics and data that will be reported.

7.1 Technical

- Building use/occupancy, type / vintage, sector, and sq. ft. of conditioned space
- Nameplate capacity and rating condition of installed space conditioning, and domestic hot water equipment
- Nameplate capacity and rating condition of other equipment served by the Utility Distribution System (e.g., heat rejection from refrigeration systems)
- Electricity consumption of installed space conditioning, and DHW equipment
- Electricity consumption of other equipment served by the UDS
- Heat pump startups
- Heat exchanger inlet and outlet temperature, UDS side
- Heat exchanger inlet and outlet temperature, customer side

- Design capacity and rating condition of each Thermal Energy Resource (including peaking, backup, and borehole balancing equipment)
- Design anticipated annual thermal energy (heating and cooling) provided by each Thermal Energy Resource
- Thermal energy extracted from each Thermal Energy Resource to UDS
- Thermal energy rejected to each Thermal Energy Resource from UDS
- Inlet and outlet temperature to each Thermal Energy Resource
- Electricity consumption of circulation pump(s)
- Electricity consumption of heat pump(s)
- Electricity consumption for each Thermal Energy Resource
- Other fuel consumption for backup operation
- Thermal energy for heating from each peaking/backup equipment
- Startups for each peaking/backup equipment
- Hours in operation for each peaking/backup equipment
- Outlet temperature from each peaking or backup equipment
- Thermal energy for heating into thermal energy storage
- Thermal energy for heating out from thermal energy storage
- Inlet and outlet temperature, thermal storage
- Array of thermal storage tank temperatures at varying levels to gauge remaining storage capacity
- Thermal energy for cooling into thermal energy storage and out

7.2 Customer

- Total number of customers offered the opportunity to take UTEN service, taking UTEN service and customers opting out of UTEN service
- Total number of customers electing to remain taking UTEN service at the term of the pilot
- Additional root-cause analysis to be conducted to determine why the customers chose not to enroll, to opt out during the pilot and chose not to remain taking service from the UTEN
- Number of customers aware of pilot project details
- Number of customers that understand the Customer Agreement
- Customer communication preference
- Customer experience with the UTEN pre-construction process and
- Customer experience with UTEN service quality and reliability
- Customer experience with the UTEN complaint and resolution process
- Customer Experience with the UTEN post-construction process
- Contact related to utility customer, billing issues, quality of service and customer operation of the UTEN and service contractor performing work on-site
- Customers that have made contact more than once and/or addressed on first resolution attempt

7.3 Safety/Reliability

- Curtailment - duration and cause
- Duration of curtailment period

- Asset failure - duration and cause on Customer and UDS side
- Leak of Transfer Fluid, location and cause on Customer and UDS side
- Shut down of all, or a portion, of the UTEN - duration and cause
- Response time to customer outage/trouble calls
- Concentration of antifreeze agent, such as glycol, in the heat transfer medium
- Maintenance tasks and / or inspections
- Property damage due to asset failure
- Environmental impact due to leak of Transfer Fluid on customer side and UDS
- Volume of Transfer Fluid loss on customer side and UDS
- Injuries or fatalities
- Theft of thermal energy from the UDS
- Property damage due to asset failure
- Excavation damages

The Company will furnish metrics related to operational and capital expenditures as well as societal. Additional metrics will be collected upon the completion of Stage 3b of the project and will continue to be gathered monthly for the UDS, customer side, and Thermal Energy Resources. Metrics shall include, but are not limited to, the following

- Necessary upgrades to electrical infrastructure, including maintenance and operational labor
- Maintenance, labor, and energy costs associated with equipment and facilities
- Property taxes related to land and land rights
- Costs associated with customer-related equipment, facilities, and labor

- Existing HVAC and DHW retrofits and / or removals
- Heat pumps, heat exchangers, piping, and valving
- Instrumentation
- Improvements to equipment and facilities
- Efficiency upgrades, if applicable
- Design and inspection costs
- Permitting expenses
- Software and intangible assets
- Metering costs

8 Construction Schedule

The project schedule in Table 2 sets forth the Company's high-level plans to progress the Troy UTEN Pilot through the pilot term and the completion of Stage 5. Please see Appendix G for a more detailed view of the project schedule. In developing the project schedule, the Company assumed certain durations for Commission review and approval of Stage 2 and Stage 3a submission material and subsequent advancement of the Company to future stages of the project. If the duration of the review and the approval processes differ from the Company's assumed durations, the schedule will need to be reevaluated to consider time of year and other restrictions which may cause non-linear changes to the schedule. Delays or changes in the schedule may also result in impacts to the project cost estimates.

Table 2: Troy UTEN Pilot Schedule

Timing (Estimated)	Action
Stage 1 and 2 Schedule	
Jan '23	Troy UTEN Pilot site proposal filed with the Commission
Sep '23	Guidance Order published by the Commission
Dec '23	15% Design Complete: UTEN w/ Atrium Energy Center Location (w/o Thermal Resource)
	15% Design Complete: Customer Connection
	Permitting: Begin process of identifying permits for UTEN
	Permitting: Begin process of identifying permits for Customer Equipment
	Stage 1 Troy UTEN Pilot Filing submitted to the Commission
Apr '24	Commission approval to advance to Stage 2 received
Jul '24	30% Design Complete: UDS
	30% Design Complete: Energy Center - Atrium Location
Nov '24	60% Design Complete: UDS
	60% Design Complete: Energy Center - Atrium Location
May '25	60% Redesign Complete: UDS (Integrate Energy Center @ 249 River St.)
	60% Redesign Complete: Energy Center - 249 River St. Location
	30% Design Complete: Customer Connections/Retrofits
Jun '25	60% Design Complete: Customer Connections/Retrofits
Jul '25	90% Design Complete: UDS
	90% Design Complete: Energy Center - 249 River St. Location
	90% Design Complete: Customer Connections/Retrofits
	Initial Stage 2 Troy UTEN Filing submitted to the Commission
Nov '25	90% Design Complete: Thermal Energy Resource
	90% Redesign Complete: UDS (Integrate Thermal Energy Resource)
	90% Redesign Complete: Energy Center - 249 River St. Location (Integrate Thermal Energy Resource)
Dec '25	Revised Stage 2 Proposal submitted to the Commission
	Letter of Intent Finalized with the City of Troy and Troy LDC
Stage 3a Schedule	
July '26	Commission approval to advance to Stage 3a received
	Phase 1 Due Diligence – Thermal Resource Property
Aug '26	Permitting: Begin filing for all construction and environmental permits
Sep '26	Complete Pre-Construction Utility Confirmation Test Holes
	Phase 2 Due Diligence – Thermal Resource Property

Timing (Estimated)	Action
Nov '26	100% Design Complete: UDS
	100% Design Complete: Thermal Energy Resource
	100% Design Complete: Energy Center
	100% Design Complete: Customer Connections/Retrofits
	Finalize Issue for Bid (“IFB”) Design and Prepare Bid documents
	Sub-leases executed with Troy LDC for Energy Center and Thermal Energy Resource
	Customer Agreement executed and Customer Enrollment Completed
Stage 3b Schedule	
Nov '26	Commission approval to advance to Stage 3b received
Dec '26	Procurement: IFB package and Request for Proposal (“RFP”) released to the market
May '27	Procurement: Contract award and onboard contractors
Jun '27	Secure Temporary Easement Agreements for Construction Laydown/Staging Areas
	Permitting: All permits obtained
Jul '27	Notice to Proceed Provided to Contractors; Mobilize for Construction
	Begin Construction
Aug '28	Begin Startup and Commissioning
Oct '28	Complete Startup and Commissioning
	Complete Construction
Stage 4 Schedule	
Oct '28	Commission approval to advance to Stage 4 received
	System placed into service
Oct '29	1 year of service complete
Oct '30	2 years of service complete
Oct '31	3 years of service complete
Oct '32	4 years of service complete
Oct '33	5 years of service complete
	Pilot phase concluded
Stage 5 Schedule	
Oct '33	Commission approval to advance to Stage 5 received
Apr '34	Pilot Project Review and Recommendations Report filed with the Commission
	Project Close-Out Report filed with the Commission

The Troy UTEN Pilot is anticipated to take two construction seasons to build. In consideration of the seasonality of construction works in Upstate New York, the proposed schedule will be highly dependent on the duration of Stage 2 submittal review. Assuming approval to move to Stage 3A is received by July 2026, procurement and pre-construction activities will begin immediately, with the target of a July 2027 construction start. It is expected that most work will occur during the 2027 and 2028 construction seasons with some Energy Center and Thermal Resource drilling work during the winter of 2027-2028. The system is planned to be placed into service in October 2028. The construction work included within this project can be divided into five primary categories as discussed below.

8.1 Utility Distribution System – In-Street Works

The Utility Distribution System consists of approximately 3,000 ft of HDPE piping that is located within the City of Troy’s streets. It is expected that the in-street work noted above will take approximately 6 months to complete. This scope is expected to begin in Summer 2027 and completed during the Summer of 2028, but it should be noted that this work cannot be performed during the winter months.

8.2 Thermal Energy Resource – Borefield Construction

Construction of the borefield will begin during summer of 2027. A dedicated drilling contractor will be working on the task of installing the geothermal boreholes and associated piping and infrastructure. Construction of the borefield will take place in parallel with construction of the Energy Center and UDS pipe network. It is expected the borefield construction will take approximately nine months with the assumption that two drill rigs are working simultaneously and that work can continue through the winter of 2027/2028.

8.3 Energy Center – Facility Construction

The Energy Center will be constructed at 249 River St. and will contain equipment responsible for conveying transfer fluid between the geothermal borefield and the UDS, and pumping transfer fluid through the UDS loop, to customer buildings, and returning to the Energy Center to exchange heat with the geothermal borefield. The construction of the Energy Center will begin during the 2027 construction season.

