national**grid**

Utility Thermal Energy Network Pilot

Stage 2 Proposal for Syracuse

Case 22-M-0429

Niagara Mohawk Power Corporation d/b/a National Grid

July 9, 2025

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1. Glossary

A – Amperes

A&G – administrative & general overheads

AFUDC – allowable funds used during construction

ASHP – air source heat pump

ASTs – Above Ground Storage Tanks

ATL – ambient temperature loop

BAU – business-as-usual

BMS – building monitoring system

Btu/h - British thermal unit per hour

Btu/h-ft-°F - British thermal unit per hour per foot per degree Fahrenheit

CapEx – Capital Expenditure

CFD – computational fluid dynamics

CLCPA - Climate Leadership and Community Protection Act

Closed System – pipe run between energy center and customers

CNI – Critical Network Infrastructure

CO_2 – Carbon Dioxide

COD – capital overhead distributable

Commission – New York Public Service Commission

COP – coefficient of performance

Cost Contributions - Incentives, grants, co-funding, tax credits or other third-party contributions

CSO – combined sewer and overflow

Customer Construction Costs – Operational expenditure incurred on behalf of customers for customer-owned assets

DAC – disadvantaged community

DHW – domestic hot water

DOE – US Department of Energy

DPS – New York Department of Public Service

DPW – Department of Public Works

DR – dimension ratio

DSRA – Delivery Rate Service Adjustment mechanism

EM&V – Evaluation, Measurement, & Verification

ERV – energy recovery ventilator

ETS – energy transfer station(s)

°F - degree Fahrenheit

Final Syracuse UTEN Pilot Proposal – December 15, 2023 Stage 1 filing

ft *or* ‘ – foot

ft^2 or sq ft – square foot

GHG – greenhouse gas

GPM – Gallon 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

HDD – horizontal directional drill

HDPE – high density polyethylene

HMI – human machine interface

HRC – heat recovery chiller

HVAC – heating, ventilation, and air-conditioning

in or “ – inch

I&R – Instrumentation and Regulation

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

ITC – Investment Tax Credit

IRA – Inflation Reduction Act

January 9 UTEN Pilot Proposal – January 9, 2023 filing

kV - kilovolt

kVa – kilovolt-amperes

kW – kilowatt

LCCA – lifecycle cost analysis

lf – linear feet

LMTD – log mean temperature difference

LOIs – letters of intent

M – million

MAOP – maximum allowable operating pressure

Metro WWTP – Metropolitan Syracuse Wastewater Treatment Plant

MG-1 – motors and generators section 1

MGD – million gallons per day

Micron – Micron Technology Inc.

Miniplant – small satellite central plant

MTCO_2e – metric ton of carbon dioxide equivalent

MT CO_2e/year – metric ton of carbon dioxide equivalent per year

NEMA – National Electrical Manufacturers Association

NIST – National Institute of Standards and Technology

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

NYSDEC – New York State Department of Environmental Conservation

NYSDOT – New York State Department of Transportation

NYSERDA – New York State Energy Research and Development Authority

ODS – Other Delivery Statement

O&M – Operation and Maintenance

Open System – pipe run between WWTP and energy center

OpEx – Operational Expenditure

Outfall #001 – the main 96" concrete outfall pipe on the Metropolitan Syracuse Wastewater Treatment Plant site

PILOT – payment in lieu of taxes

PLC – programmable logic controller

PSC – New York Public Service Commission

psi – pound per square inch

RFP – Request For Proposal

ROW – right-of-way

RTU – roof top unit

SCADA – Supervisory Control and Data Acquisition

SDR – Standard Dimension Ratio

SEPS – secondary effluent pump station

sf – square foot (area)

SPDES – State Pollutant Discharge Elimination System program

SWPPP – Stormwater Pollution Prevention Plan

Syracuse Stage 2 Filing – Stage 2: Pilot Project Engineering Design and Customer Protection Plan filing

Syracuse UTEN Pilot or the Pilot– the project

TEFC – totally enclosed fan-cooled

TERA – Thermal Energy Resource Agreement

TESP – Thermal Energy Storage Property

Thermal Energy Resource Fee – consideration to be paid by the Company to Onondaga County for occupation of the site and use of the thermal energy resource

transfer fluid –water in UDS piping

UDS – Utility Distribution System

UTEN *or* TEN – Utility Thermal Energy Network

UTENJA – Utility Thermal Energy Network and Jobs Act

V – volts

VFD – variable frequency drive

VRF – variable refrigerant flow

WACC – weighted average cost of capital

WEP – Onondaga County Department of Water Environment Protection

WEP Pumphouse – the existing tertiary pump station which will be reused by NMPC to connect to Outfall #001

WSHP – water-source heat pump

2. Executive Summary

Niagara Mohawk Power Corporation d/b/a National Grid ("NMPC" or the "Company") submits this Stage 2 Filing ("Syracuse Stage 2 Filing") for its Utility Thermal Energy Network ("UTEN") Pilot Project in Syracuse, New York ("Syracuse 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 advances the project from conceptual design to detailed engineering and customer protection planning, representing a critical milestone in the development of this proposed utility-owned thermal energy network pilot project.

The proposed Syracuse UTEN Pilot project aims to establish a utility-scale thermal energy network in Syracuse's Inner Harbor. This area, historically industrial and designated as a disadvantaged community ("DAC"), is undergoing significant redevelopment. The Syracuse UTEN Pilot is designed to demonstrate the feasibility, benefits, and replicability of utility-owned thermal energy networks in urban environments. The primary objectives of the Syracuse UTEN Pilot are to demonstrate the viability of utility-managed thermal networks, provide sustainable heating and cooling using treated wastewater effluent, and support the region's economic and residential growth with clean energy. This is particularly timely given the anticipated population and infrastructure expansion driven by a $100 billion investment in the area by Micron Technology Inc. ("Micron"). 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.

A key innovation of this project is its use of treated wastewater effluent from the Onondaga County Department of Water Environment Protection ("WEP") Metropolitan Syracuse

Wastewater Treatment Plant ("Metro WWTP") as a thermal resource. The design repurposes existing infrastructure for the WEP Pumphouse, reducing environmental impact and capital costs. The system includes a centralized Energy Center owned by NMPC that will house pumps, heat exchangers, and thermal storage, enabling efficient energy transfer. The Utility Distribution System ("UDS") is designed as a two-pipe ambient loop that delivers thermal energy to a diverse mix of residential, office, and commercial buildings, including the Onondaga County Aquarium.

The customer portfolio for the pilot includes 13 buildings, serving approximately 1,300 customers. These buildings range from apartments and hotels to retail and mixed-use developments. The project is structured for phased implementation, allowing buildings to connect to the system as they are constructed. This phased approach enables real-time learning and system optimization, providing valuable insights into the scalability and adaptability of UTEN systems as new buildings connections are phased.

From an engineering perspective, project design has reached a 90% design completion and decision-quality level of completion for the Energy Center and Utility Distribution System. The connection to the wastewater treatment plant is at 60% design completion due to pending review by the New York State Department of Environmental Conservation ("NYSDEC"). Lastly, the Aquarium Retrofit & Miniplant is at 50% design completion. The design includes detailed plans for the Thermal Energy Resource, Energy Center, UDS, customer connections. The system incorporates thermal storage to enhance resilience and efficiency, and backup generators are included to ensure service continuity during power outages. The infrastructure has been oversized to accommodate future expansion, maximizing long-term value and minimizing the need for future upgrades which would be impossible due to space constraints.

Environmentally, the Syracuse UTEN Pilot is expected to eliminate approximately 5,825 metric tons of CO_2 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 ($126.4M) and Operations and Maintenance ("O&M") cost estimates ($17.24M), developed using risk-based contingency analysis. NMPC proposes to recover total project costs of ($143.64M) 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 50% of eligible project costs, although these have not yet been included in the cost estimates due to uncertainty surrounding the status and application 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 Aquarium to inform and involve the public. Looking ahead, NMPC seeks approval to proceed to Stage 3A of the Pilot. Upon approval, the Company will finalize construction plans, execute Customer Agreements, issue a construction Request For Proposal ("RFP"), select a contractor and begin system build-out. Construction is expected to commence in 2027 and conclude by October 2028, positioning the Syracuse UTEN Pilot as a model for sustainable urban energy infrastructure.

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 for 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 regulated 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 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 Syracuse UTEN Pilot. [3]

NMPC filed a supplemental or Stage 1 filing entitled "Final Utility Thermal Energy Network Pilot Project Proposal for Syracuse, New York" ("Final Syracuse UTEN Pilot Proposal") with

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[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)

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 Final Syracuse UTEN Pilot Project Proposal supplemented the Company's January 9 UTEN Pilot Proposal and included the required Stage 1 elements detailing the Syracuse UTEN Pilot scope, feasibility, and stakeholder engagement as set forth in the Guidance Order. Stage 1 deliverables provided in the Final Syracuse UTEN Pilot Proposal 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 Final Syracuse UTEN Pilot 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 Final Syracuse UTEN Pilot Proposal to be compliant with the Guidance Order's Stage 1 requirements and granted approval for the Company to advance to Stage 2: Pilot Project Engineering Design and Customer Protection Plan and submit a Stage 2 filing within 9 months as outlined in the Guidance Order. NMPC progressed the Syracuse UTEN Pilot to 30% design completion and was proceeding towards 60% design before requesting an extension in

[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 Syracuse, New York* (Dec. 15, 2023).

January 2025 to submit the Syracuse Stage 2 Filing by August 22, 2025. The need for an extension was due to several key factors: the New York State Department of Environmental Conservation ("NYSDEC") review process for modifications at the Metro WWTP, which is regulated under the State Pollutant Discharge Elimination System program ("SPDES") and was expected to take approximately six months; the need to negotiate the terms of an interconnection agreement with WEP for use of the treated effluent as a thermal resource, which was anticipated to take 6-8 months; 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 Utility Distribution System. The 60% design drawings for the connection to the Metro WWTP, 50% design drawings for the Aquarium Retrofit & Miniplant, along with 90% design of the other components of the Syracuse UTEN Pilot represent decision quality information pertaining to the proposed Syracuse UTEN Pilot.

In response to the Company's extension request, the Secretary granted NMPC an extension to submit its Syracuse Stage 2 filing by July 9, 2025. The Syracuse Stage 2 Filing includes engineering design, outlines the path for obtaining all necessary permits and developing required documents to commence construction, along with other decision quality information needed for the Commission to assess the merits of the Final Syracuse UTEN Pilot Proposal. This filing also details the development of operational requirements, operating procedures, and performance metric data collection and reporting structures to ensure proper monitoring and oversight of the Pilot. Additionally, it includes the creation of a project-specific Customer Protection Plan.

The Syracuse Stage 2 Filing also describes the proposed workforce development and labor agreements necessary for implementing the pilot project and outlines the cost recovery approach with updated cost estimates. 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

The Syracuse UTEN has been designed to serve an area within the city of Syracuse known as the Inner Habor, a man-made harbor that connects Onondaga Creek to the southern shore of Onondaga Lake. The area is referred to in city planning literature as the Lakefront district and is considerably underdeveloped with 27% of the land still vacant and only 0.4% dedicated to housing. The surrounding area is considerably more densely populated, and the entire area is included in the NYSERDA listing of DACs. Formerly dominated by industrial use, this brownfield area is undergoing a major transformation into a mixed-use, pedestrian-friendly district through a master plan led by COR Development and the City of Syracuse Economic Development office. The census track that covers the area also meets the definition of an energy community under the Inflation Reduction Act, which could qualify the project for an additional 10% investment tax credit if eligible. The area balances environmental remediation from past use with new development, including housing, retail, offices, a hotel, and the forthcoming Onondaga County Aquarium. Its location near downtown Syracuse, Destiny USA, and regional transit routes enhances its strategic importance, while its integration with the Creekwalk Trail and marina infrastructure promotes multimodal access. The Inner Harbor stands as a key symbol of Syracuse's urban renewal and commitment to sustainable waterfront redevelopment.

Syracuse and Onondaga County are expecting to experience rapid growth over the next decade due to Micron's $100 billion manufacturing facility investment in the area. This economic growth will result in an influx of thousands of new residents to the area, which will necessitate construction of new housing. The Inner Harbor, which currently consists mainly of undeveloped land, is one of the neighborhoods that has been targeted by both the City of Syracuse and Onondaga County as an area of importance to support substantial significant development of residential and commercial buildings. (See Appendix A for City of Syracuse Letter of Support). This regional growth is significant to the Syracuse Pilot because the majority of anticipated UTEN customers are new buildings that will be constructed in parallel with the UTEN and are scheduled for completion either coincidentally with the UTEN system or shortly after the pilot period begins. Pilot period Accordingly, Stage 3A of the UTENJA project phasing is extremely critical for this project, as that will be the point when targeted customers may commit their construction plans to the pilot. If approved, Stage 3A will include customer enrollment through the execution of Customer Agreements.

The use of the Metro WWTP as a thermal energy resource for a utility thermal energy network reflects a meaningful evolution in how energy infrastructure can be developed. The site, formerly home to the NMPC manufactured gas plant, once supported fossil fuel-based energy production until its closure in 1958. Today, that same location offers an opportunity to support a cleaner, more sustainable energy system by utilizing treated wastewater effluent as a low-temperature thermal energy resource. This transition illustrates a shift from legacy energy practices to modern approaches that prioritize efficiency, environmental stewardship, and long-term resiliency within the same geographic footprint.

4.1 Industrial History

For centuries, the area around Onondaga Lake was a rich resource for salt production. Native Americans and European traders are documented to have produced salt from springs via the boiling process as early as the 1600’s. By the late 1700’s, the methodic production of salt had begun with the New York State legislature designating the area now known as the Inner Harbor as “Onondaga Salt Springs Reservation.” Over 11 million tons of salt was produced via evaporation from 1797 to 1917. In 1888, the industrial need for salt increased dramatically as the Solvay process Company established a chemical plant along the southern shore of Onondaga Lake which required halite as a component of its production of Soda Ash. In the early 1900’s, land use changed further in parallel with local growth. Regional canals and waterways served as efficient trade routes for companies in the growing oil industry to transport their products, and the Inner Harbor area of Syracuse served as a hub for storing and transporting petroleum products into the region. At its peak, the area was known as Oil City and was home to over one hundred large capacity Above Ground Storage Tanks (“ASTs”) owned by most major petroleum companies. Additional development of note during this time included a 289’ by 188’ Gas Storage Tower that stored Manufactured /Town Gas, then natural gas from 1931 to 1961 for Niagara Hudson/NMPC. As transmission mains brought natural gas into the area, this structure became obsolete and was demolished in 1961. By the early 2000s, all ASTs had been demolished to make way for redevelopment.

The cleanup of Syracuse’s Onondaga Lake and adjacent areas including the Inner Harbor represents one of the most significant environmental remediation efforts in New York State. Beginning in the 1990s, coordinated efforts by the New York State Department of Environmental Conservation, the U.S. Environmental Protection Agency, and various responsible parties led to large-scale remediation, including soil removal, groundwater treatment, and capping of contaminated areas both in the Inner Harbor and Onondaga Lake.