8.4 Energy Center – Inside Work

The Energy Center requires significant mechanical, electrical, and control installations. Since this portion of the construction primarily will occur inside the buildings, NMPC will be able to work during the winter. Depending on the construction progress, inside work in the Energy Center will take place during the winter of 2027/2028 and continue through the 2028 construction season.

8.5 Customer Retrofits and Connections

Construction of customer connections and customer retrofits will be performed in parallel with the work on other areas of the project. New customer equipment and infrastructure will be installed adjacent to existing equipment, and all connections will be installed, tested, and commissioned prior to shutting down the existing HVAC and plumbing systems and connecting to the new UTEN system, so that when the UTEN is complete, the process to shift the building to the UTEN system is designed to be a seamless transition. All work which requires a shutdown of a building's HVAC heating or cooling services will be performed during the shoulder seasons, or during the summer for a limited window of time.

9 Project Costs

9.1 Construction Costs

For the Stage 1 Troy UTEN Pilot Filing submitted by the Company on December 15, 2023, a preliminary cost estimate was prepared based on a conceptual design and developed for feasibility analysis (“Preliminary Construction Cost Estimate”). In the Stage 1 Troy UTEN Pilot Filing, the Company had estimated the cost of construction to be \$38.2 M. The Preliminary Construction Cost Estimate expanded on previous iterations of the project estimate which were submitted prior to December 15, 2023. During the advancement of the required Stage 2 deliverables, most notably the development of decision quality design documents, the Company has undergone a more detailed cost estimation process to further facilitate financial planning and resource allocation.

For the Stage 2 Troy Filing, the Company has developed a detailed project cost estimate using a 90% design for all project components, including, but not limited to, the Energy Center, Utility Distribution System, Thermal Energy Resources, and Customer Retrofits (“Detailed Construction Cost Estimate”). Quantity takeoffs were completed for each of the project components to calculate direct project costs. Indirect project costs were calculated and added, as well as risk-based contingency, which was calculated in accordance with the Company’s risk management procedures. A quantitative risk analysis was performed using a Monte-Carlo simulation to generate a P80 risk contingency value.

To define the inputs for the Monte-Carlo simulation, a risk workshop was conducted to identify project specific risks and rank probability, cost, and schedule impacts. The simulation output created a distribution curve showing the theoretical range of possible outturn costs based on the risks identified. The P80 Risk-Based Contingency, produced as a result of the simulation,

assigns specific monetary value to the risks identified based on their probability, cost impact, and schedule impact. P80 Risk-Based Contingency is not calculated as a percentage of the total project cost as was done in the Preliminary Construction Cost Estimate. The Detailed Construction Cost Estimate incorporates the P80 value (80th percentile from the risk simulation).

The Detailed Construction Cost Estimate submitted herein reflects the Company's most informed projection of project cost expenditures at this time. However, external influences such as market volatility, inflation, and tariffs are unpredictable, and it is uncertain how conditions will change between submission of this Revised Stage 2 Proposal and, if approved, progression to Stage 3b and the issuance of the RFP. Once Stage 3b commences and the procurement process begins, the Company will have an even more accurate understanding of project cost expenditures based on final quotes and bids received from contractors and vendors. At this point, if the actual bids and quotes exceed the estimated amount submitted with its Revised Stage 2 Proposal, the Company may need to seek a funding increase from the Commission before agreeing and contracting with any vendor and /or contractor. NMPC's Revised Stage 2 Proposal cost estimate has been prepared using all currently available information and is expected to cover all costs needed to construct and operate the Troy UTEN Pilot for its 5-year pilot lifetime. With the current volatile market conditions in mind, and the inability to accurately predict pricing at the time of procurement with certainty, NMPC will address such cost expenditure issues as presented above.

Based on the detailed estimate developed by the Company, the total design and construction costs are estimated to be \$77.9 M as set forth in Table 3 below.

Table 3: Troy UTEN Pilot Design and Construction Cost Estimate

Construction Costs (\$M)	
Project Component	Cost
Utility Owned Equipment	\$41.1
Customer Equipment	\$8.8
Design & Project Development	\$6.1
P80 Risk-Based Contingency	\$17.5
Escalation	\$4.5
Total	\$77.9

The increase of \$39.7 M from the Preliminary Construction Cost Estimate to the Detailed Construction Cost Estimate is primarily due to scope and schedule changes. Scope changes which are reflected in the Detailed Construction Cost Estimate are the inclusion of the cost of the geothermal borefield, which was previously not included, redesign of the Energy Center from being located in the basement of the Atrium to being its own standalone building, the addition of an ASHP at the Energy Center, revisions to the participant buildings connecting to the UTEN, and design advancements from the preliminary design.

9.2 Operations and Maintenance (“O&M”) Costs

For the Stage 1 Troy UTEN Pilot Filing submitted by the Company on December 15, 2023, a preliminary operation and maintenance cost estimate (“Preliminary O&M Cost Estimate”) was prepared based on a conceptual design and understanding of system requirements. The

Preliminary O&M Cost Estimate was developed for feasibility analysis. The Preliminary O&M Cost Estimate claimed that the total 5-year O&M cost would be \$14.4 M, including a 40% contingency on all O&M line items. The Preliminary O&M Cost Estimate expanded on previous iterations of the project estimate which were submitted prior to December 15, 2023. Since then, the Company has advanced the design of the Troy UTEN Pilot significantly, changed the scope of Company owned assets, and has gained a better understanding of the system requirements. Based on a 90% design of project components owned by the Company, including, but not limited to, the Energy Center, Utility Distribution System, and Thermal Energy Resources, the Company has developed an updated estimate (“Detailed O&M Cost Estimate”) of the costs to own, operate, and maintain these components, and therefore, the system. The Company will be updating the O&M cost estimates during Stage 3b when the in-service date will be closer, and the Company can more accurately determine expected maintenance costs, and, respectfully requests the flexibility to reallocate approved funding across all project categories including these O&M costs to offset unexpected cost overruns in one area with savings realized in another area. As mentioned above, all such reallocations would be fully documented and included in the monthly reports submitted to the Commission. Table 4 below sets forth the O&M costs estimated to be incurred post-commissioning.

Table 4: O&M costs during 5-year pilot period

Operations & Maintenance Costs (\$M)	
Project Component	Cost
Full-Time Employees & Upskilling	\$5.31
Property Taxes	\$5.85
System O&M Requirements	\$1.84
Selective 5% Contingency	\$0.003
5-Year O&M Total	\$13.01

The 5-year O&M total of \$13.01 M as presented in the table above is expected to cover all costs NMPC expects to incur during the 5-year pilot lifetime. This total includes the funds necessary to hire new full-time employees (“FTE”) to support the safe and reliable operations and maintenance of the UTEN system. The 5-year O&M total also includes property taxes which NMPC expects to pay on the assets it will install and own. The property tax burden was calculated using a cost approach. The Company will engage the local Industrial Development Agency to explore the opportunity for a Payment in Lieu of Tax Agreement (“PILOT”) for this project. A PILOT would enable the Company to structure the property taxes over a longer period of time and make the project more cost competitive to ensure a lower cost burden on rate payers. The decrease of \$1.39 M in 5-year total O&M costs from the Preliminary O&M Cost Estimate to the Detailed O&M Cost Estimate is due to two main driving factors. The first major driving factor is a change in how NMPC applied contingency to the O&M cost line items. Previously NMPC used a 40% blanket contingency on all O&M line items. In this estimate, due to advancements in design and a better understanding of system requirements, NMPC has reduced

the contingency to 5%. Additionally, NMPC has not applied the 5% contingency to all line items; rather it has chosen specific line items to which it was applied. For line items which NMPC has relative certainty about such as FTE salaries and real estate costs, no contingency was applied. The second major driving factor is a refinement of, and deeper understanding of, system O&M requirements obtained by advancing the design of the UTEN from 15% to 90%.

9.3 Total Project Costs

A summary of costs to be incurred through the end of the 5-year pilot period is provided in Table 5 below. NMPC will continue to incur O&M costs after the 5-year pilot period so long as it is authorized to continue to own and operate the Troy UTEN.

Table 5: Summary of Costs

Item	Cost (\$M)
Project Development, Design, and Construction Costs	\$77.9
5-Year Pilot O&M Costs	\$13.01
Total Pilot Costs	\$90.91

It is important to note the following exclusions:

- The current total cost estimate does not consider any incentives, grants, co-funding, tax credits or other third-party contributions (collectively “Cost Contributions”) that could be found to be available to offset the cost of the Troy UTEN Pilot.
- The current total cost estimate does not include Allowances for Funds Used During Construction (“AFUDC”), as these costs are reflected in the revenue requirement calculation provided in Appendix H. The current total cost estimate also does not reflect the Company’s internal allocation of Capital Overheads (“COD”) and Administrative and General Overhead expense (“A&G”) as these costs were assumed to be inapplicable to

the Pilot. Forecasted labor and related overhead costs proposed to be recovered through the Pilot cost recovery mechanism will only be those costs incremental to base rates under NMPC's current rate plan.

Adjustments to the total project cost estimate reflecting any Cost Contributions will be included only after NMPC has received approval or other certainty of the applicability of any Cost Contributions to the project. It is important to note that these costs are not fully indicative of the costs of a full-scale UTEN with influential factors such as economies of scale and incentives that will optimize costs. Through the results of NMPC's EM&V program, NMPC anticipates obtaining learnings of how UTENs' cost effectiveness at scale can be improved.

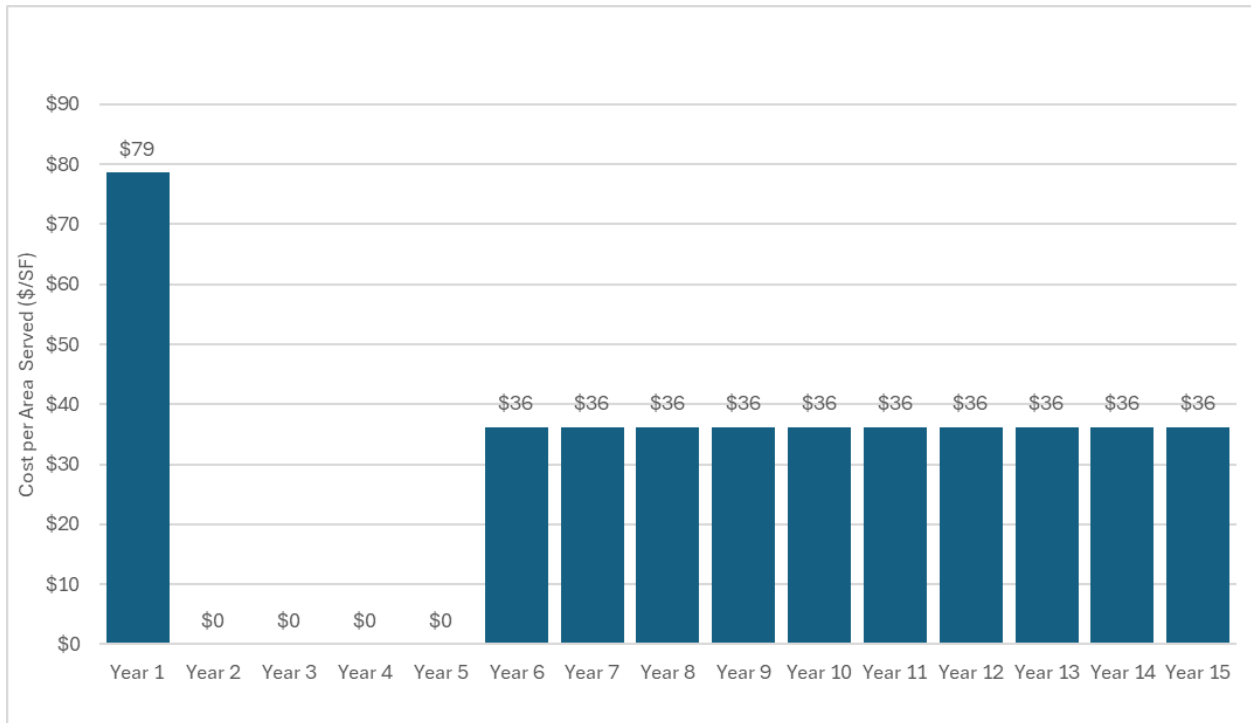
See Appendix I for more details of the Construction and O&M cost estimates for the Troy UTEN Pilot project costs.

9.4 Value of Sizing for Future Expansion

When designing the Pilot, there was some uncertainty as to which buildings would connect to the system at the current time or in the future. If NMPC were to design the system to meet only the needs of the five current customers, the pipe size would only be about 10". Pipe trench street restoration would still be similar in scope. The costs of sizing components for future expansion accounts for only approximately 1% of the estimated construction costs. This sizing allows for additional load to be added in the future to the system efficiently, with fewer impacts, and within reasonable costs. If the pipe were not sized for future expansion, and there were customers in the future who wanted to connect to the system, adding capacity would be prohibitively expensive compared to the marginal cost of future-sizing the system during construction.

Based on estimated building load, the UDS main has been sized large enough to serve all of the buildings along the distribution path. Additional thermal resources would be required to meet the heating and cooling loads, which could be connected at any point along the main. The remaining, unconnected building area along the UDS main totals approximately one million square feet with the average building size coming in around 20,000 ft². This assumes that four buildings connect per year, over years 6-15 after the UTEN is in service, and that thermal resources can be added to support the additional load. Customer connection costs will be considerably lower after the initial connections for the pilot participants, as shown in the figure below. Costs include new pipe laterals from the main to the building mechanical rooms, pumps, BTU meters, and heat exchangers. Excluding the cost of thermal resources from the pilot costs and from the future costs, future connection costs are approximately 1/2 that of the costs during the pilot, due to the future-sizing of the UDS main.

Figure 5: Cost of Connecting to Customers Over Time



9.5 Total Project Costs to Date

Table 6 below sets the total costs incurred through November 2025, for the design & project development of the Troy UTEN Pilot. An updated table displaying the total costs incurred through December 2025 will be included in the Company’s January 2026 UTENJA Monthly Progress and Expenditure Report. For all costs incurred by the Company beyond December 2025, the Company shall continue to update its UTENJA Monthly Progress and Expenditure Report monthly in accordance with the guidelines presented in the Guidance Order. The expenditure shown in Table 6 below reflects the Company’s ongoing commitment to thorough planning, development, coordination, and engineering efforts to ensure successful project implementation.

Table 6: Troy UTEN Pilot Costs incurred through November 2025

Cost Category	Expenditure to Date (September 2022 – November 2025)	
	CapEx (\$)	OpEx (\$)
3rd Party Consulting	1,087,593	398,935
NMPC Engineering	253,611	34,009
NMPC Legal	-	-
NMPC Administration	126,707	15,756
Total	1,467,911	448,701
Grand Total	1,916,612	

After submission of the Revised Stage 2 Proposal, during the PSC review period, NMPC intends to prudently continue Stage 2 activities to advance the NMPC UTEN Pilot. NMPC will continue to complete tasks which are in line with the expectations of Stage 2. NMPC will

continue to engage with prospective customers and key stakeholders such as Troy LDC. Such tasks must be completed in the interim so that, following Commission approval to advance the Troy UTEN Pilot to Stage 3, NMPC will be well positioned to enroll customers and begin construction without delay. With respect to design progress, NMPC will pause any expenditures necessary to progress the design of all system components towards 100% completion until approval is received to advance to Stage 3.

9.6 Federal Investment Tax Credit

The Company has analyzed whether the Troy UTEN Pilot qualifies to claim the Section 48 federal Investment Tax Credit (“ITC”). This ITC offers a base credit of 6% of eligible project costs, which can increase up to 30% of eligible costs by satisfying prevailing wage and apprenticeship requirements. If approved to continue to Stage 3, the Company will complete a thorough review of the project with the assistance of a tax attorney to confirm whether or not the tax credit is applicable to the project at that time. Preliminary reviews of available information indicate that the Troy UTEN Pilot will likely qualify to claim the ITC as currently drafted now that there will be common ownership by NMPC of the borefield, underground distribution system, and at least one heat pump served by the geothermal network.

The Section 48 ITC, which applies to Geothermal Energy Property, includes projects that start construction before 2032 for equipment that uses the ground, groundwater, or other underground working fluids as a thermal energy source to heat or cool a structure. The final regulations issued in December 2024 clarified that ownership of both the geothermal ground loop equipment and at least one connected heat pump is required, although ownership of every heat pump connected to/served by the ground loop is not required. The geothermal property must

be used to heat/cool a structure, and equipment or portions of the system that provide hot water are not eligible for the ITC.

The Troy UTEN Pilot includes a geothermal borefield used as a thermal resource for the buildings connected to the UDS. Additional equipment that's integral to the borefield being able to perform its intended function of providing space heating and cooling services to the interior of a building may also be eligible property. The Energy Center pumps required to pump transfer fluid around the UDS and to deliver thermal energy to buildings could be considered eligible if ruled functionally interdependent. The Utility Distribution System transports ambient temperature transfer fluid to the buildings on the pipe route, and its eligibility depends on whether it can be seen as functionally interdependent.

In the rescoped project ownership structure, the entire UTEN, including the borefield, is under the single ownership of NMPC, satisfying one important criterion of qualifying for the ITC. In the bifurcated business model, with Troy LDC owning the borefield, it was less likely the project would qualify for the ITC. NMPC is obtaining tax counsel advice on the ability to claim the ITC for the different components of the Troy UTEN Pilot. The ITC cannot be claimed until the tax year the UTEN is placed into service. The preceding information accounts for revisions to the Section 48 ITC made with the passage of the One Big Beautiful Bill Act, passed July 4, 2025. Since the investigation by tax counsel as to the applicability of the ITC is ongoing and future legislation could also reduce or eliminate the availability of the ITC until the pilot project is in service, the applicability to the various components of the UTEN has not yet been determined, and the Troy UTEN Pilot's cost estimates have not included the estimated value of a potential ITC. If the Company is able to claim the ITC the year when the UTEN is placed into

service, the Company will not seek to recover costs for the amount of the tax credit claimed, as only actual costs incurred net of the claimed ITC will be included for cost recovery.

9.7 Customer Reversion Budgetary Costs

As part of NMPC's Customer Agreement, the Company offers participating Customers the ability to withdraw from participation should the UTEN system not meet certain specified operating requirements during the pilot's 5-year term. Should a customer choose to withdraw from participation in the UTEN through the applicable provision, Customers will have the option to be converted to the lowest-cost alternate heating or cooling system as determined by the Company. Provided the Customer qualifies for withdrawal from the pilot due to system performance in accordance with the terms of the Customer Agreement, the reversion costs will be the responsibility of the Company. NMPC does not expect this scenario to occur and has designed the UTEN system to operate well within the specified operating parameters. However, NMPC has developed conceptual cost estimates of the possible reversion costs it hypothetically could incur for each customer should the system be unable to meet the specified operating parameters and the Company is unable to correct the issue.

These costs are referred to as "Budgetary Costs" as they are conceptual in nature. The Company is not anticipating having to incur such costs and has not included these Budgetary Costs in the total project cost estimate for which it currently seeks approval to incur and recover. These Budgetary Costs are included for the Commission's information, to provide a sense of the potential, but unlikely, costs the Company may need to incur and recover in the future should a customer need to withdraw from the UTEN. The Company intends to file for the approval to incur reversion costs if, in the future, such costs are incurred. The Company can provide an update to the estimated cost of each customer reversion after a complete and detailed design and

estimate are developed. Table 7 summarizes the Budgetary Cost of converting each potential customer to an alternate heating and cooling system.