The City of Syracuse has supported the redevelopment of the Inner Harbor through a combination of tax incentives, infrastructure improvements, and strategic planning. Key efforts include approving a 15-year payment in lieu of taxes ("PILOT") agreement to attract private investment, adopting a Local Waterfront Revitalization Program to guide development, and issuing a request for proposal ("RFP") to redesign Inner Harbor Park with enhanced trails, safety features, and public amenities. The city has also partnered on major harbor dredging efforts to support navigation and marina access, while complementary investments such as the Onondaga Creekwalk extension and smart city infrastructure have improved neighborhood connectivity and appeal.

Looking ahead, the Inner Harbor will include a diverse mix of newly constructed residential and commercial buildings, providing a balanced thermal load profile for system efficiency.

4.2 Development

In 2023, Micron Technology selected Central New York as the location of a 20-year, $100 billion investment to build four microchip fabrication facilities. The proposed project would be the largest private investment in the history of New York State. An Empire State Development sponsored study prepared by Regional Economic Models, Inc, and cited in Micron's June 2025 Draft Environmental Impact Statement, estimates that Micron's investment will result in as many as 64,000 new residents moving to the region, 7,500 new households within the City of Syracuse, the creation of nearly 50,000 new jobs, and a $16 billion increase in the local economy, with an approximately $2 billion increase in disposable income for local residents. Recent progress made by Micron and partners in development of supportive utility infrastructure provide certainty as to the project's future. Onondaga County has started construction on a 26-mile water line to supply Micron with water for manufacturing and a new industrial wastewater treatment plant dedicated to Micron's facility. In May 2025, the Onondaga County legislature approved spending an additional $27 million to purchase land that can be developed for Micron related businesses.[5] NMPC has already applied to the Commission for permission to install new infrastructure to supply Micron with energy,[6] and Micron has already invested significant funds into this effort. The significant investments already made by Micron, Onondaga County, and NMPC serve as a strong indicator this project will be moving forward in the very near future, and that it's time to plan for accommodating the population increase expected to occur along with Micron's investment.

The influx of residents will necessitate the construction of over 12,000 new single-family homes to meet demand. As a result, Onondaga County has encouraged area towns and villages to develop multifamily buildings and mixed-use developments. According to estimates, about 75% of new housing is expected to be multi-family housing with the majority being in the city of Syracuse. COR Development holds exclusive development rights for approximately 28 acres of Syracuse's Inner Harbor, where it is leading a multi-phase, $350 million transformation into a vibrant, mixed-use waterfront district. The site master plan includes over 400 residential units, 150,000 square feet of retail, 130,000 square feet of office space, hotels, restaurants, public waterfront access, and potential academic and recreational facilities. Between the time of the Company's initial January 9 UTEN Pilot Proposal filing submitted to the Commission on January 9, 2023, and the Company's Final Syracuse UTEN Pilot Proposal submitted to the Commission on December 15, 2023, COR's plans for residential development in the Inner Harbor increased by 400,000 square feet. Projects already completed by COR in the Inner

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[5] https://www.waer.org/news/2025-05-08/party-line-vote-highlights-divide-in-priorities-as-county-sets-stage-for-semiconductor-supply-chain?utm_source=chatgpt.com

[6] See Case 24-T-0120, "Petition of Niagara Mohawk Power Corporation d/b/a National Grid For a Certificate of Environmental Compatibility and Public Need, Pursuant to Article VII of the Public Service Law, for 345 kV Underground Service Transmission Laterals Between the Expanded Clay Substation and Micron Technology Fabrication (filed February 27, 2024).

Harbor include the Aloft Hotel and the Iron Pier apartments. The existing projects, exclusive development rights, and extensive plans for expansion over the next several years, positions COR as the central entity shaping the long-term revitalization of the Inner Harbor area. In addition to the development COR has already undertaken and planned, Onondaga County has approved the design and construction of an approximately 80,000 square foot Aquarium facility in the project area. Construction on the building has begun and is currently targeting completion in spring or early summer 2026.

The Syracuse UTEN Pilot system is a practical and timely infrastructure investment given the expected surge of residential and commercial development in the Inner Harbor. Most of the newly developed buildings would be subject to the revisions to the New York State Energy Conservation code that were codified in the All-Electric Building Act[7]. Starting in 2026 , the proposed code changes will require that most new construction buildings seven (7) stories or less and commercial buildings with 100,000 ft^2 or more of conditioned floor area be built without the use of onsite fossil fuel combustion. Commercial buildings greater than 7 stories or larger than 100,000 ft^2 are subject to this requirement starting in 2029. The sudden influx of new developments with all or mostly all energy use being electrical processes will put strain on local electric grids. Constructing the Syracuse UTEN and providing a network of energy efficient heating and cooling services will enable these buildings to use less electricity to meet their heating and cooling demands than they would otherwise use if they were all using individual

[7] Senate Bill 6843C enacted May 19, 2021.

electrified solutions such as air source heat pumps (“ASHPs”). This will ease the strain on the local grid and maintain more available capacity for serving other new developments in the area.

5. Pilot Design

NMPC selected the Syracuse UTEN Pilot for its ability to provide key learnings about the development of viable UTEN deployment models that can be utilized by the many similar facilities across the country. The Pilot will utilize a Thermal Energy Resource owned by the local municipality, distribute thermal energy to customers in support of upcoming economic development, and leverage the unique attributes of treated effluent as a Thermal Energy Resource. Each aspect has particular advantages over other utility thermal energy network approaches:

- Municipal Ownership leverages existing assets to provide an additional revenue stream to the local area that would not otherwise be available. This allows the municipality to show climate and policy leadership as well as support and enhance other economic development efforts. This business structure creates opportunities for NMPC to create the legal framework for thermal energy resource fee(s) as well as leasing and permitting agreements with municipal third parties that can be used for future UTEN efforts.
- Connecting to mainly new construction buildings and coordinating with the developer allows the building heating, ventilation, and air conditioning (“HVAC”) systems to be designed specifically to use water source heat pumps at the appropriate ambient loop temperatures. New construction buildings, built to modern energy codes, have energy efficient envelopes and are well suited for the lower heating temperatures that are

commonly used in heat pump-based systems. Connecting to new buildings also avoids costly retrofit solutions.

- Since most buildings planned to connect to the Syracuse UTEN will be constructed either in parallel with or after the Syracuse UTEN, the primary retrofit effort is at the Onondaga County Aquarium, which is currently under construction. Since the building will be finished before the Syracuse UTEN is complete, this scenario creates an additional retrofit cost for the project. The difference in timing between the Syracuse UTEN Pilot and the Aquarium project along with NMPC's inability to commit funds at risk before PSC approval to move the Pilot to Stage 3 prevented pre-work at the site to occur that would have otherwise made the retrofit easier and less expensive. The Aquarium will be the largest single customer on the system during the pilot. In order to allow the Aquarium to operate without service interruptions, avoid hindering their normal operations, and avoid complex retrofit work, the Company will own and operate a small satellite central plant ("Miniplant") to provide chilled water and heating hot water directly to the Aquarium system.
- As a Thermal Energy Resource, wastewater effluent typically provides more favorable temperatures than geothermal systems. To provide thermal energy of the same magnitude as the wastewater effluent, a geothermal borefield would take up vast amounts of land and would be significantly more expensive. Wastewater effluent is a continuously renewing resource and is not sensitive to the thermal balance of the connected loads in the way that geothermal systems are. During development of the Syracuse UTEN Pilot, NMPC is determining strategies to overcome the particular engineering challenges of

accessing wastewater resources as well as navigating the regulatory aspects of the permitting process with NYSDEC.

Of the 13 buildings targeted for the Syracuse UTEN Pilot, one will be constructed and occupied before the Pilot is operational, five will complete construction concurrently with the UTEN system, and the remaining buildings are scheduled to be completed in 2030. See Appendix B for a letter of intent and commitment from COR, the major property developer in the Inner Harbor area and Appendix C for aerial renderings of the area. Since not all the new construction buildings will be completed prior to system startup, the Company plans to connect the initial six buildings to the system upon the start of the Pilot period and connect additional buildings as they finish construction after the UTEN is in service. By connecting buildings in a phased approach, rather than all at the same time, the Company will gather valuable learnings about how to grow a UTEN system once it is in service. Anticipated learnings include a better understanding of how the system will respond to new loads as they are connected, the costs of connecting customers after the system is operational and learning how to connect new buildings while maintaining service to already connected buildings. This knowledge will be applied by the Company as UTENs become a utility service, akin to gas and electric.

COR has indicated that they are intending for their newly developed buildings to be all electric, even where not currently required to as part of the All-Electric Buildings Act. In a baseline scenario, this would entail installing ASHP based systems. The equipment to run an ASHP based system is less expensive than what the buildings will need to run a water-source heat pump ("WSHP") based system. To compensate the customer for the additional incremental costs of constructing a WSHP system, that will connect to the UTEN and participate in the pilot, the Company proposes offering a cash incentive to the customer. The incentive will be structured as $1,250 per 10,000 btu / h, which is based on the total installed heat pump heating capacity. As participants in the Pilot, the connected buildings are not considered eligible for the Clean Heat incentives that they would otherwise have available for heat pump installations. This $1,250 per 10,000 btu / h incentive is comparable to what they would receive had they participated in the Clean Heat incentives program instead of the UTEN. Before authorizing the release of any incentive, the Company will review the developer(s)' HVAC design plans to ensure prudency in the selected equipment sizing. This incentive will be available for all customers participating in the pilot and installing compatible equipment on their property.

The cost of the customer connections themselves, inclusive of the supply and return service laterals and any equipment needed to construct the Energy Transfer Station will be included in the Pilot costs in their entirety.

Additionally, the inclusion of domestic hot water is an essential component of all electric buildings, especially multifamily and hotel type buildings. Inclusion of domestic hot water is an additional benefit as it increases utilization of the available resource and provides significant utility cost savings when compared to the baseline electric resistance hot water heaters. However, as centralized heat pump hot water heaters are a departure from typical developer system configurations, NMPC will be compensating for the incremental cost of the heat pump domestic hot water equipment.

By proposing to offer the incentive structured in this manner, NMPC will ensure rate payers are not covering the full cost of building out the HVAC and DHW systems of the building and instead will be covering only incremental costs, as the property developers would be incurring baseline costs to install HVAC and DHW systems regardless of whether the UTEN service was available to them.

The Company will not be performing design, procurement, and installation of any of the HVAC systems. The specific design and configuration of the HVAC systems is left up to the building owner, with guidance on the input conditions provided by the Company as to the operating temperatures and performance and compatibility requirements.

Based on conversations with the developer, as part of the Pilot, the new construction buildings will utilize WSHPs as the main heating and cooling equipment. A heat pump loop will be installed in the building with insulated piping, with a connection to the Utility Distribution System through a plate and frame heat exchanger installed as part of the Energy Transfer Station. Ventilation is up to the customer and in most cases energy recovery ventilators ("ERV"s) may not be required by energy code if each unit is individually exhausted. As this is not a geothermal system, management of system load balancing is not as integral to optimal system performance, and NMPC does not have to impose additional energy usage requirements beyond those specified by code to ensure that the system continues to operate within its design parameters.

Without UTEN involvement, DHW for the apartment buildings would otherwise be provided by distributed electric resistance tanks, with centralized hot water systems in the hotel and senior housing buildings. The amount of heating for domestic hot water required in high usage space types is comparable to that of space heating, therefore it would be a worthwhile payback to include heat pump hot water equipment into the Pilot. The incremental cost of CO_2 water to water heat pumps connected to the UTEN as well as a centralized distribution system and recirculation system has a good payback when compared to electric resistance heat, as the CO_2 water source heat pumps have coefficients of performance ("COP"s) between 4.5 and 5.0 at a supply water temperature of 140 °F and a source water temperature of 50 °F. Retrofitting the existing Aloft hotel with a similar DHW system was considered, but the high efficiency CO_2 hot water equipment had a comparable utility cost to the existing natural gas condensing hot water heaters. Therefore, the Aloft hotel would not realize a similar payback to retrofit its existing system.

Without UTEN involvement, DHW for office and retail type spaces would otherwise be electric resistance. As part of the Pilot, DHW will continue to be provided by electric resistance as the usage levels are not high enough to justify the expense of the heat pump water heater equipment.

See Appendix D for a full design plan set including specifications and Appendix E for a detailed Basis of Design Report for the Syracuse UTEN Pilot.

5.1 Customer Portfolio

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

- Onondaga County Aquarium: A municipally owned building slated to be completed by 2026 and will be the first customer connected to the UTEN. Since the building will be completed before the Syracuse UTEN is available, a baseline HVAC system will be installed during the building's construction and the building will need to be retrofit to connect to the UTEN. Due to the large size of the building and the process loads involved, the aquarium represents nearly 30% of the peak and annual load NMPC intends to serve during the 5-year pilot lifetime.
- Building 1B
  - 182,000 SF, 5–6 floors
  - 112 apartments and 30,000 sf of ground-level retail/restaurant

• Mixed-use residential and commercial

• Completion: Phase 2 - 2030

- Buildings 2A, 2B and 2C

  • 430,360 sf total, 5–6 floors across 3 buildings

  • 462 mixed-income apartments, 55,000 sf of commercial space, and 980-car garage

  • Completion: Phase 2 – 2030

  Building 3

  • 76,290 sf, 3–4 floors

  • 62 senior one-bedroom apartments and 36 enclosed parking spaces

  • Income-restricted residential

  • Completion: Phase 1 - 2028

  • Additional funding provided through LIHTC, NYS HCR, and an Onondaga County grant

- Building 4A and 4B

  • 126,685 sf each, 3–4 floors each

  • 166 waterfront market-rate apartments

  • Completion: Phase 1 – 2028

  Building 5

  • 68,640 sf, 3–4 floors

  • 72 workforce apartments

  • Affordable housing

  • Completion: Phase 2 – 2030

- Buildings 6A and 6B

  • 29,900 sf, each building

  • 24,000 sf restaurant/retail and 33,000 sf office

  • Commercial mixed-use

  • Completion: Phase 2 – 2030

  Building 8B

  • 160,000 sf, 5–6 floors

  • 227 hotel rooms, 10,000 sf conference space, 5,000 sf rooftop bar, 5,000 sf spa

  • Completion: Phase 1 - Q3 2028

- Building 10A

  • 383,000 sf, 5–6 floors

  • 125,000 sf retail, 224 market-rate apartments, 1,400-car public/private garage

  • Completion: Phase 1 – Q3 2028

Table 1 below summarizes the Customer portfolio and building details.