Table 7: Budgetary Customer Reversion Costs

Customer Name	Conversion Cost (\$)
Building 1	\$218,000
Building 2	\$235,000
Building 3	\$161,000
Building 4	\$311,000
Building 5 and Building 6	\$217,000
Total	\$1,143,000

It is important to note the following assumptions and exclusions:

- Any structural modifications required to support heavier equipment are not included.
- These costs are based on 2025 dollars and do not include inflation or escalation through the pilot’s development and 5-year term.
- The costs to design the replacement systems are not included.
- Requirements of any future regulations are not included.

In the event each customer needs to withdraw from the UTEN system, the following description illustrates how NMPC proposes to revert the customers.

9.7.1 Building Conversions

If each building were to withdraw due to poor system performance in accordance with the Customer Agreement, NMPC would propose converting the building to a boiler/tower water source heat pump loop. The conversion strategy assumes that the existing hydronic piping and equipment connected to the UTEN will remain in place to serve the building once converted.

Therefore, NMPC will install a gas-fired boiler and a cooling tower/fluid cooler (depending on the application) to meet the building loads. In instances where the building already has an operational and correctly sized boiler, cooling tower, or fluid cooler on site from pre-UTEN conditions, NMPC will reconnect the existing equipment for operation instead of installing a new piece of equipment.

9.8 Cost Recovery

If the Troy UTEN Pilot is approved by the Commission, the Company is requesting that all UTEN Pilot costs be recovered as follows:

- a. All capital expenditures for NMPC-owned assets are capitalized to plant, with an assumed ten-year life and recovered through normal rate recovery.
- b. Stage 1 and Stage 2 pre-commissioning operational expenditures (“OpEx”), and OpEx for expenditures made on behalf of customers for customer-owned assets (“Customer Construction Costs”), offset by the Thermal Energy Fees collected from the Troy UTEN Pilot participants, receive regulatory asset treatment amortized over 10 years, with carry charges accrued at the Company’s pre-tax weighted average cost of capital (“WACC”), beginning in the year the Pilot goes into service, and recovered as follows:

Recovery of Stage 1 and Stage 2 pre-commissioning OpEx expenditures and Customer Construction Costs will be initially set based on the amortization schedule of projected costs as provided in Appendix H. Recovery will be through a UTEN surcharge to sales and transportation customers. The UTEN surcharge will be recovered under the existing Delivery Rate Adjustment surcharge mechanism.

- c. All post-commissioning O&M expenditures other than Customer Construction Costs,

for the 5-year pilot period and for years after the 5-year pilot period ends, will be recovered through the UTEN surcharge in the year they are projected to be incurred as provided in Appendix H.

- d. Carrying charges for the recovery of all Troy UTEN Pilot costs will be at the Company's pre-tax WACC. The UTEN surcharge rate would be reset each year as follows:
 - i. To reflect a change in the projected revenue requirement based on actual expenditures.
 - ii. To reflect any over or under recovery based on the reconciliation of actual revenue collected through the UTEN Surcharge over the previous year, against the actual revenue requirement for that same period.
- e. The UTEN Surcharge will collect the UTEN Costs from customers by service class based on a volumetric basis.

If the Pilot does not receive Stage 3 approval, the Company proposes to record all Stage 1 and Stage 2 costs to a regulatory asset amortized over five years and recovered through the UTEN Surcharge. If the Pilot receives approval to proceed to Stage 3 and ends before the completion of the pilot period, the Company proposes to record all unrecovered costs to a regulatory asset amortized over five years and recover through the UTEN Surcharge.

The Company's cost recovery proposal in this Revised Stage 2 Proposal has been modified from the preliminary cost recovery approach included in its January 9 UTEN Pilot Proposal. The Company had preliminarily proposed that both capital and operating expenditures for the UTEN pilot be considered regulatory assets to be amortized over ten years, due to the lack of a geothermal plant account in the Federal Uniform System of Accounts. After further consideration and consultation with the Company's tax department concerning eligibility for federal investment tax credits and whether amortized regulatory assets could be challenged as

being ineligible, the Company has revised its proposal and will record UTEN capital costs to a Miscellaneous Equipment (Account 398) Plant Account.

The Company anticipates and requests that it be allowed to include Pilot costs and Thermal Energy Fees in base rates in future NMPC rate cases and that collected Thermal Energy Fees for the Pilot beyond the ten-year amortization period continue to reduce the revenue requirement for gas and electric customers. The draft gas and electric tariff leaves enabling cost recovery are attached as Appendix J.

9.9 Revenue Requirements and Bill Impacts

The revenue requirements for the Troy UTEN Pilot based on the cost recovery mechanism discussed above, and levelized over the ten years are summarized in Table 8a below and are presented in Appendix H. The associated bill impacts to typical Electric and Gas customers are presented below in Table 8b and Table 8c, respectively, and presented in Appendix H.

Table 8a: Summary of the Revenue Requirements

Units: (\$000's)	FY29	FY30	FY31	FY32	FY33
Return on Net Plant ADIT and OpEx	\$11,902	\$11,902	\$11,902	\$11,902	\$11,902
Regulatory Asset Amortization	\$1,068	\$1,068	\$1,068	\$1,068	\$1,068
Total Revenue Requirement	\$12,970	\$12,970	\$12,970	\$12,970	\$12,970
Electric Allocation (82%)	\$10,663	\$10,663	\$10,663	\$10,663	\$10,663
Gas Allocation (18%)	\$2,307	\$2,307	\$2,307	\$2,307	\$2,307

Table 8b: Average Monthly Bill Impacts to Electric Customers

	UTEN Surcharge	Delivery Bill Impact	Total Bill Impact
Service Classification No. 1	\$ 0.00060	0.40%	0.25%
Service Classification No. 1C	\$ 0.00015	0.21%	0.09%
Service Classification 2ND	\$ 0.00080	0.41%	0.28%
Service Classification 2D	\$ 0.09573	0.36%	0.18%
Service Classification No. 3 Sec	\$ 0.07328	0.29%	0.13%
Service Classification No. 3 Pri	\$ 0.06498	0.30%	0.11%
Service Classification No. 3 Sub	\$ 0.02300	0.22%	0.05%
Service Classification No. 3 Tran	\$ 0.02300	0.22%	0.05%
Service Classification No. 3A Pri	\$ 0.05972	0.25%	0.09%
Service Classification No. 3A Pri	\$ 0.05972	0.25%	0.09%
Service Classification No. 3A Sub	\$ 0.01776	0.15%	0.03%
Service Classification No. 3A Tran	\$ 0.01432	0.13%	0.03%

Table 8c: Average Monthly Bill Impacts to Gas Customers

	UTEN Surcharge	Delivery Bill Impact	Total Bill Impact
Service Classification 1	\$ 0.00323	0.32%	0.22%
Service Classification 2	\$ 0.00143	0.24%	0.13%
Service Classification 5	\$ 0.00038	0.25%	0.06%
Service Classification 7	\$ 0.00070	0.27%	0.10%
Service Classification 8	\$ 0.00033	0.24%	0.06%

10 Customer Protection Plan

The UTEN Customer and Community Engagement Program is designed to ensure transparent, timely, and accessible communication with the public regarding the UTEN project’s progress and its potential impacts on local roadways, homes, and businesses. A comprehensive Stakeholder Outreach Plan has been developed to keep all affected stakeholders informed and

engaged throughout the project lifecycle from development through construction to commissioning.

10.1 Customer & Community Engagement

The UTEN Customer and Community Engagement program will ensure that members of the public will have access to current information about project status and potential impacts to their roadways, homes and businesses.

The project team has created a dynamic Stakeholder Outreach Plan to ensure that all affected stakeholders and communities are engaged and well informed. By providing clear and timely information about current and upcoming activities, this plan seeks to set expectations for local residents about work in their area. A variety of outreach methods will be utilized to achieve this goal, including a multi-channel outreach strategy that includes a dedicated project hotline for public inquiries, a project website featuring FAQs, construction updates, an interactive system graphic, and the distribution of informational collateral such as fact sheets and project maps. Additional efforts include direct mailings to nearby residents and businesses, field cards and signage for on-site walk-up information, and door-to-door outreach to provide personalized engagement where needed.

The Project Engagement team will utilize these methods to support the project at all stages, from development, to construction, to commissioning. By layering the outreach approach through multiple channels, the project team will create a comprehensive network of information where impacted residents will have multiple resources available to learn about the work that is happening in their area and contact the project team with any more specific questions or concerns.

The UTEN Troy Pilot Stakeholder Outreach Plan is provided herein as Appendix K.

10.2 Customer Agreement

The proposed Utility Thermal Energy Network Customer Agreement (“Customer Agreement”), a sample of which is included herein as Appendix L, outlines the terms and conditions for customers participating in the Troy UTEN Pilot. Prior to enrolling, potential customers also will be provided with a Summary of the Customer Agreement, attached as Appendix M, highlighting the main components of the Customer Agreement. The Customer Agreement provides details of the Customer’s and the Company’s rights, responsibilities, and obligations including, without limitation:

- a. Installation and maintenance responsibilities and costs:
 - a. The Customer Agreement clearly distinguishes between the “Utility Thermal Energy Network” (installed, owned, and maintained by NMPC) and “Customer Equipment” (owned, operated, and maintained by the customer after the first year). It specifies who is responsible for installation, maintenance, and costs, including a provision for NMPC to repair/replace customer equipment within the first year.
- b. Pricing, billing process, thermal fees, costs covered by the UTEN Pilot Program, and payment options:
 - a. The Customer Agreement includes a section on the thermal fee, billing process, due dates, late payment charges, and other fees. It details how the thermal fee is calculated and the process for billing and payment, including special provisions for residential and non-residential customers.

- c. Customer exit/withdrawal options during the UTEN Pilot period and at the conclusion of the pilot phase:
 - a. Section 16 provides detailed “Withdrawal and Termination Options,” including multiple “Termination Alternatives” (e.g., shift to ASHP, individual GSHP, or return to original heating system). It outlines the process for customer-initiated termination and the responsibilities of both parties.
- d. Home Energy Fair Practices Act (“HEFPA”) protections, including, but not limited to, service terminations and the complaint process for residential customers:
 - a. The Customer Agreement directly references HEFPA protections for residential customers, including billing, payment, complaint procedures, and service termination protections as required by 16 NYCRR Parts 11 and 12.
- e. Customer consents and customer privacy.
 - a. Authorizes NMPC to share customer information with contractors, program administrators, and the PSC for pilot evaluation, with a commitment to anonymize data for public reporting. It also requires landlord assistance in obtaining tenant consents where applicable.

The Customer Agreement provides that the Company will provide thermal energy service during the “Pilot Period,” typically 60-months for those Customers connected from the initial date the UTEN is placed into service and will continue to provide thermal energy service in accordance with the terms of the Customer Agreement unless the Company is no longer

authorized by the Commission, regulation, rule or law to do so. If the Company is no longer authorized to provide thermal energy service, the Customer Agreement provides that the Company either will transfer their obligation to a third party or provide the Customer with another heating and cooling system based on the selected option. The Customer Agreement provides that in the unlikely event that the Company's UTEN fails to provide adequate service, and the Company cannot correct the issue in a timely manner, the Customer will have the option to end their UTEN service. If Customers choose to terminate for reasons not covered by the Customer Agreement, or maintain temperatures outside the recommended range, or otherwise do not comply with the Customer Agreement, the Customer will be responsible for *all costs* associated with the transition to another heating and cooling system.

The Customer Agreement authorizes the Company to install the equipment necessary to provide the Customer with heating, cooling, and/or domestic hot water service. This equipment may include a water source heat pump or other specialized components. The Customer is responsible for keeping their interior heating and ventilation equipment, such as heat pumps or ducts, in good working order. In the Customer Agreement, the Customer agrees to provide access to the Company when needed for inspecting, installing, or repairing the thermal network.

The Customer Agreement provides a monthly thermal fee to be paid by Customer and explains that the fee has been calculated so that Customer's total energy costs during the pilot period do not exceed what they would have incurred in total energy costs without participating in the UTEN Pilot Program. The Customer Agreement also provides that the thermal fee may be subject to change with prior Commission approval.

The Customer Agreement also provides that the Customer consents to the Company and its authorized representatives to access information about their energy usage and building to

monitor how effectively the thermal network is performing and explains that this information may be used to improve the UTEN Pilot Program and shared with third parties only as necessary to construct, maintain, and operate the UTEN and to meet the reporting requirements before the Commission or other relevant authorities. The Customer Agreement provides that the Company will take steps to anonymize Customer data as much as possible in public reports.

The Customer Agreement provides for important Customer rights as a participant in the UTEN Pilot as follows:

- The right to receive reliable service through the UTEN Pilot Program.
- For residential customers, the protections by the Home Energy Fair Practices Act which provides safeguards regarding billing, payment plans, dispute resolution, and notice before any service termination.
- The right to clear and timely billing, with the ability to dispute charges and seek resolution through the processes described in the Customer Agreement.
- The right to be informed about any changes to the terms of service, fees, or program structure, subject to approval by the Commission.

The Customer Agreement provides that, by signing, the Customer has the necessary authority or permission (as an owner or a tenant) to participate in the UTEN Pilot and that upon a sale or transfer of the property, a new owner or occupant must accept the responsibilities if service is to continue. If the Customer is a tenant and its lease terminates, the Customer Agreement provides that the Owner will take over the tenant's obligations.

The Company anticipates having to make minor modifications to the Customer Agreement as it receives participant queries and also to tailor to specific needs unique to a participant.

10.3 Customer Thermal Energy Fee

NMPC intends to charge all participating customers a flat Thermal Energy Fee which is not based on the actual capital or operating costs of the UTEN. The Thermal Energy Fee will be calculated individually for each participant in the Troy UTEN Pilot based on existing energy bills. To calculate the Thermal Energy Fee, NMPC completed extensive energy modeling for each building, as discussed in more detail in Section 5.1. The energy modeling created two scenarios for each building; a baseline scenario which modeled the buildings' current energy usage and a UTEN scenario which modeled the buildings' energy usage as a participant. Based on the models, NMPC calculated what each customer's annual energy cost would be for both scenarios by applying the appropriate electric and gas rate classes that each customer is subject to. Customer bills were used to calibrate models to reflect actual usage. The current project schedule places the in-service date for the Troy UTEN Pilot in October 2028. To most accurately model the annual energy costs for customers, NMPC applied NMPC Post-Rate Year 3 electric & gas rates. Currently, future supply rates for gas and electric are based on projections and the applicable future surcharges are unknown. Due to these limiting factors, which introduce a level of uncertainty which might put customers at risk of paying more than they otherwise would have, NMPC respectfully requests the ability to recalculate and update the Thermal Energy Fee it proposes to charge customers during Stage 3A when the in-service date is nearer and future energy rate projections more accurate.

Once the annual baseline and UTEN energy costs were established, NMPC subtracted the annual UTEN energy cost from the annual baseline cost to determine the total amount of savings that each customer may be eligible for. Understanding that energy modeling carries inherent uncertainty and requires several simplifying assumptions, NMPC proposes to only recover a

portion of the available savings from each customer as the Thermal Energy Fee during the pilot period. Charging only a portion of the available savings as the Thermal Energy Fee will mitigate the risk of increased energy bills for participating customers, which could result from potential inaccuracies in the energy models or adverse weather patterns causing customers to use more energy than predicted. To ensure that customers are not paying more for UTEN service than they otherwise would have paid for their baseline heating and cooling systems, NMPC proposes to review each customer's energy bills after the first year of pilot service and compare them to the previous 12 months' bills. Based on this comparison, NMPC may offer to lower a customer's Thermal Energy Fee if, in NMPC's sole discretion, a customer is paying more than they otherwise would have for a similar amount of energy usage in previous years. After this first year, NMPC proposes to hold the Thermal Energy Fee constant for the remainder of the Pilot term. After the Pilot term, if authorized to continue operating the UTEN, NMPC would propose that the Thermal Energy Fee assessed to customers will be determined based on data and analysis derived from shadow billing, described in more detail in Section 10.3.1, and future customer rates. Additionally, any increase in the Thermal Energy Fee will not exceed the rate of escalation approved for electric or gas services in the applicable rate case following the Pilot Term.

NMPC proposes to charge 80% of available savings from the participants as the Thermal Energy Fee. To calculate the exact Thermal Energy Fee that each customer will be required to pay, NMPC calculated the baseline and UTEN annual energy cost as described above. The cost delta between the baseline and UTEN scenario was reduced by 20% and divided by twelve, resulting in equal monthly payments.

However, if the calculation results show that a customer may pay more for their annual energy usage as a UTEN participant, compared to their baseline, NMPC proposes to not assess this customer a Thermal Energy Fee.

10.3.1 Shadow Billing

NMPC will employ shadow billing during the Troy UTEN Pilot to monitor and assess costs, analyze customer usage patterns, and evaluate rate performance and associated revenues without imposing actual billing changes on customers. Under this approach, NMPC will continue to provide customers with a single, official monthly bill, while simultaneously generating a simulated bill for each participating account based on the alternative rate structure or pricing schedule under evaluation. This process will allow NMPC to gather real-time data on how the Pilot's pricing model would affect customer bills, measure potential variations in customer costs, and determine whether the proposed structure yields outcomes that are more cost-reflective, equitable, or aligned with regulatory objectives, all while preserving the customer's status quo and avoiding customer confusion.

Throughout the Pilot, NMPC will collect, aggregate, and analyze data from the shadow billing process to project revenue shifts, identify potential gaps or inefficiencies, and assess changes in customer behavior that may result from the new pricing structure. By comparing shadow billing results to actual billing outcomes, NMPC can evaluate whether the pilot program, if implemented permanently, would yield stable revenues, promote expected customer conservation or load-shifting behaviors, and remain compliant with applicable regulations. This process will protect customers from exposure to experimental rates that have not been fully vetted and will support the preparation of comprehensive reports for the Commission and other

stakeholders. These reports will provide statistical data on customer classes, usage cost variability, and revenue impacts, offering an evidence-based framework for evaluating the feasibility of new pricing structures and informing potential adjustments to rate design or broader policy changes.

11 Project Impacts

The Troy UTEN Pilot project will be a source of cleaner heating and cooling for the historical City of Troy, will lower greenhouse gas emissions and minimize impacts to the electric grid as power demands increase relative to alternative approaches, and will provide a breadth of data, experiential learnings, and evidenced challenges and successes of UTEN implementation that will be key for implementing projects of this type in the future. Certain key learnings will be novel when compared to the data and learnings gathered by the portfolio of other UTEN pilot projects that the Company and other utilities will be submitting. Interest around the benefits of geothermal heat pumps for electrification is increasing as evidenced by the recent Department of Energy Report, Cost and Total Emissions Reductions Through Mass Deployment of Geothermal Heat Pumps for Building Heating and Cooling Electrification in the United States⁷ dated November 2023. These benefits include consumer heating bill decreases due to higher efficiency and emissions reductions with the driving benefit being the avoided electric system upgrades and costs, impact and timing required, as well as other advantages that the Company hopes to demonstrate with the Troy UTEN Pilot.

⁷ Liu, Xiaobing, et al. "Grid Cost and Total Emissions Reductions Through Mass Deployment of Geothermal Heat Pumps for Building Heating and Cooling Electrification in the United States." , Nov. 2023.

The Company intends to share the data and learnings, or a summary of the data and learnings, with the Commission through the Stage 5 Pilot Project Review and Recommendations Report. The information gathered throughout the pre-construction, construction, and operational phases of the pilot project will be used by the Company and may be used by others in the future to inform the design, development, construction, and operation of future UTEN systems.