Table 1: Customer Portfolio

Customer Name	Customer Type	Building Area (sf)	Customers Served[8,9] (Res./Comm.)		Heating Capacity (kBtu/h)	Cooling Capacity (tons)	Year Connecting to UTEN
Aquarium	Commercial	80,000	-	1	9,500	450	2028
Bldg 1b – Mixed Use	MF / Retail	182,000	112	4	2,800	210	2030
Bldg 2a - Apartment	Multifamily	151,680	152	-	1,600	130	2030
Bldg 2b - Apartment	Multifamily	151,680	176	-	1,600	130	2030
Bldg 2c - Mixed Use	MF / Retail	127,000	126	8	1,600	130	2030
Bldg 3 - Senior Housing	Multifamily	76,290	62	-	700	60	2028
Bldg 4a - Apartment	Multifamily	125,685	83	-	900	70	2028
Bldg 4b - Apartment	Multifamily	125,685	83	-	900	70	2028
Bldg 5 - Apartment	Multifamily	68,640	72	-	900	60	2030
Bldg 6a - Mixed-Use	Office / Retail	29,900	-	5	800	60	2030
Bldg 6b - Mixed-Use	Office / Retail	29,900	-	5	800	60	2030
Bldg 8b - Hotel	Hotel	163,676	-	1	1,700	180	2028
Bldg 10a - Mixed Use	MF / Retail	383,000	224	19	3,500	370	2028
SUM		1,695,136	1133		27,300	1,980	

[8] For new construction buildings, without predetermined building programming, the number of retail, commercial, and / or office type customers was determined by dividing the total commercial space available by the average size of a commercial lease space in Syracuse, NY (6,600 sf).

[9] For multifamily buildings, the number of customers served is equal to the number of apartment dwellings available for rent. For retail, commercial, and office buildings, the number of customers served is equal to the number of individual businesses present within the building. For buildings without predetermined building programming, the number of individual businesses was calculated in accordance with footnote 6.

5.2 Energy Modeling

All buildings were modeled separately using the Design Builder user interface for the EnergyPlus whole building simulation engine. EnergyPlus is a building simulation engine developed and maintained by the US Department of Energy ("DOE"). For the multifamily, office, retail and hotel space uses, heating and cooling loads of the typical use types were modeled using DOE reference models of common building types. The DOE has developed standard or reference energy models by aggregating thousands of the most common commercial buildings into building-type categories, age/construction, and climate zones to serve as an average representative dataset for energy efficiency research to assess new technologies. DOE's modeling approach and assumptions use typical programming, form, envelope, and equipment usage to approximate energy usage within the building types. Data sets exist for each new energy code release, which helps the DOE to evaluate the overall energy savings due to code changes. For this project, the models associated with the 2018 International Energy Conservation Code were used, as it is the basis of the current 2020 New York State Energy Conservation Code. The data set for the 2024 International Energy Conservation Code models that would be the basis of the upcoming 2024 New York State Energy Conservation Code were not yet available.

The reference models were transformed into energy models specific to this study for all potential buildings connecting to the UTEN using the following approach:

- Building geometry was created based on available data on the building footprint, number of floors, and space type usage.
- DOE models were selected as reference buildings that most closely matched building construction/materials as the buildings in Syracuse and climate zone.

- 8,760 hourly simulations were performed using Syracuse, NY weather, which includes heating, cooling, domestic hot water loads, and TMYx weather files, which represent typical weather patterns from 2005-2021.

The Aquarium energy model was developed based on the bid documents released in June 2024, including the life support systems. Building layout, envelope, lighting, and HVAC systems were modeled based on scheduled equipment. EnergyPlus does not have a built-in tool for modeling the energy consumption of the aquarium exhibit water heating and cooling, so this had to be done in a different manner. A model was created in GNU Octave which calculated (for each hour of the year):

- The heating and cooling load required by the aquarium exhibit tanks
- The latent load on the space created by the evaporation of water off the exhibit surfaces
- Both calculations could be then passed into the energy modeling software as inputs.
- For each exhibit (19 in total), the following parameters were estimated from the drawings:
    - System Volume, Total Tank Wall Area, Total Tank Surface Area, Operating Pump Flow Rate
    - The number of pumps was simplified from what is shown on the drawings, since most of the pump sets have redundant pumps

In addition, the tank temperature setpoint throughout the year was needed. This was estimated for each tank using public data from other aquariums, and through conversations with staff at another operational aquarium of a similar size in the Great Lakes region. For some systems, the tank temperature setpoint was kept constant throughout the year, while for others (especially those mimicking shallower bodies of water), the setpoint would vary with the outdoor air temperature of the simulated area. A backwash cycle for the exhibit filters assumes that exhibit water is replaced using city water. The temperature of this city water was assumed to vary with the ground temperature of the area. It is assumed that only heating and cooling end uses are affected by the connection to the UTEN and that all other aspects of the building operation will be unaffected.

5.3 Thermal Energy Resource

Treated effluent is discharged to Onondaga Lake from the Metro WWTP facility via a 96" concrete outfall pipe ("Outfall #001"). This treated effluent contains thermal energy which is currently unutilized. The objective of this Pilot is to divert treated effluent from Outfall #001 to the proposed Energy Center ("EC") building located on North Geddes St, where it will be processed through a heat exchanger and used as a thermal resource for the UTEN system. Once the thermal energy is exchanged between the UTEN and the effluent, that flow will be returned to Outfall #001 and discharged to Onondaga Lake as usual.

WEP maintains an existing building on the Metro WWTP site that previously functioned as a tertiary influent pump station which conveyed secondary clarifier effluent to the tertiary clarifiers. The tertiary clarifiers were removed in a previous upgrade to provide enhanced ammonia and phosphorus removal. The tertiary influent pump station building also functions as an emergency overflow (to Outfall #001) during times when surges of secondary clarifier effluent overwhelm the secondary effluent pump station. The pump station is connected to the existing 96-inch concrete box culvert (that carries flow to Outfall #001) by one 72-inch box culvert and one 84-inch diameter pipeline. The 72-inch box culvert formerly served as the tertiary effluent connection to Outfall #001 and the 84-inch diameter pipeline was formerly a tertiary process bypass to Outfall #001. The Company proposes to repurpose this existing structure as the proposed pump station while also maintaining the ability to overflow secondary effluent to Outfall #001 during the emergency conditions described above.

The Pilot will be implemented in a phased manner. The phasing corresponds to the peak Metro WWTP effluent flow that will be withdrawn / returned to Outfall #001 to serve to thermal demands of the planned end-users of the thermal energy network. The design maximum instantaneous flow of Phase 1 is 7.2 MGD (5,000 GPM). Provisions for future expansion will be included in the design with a maximum instantaneous flow in the future Full Buildout Phase of 25 MGD (17,500 GPM).

By using the treated effluent as a thermal energy resource, NMPC in association with WEP will beneficially reuse the energy in a "waste" product to provide sustainable heating and cooling to thousands of customers. In the proposed Syracuse UTEN Pilot system configuration nearly 10,000 MWh of thermal energy will be captured from the treated effluent annually. In a full scale build out of the system, NMPC can capture and reuse nearly 40,000 MWh of thermal energy.

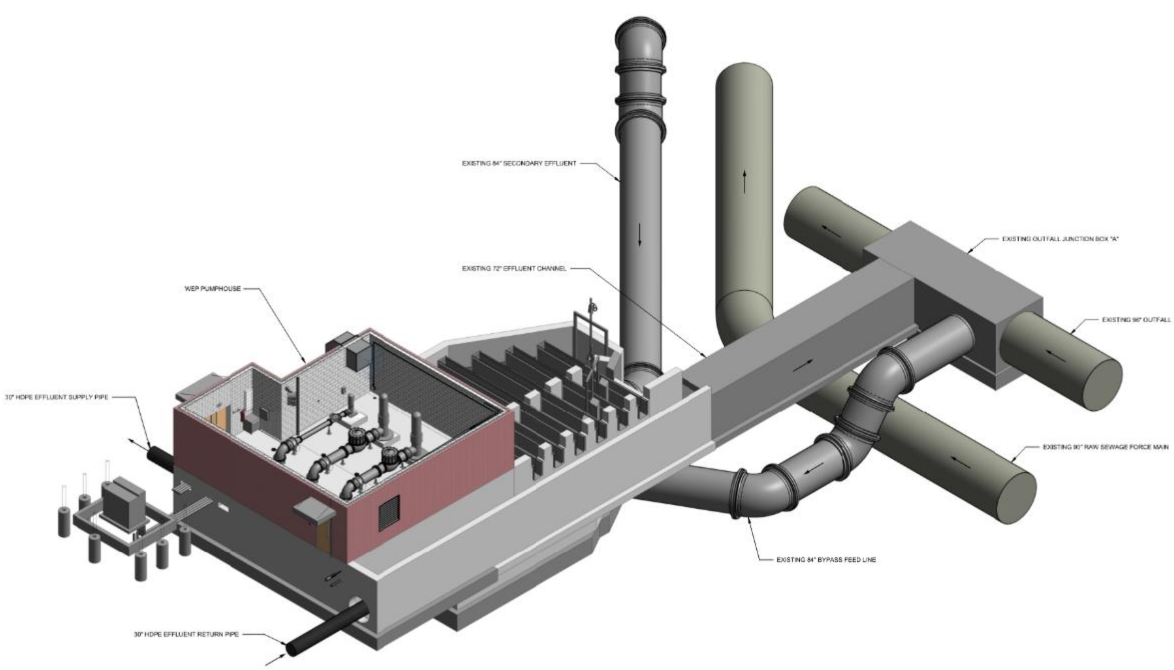
To access the energy available in the flow through Outfall #001, a connection must be established between the Energy Center described in Section 5.6 and the outfall pipe, which flows from the plant to the outlet located at the lake shore. In previous filings, NMPC proposed to construct a new pumphouse near the lake shore, necessitating construction of a new pipe connection to the 50-yr old concrete outfall and installation of approximately 2,000 linear feet of trench for supply / return piping to the Energy Center. Instead, NMPC has worked with WEP to identify a more efficient solution that poses less risk to Outfall #001, and will use the foundation and pipe connections of an existing tertiary pump station with wet well ("WEP Pumphouse") connected to Outfall #001 to divert flow from the outfall to the UDS. This existing pump station is not currently used in Metro WWTP's daily operations. Two (2) UDS mains, a supply and return, will convey flow off-site between the WEP Pumphouse and the Energy Center. This section of the UDS is referred to as the "Open System" in Section 5.4 below. This re-use approach affords approximately $10 million in savings to the project.

Once the WEP Pumphouse is reconstructed, by NMPC, to divert flow for the Syracuse UTEN Pilot, flow will enter the WEP Pumphouse via the 84-inch diversion pipe, be pumped off-site to the Energy Center located approximately 0.7 miles southeast via a 30" underground force main and return to the outfall via a similarly sized return force main which feeds into the existing 72" box culvert. A hydraulic computational fluid dynamics ("CFD") model was produced to study the efficacy of the design and the impact the diverted flows will have on the flow in the outfall pipe. The results of the CFD modeling showed that the impacts on water level within the outfall pipe were mild and will not impede flow of effluent within the outfall pipe. This finding was critical to furthering the relationship with WEP, as any major changes to plant operations, because of changes required by the Syracuse UTEN Pilot, would not be acceptable.

The entire WEP Pumphouse superstructure will be removed, along with the suspended slab that supports the building portion of the WEP Pumphouse, and the secondary effluent overflow weirs. The suspended slab and building will be reconstructed to meet the needs of the new WEP Pumphouse. The new WEP Pumphouse will be a single story, split faced concrete masonry unit ("CMU") building with a galvanized metal roof and will be approximately 1,350 sf. The existing wet well will be divided to allow for a portion of the wet well to convey bypassed secondary effluent to reconstructed overflow weirs. The other portion of the wet well will feed the WEP Pumphouse pumps.

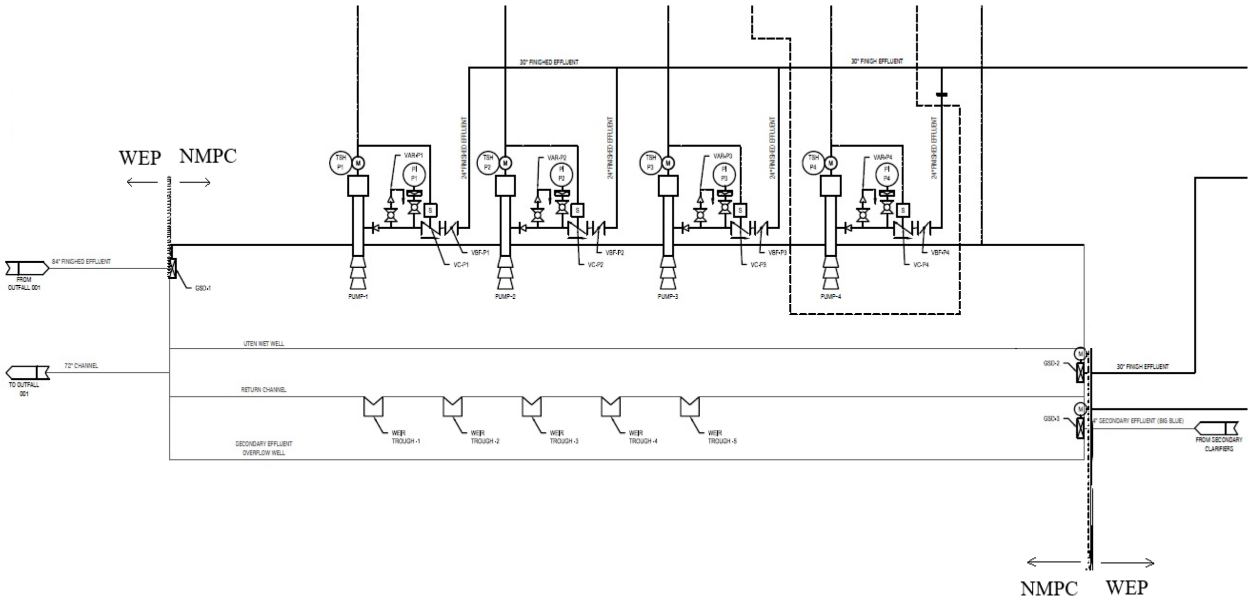
The WEP Pumphouse contains three (3) vertical turbine pumps that are connected to a 72” steel pipe force main which is abandoned in place. This pipe will be welded shut with a ¼” thick carbon steel plate outside of the WEP Pumphouse. The existing vertical turbine pumps and connected piping within the WEP Pumphouse will be removed. Three (3) new vertical turbine pumps will be installed inside the WEP Pumphouse to serve the UTEN system. Pump-1 will be a 20 horsepower (“hp”) 8” vertical turbine pump with a capacity of 1,400 GPM. Pump-2 and Pump-3 will each be 250 hp 18” vertical turbine pumps with a capacity of 7,000 GPM. Pump-1 will be used to provide the low flow condition that will be common throughout the Pilot period but especially during early stages, where a limited amount of buildings are connected to the system. An equipment pad for a fourth pump will be installed to allow for simple capacity expansion in the future, and all equipment is sized to allow for future expansion. A rendering of the WEP Pumphouse is shown in the figure below:

Figure 1: Rendering of the WEP Pumphouse once Repurposed for the Syracuse UTEN



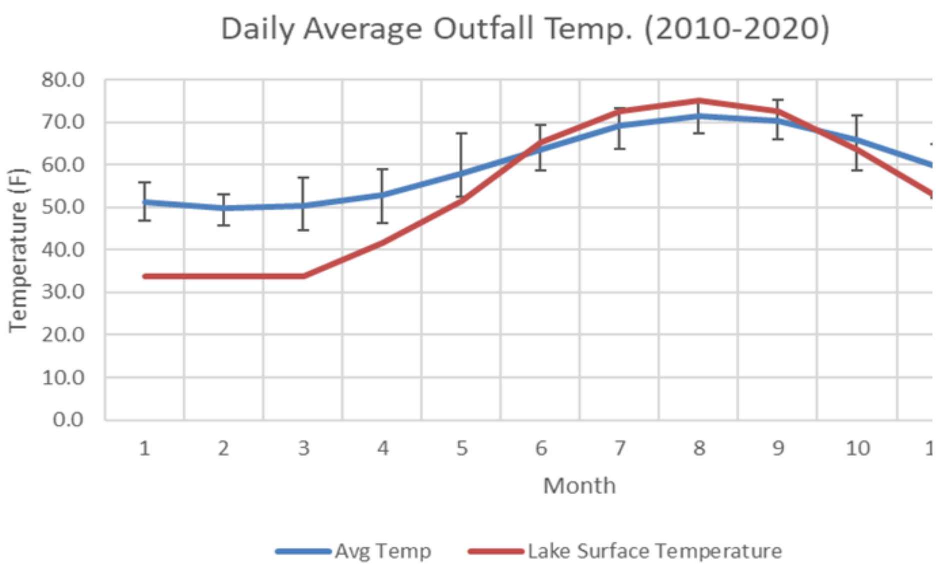
Two (2) 30” diameter high-density polyethylene (“HDPE”) UDS main pipes will convey flow off-site to the energy center and return the flow to the Outfall #001. The supply main delivering flow to the Energy Center will exit the WEP Pumphouse below the ground floor through an existing pipe gallery and then traverse the Metro WWTP site southeastward through the existing turf areas where the tertiary clarifiers were formerly located. The pair of UDS mains will be installed in a parallel configuration in a tunnel. The UDS mains will cross the paved parking areas at the front of the administration building and exit the Metro WWTP site on to the Hiawatha Boulevard right-of-way (“ROW”) in the turf area immediately south of the most southerly plant entrance gate. The total length of UDS main on the Metro WWTP site will be approximately 700 ft. The pipelines will be constructed by approximately 300 ft of open trench, then transitioning to dual 540 ft long horizontal directional drills (“HDD”) to a point offsite across Hiawatha Blvd. The open trenching will be performed so that the UDS pipes on the Metro WWTP site are installed at a typical depth of approximately 5 feet to the top of the pipes. The HDD follows a parabolic depth profile with a max depth of about 29 ft below grade to avoid the considerable amount of underground pipe infrastructure that exists at Metro WWTP as well as a large pipe gallery. WEP will allow access to thermal energy to the Company at the point of demarcation. The point of demarcation between NMPC and WEP will be the upstream side of the NMPC owned outfall isolation valve, inclusive of the valve, which will be constructed as part of the WEP Pumphouse. All equipment and infrastructure past this point makes up the UDS and will be owned and operated by the Company. Figure 2 below depicts the point of demarcation between NMPC and WEP.

Figure 2: Point of Demarcation Between NMPC and WEP



Effluent temperature and flow tracking by Metro WWTP is the basis for the analysis to determine the quality of available heat recovery. WEP provided daily averages of temperature and flow data from January 2010 through December 2020, as well as 4-hour timestep data for the period between January 2022 and April 2025. The length of the data set available provides a high level of certainty in the operating range of the plant. Diurnal flow variation was also collected for the first day of the month between 2018 and May 2022 to allow for a better understanding of the daily variation. The dataset provided by WEP includes monthly average temperatures, the daily maximum temperatures, and the daily minimum temperatures. These temperatures can be compared with a 22-year dataset of average lake surface temperature recorded by the southern deep buoy maintained by the Upstate Fresh Water Institute. In this dataset, April through December temperatures are observed, and for the months of January, February, and March, when the lake is iced over and the buoy is not deployed, a surface temperature of 33°F is assumed. The graph in Figure 3 below provides the daily average temperature of the outfall for January 2010-December 2020.

Figure 3: Daily Average Temperature of the Outfall of Metro WWTP



The effluent temperature follows a seasonal temperature variation with the ground temperature, with the extremes of the outdoor air temperature greatly moderated by the municipal cold-water temperature and heat transfer from the fluid to sewer pipes and the surrounding soil. The standard deviation is ± 1.96 °F annually, showing high data consistency year-to-year. The plant serves a combined sewer and overflow ("CSO") area and therefore precipitation events and runoff will impact the effluent flow in addition to wastewater production. The larger flow ranges are caused by sustained rain or melting events. The median temperature for winter months is 51.6°F and 68.8°F for the summer months. 99.6% design day temperature condition is 47.2°F, though it is noteworthy that the minimum temperature condition corresponds to winter snow melt events and not the design outdoor air temperature, meaning that the peak heating loads and minimum effluent temperature do not coincide. The thermal storage system discussed later is intended to address this condition. The 0.4% design cooling condition is

74.1°F. Effluent temperature data for years 2022, 2023, and 2024 are shown in more granularity in Figure 4, as temperatures are taken every 4 hours to meet NYSDEC reporting requirements. Average monthly flow through the Metro WWTP is shown in Figure 5.

Figure 4: Four Hour Effluent Temperature

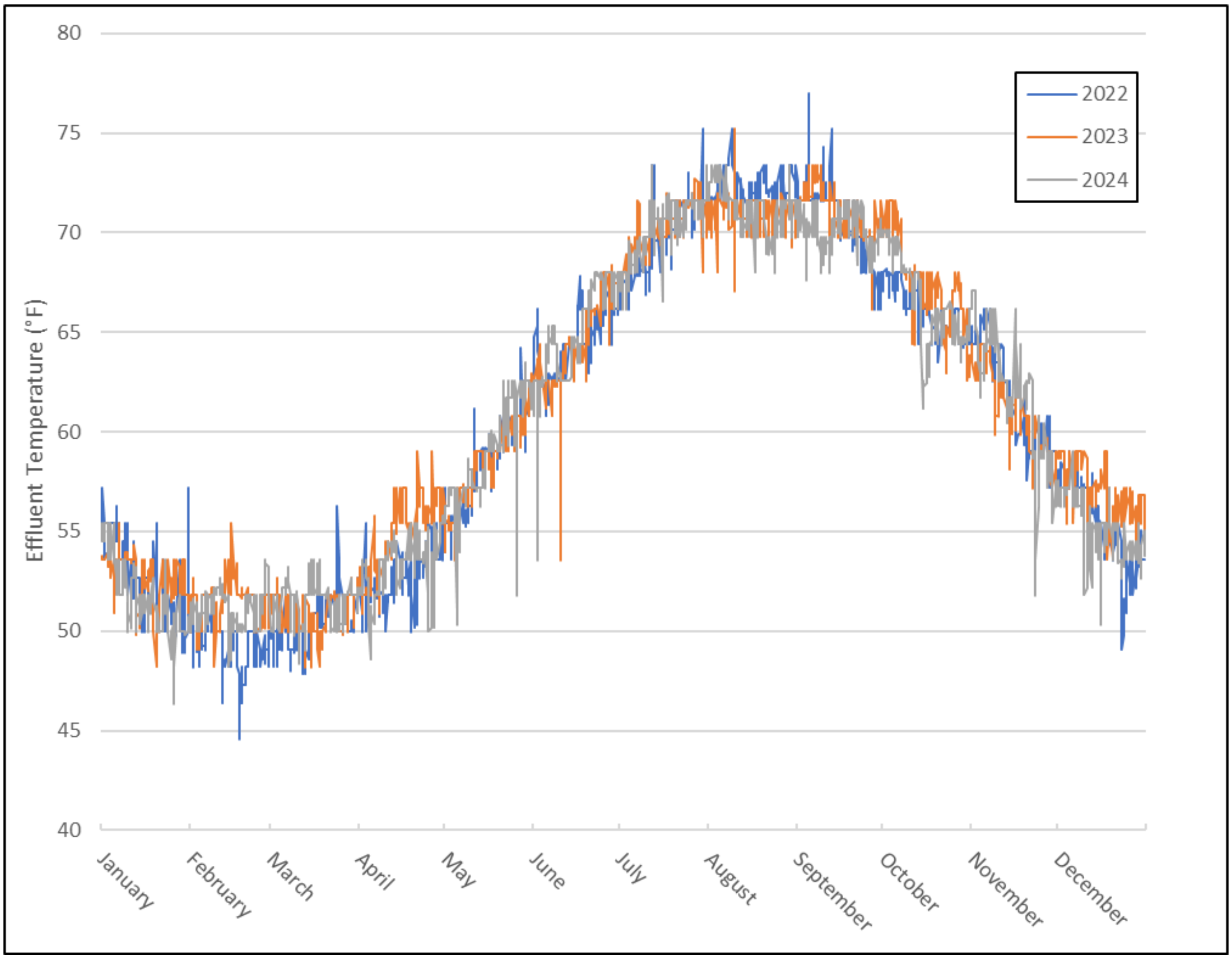
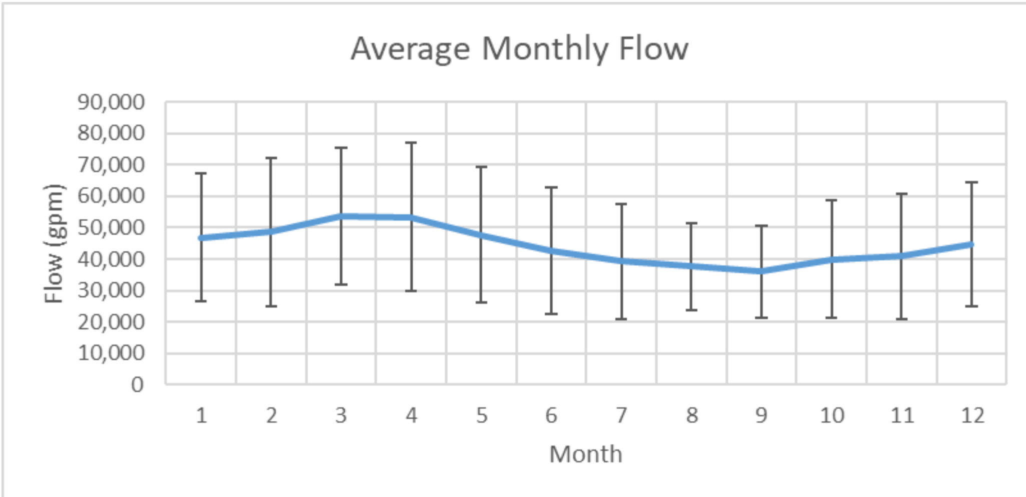


Figure 5: Average Monthly Flow



Two reports containing a detailed analysis of the flow and temperature profiles were undertaken as part of the project development. These two reports are authored by Arcadis and Anchor QEA and are provided in Appendix F. As the effluent is returned to Outfall #001 after use, the overall Metro WWTP effluent discharge rate was assumed not to be affected by the pilot project, and as such, the discharge rate was identical to the existing conditions discharge rate. Temperature of the effluent had a seasonal pattern of cooler temperatures in the winter and warmer temperatures in the summer. Effluent temperature under Pilot conditions ranged from 44.6 °F to 75.4 °F, with a median value of 59.0 °F. Under proposed Pilot conditions, the change in effluent temperature as a result of the Pilot ranged from -0.35 °F to 0.72 °F, with a median of -0.031 °F. Approximately 50% of the time, the effluent temperature was lowered; and 50% of the time, the effluent temperature was raised. These calculated changes in effluent temperature resulting from the Pilot are relatively small compared to the observed daily temperature range of the Metro WWTP effluent. Specifically, all the calculated changes in effluent temperature under Pilot conditions were less than the median daily measured temperature range of the Metro WWTP effluent (1.4 °F), and 69% of the daily temperature changes were less than the 5%

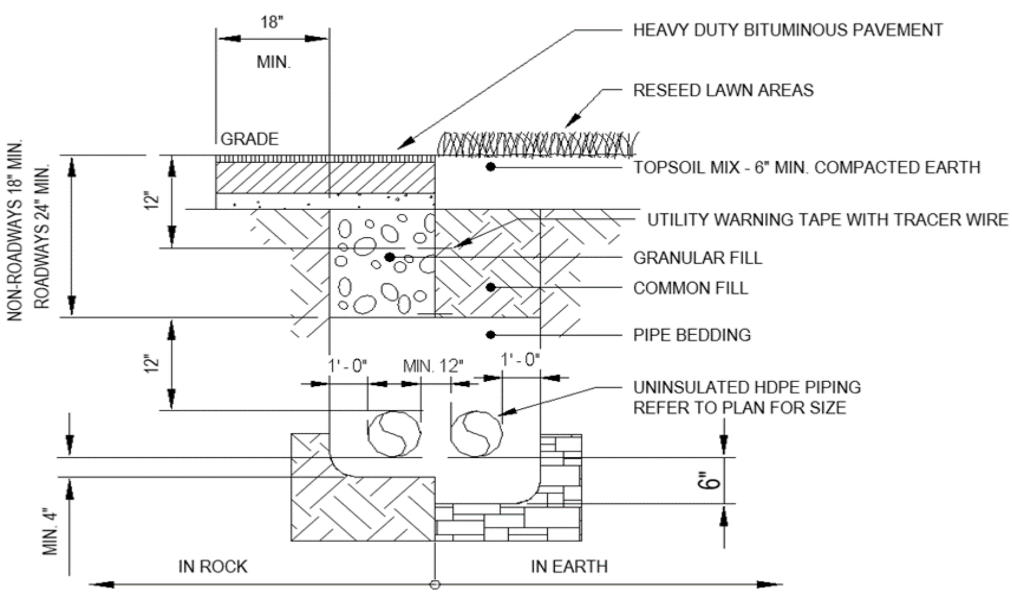
occurrence in the measured daily range (0.2 °F). The changes in effluent temperature and density as a result of the Pilot were relatively small compared to the changes resulting from seasonal differences between the lake and the existing-conditions effluent. The temperature difference between the lake surface water and the existing-conditions effluent ranged from -17.0 °F to 20.3 °F. By comparison, the temperature difference between the lake surface water and the project-conditions effluent had a similar range from -17.0 °F to 20.6 °F. Due to the small magnitude of the change in temperature, it is not anticipated that there will be any effect on the winter conditions in the lake, where the outflowing water at an elevated temperature from the plant creates an area where ice is unable to form during conditions where the lake surface is otherwise frozen. As part of the pilot, a monitoring bouy will be installed to monitor this condition for further study and to support any future expansion in the system.