11.1 Pilot Benefits

11.1.1 Explore New Revenue Stream for Public Land

In close collaboration with Troy LDC and the City of Troy, NMPC will be siting both the geothermal borefield and the Energy Center on land owned by the City of Troy. Following the project's recent rescoping, Troy LDC will no longer own the geothermal borefield itself; instead, they will retain ownership of the land on which the borefield is constructed. This arrangement ensures that Troy LDC continues to benefit from a new revenue stream associated with the project, while avoiding the additional risks and operational complexities that would accompany third-party ownership and management of the borefield.

11.1.2 Avoided Electric Grid Upgrades

Retrofitting historic buildings is difficult as most of these buildings are not energy efficient and have space constraints or use high-temperature building side distribution systems, which are not compatible with low-temperature ground-source heat pumps ("GSHPs"). If these buildings were to electrify their HVAC systems individually, they'd likely use ASHPs to serve this purpose. ASHPs are less efficient than GSHPs and would have a higher electric demand and consume more energy to provide heating, cooling, and domestic hot water than GSHPs.

Logically, it follows that if ASHPs were selected, the impact to the electric grid would be greater

than the UTEN solution and would likely require additional electric grid infrastructure upgrades which may not be necessary when implementing the UTEN solution. The Company plans to prepare a detailed study examining the potential impacts to the electric grid in each alternative scenario, both at the scale of the Troy UTEN pilot project, and at larger scale should the use of UTEN systems be expanded. It is anticipated that, if UTENs are implemented at scale, significant long-term electrical grid impacts could be avoided. This mitigation reduces cost impacts to ratepayers, reduces construction interference to the general public, and allows more grid capacity to meet other demands as many other energy systems electrify simultaneously with increasing grid demand. By showcasing the benefits of thermal energy networks, the Troy UTEN Pilot highlights the potential to avoid building new grid infrastructure, as opposed to individual building electrification.

11.2 Key Learnings

11.2.1 UTEN Systems Suitability for Historical Building Retrofits

Retrofitting historic buildings presents a unique opportunity to evaluate the applicability of thermal energy networks in addressing the widespread challenge of aging, inefficient heating systems. Across New York State and the broader United States, a significant portion of the building stock consists of historic structures that were not designed with modern energy efficiency standards in mind. Many of these buildings are currently undergoing electrification through individual solutions, such as air-source heat pumps, which may not optimize energy performance or grid impact. The Troy UTEN project will serve as a critical case study in demonstrating the feasibility, effectiveness, and potential advantages of connecting historic buildings to a shared thermal energy network. Key learnings will include the technical and

logistical considerations of retrofitting legacy infrastructure, the comparative performance of UTENs versus individual electrification methods, and the broader implications for emissions reduction in the built environment. These findings will inform future policy and infrastructure planning efforts aimed at decarbonizing historic building stock at scale.

11.2.2 Assess Customer Bill Impacts, Thermal Fee, and Cost Recovery Mechanisms

Through the Troy UTEN Pilot, the Company will evaluate the effects of being served by a UTEN system against other alternative scenarios. In the Troy project, the UTEN network is serving newly developed buildings, which otherwise would have been required by the CLCPA to select an alternative electric heating system, likely relying on ASHPs. This project can evaluate the performance of UTEN buildings vs other electrified buildings through the lens of increasing compliance with and achieving the goals of the CLCPA, and which system would provide greater utility savings relative to the alternative. By comparing potential electric bills with the anticipated customer bills of alternative systems, the Company will evaluate an equitable Thermal Energy Fee structure which can be implemented in the future as UTEN systems are expanded. The Company will charge pilot participants a flat Thermal Energy Fee during the pilot and will use shadow billing analysis on actual energy usage to develop a Thermal Energy Fee structure to be used in the future.

The Thermal Energy Fee will be used to offset some capital costs of installing the UTEN system, but the Thermal Energy Fee will not be high enough to fully recover capital costs from Troy UTEN participants alone. Through the Troy UTEN Pilot, the Company will explore cost contributions, such as tax credits, which will be used to lessen the impact on rate payers and learn how effective the chosen strategy for cost recovery is for implementing the pilot projects. The selected strategy for cost recovery for the Troy UTEN pilot will be assessing a surcharge to

existing gas and electric customers. The Company will assess whether this is an equitable strategy or if it disproportionately has negative impacts on any existing customers.

11.2.3 UTEN Projects Role in the Green Energy Workforce Transition

One of the main goals of the UTENJA legislation is to evaluate the effectiveness of implementing UTEN systems as a new industry that can employ natural gas workers as gas usage is phased out and building electricity usage increases. Gas pipeline workers and operators will need a new field to seek employment in, and UTEN systems have similar installation and operation procedures. The Troy UTEN pilot will evaluate the process by which an existing union contract can be leveraged to enlist the workforce in the construction phase of the UTEN project. The Company also plans to collaborate with workforce training and apprenticeship programs in order to grow the green energy workforce. Beyond the construction phase, the Company will train existing operations and maintenance employees on the UTEN system. This will help evaluate how suited existing employees are to operating and maintaining UTEN systems, and the amount of training required to upskill existing employees for work on UTEN systems.

11.3 Lessons Learned to Date

11.3.1 Coordinating with Troy LDC

Through the process of negotiating the Thermal Energy Resource Agreement with Troy LDC, the Company has gained critical insights into the complexities of structuring third-party partnerships for thermal infrastructure development. One of the primary challenges encountered was the need to establish a capped Thermal Energy Resource Fee years in advance of when that fee will be incurred to meet regulatory requirements for cost recovery submissions as part of the Stage 2 filing. This introduced significant uncertainty, requiring the development of risk

mitigation strategies to address potential cost variability. Additionally, the Company had to navigate the implications of working with a partner that does not bear financial liability for cost overruns, prompting the need for contractual mechanisms to allocate and manage risk appropriately. Beyond financial structuring, the coordination process has also facilitated early planning for several integrated operational functions, including system controls, data collection protocols, operations and maintenance responsibilities, and emergency response procedures. These learnings will inform future agreements and operational planning for UTEN systems involving third-party resource owners.

Between the time of the initial Stage 2 Troy filing in July 2025 and now, NMPC and Troy LDC collectively determined that the concept of third party ownership posed no benefits and the rewards of that configuration did not outweigh the risks which have been described above. There is no advantageous financing mechanism that comes from a third party owner that has no means of financing the borefield on its own. There may be more advantages of third party ownership of a thermal resource if the thermal resource already exists, as is the case with the Syracuse pilot, or if the owner would develop its own financing plan based on financial plans to monetize the thermal resource based on its own financial plans accounting for cost to construct and expected profit, which would be more analogous to a third party owning a natural gas supply and selling that to a utility company.

11.3.2 Evaluation of Third-Party Ownership for Thermal Resources

During the period between the initial Stage 2 filing in July 2025 and the present, NMPC and Troy LDC jointly assessed the potential benefits and drawbacks of third-party ownership of thermal resources. After thorough consideration, both parties concluded that third-party

ownership did not offer meaningful advantages in this context. The risks associated with such an arrangement, as previously described, outweighed any potential rewards.

One of the central findings was that a third-party owner, without its own means of financing the borefield, could not provide a beneficial financing mechanism for the project. In scenarios where the thermal resource already exists—such as with the Syracuse pilot—third-party ownership may present more advantages. Additionally, if a third-party owner were able to develop and execute its own financing plan, monetizing the thermal resource based on construction costs and anticipated profits, the model could resemble the existing structure in which a third party owns a natural gas supply and sells it to a utility company. However, in the case of the Troy UTEN project, such conditions were not present, and third-party ownership was not deemed advantageous.

11.3.3 Permitting in a Historic District

To date, the Troy UTEN Pilot has yielded valuable insights into the permitting and engineering design processes required to implement thermal energy infrastructure within a designated historic district. Early coordination with local preservation boards and municipal planning departments proved essential in aligning system design with historic preservation requirements. Permitting timelines were extended due to the need for architectural reviews and public hearings, underscoring the importance of early stakeholder engagement and transparent communication. Additionally, the engineering team identified opportunities to minimize surface disruption by co-locating utility distribution system piping within existing utility corridors, reducing both construction impacts and permitting complexity. These lessons will inform future UTEN deployments in similarly constrained urban environments and support the development of streamlined permitting frameworks for thermal infrastructure in historic contexts.

11.4 GHG Emissions Reductions

To compare the environmental impact of the baseline heating, cooling, and DHW systems to the electrified and to the UTEN heating, cooling, and DHW systems, greenhouse gas emissions were calculated for each scenario.

The appropriate emissions factors for each fuel type were defined in the LCCA Reporting Workbook provided by the DPS. The emissions factors were applied to the electricity and natural gas consumption over the project period and beyond the project period, extending out to 25 years, for all scenarios. Year 1 in this instance is 2028, the year the Troy UTEN is expected to be placed in service. The table below reports the total emissions in metric tons of carbon dioxide equivalent (“MT CO₂e”).

Table 9: Greenhouse Gas Emissions (MT CO₂e)

	Year 1	Year 5 Cumulative	Year 25 Cumulative
Baseline	1,747	8,032	31,685
Electrified	1,168	4,712	9,477
UTEN	999	4,062	8,666

11.5 Lifecycle Cost Analysis

The Guidance Order requires that utilities provide economic LCCA in their Stage 1 filings of a “UTEN versus individual building electrification.” An LCCA was performed for (1) the baseline, business-as-usual (“BAU”) case wherein there are existing systems with continued natural gas service, (2) an electrification case wherein individual electrification of buildings occurs, and (3) the UTEN case.

There is no analysis included for individual geothermal system since most properties in downtown Troy lack the land area needed for a standalone borefield. Drilling with specialized costly equipment in the basements of existing buildings may be possible in some scenarios, but the thermal loads of the buildings would not necessarily be able to be met by the bore holes within the footprint of the building. The same constraint stands for angled drilling, for which all bore holes would need to be contained entirely within the property. Therefore, a thermal energy network system is the only realistic means for utilizing GSHPs when electrifying these buildings; otherwise, ASHPs would likely be used for electrification in this downtown area.