5.4 Utility Distribution System ("UDS")

The Syracuse UTEN Pilot is designed as a two-pipe distribution system, with separate supply and return distribution mains conveying thermal energy to customers with each customer being connected in parallel. The design supply temperature range of the UDS is 52-75 °F, which is moderated by the thermal storage system to provide those temperatures during peak load conditions. Minimum system temperature is expected to be 46°F during off peak conditions when the thermal storage system would be charging.

The UDS is classified as an "ambient loop" since it operates at a typical supply temperature range of 50 °F to 75 °F similar to average ambient air temperature, with the lowest temperature occurring during the winter and the highest during the summer. This temperature range ensures that customer heat pumps will operate at a high rate of efficiency. A two-pipe ambient temperature loop was selected because a single large thermal resource lends itself to a centralized pumping solution with a higher carrying capacity. The configuration of the harbor also does not allow for a natural loop to be formed for a monoloop. The material of the UDS is PE4710 high density polyethylene (HDPE), with a wall thickness of dimension ratio ("DR") DR11, with the exception of the HDD locations, which have DR 9 piping. The UDS will be installed via direct burial, with the exception of two locations where horizontal directional drilling will be utilized. 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 by curving the pipe at a maximum radius of 25x the pipe diameter, with a minimum of 1 ft clearance to existing piping. The general configuration of the trench installation is shown in Figure 6 below. The piping is uninsulated, since at the ambient operating temperatures there is only a 5% heat loss at design heating conditions which is also offset by a 5% beneficial heating loss at design cooling conditions.

Figure 6: General Configuration of Trench Installation



The UDS consists of two piping systems. The first pipe system conveys treated effluent from the WEP Pumphouse on the Metro WWTP site to the Energy Center and from the Energy Center back to the Metro WWTP. Once returned to the Metro WWTP, the treated effluent is discharged to Onondaga Lake. This first section of the UDS is designed as an open loop force main ("Open System"). The second pipe system is designed as a closed loop system and conveys ambient temperature water from the Energy Center to the customers connected to the UDS and back to the Energy Center ("Closed System"). Water was selected as the thermal energy transfer fluid ("Transfer Fluid") because modeling results show that the loop temperature will never approach the freezing point of water, eliminating the need to incorporate an anti-freeze agent such as propylene glycol. The Transfer Fluid conveyed by the UDS will be a heat source and/or sink for the WSHP based systems installed in customers' buildings. The Closed System will be filled with approximately 450,000 gal of Transfer Fluid. In the pilot phase, the Open System will circulate 750 GPM of treated effluent during minimum flow conditions and 5,000 GPM of treated effluent during maximum flow conditions. The Closed System will circulate 750 GPM of Transfer Fluid during minimum flow conditions and 5,000 GPM of Transfer Fluid during maximum flow conditions. The Open System will operate at 15 psi on average with a maximum allowable operating pressure ("MAOP") of 125 psi. The Closed System will operate at 35 psi on average with a MAOP of 150 psi. Pump sizing, pipe pressure class, and system pressure drop were determined with the future build out state as the limiting condition and then allowed to turn down to the volume of flows needed for the Pilot.

Pipe runs are oversized to allow for increased flow as more customers connect to the UTEN in the future. Oversizing the pipe runs was incorporated into the design because it would be cost prohibitive and both operationally and physically impossible to upsize the pipes in the future. To upsize the pipe systems in the future as needed for connecting new customers would require the installation of the larger piping network in parallel to the existing smaller diameter pipe network; since there is not adequate space in the roadways to accommodate both sets of piping, upsizing the pipe the future would not be feasible. Even if it were feasible to install larger diameter pipe in the future, 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 installed to meet the immediate system needs. Therefore, due to the minimal difference in costs between the different sized pipes when compared to the cost of excavation, installation and restoration, it is more economically prudent to only excavate and repair for the purpose of pipe installation once. It is estimated that installing smaller diameter pipes only sized for the pilot would have been 7% less expensive than installing the pipe in the Pilot design. There also are considerable fixed costs related to installing the thermal resource connection and installing the smaller diameter pipe limits the amount of energy that can be accessed despite the availability of considerably more thermal energy tha can be accessed via the connection.

Work within streets will require removal of existing granite curbs, restoration of the pavement from the road centerline to the curb and the reinstallation of the curbs. All road crossings will be normal to the flow of traffic. The vast majority of the work will occur within city streets and managed under a City of Syracuse road cut permit. All work will be in accordance with the City of Syracuse's road cut permit standards, with a full thickness application of asphalt assumed. Additional coordination will be required where Pulaski Street crosses Bear Street, which is a New York State Department of Transportation ("NYSDOT") owned roadway. NYSDOT has been briefed on the project during each phase of the design, and this crossing will be permitted separately. Piping will be butt fusion bonded where possible, and all joints will be mechanically restrained, eliminating the need for thrust blocks at bends.

Thermal expansion is not anticipated to pose a concern for the direct buried HDPE piping installed as part of the Syracuse UTEN system. Based on established material properties and conservative assumptions, a 50°F temperature differential would result in an estimated axial strain of 0.5%, corresponding to a thermal stress of approximately 550 psi. This value remains well below the long-term allowable stress for PE4710 piping.

The piping is generally unrestrained along its buried length, with anchoring provided at strategic points such as the Energy Center and isolation valves. In this configuration, the surrounding soil acts as a continuous restraint, limiting physical movement of the pipe and converting thermal expansion into axial compressive stress. This behavior is consistent with design guidance provided in PPI Technical Reports TR-21 and TR-46, which confirm that restrained thermal expansion in buried polyethylene pipe systems is accounted for within the allowable stress limits of the material. Accordingly, no thermal expansion joints or loops are required, and the proposed installation is expected to perform within accepted industry standards for durability and reliability under thermal load.

From the Metro WWTP, the Open Loop consists of 3,600 lf of 30” mains. The 30” mains terminate at the Energy Center located on North Geddes Street. To install the initial segment of 30” supply and return piping from the WEP Pumphouse off of the Metro WWTP facility, NMPC evaluated two different methods of installation: trenched installation or horizontal direction drill installation and determined the best option to be horizontal directional drilling as trenched installation would have had significant challenges. The Metro WWTP site is operationally busy, and the entrance to the facility is very densely packed with utilities, including large diameter sewer interceptor lines. Deep excavations, required for trenched installations, would have impeded operations on the site as there is only a single point of ingress /egress for triaxle trailers to enter the facility, which cannot be closed at any time. Additionally, Hiawatha Boulevard is a busy street compared to the rest of the streets in the UTEN service area, and trenching along this street would significantly impair traffic flow in the neighborhood.

By installing the 30" mains via horizontal directional drilling, NMPC will avoid these challenges. Horizontal directional drilling ("HDD") will be employed for the pipe run in this instance, with two ~46" diameter drills extending ~600' from the WEP Pumphouse, under the Metro WWTP gate and subsurface assets, exiting on a property at the southwest corner of Pulaski Street and Hiawatha Blvd. From the exit of the Hiawatha HDD installation, mains will be installed via trenched installation until they reach the Energy Center. From the Energy Center the UDS consists of 1,500 lf of 36" mains that reduce to 24" lf prior to the Onondaga Creek crossing. A pair of isolation valves are provided to segment the system before the HDD installation. To cross Onondaga Creek, two ~40" HDDs will be advanced underneath the Creek. The initial layout of the bore pits is provided in Appendix D pages 138-139. The two 24" pipes will be pulled back through the bores, with final installation ~40' below the mud line of Onondaga Creek. On both ends of the HDD, permanent easement will be required from three property owners. Once on the other side, the 24" mains increase in size back to 30" to allow for more flow to continue to the east side of the creek, where there are more areas for future expansion. The 30" main will continue for another 60 lf until the mains reduce to 24" at Solar Street. Table 2 provides a summary of the UDS main routing described above.

Table 2: Utility Distribution System Main Routing

Segment	Description	Diameter (in)	Flow – Pilot (GPM)	Flow – Future (GPM)	Length (ft)
1 -> 2	WEP Pumphouse to HDD Inlet	30	5,000	17,500	344
2 -> 3	HDD Crossing - Hiawatha Blvd	30	5,000	17,500	861
3 -> 4	HDD Outlet to North Geddes	30	5,000	17,500	2100
4 -> 5a	Energy Center - TR Entry	30	5,000	17,500	819
5b	Energy Center - UDS Supply	36	5,000	15,250[10]	-
5b -> 6	Iron Pier Dr Takeoff	36	5,000	14,375	310
6 ->7	To W Kirkpatrick	36	3,050	12,225	1,000
7 -> 8	W Kirkpatrick to HDD Inlet	36[11]	3,050	12,225	500
8 ->9	HDD under Onondaga Creek	24	3,050	9,925	450
9 -> 10	HDD Outlet to W Kirkpatrick	30	3,050	9,925	1,100
10 -> 11	Solar St / West Kirkpatrick	24	2,750	6,050	583
11 ->12	Solar St	20	2,150	5,175	580
12[12]	Aquarium Miniplant	18	2,000	5,100	680
6 - 6b	Branch to Mixed Use Site	6	555	555	250
6b -> 6c	Branches to Apartment Sites	6	125	125	200
10 -> 10b	Branch to Bldg 10a	20	600	3,100	10,908

Design details of the pipe routing, including coordination with existing surveyed utilities, and depth of pipe can be found in the drawings in Appendix D, pages 124-151. The UDS will be buried at a nominal depth of 5 ft to achieve a distance to top of pipe. The depth increases at intersections where there are conflicts with the existing storm sewer infrastructure, with a maximum depth of 8’ top of pipe. A minimum clearance to other utilities of 1 ft is used throughout the coordination process. At each customer’s premises a pair of supply and return

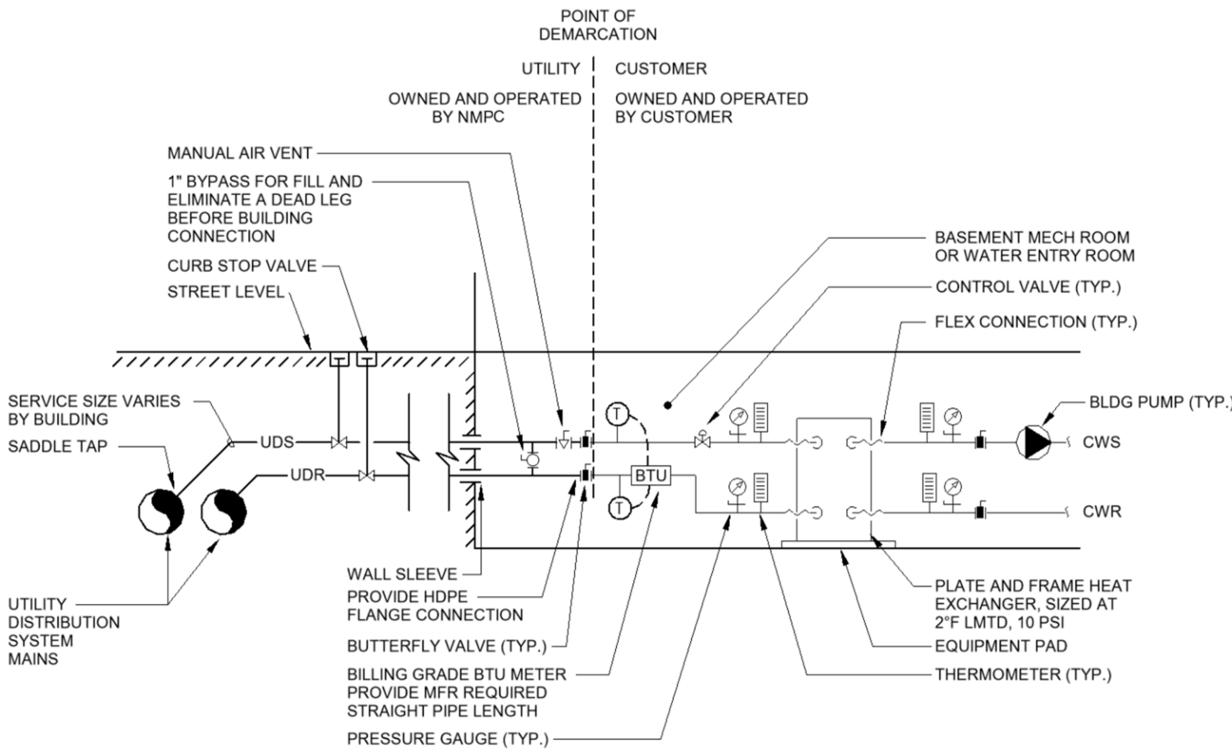
[10] Maximum flow of 20,000 GPM
[11] 24” take off for future load grown down Van Rensselaer Street.
[12] 18” valve with cap for future connection. 14” service line to Aquarium Miniplant and system bypass.

service lines will be run from the distribution mains to the building. The service lines will be made of HDPE and will be sized between 6” and 12” depending on the building load being served. A utility gate valve at the street will serve as a manual shutoff outside of the building, the pipe will transition to steel after it passes through the wall of the building.

5.5 Energy Transfer Station(s)

Within each Pilot customer 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, 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, as 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 7 below depicts a view of a typical customer connection and illustrates the point of demarcation between NMPC infrastructure and customer-owned equipment.

Figure 7: Energy Transfer Station



To achieve isolation of the UDS from the building's internal system(s), the supply and return services, which are run from the distribution mains to the customers buildings, will be routed through a plate and frame heat exchanger. The heat exchanger 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 throughout 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 the Energy Center on a vacant parcel located at the corner of North Geddes Street and Van Rensselaer Street, directly adjacent to the site of a planned future building development. The parcel is owned by COR Development; COR will lease approximately one acre to NMPC for the Energy Center.

Figure 8: Proposed Energy Center

5.6.1 Building Design

The Energy Center building will include the primary mechanical space which will contain equipment such as pipes, pumps, heat exchangers and supporting electrical equipment. The mechanical room will have a utility basement where the incoming piping from the WEP Pumphouse and the UDS enter the building below grade. Connections between the UDS piping, pumps, and heat exchangers will be accessible for maintenance. The basement will be covered by removable metal grates and accessible via a ships ladder. Additional space is set aside for an electrical room and an IT/data room which will house digital communications equipment. The footprint of the building is designed such that existing equipment may be replaced with larger alternatives and additional equipment may be added in the future, with relative ease, to facilitate the expansion of the UTEN. Additionally, a small space in the building's footprint has been reserved to enable facility tours, support educational opportunities, and host meetings. The building construction will be a steel framed structure with precast concrete panel walls, built on a concrete structural slab supported by 135 ft structural piles. Building aesthetic choices were made in consultation with the property owner to match stylistically with the future mixed-use development that will eventually surround the Energy Center. Architectural plans that provide the site layout, and external renderings can be found in Appendix D (EC-A-201 through EC-A-203).

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 serving the Energy Center building include potable water, sanitary, storm and underground electrical. A small parking area will be provided for the building staff and anticipated visitors.