11.5.1 LCCA Assumptions

For all scenarios, the LCCA makes the following assumptions:

- Analysis is for 25 years starting in 2028
- Electric and natural gas utility rates per 2026 NMPC rates
- Energy escalation including 2% general inflation per National Institute of Standards and Technology (“NIST”) tables
- The LCCA was conducted with an 8.42% nominal discount rate over 25 years
- The LCCA was conducted with general inflation at 2.20% per New York Department of Public Service (“DPS”) guidance
- O&M inflation was assumed to be 4.0%
- All cases are conducted in nominal dollars, which are inclusive of general inflation
- A factor of 2.1x was added to capital costs for the non-UTEN cases that would represent the design and construction contingencies, contractor overhead and profit, and construction inflation
- A sales tax of 8% was included for all cases.

11.5.2 LCCA Limitations

The LCCA is a high-level, preliminary estimate on the capital costs, operating costs, and Thermal Energy Fee for each analysis based on the information available. The following limitations should be considered:

- Electric grid upgrades will also contribute to project costs, the specific of which are still being estimated. It is anticipated that the individual electrification case, with the highest electric demand, will require higher cost upgrades than the UTEN case.
- There are significant costs associated with maintaining the NMPC gas and electric networks that are not considered in the analysis. These networks are intricately connected to provide redundancy and resiliency, it is difficult to calculate as a standalone cost.
- The project cash flow relies on long term estimates of utility rates that are difficult to predict with any accuracy.

The natural gas escalation rates from NIST do not include an assumption of the impact electrification has on the gas rate base and required capital recovery.

11.5.3 Baseline, Business-As-Usual (Natural Gas Continuation)

Assumptions applicable to the baseline case are as follows:

- Financing for equipment is at a rate of 8.42% over 10 years

11.5.4 Individual Electrification Case

Assumptions applicable to the individual electrification case are as follows:

- Financing for customer equipment is at a rate of 8.42% over 10 years

- Building HVAC system conversions are as follows:
 - Buildings 1, 2, 3, 5 and 6 complete the same work as in the UTEN case, except with electric boilers and cooling towers/fluid coolers instead of the UTEN connection
 - Building 4 converts from conventional rooftop units to ASHP rooftops units where applicable and installs variable refrigerant flow (“VRF”) systems with mechanical ventilation in all other spaces. Due to the refrigerant changeover and new A2L refrigerants, it is not clear without completing design whether this would be technically feasible and/or what refrigerant leak mitigation technologies would need to be incorporated.

11.5.5 UTEN Pilot Case

Assumptions applicable to the UTEN Pilot case are as follows:

- Cost recovery for the upfront NMPC owned infrastructure is amortized over 10 years with a nominal weighted average cost of capital of 8.42%.
- Cost recovery for upfront customer connections and equipment that NMPC will provide is amortized over 35 years with a nominal weighted average cost of capital of 8.42%.
- Customer connection costs will be covered by NMPC for those customers who choose to have NMPC perform retrofit design.

11.5.6 Results

The LCCAs were calculated both for societal and for customer costs. The societal LCCA analyzes the capital cost paid by NMPC, customer equipment replacement costs paid by the customer, natural gas costs, electricity costs, and maintenance and operation costs. The societal costs are shown in the Figure below:

Figure 6: Societal LCCA Results

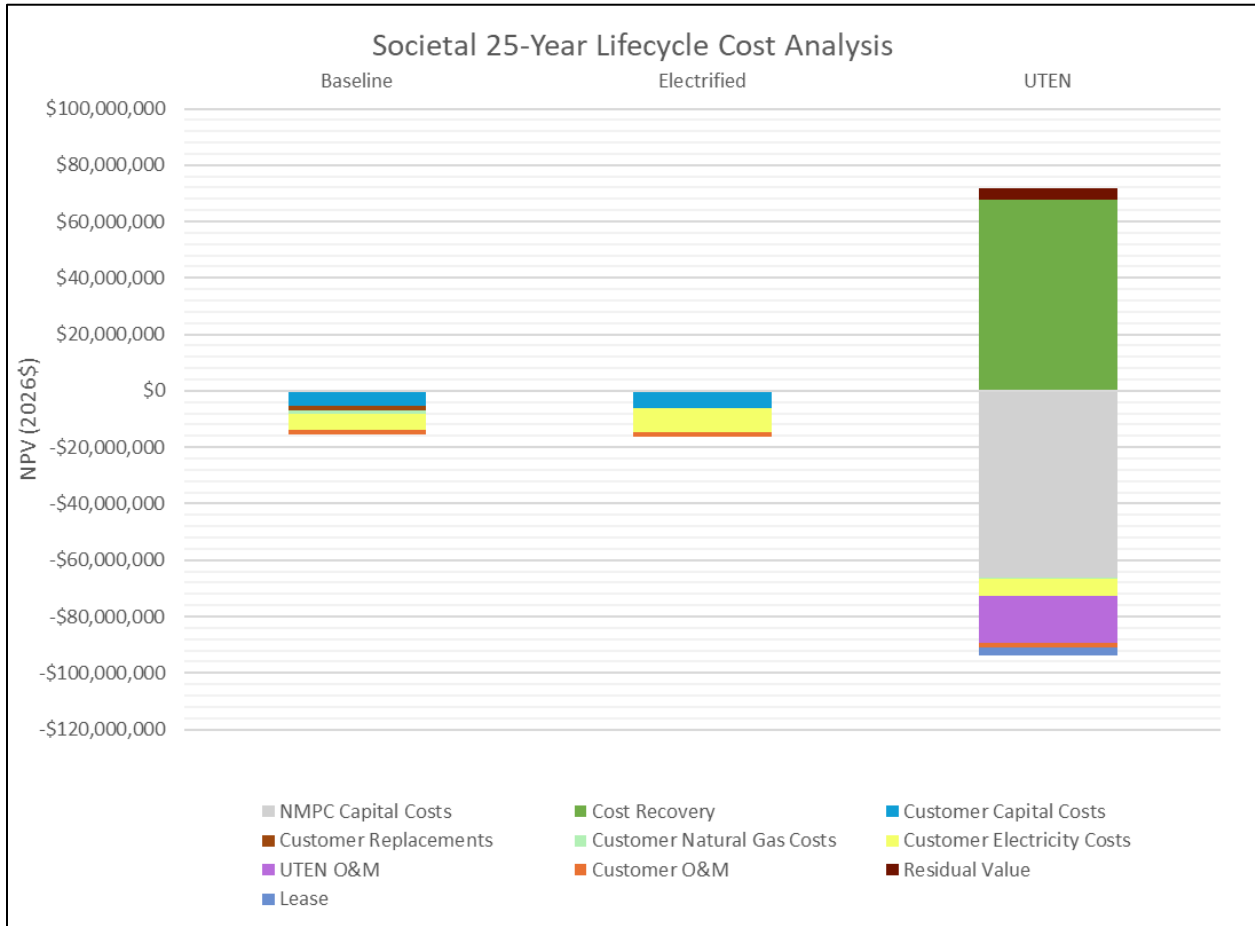


Table 10: Societal LCCA Results (\$ Million)

	Baseline	Electrified	UTEN
NMPC Capital Costs	\$0	\$0	-\$66.29
NMPC Cost Recovery	\$0	\$0	\$67.89
Customer Capital Costs	-\$6.95	-\$7.63	\$0
Customer Natural Gas Costs	-\$1.07	-\$0.15	-\$0.24
Customer Electricity Costs	-\$5.70	-\$8.40	-\$6.26
UTEN O&M	\$0	\$0	-\$16.61
Customer O&M	-\$1.78	-\$1.74	-\$1.41
Lease	\$0	\$0	-\$3.17
Residual Value	\$0.05	\$0.07	\$4.02
Total	-\$15.44	-\$17.85	-\$22.08

The customer LCCA analyzes the customer equipment replacement costs paid by the customer, customer electricity costs, customer natural gas costs, maintenance and operation costs, and thermal energy fee. The customer costs are shown in the figure below.