5.6.3 General HVAC and Plumbing

Spaces within the Energy Center will be served by two (2) water source roof top units ("RTUs") which are connected to the UTEN. A dedicated flow meter will monitor the usage of the building as a separate customer of the system. Electric unit heaters will be installed in the electrical room and the hallway of the office space.

5.6.4 Pipe Materials

All piping routed between buildings is to be HDPE, at a point just inside of the Energy Center, the force main will transition to concrete lined ductile iron with flanged fittings. All incoming pipe mains are anchored with concrete just outside the building, so that any thermal expansion occurs away from the building connection. Sampling and analysis of the wastewater effluent showed chloride levels that were determined to be too high to allow for the use of carbon steel. levels that were determined to be too high to allow for the use of carbon steel. Past this point, while inside the energy center, the Open System will remain ductile iron. Just before the piping leaves the Energy Center it will transition back to HDPE.

As the Closed System approaches and exits the Energy Center the UDS is designed as 36" DR11 HDPE. At a point just inside the Energy Center, the Closed System UDS will transition to schedule 40 carbon steel and all utility side piping within the Energy Center will be steel. Just before the Closed System UDS leaves the Energy Center it will transition back to HDPE.

Inside the Energy Center, the steel piping will be welded joints, with valves and pipe accessories provided with flanged connections. Piping will be supported off the floor by posts or a pipe grid. All piping will be insulated with 0.5-1" of elastomeric insulation to provide a vapor barrier and prevent condensation in the summer.

5.6.5 Pumping

The UDS distribution pumps to be installed within the Energy Center during the initial phase will be sized at (3) three x 50% for n+1 redundancy. For this phase, pumps are sized with a 200 hp motor at duty point of 2,500 GPM at 205 ft. The pumps are selected at a head pressure required during the full build out, the phase 1 pressure drop is closer to 75 ft of head. Several styles of pumps were investigated, and inline pumps were selected for having a good performance match to the system requirements and favorable space requirements. The pumps will be installed on concrete equipment pads with support posts to support the pumps independently from the piping. Pumps will be provided with variable frequency drives (“VFD”) to provide part load operation and comply with the energy code. Air/dirt separators are provided in the main suction line and suction diffusers with integral strainers at each pump. Motors will be heavy-duty, inverter-duty, totally enclosed fan-cooled (“TEFC”), and premium efficiency per National Electrical Manufacturers Association Motors and Generators (“NEMA MG-1”) Standard. Locations for six (6) total pumps will be provided, to allow future installation of three (3) pumps rated for 5,000 GPM and 205 ft of head each to enable future system expansion. The varying pumps sizes will allow for better staging and turndown of the system during both the Pilot and future phases of operation. Changes in transfer fluid temperature will result in volume fluctuations; to accommodate these changes in volume two (2) expansion tanks will be installed with 5,280 gallons of expansion volume. Much of the increased fluid volume due to thermal expansion is offset by increased pipe diameter from thermal expansion so the required expansion tank is smaller than a system with all steel piping.

5.6.6 Heat Exchangers

Two (2) plate and frame heat exchangers rated at 2,500 GPM on both the Open System and Closed System sides will be provided. Heat exchangers will be selected at no more than 10 psi pressure drop and 2 °F log mean temperature difference (“LMTD”). The heat exchangers are each sized for a capacity of 10,000,000 Btu/h. The heat exchangers are sized at 50% redundancy, as the average flow of the system is between 1,200-1,500 GPM, allowing for a heat exchanger to be taken out of service during the shoulder season for cleaning every 2-3 years. Each heat exchanger is protected by a basket strainer upstream. The heat exchangers will be installed on concrete equipment pads. Locations for five (5) total heat exchangers will be provided to allow for the future installation of three (3) heat exchangers rated at 5,000 GPM each to enable future system expansion. The heat exchanger materials were upgraded from 304 to 316 stainless steel to increase the corrosion resistance to chloride in the wastewater stream. The water chemistry was reviewed with the heat exchanger manufacturer and the operating temperatures are low enough that 316 stainless steel is an acceptable material, this avoids the use of expansive titanium for heat exchanger plates.

5.6.7 Electrical

A 13.2 kV, 3 phase, primary service will be provided by NMPC to the site from an electrical vault on Van Rensselaer St. A 2,500 kVA transformer with a 480 V secondary will serve the site now and in the future. A 750 kW backup generator will be installed in the current phase to serve the phase 1 pumps and building equipment. A future 750 kW backup generator would be required to install the future pumps. Space is allocated on the site for the future generator, as well as empty conduits for routing wiring and for a future transfer switch. An additional room on the site is allocated to store a 350 kW generator that can be dispatched to serve the WEP Pumphouse in the rare case that the Metro WWTP experiences a power outage. Space was not readily available at the WEP Pumphouse and the subsurface conditions would dictate that any equipment pads would have to be pile supported. All major equipment will be provided with 480V / 3 phase power, with 120 V / 1 phase power provided for lighting, controls, and other support areas. The main pump VFDs have integral line reactors to prevent building harmonics.

5.6.8 Instrumentation and Control

The Energy Center will be provided with a BACNet compatible building monitoring system ("BMS") for monitoring and control of the energy center building systems. Instrumentation and points will be provided to maximize the amount of remote observation available to minimize the need for on-site staff. Mechanical process equipment, including the equipment servicing the Thermal Storage system will be provided with programmable logic controller ("PLC") linked to a Supervisory Control and Data Acquisition ("SCADA") system compatible with the gas operations system for remote monitoring and control. Data from the WEP Pumphouse will be directly connected to the Energy Center through a dedicated fiber optic communications line routed through the same trenching as the Open System. SCADA controls will be capable of interfacing with the existing Metro WWTP instrumentation and control system to allow viewing and emergency override by the plant control room.

5.6.9 Thermal Storage

The proposed Pilot includes a strategic provision for Thermal Storage as a means of ensuring reliable, resilient, and efficient operation of the UTEN. This component is not only a functional enhancement, but also a central element of system optimization. The primary driver for including Thermal Storage is the need for a backup Thermal Energy Resource that can sustain system operation for up to 24 hours in the event of an interruption in flow from the WEP Pumphouse. This contingency planning addresses scenarios such as extreme weather events that force untreated wastewater discharge, extended utility power outages, or mechanical failures such as valve closures. Importantly, Thermal Storage also provides resilience to critical loads, such as the Aquarium.

Beyond its emergency function, Thermal Storage enables several long-term system performance and economic benefits. It smooths thermal load consumption across daily cycles, thereby reducing unnecessary pump cycling. Design conditions are set by the system extremes and the thermal storage system allows for those peaks to be reduced, increasing the peak capacity of the system with no increase in the size of system equipment. This is especially advantageous for cooling, which is the capacity-limiting factor in the total connected capacity of the UTEN system. In this context, Thermal Storage serves as a buffer that extends system capacity without increasing the volume of thermal energy resource extracted from WEP.

Two primary thermal storage system types were evaluated. The first was an integral thermal storage tank operating at system loop temperatures (approximately 48 °F), with a 1.5-million-gallon capacity. This configuration functions as a passive buffer, storing energy for later use without altering loop conditions. While effective for consumption smoothing and emergency operations, this approach requires a larger footprint and capital outlay.

The second, and preferred option, is a dispatchable thermal storage system, which utilizes a smaller 0.75-million-gallon tank that is actively charged using a heat pump chiller. This allows the stored water to be heated or cooled beyond the loop’s operating setpoints, providing a dispatchable energy resource during periods of high demand or supply disruption. The active system charges during off-peak periods and discharges during peak loads, allowing better temperature management and more efficient recovery of heat from the wastewater source. The active storage system offers approximately 15% lower capital cost than the larger passive tank while delivering superior operational value.

To avoid using fossil fuels as a backup source, the other back up options considered were large air to water heat pumps and electric boilers with cooling towers. Emergency connections were also considered but did not appear to have sufficient back up cooling and heating capacity available in a quick enough timeframe to be effective. There is notable thermal inertia of the UDS Closed System loop, with a system volume of about 450,000 gal, which in itself is sufficient and large compared to the pilot phase loads and can provide 2 - 4 hours of delay before the loop temperature deviates from the specified optimal temperature range.

A comparison of the backup options considered are presented in Table 3 below:

Table 3: Backup Options Considered

Option	Electric Demand Impact	Capital Cost	Notes
Thermal Storage (Recommended)	Minimal (Charging only)	$$	Improves resilience. Eligible for up to 50% Investment Tax Credit (“ITC”)
Electric Boilers + Cooling Towers	+4.4 MW	$$	Low equipment cost but significant electrical upgrade. Low COP, inefficient for long-term use
Air Source Heat Pumps	+1500 kW	$$$	Adds significant electric infrastructure load

The Thermal Storage option also will have the additional benefit of potential eligibility for investment tax credit under Section 48e of the Internal Revenue Code - thermal energy storage property directly connected to an HVAC system and capable of shifting thermal load by at least one hour. With prevailing wage compliance, domestic content, and location within an energy community, the total credit available for qualifying components could reach up to 50% of qualifying costs. The statutory guidance clarifies that systems capable of storing thermal energy for space conditioning, not merely transferring it, are eligible.

The active thermal storage system will work by storing hot water at 85 °F in the winter, or chilled water at 44 °F in the summer. A 1,000 ton heat pump chiller would be used to charge the tank during off peak hours, when the system demand is low. In the winter the chiller will pull heat from the return UDS main, reducing its temperature further, which increases the amount of heat that can be extracted from the treated effluent. During peak times the tank will be discharged as needed to maintain 54 °F winter supply temperature and 75 °F peak summer temperature. This range will ensure the efficiency of the equipment connected to the system. The tank will not be discharged to less than 50% of the capacity, leaving the remaining volume available if the primary thermal energy resource source (treated effluent) becomes unavailable.

To confirm emergency operation, a loss of heat event was run through the system model. The limiting conditions chosen were to start on a day that had the design heating temperature (-3 °F) in the morning. It is then assumed that the thermal storage tank starts fully charged at 85 °F but had been already discharging warm water to the loop to maintain a 54 °F supply temperature and help manage peak loads. At 9 pm (t = 0), the thermal storage tank is at 69 °F, and the availability of the thermal resource from Metro WWTP is set to 0 to simulate the main outfall connection valve closing due to external factors. The system supply temperature is reset to an emergency condition of 50°F. The same design day weather and load profile is then repeated to simulate two consecutive days at design heating conditions. The thermal storage tank then continues to discharge into the reserve capacity to maintain a 50 °F supply temperature. Two discharge pumps are available, with the second pump being required for emergency operation where the tank temperature and the loop temperature approach a temperature differential of 5 °F or less. At t = 18 hours the storage is unable to further maintain the 50 °F setpoint. The discharge pumps continue to run and at t = 27 hours the system supply temperature drops below 46°F and a system shutdown is initiated to prevent potential freezing of heat exchangers at customer buildings. This scenario assumes that all 13 buildings in the pilot are connected to the system. Additional measures may be required in the future outside of the pilot as more buildings are added, but at that point there will be several years of operational data available to inform the analysis.

5.6.10 Physical Security & Safety

The Energy Center building 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. Additionally, a security fence will be installed at the rear of the facility, providing security to the overhead door, tank, and generator storage areas.

5.7 Aquarium Retrofit & Miniplant Design

The Onondaga County Aquarium will be constructed and operational before the Syracuse UTEN and will utilize a low-temperature heating hot water (130°F) and chilled water system (42°F) to meet the building's heating, cooling, and process load demands. Before connecting to the UTEN, the low-temperature heating hot water will be produced by an on-site natural gas fired condensing boiler and the chilled water will be produced by five (5) 130-ton on-site air-cooled chillers. The internal distribution system will use a 40% propylene glycol solution as the working fluid. The Aquarium HVAC systems will be sized for a design load of 450 tons of cooling and 9,500 MBH of heating. The extensive life support systems that will be installed to maintain the aquatic life have year-round heating and cooling loads, some of which occur simultaneously. The baseline system installed at the Aquarium will not have the ability to take advantage of simultaneous loads.

Once operational, it will be extremely difficult to retrofit the Aquarium as any disruptions to normal business operations would be unacceptable, especially considering that the building, and its heating, cooling, and process systems, will be brand new. Therefore, a low disruption retrofit solution, which places most of the retrofit work external to the building, needed to be developed to connect the Aquarium. To meet this criterion, NMPC chose to connect to the Aquarium via a 4-pipe system, which will deliver heating hot water and chilled water to the Aquarium and connect to their existing systems. This is different than NMPC's 2-pipe connection plan which will be used for the buildings connecting to the UTEN during the Pilot. To generate heating hot water and chilled water, NMPC will construct a standalone mechanical room which will house a heat pump chiller and connect to the UDS. Supply and return heating hot water and chilled water piping will be run between the Miniplant and the Aquarium. Inside the Aquarium, the delivered heating hot water and chilled water will enter the building's distribution system. This retrofit design approach has four primary objectives which are discussed in more detail below:

1. Directly connect to the building's heating and cooling loops;
2. Maintain redundancy and system resiliency;
3. Enable simultaneous heating and cooling to maximize energy efficiency;
4. Reduce the disruption and impact to normal business operations.

A small satellite central plant, referred to as the Miniplant, located on an adjacent parcel owned by Onondaga County, will house a modular heat recovery chiller ("HRC") system equipped with variable-speed screw compressors. The chiller will have six modules that can each create chilled or hot water from either the UDS or as a simultaneous heating and cooling operation. The current Aquarium system does not have this ability to make hot water from the production of chilled water. The Miniplant will generate significant energy savings, compared to the current Aquarium system, due to the constant process loads from the life support systems. The Miniplant system will provide high-efficiency heating, cooling, and simultaneous operation as needed to the Aquarium. The Miniplant also will serve as the terminus of the UDS, with a 12-inch bypass line installed within the Aquarium to maintain minimum loop flow. Pre-insulated, direct-buried HDPE piping will be routed from the Miniplant to the southwest corner of the Aquarium. The chilled water supply and return will be 10-inch DR11 HDPE, while the heating hot water system will utilize pre-insulated DR11 HDPE-RT piping, rated for elevated temperatures. Routing will require coordination with the ongoing Aquarium construction and an easement from the City of Syracuse to cross public land adjacent to the Inner Harbor.

Connections to the Aquarium's mechanical systems will occur at identified tie-in points. The operational strategy is to mimic the behavior of the building's lead boiler and chiller, ensuring that the HRC system maintains target loop temperatures. When functioning correctly, the HRC system will meet building demands without activating the on-site air-cooled chillers or boilers. However, those units will remain in place to provide backup capacity if needed. Over time, as operational confidence increases, it may be possible to decommission or remove the air-cooled chillers. The aquatic life, which will be on display within the aquarium, requires precise temperature control and a loss of temperature control could result in the death of many animals and the loss of millions of dollars which were spent acquiring these animals. NMPC feels that it is appropriate to allow the Aquarium to retain its existing heating and cooling systems as backup as a form of insurance. Therefore, in the unlikely event that the UTEN is unable to serve the building, the backup systems will be allowed to turn on to preserve the life of the aquatic animals. Once the UTEN is operational again, the backup systems will be turned off and normal UTEN operating conditions will ensue.

The mechanical systems will be housed in a new 1,600-square-foot standalone building. The architectural design will align with the surrounding context, incorporating red brick and black steel elements to reflect the aesthetic of Franklin Square and adjacent development by COR. Utility services, including power and water, will be sourced from Solar Street. Final coordination on the building location and site plan will be conducted in collaboration with adjacent landowners.

Because the stage gate process requires approval of pilot design and concept prior to enrolling customers, it wasn't possible to perform coordination work with the Aquarium during the facility's construction which would have simplified the process of connecting this customer and made connecting the customer less expensive than the retrofit process being implemented. As of June 2025, no inside mechanical work has occurred yet, but some site utilities have already been installed that would create future obstacles as well as future site restoration that would not have been required if installed during the initial construction. It is likely that mechanical work will be completed by the time Stage 3 approval and funding are available based on the anticipated timeline. Since no funds as part of construction could be incurred to pay for enabling work during Stage 2, that coordination could not occur during Stage 2, thereby increasing retrofit costs.

5.8 Resilience & Reliability

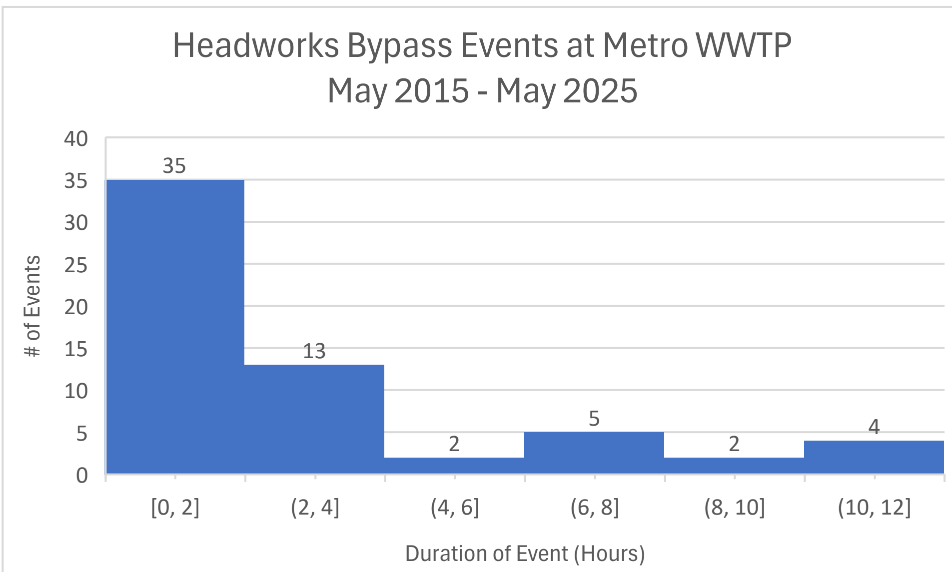
The Syracuse UTEN system will be the primary source of space heating, space cooling, and domestic hot water service for approximately 1,000 users in the newly developed Inner Harbor neighborhood in Syracuse. Failure of the system to operate as intended could jeopardize health and safety, especially during periods of extreme weather. In residential areas, reliable heating and cooling is essential for livable indoor conditions, particularly for vulnerable populations such as infants and the elderly. Interruption of these services can disrupt business activities, leading to financial losses. With these crucial dependencies in mind, the Syracuse UTEN was designed to be a system that is reliable and resilient and includes multiple layers of engineering controls and risk mitigation to ensure the system remains functional during times of power outages and abnormal operation at the WEP facility.

5.8.1 History of Minimal Shutdowns at WEP

As a piece of critical infrastructure for Onondaga County, Metro WWTP has a history of minimal shutdowns, ensuring a reliable and consistent thermal energy resource for the Syracuse UTEN Pilot. This resilience is crucial for maintaining uninterrupted service and optimizing the system's performance. The design of the heat exchanger system also provides for reliability even during certain periods of stress on Metro WWTP system operations. The only situation in which the effluent will be unavailable as a thermal energy resource will be during a headworks bypass, when wastewater bypasses the entire Metro WWTP treatment system resulting in a flow of untreated sewage through Outfall #001 and a discharge to Onondaga Lake. Overflows of the secondary effluent pump station (“SEPS”) to the tertiary wet well would not affect the ability to exchange heat with the treated effluent. Treatment units after the SEPS only remove ammonia and phosphorus which is in solution. Those pollutants will not affect the operation of the pumps, pipelines, or heat exchangers.

A review of data provided by WEP shows that between May 2015 and May 2025 there were 61 headworks bypass events at Metro WWTP. These events would require NMPC to isolate the WEP Pumphouse because the pumps and downstream system cannot pass raw sewage. Of these, 57% were two hours or less in duration, 90% were eight hours or less in duration, and no events lasted longer than 12 hours. Figure 9 below shows the number and duration of all headworks bypasses that have occurred at the Metro WWTP between May 2015 and May 2025.

Figure 9: Number and Duration of Headworks Bypass Events



In the event a headworks bypass occurs during the operation of the Syracuse UTEN system and the treated effluent is unavailable for thermal exchange, the UTEN system would shift to using the Thermal Storage tank as a thermal energy resource. The Thermal Storage tank is capable of meeting peak heating and cooling loads for the system for a 24-hour period of operations, which is twice as long as the longest headworks bypass event that occurred in the last ten years. Based on available WEP operational data, this is more than sufficient to enable continued UTEN operations if a headworks bypass scenario occurs.

5.8.2 Backup Generators

At the Energy Center, two diesel generators will be located on site, along with stored fuel reserves in an AST, to provide power to critical system equipment such as pumps, controls, etc. in the event of an electric grid outage. These generators are sufficiently rated to power all Syracuse UTEN electrical equipment. By providing backup power to these system components, NMPC will ensure that UTEN customers are still receiving space heating, space cooling, and domestic hot water service during regional power outages.

5.9 Real Estate and Leases

The construction and operation of the project will require the acquisition of several property rights for the WEP Pumphouse, Energy Center, and related facilities. Lease agreements have either been executed or agreed to in principle (as described below). Permanent (for routing of pipe) and temporary easements (for design and workspace during construction) have been discussed with the relevant parties and will be executed following approval to move to Stage 3.

5.9.1 Lease Agreements

Purpose: WEP Pumphouse

Address: 650 Hiawatha Blvd W, Syracuse, NY

Status: Agreement in principle

Details: Onondaga County has agreed in their Letter of Intent ("LOI") to allow NMPC to lease the WEP Pumphouse and related property as required to install supply and return piping from the site to the public roadway. Compensation for this item will be a component of the Thermal Resource Fee NMPC pays to WEP. These agreements will be progressed in parallel with PSC review of Stage 2 submittal for finalization following approval to move to Stage 3. The LOI is attached as Appendix G.

Purpose: Energy Center

Address: 751 Van Rensselaer St & North Geddes Street, Syracuse, NY

Status:

Details: A Letter of Intent has been drafted and shared with the Owner; most terms have been agreed to. Temporary License Agreements for access and testing have been executed while NMPC awaits the Lease. The lease will be written to go into effect following PSC approval of the Syracuse Stage 2 Filing and will be a ten-year lease with options to extend for up to 30 years. At the conclusion of the lease, the building would either need to be transferred to the property owner or demolished at cost to the project.

5.9.2 Permanent Easement

Address: 329 West Kirkpatrick Street, Syracuse, NY

Details: A permanent easement is required at this property for installation of the two UDS pipes from West Kirkpatrick Street ROW onto City of Syracuse property to facilitate the two HDDs from the West under Onondaga Creek.

Address: 399 West Kirkpatrick Street, Syracuse, NY

Details: A permanent easement is required at this property for installation of the two UDS pipes from West Kirkpatrick Street ROW onto COR Development property to facilitate the two HDDs from the East under Onondaga Creek.

Address: 380 Spencer Street, Syracuse, NY

Details: A permanent easement is required at this property for installation of the two UDS pipes from West Kirkpatrick Street ROW onto COR Development property to facilitate the two HDDs from the West under Onondaga Creek.

Address: 451 Solar Street, Syracuse, NY

Details: A permanent easement or a lease will be required to facilitate the installation of the Miniplant and associated heating hot water and chilled water piping.

Address: 701 Pulaski Street, Syracuse, NY

Details: A permanent easement will be required to allow for the installation of supply and return pipes from the HDDs traversing underneath Hiawatha Blvd back to the public ROW of Pulaski Street.

5.9.3 Temporary Access Agreements

Address: 701 Pulaski Street, Syracuse, NY

Details: Landowner is reviewing the temporary access agreement for geotechnical boring, additional temporary access will be required during construction to facilitate completion of the two HDD’s exiting the Metro WWTP facility.

Address: 751 Van Rensselaer Street, Syracuse, NY (COR Development)

Details: New Access Agreement executed April 23, 2025 – Term 180 Days – for survey and testing. Additional temporary access will be required during construction for workspace adjacent to the area leased for the Energy Center.

Address: 329 West Kirkpatrick Street, Syracuse, NY(COR Development)

Details: New Access Agreement executed April 3, 2025 – Term 180 Days – for survey and testing. Additional temporary access will be required during construction to facilitate the completion of the two HDD's to be drilled under Onondaga Creek.

Address: 399 West Kirkpatrick Street and Van Rensselaer, Syracuse, NY (City of Syracuse)

Details: New Access Agreement executed April 23, 2025 – July 31, 2025 – for survey and testing. Additional temporary access will be required during construction to facilitate the completion of the two HDD's to be drilled under Onondaga Creek.

5.10 Permits

NMPC has identified the following permits which will be required to construct the Syracuse UTEN Pilot. Several permit applications, like the SPDES modification, have begun already. Other permit applications will be filed once granted approval to advance to Stage 3.

5.10.1 Metro WWTP SPDES Modification

A Basis of Design Report was authored by NMPC and submitted for NYSDEC review with a cover letter from WEP in December 2024. Since then, five meetings have taken place with NMPC, WEP, and NYSDEC representatives of various departments to discuss project impacts and permitting requirements. In consideration of WEP's current Metro WWTP SPDES permit renewal, NYSDEC provided iterative comments on the design and modeling for incorporation into the NMPC design. Following receipt of their current renewal during Q3 or Q4 2025, NMPC and WEP will work to submit an official SPDES review application, which will be held for approval until the receipt of PSC Stage 2 approval.

5.10.2 NYSDEC Stormwater Permits

Stormwater Pollution Prevention Plan ("SWPPP") field work has been completed in preparation for submittal for Separate Storm Sewer System ("MS4") review promptly following PSC approval to advance to Stage 3. This will provide sufficient review time for a Q2 2027 Construction Start.

5.10.3 United States Army Corps of Engineers ("USACE") Section 10

A Section 10 permit is needed for the dual HDD crossing of Onondaga Creek. This application was prepared in parallel with the HDD design and application was submitted in June 2025. Once received, this permit is in place for two years and can be extended as necessary pending completion of the work.

5.10.4 Building Permits for Utility Facilities

NMPC has communicated with the City of Syracuse to determine the appropriate building permits required for the project. These would be required for the WEP Pumphouse, Energy Center, and Miniplant. Applicable costs have been included in the Detailed Construction Cost Estimate, and appropriate information for completion of permit applications has been included in the design package. Following approval to move to Stage 3, building permit applications will be submitted for review.

5.10.5 NYSDOT Crossing Permit

A NYSDOT PERM 32 permit will be required where subsurface piping crosses Bear Street, NYSDOT has been engaged through various design iterations in consideration of the upcoming Bear Street work as part of the I-81 project in Syracuse. The PERM 32 permit expire after 1 year, and as such will be submitted for approval following approval to move to Stage 3.

5.10.6 City of Syracuse Street Opening Permit

A street opening permit will be required for UDS pipe installation. Department of Public Works ("DPW") permits expire after 1 year and will not be submitted until Stage 3; however, the City of Syracuse has been made aware of the project throughout design and have granted two permits previously for design investigations (utility test hole verifications). The Stage 2 design incorporates City of Syracuse backfill and restoration requirements and the associated costs are included in the Detailed Construction Cost Estimate.

5.10.7 City of Syracuse Site Plan Application

NMPC has participated in two pre-application review meetings in 2024 and 2025 to review the entire UTEN project, and the Energy Center siting specifically, with city planning. The Energy Center location is zoned MX-4, in which the Energy Center is permitted, with a variance of the three-story minimum height. This development will be labeled a "major utility use", which requires Site Plan and Special Permit Approvals. Major Site Plan review will be required, which will include a public hearing. NMPC will submit the variance request during Q3 2025 followed by Site Plan Review in Q1 2026.

5.11 Environmental

As a result of the long and varied land use history of the Inner Harbor, legacy environmental impacts are known to remain within the area. Completion of the Syracuse UTEN Pilot will necessitate the removal of large quantities of soil for construction along the ~1.5 mile long transect. During design, NMPC contracted with VHB to complete evaluation of soil conditions throughout the work area to allow for an accurate estimate of waste management costs and for the creation of a Soil Management Plan that will be utilized during construction to facilitate active management of the spoils and maximize efficiency through live loading when working in the city streets. Nearly 50 soil borings were advanced, none of which revealed any contaminant levels that would require management of spoils as hazardous waste, but many with impacts requiring non-hazardous management as contaminated soil. Modeling suggests that approximately 16,769 cubic yards will be disposed of as contaminated, while 10,875 cubic yards can be managed without restriction. Sediment and stormwater will be managed by a Storm Water Pollution Prevention Plan and Erosion and Sediment Control plan, and dewatering during construction will be managed appropriately according to water quality assessments performed at the time of construction. VHB has also conducted modeling efforts to determine likely dewatering quantities and environmental management costs, which have been included in the proposed budget.

6. Coordination with Metro WWTP

The thermal energy resource for the Syracuse UTEN Pilot is the treated wastewater effluent at the Metro WWTP. Utilization of this resource will require construction within the active facility as well as creation of a point of demarcation between the Company’s assets and Onondaga County owned assets.

To facilitate this, the Company and Onondaga County have collaborated and signed a LOI that outlines a framework of the understanding between both parties that will be used to draft final agreements in the future. This includes consideration to be paid by the Company to Onondaga County for occupation of the site and use of the thermal energy resource ("Thermal Energy Resource Fee").

In December 2024, the Company and Onondaga County together submitted a Basis of Design Report to NYSDEC for review. Five meetings have since been held with NYSDEC, WEP, and the Company in 2025 as a component of the review. This process, which governs modifications at regulated wastewater treatment plant facilities, allows NYSDEC to review the design of planned projects, ultimately dictating any necessary changes to ensure continuity of plant operations and protection of the environment. NYSDEC feedback has been incorporated into the design submittal and budget presented in the Syracuse Stage 2 Filing. In parallel with the review of the Syracuse Stage 2 Filing, NMPC and WEP will work to issue 90% design drawings, which will be submitted with the SPDES modification request late as previously described. At this stage, NYSDEC will formalize any additional monitoring requirements attached to the Metro WWTP SPDES permit that are related to the UTEN system. In parallel, the LOI will be expanded upon into a formalized Term Sheet and drafted agreements for signature following approval to move to Stage 3.