Figure 7: Customer LCCA Results

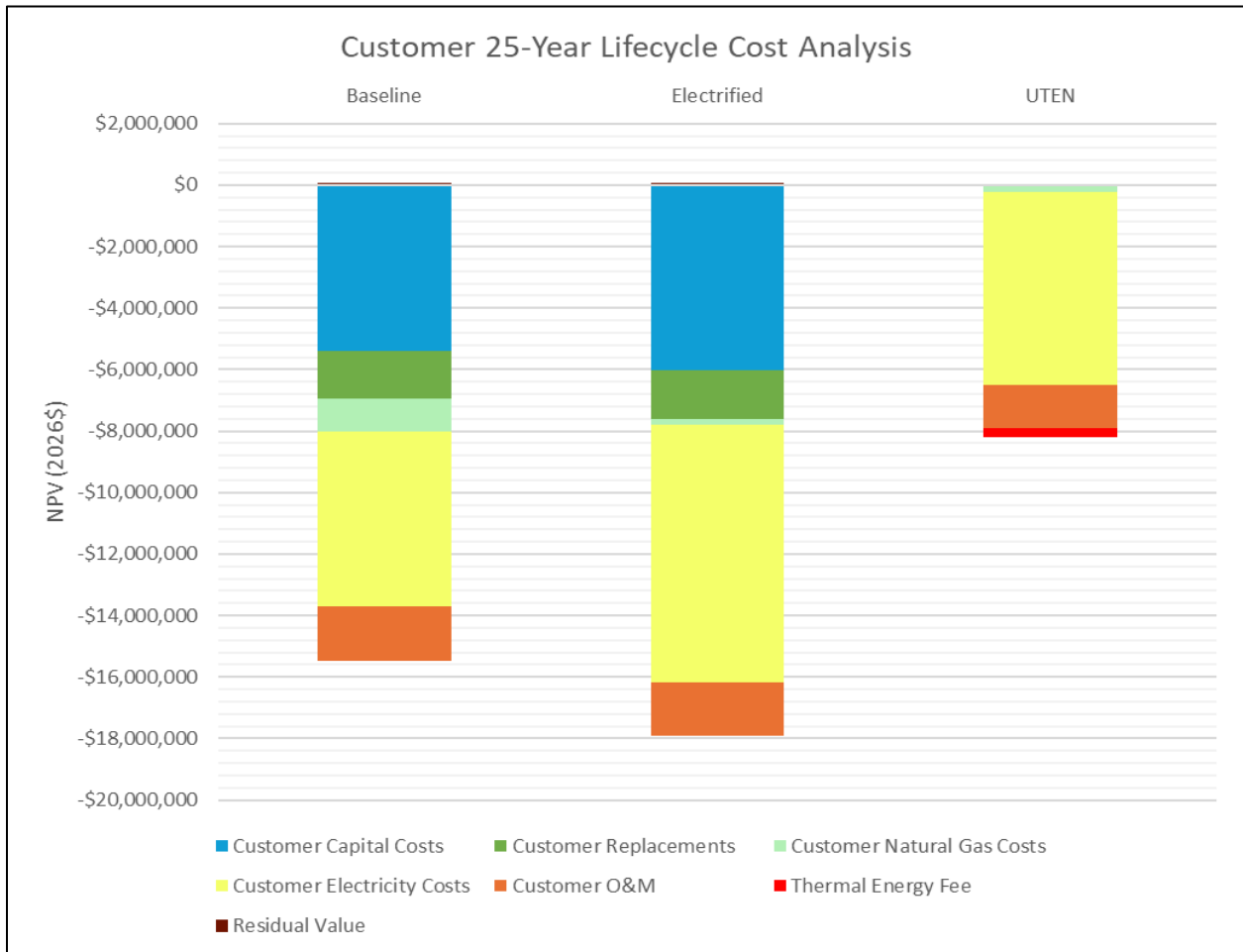


Table 11: Customer LCCA Results (\$Million)

	Baseline	Electrified	UTEN
Customer Capital Costs	-\$6.95	-\$7.63	\$0
Customer Natural Gas Costs	-\$1.07	-\$0.15	-\$0.24
Customer Electricity Costs	-\$5.70	-\$8.40	-\$6.26
Customer O&M	-\$1.78	-\$1.74	-\$1.41
Thermal Energy Fee	\$0	\$0	-\$0.29
Residual Value	\$0.05	\$0.07	\$0.05
Total	-\$15.44	-\$17.85	-\$8.15

For more details on the LCCA, refer to Appendix N.

12 Jobs Act

The UTENJA places a strong emphasis on supporting workers during the transition to clean energy. One of its core provisions is to ensure that utility companies prioritize hiring individuals who have lost or are at risk of losing their jobs due to the decline of fossil fuel-based infrastructure. This approach helps safeguard livelihoods while aligning with the state’s climate goals.

To prepare workers for emerging roles in the clean energy sector, the UTENJA aims to address the robust training and upskilling initiatives that will need to be designed to equip workers with the technical knowledge and practical skills needed to participate in the development and maintenance of thermal energy networks. This ensures that the workforce is not only retained but also empowered to thrive in a changing energy landscape.

In addition, UTENJA mandates that all projects adhere to prevailing wage laws and uphold strong labor standards. This guarantees fair compensation and safe working conditions for all workers involved in these projects. The act also encourages active collaboration with labor

unions, recognizing their critical role in shaping workforce development strategies and ensuring that worker interests are represented throughout the transition.

12.1 Workforce Development

The Company is committed to ensuring that its internal workforce is equipped to handle the additional skills and resources required by the Troy UTEN pilot and future UTENs and has recently engaged in numerous discussions, meetings, and collaborations to lay the groundwork for this initiative.

Collaborations undertaken to date include kickoff meetings designed to ensure that internal departments anticipated to have future involvement with the system are adequately informed of the relevant details. These meetings provided a platform for participants to raise any concerns or requirements pertinent to their respective groups. Based off the kickoff meetings, the majority of groups have confirmed their ability to assist and support the initiative without the need for additional resources at the current time. Lessons learned from the pilot with respect to resourcing will include the anticipated additional resources that may be needed long-term based off the tasks performed during the pilot. Discussions with NMPC's call center managers and directors, as well as representatives from the Billing Operations and Account Maintenance departments, were instrumental in shaping the Company's approach to UTEN customer billing processes. These interactions facilitated the dissemination of information to customer representatives regarding the progress of UTEN, enabling them to effectively address inquiries, concerns, and escalated issues. To facilitate this, an FAQ sheet will be created and will aid in providing additional training. Furthermore, there will be a Company representative in the field during construction to address any questions, manage field issues, and collect data both during construction and as the system goes live.

In addition to the already designated UTEN team, several key departments will play a vital role in supporting the UTEN project moving forward. These include System Operator and Control Center, IT & Digital, Estimating, Legal and Regulatory, Damage Prevention, and the Instrumentation and Regulation (“I&R”) department. Specifically, NMPC’s I&R team will shadow a contractor with experience in thermal energy systems to ensure job tasks can be brought in-house after the pilot period concludes. Throughout the shadowing process, we will develop procedures related to various aspects of the project, including but not limited to the maintenance of the Energy Center, glycol sampling protocols, and the facility and emergency response plan. NMPC’s I&R team’s skills align well with UTEN operational requirements. In instances where a current skill set is not available, they will engage a vendor to provide the necessary training to upskill the team. Furthermore, ongoing meetings with the IT and Digital departments are focused on the collaborative effort to identify the most suitable platform for our SCADA system, which will enable the extraction of metrics and reporting. The team has appointed a solution design architect to oversee the safeguarding of this data and address any additional IT requirements. The Company is also investing in the development of the future workforce through initiatives like “From the Ground Up,” an educational series in collaboration with Stony Brook University. As part of this program, members of the Troy UTEN Pilot team and other industry experts hosted a series of lunch-and-learn sessions designed to educate individuals who are new or soon to be entering the Utility Thermal Energy Network industry or the broader workforce.

12.2 Project Labor Agreements and Labor Peace Agreements

Prior to construction, the Company will use a Project Labor Agreements (“PLA”) for the construction of the UTEN. The Company is dedicated to ensuring that all construction and

installation work complies with New York State Labor Laws regarding prevailing wages and providing training opportunities for its current employees.

For any work performed by the Company's represented workforce during construction or once the UTEN is in service, it has been confirmed that the existing collective bargaining agreements will be applicable, and standard contractual agreements will be invoked to address any potential future roles. NMPC is committed to adhering to the hiring requirements outlined in the UTENJA. The Company's objective is to prioritize the employment of individuals who have been displaced or are at risk of losing their positions to fill these roles.

The I&R team trust that their skills align well with UTEN operational requirements but will need to shadow a contractor with experience in thermal energy systems to ensure these job tasks can be brought in-house after the pilot period concludes. Compensated union employees would be onsite to observe and take notes along with supervisor personnel. This will also inform all parties of expectations for the Operations and Maintenance phase of the pilot. NMPC will establish training programs tailored to specific asset types and manufacturers. Based on field assessments, it may be necessary to establish new job titles and descriptions, as well as wage scales. The Company also plans to conduct question/answer informational sessions with our internal employees and local labor union. NMPC intends to further discussions with the New York Department of Labor for additional guidance and further dialogue with labor unions once approved for Stage 3 of the project.

13 Conclusion

As set forth above, NMPC has submitted decision quality final project engineering design for the Troy UTEN Pilot. This Revised Stage 2 Proposal provides decision-quality design, schedule, cost recovery, and customer protections information, all in accordance with the Commission's

Guidance Order, sufficient for Commission review. The Company's revision to a single-owner model—under which NMPC will construct, own, operate, and maintain the borefield together with the Energy Center, UDS, and at least one building heat pump—reduces project risk, improves operational control, and enhances long-term reliability and resilience. This change materially minimizes the financing and operational uncertainties inherent in the bifurcated model, simplifies emergency response and accountability, and positions the Pilot to qualify for the Section 48 Investment Tax Credit under the December 2024 final regulations requiring common ownership of the ground loop and at least one connected heat pump. Having satisfied the Stage 1 and Stage 2 requirements in the Commission's Guidance Order, the Company respectfully requests the Commission find and approve:

1. NMPC to receive cost recovery for the Stage 1 and Stage 2 costs incurred up to the maximum amount approved by the Commission for the Troy UTEN Pilot project in its Guidance Order;
2. NMPC's cost recovery mechanism and draft tariffs proposed and provided in this Revised Stage 2 Proposal;
3. The Troy UTEN Pilot project to progress to Stage 3 as set forth in the Commission's Guidance Order;
4. The total Troy UTEN Pilot funding of \$90.91 million as estimated in this Revised Stage 2 Proposal;
5. Once advanced to Stage 3, the Company be allowed to reallocate approved funding, capital expense and operating expense, across all project categories to enable the Company to offset unexpected cost overruns in one area with savings realized in another; and
6. Take such further action as the Commission deems necessary.

Appendices

Appendix A: Troy Savings Bank Music Hall Letter of Support

Appendix B: Design Drawing Set and Specifications (Redacted and Confidential)

Appendix C: Basis of Design Report (Redacted and Confidential)

Appendix D: Alienation Legislation Authorizing Leasing of Parkland for Borefield

Appendix E: City of Troy Letter of Support and Letter of Intent between Troy LDC and National Grid

Appendix F: Troy Performance Metrics

Appendix G: Construction Schedule

Appendix H: Revenue Requirement and Bill Impacts

Appendix I: Construction and O&M Costs (Redacted and Confidential)

Appendix J: Draft Tariff Leaves

Appendix K: UTEN Troy Outreach Plan

Appendix L: Customer Agreement

Appendix M: Summary of UTEN Customer Agreement

Appendix N: Life Cycle Cost Analysis (LCCA)