An Access / Construction agreement is planned to allow the Company access to the facility during construction, which will include HDD activities, open trench work, construction & demolition at the wet well, and commissioning. Once operational, the point of ownership demarcation will be the upstream side of the NMPC owned outfall isolation valve, inclusive of the valve, which will be constructed as part of the WEP Pumphouse (after removing an unused existing structure). WEP will have visibility, but not control, into the real time monitoring of the supply and return side of the Open System. Here, the isolation valve, which denotes the point of demarcation, can be closed by WEP or the Company in the event of needed maintenance or during an emergency situation. The agreement will dictate the communication required from either party in the event of a planned or emergency closing of the valve. An O&M agreement will allow the Company to access the facility to monitor, maintain, repair, and operate the WEP Pumphouse as required.

6.1 Discharge Permitting

The SPDES permit issued by NYSDEC to WEP allows the Metro WWTP to discharge treated wastewater effluent to Onondaga Lake, and as such is critical to their operation. The SPDES permit for Outfall #001 does not currently have any temperature limits associated with it, although it is listed as a monitored parameter. NYSDEC's review of the potential impact of the UTEN connection has been a crucial aspect of the Stage 2 design phase of the Syracuse UTEN project. Using a design flow of 5,000 GPM (7.2 MGD), the interaction with the UTEN system could modify the bulk temperature of the fluid leaving the outfall in the order of 1.1°F during periods of peak heat rejection (cooling load) on the system. This is within the typical current variation in temperature seen in the historical data. The most analogous scenarios from a permitting perspective are in other HVAC applications as seen in several locations on the Hudson River and the Cornell Lake Cooling System where heat is being added to a natural source but at a variable rate. Furthermore, the interaction of the system typically changes the flow temperature to be closer to the lake surface temperature which could have a marginally beneficial effect by lessening the thermal impact of the flow on the lake. There are complex hydrologic effects that will need to be evaluated to determine the impact of the thermal variation both on the temperature of the lake but also the flow and mixing patterns. The Metro WWTP has a net heat addition of approximately 1,400,000 MMBtu to the lake annually, largely owing to the +15-20 °F temperature difference between the flow and the lake surface temperature during the December – March period in the winter when the surface temperature is 32-33 °F. Metro WWTP treated effluent accounts for approximately 20% of the lake inflow, which makes any variations in the conditions leaving the plant have an outsized effect on the local hydrology.

In December 2024, the Company collaborated with WEP, who submitted to NYSDEC a 30% Basis of Design report which included the proposed WEP Pumphouse design, modeling of the hydrologic impacts the addition of the UTEN are expected to have on Metro WWTP's operations, and detailed analysis of the temperature impacts of the UTEN on both the Metro WWTP effluent and Onondaga Lake. NYSDEC has determined that the addition of the Company's UTEN project and the thermal exchange with the effluent constitute a new thermal process at the WEP site, requiring additional hydrologic modeling that studies the effects on the lake surface temperature to ensure compliance with New York Codes Rules and Regulations ("NYCRR") Part 704.2. In coordination with NYSDEC, WEP, CHA, and Anchor QEA (for lake modeling), studies have shown that that the addition of the UTEN heat in summer, and subtraction of heat in the winter, will have a negligible impact on lake surface temperatures or thermal behavior. These reports have been provided to NYSDEC and their comments received and incorporated into the design. Following Metro WWTP's receipt of their current SPDES renewal, a new modification will be submitted in parallel with PSC review of the Syracuse Stage 2 Filing based on the previously reviewed Basis of Design Report. Based on collaboration to date, NMPC then expected NYSDEC to grant a modification requiring the addition of temperature monitoring and reporting to WEP's SPDES permit. It is also expected that in-lake temperature monitoring (via a data collection buoy) will be required. Costs for this effort have been included in the Detailed O&M Cost Estimate.

6.2 Thermal Energy Resource Agreement

To govern the relationship and establish a framework that outlines the responsibilities of both WEP and NMPC, NMPC will develop and negotiate a comprehensive Thermal Energy Resource Agreement ("TERA") if approved to progress to Stage 3. The TERA for the Pilot is unique because WEP does not gain any direct benefits and only assumes additional risk by allowing NMPC access to their site to interact with the wastewater effluent. Consequently, the Company will assume all the risk associated with the Pilot. The Thermal Energy Resource Fee, which NMPC will pay to Onondaga County, will be structured to include the cost of access to the facility, the approximate economic value of using land and facilities in that area, as well as compensation for the impact to their labor resources.

Given that WEP provides a critical service to Onondaga County, NMPC operations must not interfere with their essential functions. The TERA will expand upon an existing Letter of Intent and will address circumstances warranting system isolation and maintenance & service interruption notification requirements. WEP will have the right to isolate the UTEN system from the Metro WWTP at the delivery points under certain conditions, such as ensuring proper management, operation, and maintenance of the Metro WWTP. WEP will make commercially reasonable efforts to provide notification of such circumstances to the Company within specified timeframes. In the event of an emergency or any occurrence that alters the expected flow rate, temperature, or water quality of the finished effluent, WEP will endeavor to provide timely notice. When possible, WEP will schedule maintenance which requires system isolation during the shoulder seasons between summer and winter.

At the time of this Syracuse Stage 2 Filing, WEP and the Company have agreed upon basic terms but have not developed a final TERA. Development of the TERA will continue in parallel with review by the Commission as described above (along with the associated relevant NYSDEC SPDES modification activities). Once the Syracuse Pilot project is approved to move forward to construction, the TERA will be executed by the two parties.

7. Metrics

As part of the Syracuse UTEN Pilot, the Company will have an Evaluation, Measurement, & Verification ("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 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 will operate 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 will be controlled by a SCADA system that tied into the existing gas operation 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 BMS based system will be provided at the Energy Center to collect temperature, flow, and energy usage of the system as defined in the EM&V plan. Additionally, each customer site and the Aquarium mechanical room will be provided with similar BMS overlays to the installed equipment, with cellular modems relaying that data back to the Energy Center for collection. Set forth below are details about the type of data to be collected via NMPC's comprehensive EM&V plan.

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 (excluding borehole balancing equipment)
- 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

NMPC shall conduct a comprehensive review and provide a report on the electric consumption and demand of customers. Only the Aquarium will be completed and operational before connecting to the Syracuse UTEN. Therefore, the Company will report on the electric and natural gas consumption of the Aquarium both prior to and following connection to the UTEN. All other customer buildings will connect to the UTEN as they are constructed and will not have baseline data available. The Company will only be able to report electric consumption data following connection to the UTEN for these buildings. In addition to monitoring electric consumption for customers, the Company will monitor and report the electric consumption, demand, and associated costs for the UDS, Thermal Energy Resource, Energy Center, and Miniplant. The Syracuse UTEN intends to collaborate with WEP to obtain any electrical consumption and cost data that the Company does not have direct access to.

Furthermore, the Company will furnish metrics related to operational and capital expenditures. 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. These 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 Domestic Hot Water 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 4 sets forth the Company's high-level plans to progress the Syracuse UTEN Pilot from submission of the Syracuse Stage 2 Filing through the pilot term and the completion of Stage 5. Please see Appendix H 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 4: Syracuse UTEN Pilot Schedule

Timing (Estimated)	Action
Stage 1 and 2 Schedule	
Jan '23	Syracuse UTEN Pilot site proposal filed with the Commission
Sep '23	Guidance Order published by the Commission
Dec '23	15% Design Complete: UTEN
	15% Design Complete: Customer Equipment
	Permitting: Begin process of identifying permits for UTEN
	Permitting: Begin process of identifying permits for Customer Equipment
	Final UTEN Pilot Project Proposal filed with the Commission
Apr '24	Commission approval to advance to Stage 2 received
May '24	30% Design Complete: UDS
	30% Design Complete: Aquarium Retrofit & Customer Connections
Oct '24	30% Design Complete: Energy Center
Dec '24	30% Design Complete: Thermal Energy Resource
	Engage NYSDEC to begin SPDES permit review
Aug '24	30% Design Complete: UTEN
	30% Design Complete: NYCHA Retrofit
	30% Design Complete: Commercial Customer Retrofits
Jan '25	60% Design Complete: UDS
	60% Design Complete: Energy Center
Apr '25	60% Design Complete: Thermal Energy Resource
May '25	90% Design Complete: UDS
	90% Design Complete: Energy Center
Jun '25	50% Design Complete: Aquarium Retrofit & Customer Connections
Jul '25	Syracuse Stage 2 Filing filed with the Commission
	100% Design Complete: UDS
	100% Design Complete: Energy Center

Timing (Estimated)	Action
Dec ‘25	90% Design Complete: Thermal Energy Resource
	90% Design Complete: Aquarium Retrofit & Customer Connections
Feb ‘26	100% Design Complete: Aquarium Retrofit & Customer Connections
May ‘26	SPDES Permit Approved by NYSDEC
	100% Design Complete: Thermal Energy Resource
	Thermal Energy Resource Agreements Finalized with Onondaga County
Stage 3a Schedule	
May ‘26	Commission approval to advance to Stage 3a received
Jun ‘26	Finalize Design and Prepare Bid documents
	Permitting: Begin filing for all construction permits
Aug ‘26	Customer Agreement executed and Customer Enrollment Completed
Stage 3b Schedule	
Aug ‘26	Commission approval to advance to Stage 3b received
	Procurement: Issue for Bid (“IFB”) package and Request for Proposal (“RFP”) released to the market
Feb ‘27	Procurement: Contract award and onboard contractors
Mar ‘27	Permitting: All permits obtained
Apr ‘27	Notice to Proceed Provided to Contractors; Begin Construction
	Begin Construction
Sep ‘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 Syracuse 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 May 2026, then procurement and pre-construction activities will occur with the target of an April 2027 construction start. It is expected that most work will occur during the 2027 and 2028 construction seasons with some mehanical work during the winter of 2026-2027. The system is planned to be placed into service in October 2028.

The construction works included within this project can be divided into five primary categories as discussed below.

8.1 Utility Distribution System – In-Street Work

The Utility Distribution System consists of 7,325 ft of HDPE piping that is primarily located within the City of Syracuse’s streets. This work cannot be performed in the winter. It is expected that the in-street work noted above will take approximately 10 months to complete; this scope will begin in Spring 2027 and will be completed during the summer of 2028.

8.2 Utility Distribution System - Trenchless Crossings

Construction of the Syracuse UTEN Pilot includes two trenchless crossings. The first will involve two horizontal directional drills that will convey HDPE piping under Onondaga Creek parallel to West Kirkpatrick Street. These drills will be to accommodate 24” diameter pipe and are approximately 890 ft in length. The second crossing will include two drills to accommodate 30” diameter HDDs to convey HDPE piping off the Metro WWTP facility and under Hiawatha Blvd. Each of these efforts are expected to take approximately 1 month each and will be done in series during the first construction season.

8.3 Energy Center and Thermal Energy Resource – Facility Construction

The WEP Pumphouse will be constructed at the Metro WWTP and it will contain equipment responsible for conveying treated effluent off the Metro WWTP to the Energy Center and back to the Metro WWTP where it will ultimately be discharged into Onondaga Lake. The Energy Center will contain pumps, heat exchangers, and other equipment designed to extract thermal energy available in the treated effluent and deliver that thermal energy to customers further who are connected to the UDS. The construction of both facilities will begin during the 2027 construction season.

8.4 Energy Center and Thermal Energy Resource – Inside Work

The WEP Pumphouse and Energy Center both require 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. The inside work in both the WEP Pumphouse and the Energy Center will begin during the winter of 2027/2028 and continue through the 2028 construction season.

8.5 Aquarium Retrofit & Customer Connections

Construction of the Onondaga County Aquarium will be completed before the Syracuse UTEN Pilot is completed. Therefore, the Aquarium will install its own heating and cooling equipment to operate on its own before it can connect to the Syracuse UTEN. To serve the Aquarium, NMPC is proposing to construct a standalone building which will house a heat pump chiller responsible for generating hot and chilled water which NMPC will deliver to the Aquarium via a 4-pipe system. The heat pump chiller will be served by the 2-pipe UDS. The construction of the Miniplant, as well as the 4-pipe connection to the Aquarium will take place during summer 2028.

Several buildings will be under construction at the same time as the Syracuse UTEN. These buildings will not be completed before the Syracuse UTEN; however, they will be finished in parallel. These structures will not require any retrofit solution since they will be constructed with the intention of connecting to the UTEN. Service lines will be run from the UDS to the buildings during the construction of the UTEN. These service lines will be valved off until the building(s) is ready to be connected. Other buildings will be constructed after the planned in-service date of October 2028. Similarly, these buildings will not require any retrofit solution since they will be constructed with the intention of connecting to the UTEN. NMPC will construct the service lines and ETSs to connect these buildings as their completion date approaches.

9. Project Costs

The Company's cost estimate for the development, construction, and operation of the Syracuse UTEN Pilot throughout its 5-year pilot lifetime are detailed below. The total cost incurred by the Company in the development of the Syracuse UTEN Pilot, from its inception in September 2022 through May 2025, are also discussed. Tax credits are discussed below as a potential method to lower project costs. Lastly, the costs which NMPC has identified but does not intend to incur during the 5-year pilot period are described as budgetary costs.

The Syracuse UTEN Pilot represents a first-of-its-kind initiative for the Company. Given its pioneering nature, there is an elevated risk of encountering unique construction, operational, and business challenges beyond the Company's traditional experience in managing gas projects. To effectively address these potential challenges, the Company respectfully requests the flexibility to reallocate approved funding across project categories. This flexibility would enable the

Company to offset unexpected cost overruns in one area with savings realized in another area. All such reallocations would be fully documented and included in the monthly reports submitted to the Commission.

9.1 Construction Costs

For the Final Syracuse UTEN Pilot Proposal submitted for Stage 1 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 Final Syracuse UTEN Pilot Proposal, the Company estimated the cost of construction would be $112.8M. 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 detailed cost estimation process to further facilitate financial planning and resource allocation.

For the Syracuse Stage 2 Filing, the Company has developed a detailed project cost estimate using a 90% design for the Energy Center and Utility Distribution System, a 75% design of the Thermal Energy Resource, and a 50% design of the Aquarium Retrofit and & Miniplant ("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 provided 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's uncertainty in how conditions will change between submission of the Syracuse Stage 2 Filing and receipt of approval to move to Stage 3. Once Stage 3 commences and the procurement process begins, the Company will have a 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 the Syracuse Stage 2 Filing, the Company would petition for a funding increase from the Commission before agreeing and contracting with any vendor and/or contractor. NMPC's Syracuse Stage 2 Filing cost estimate has been prepared using all currently available information and is expected to cover all costs needed to construct and operate the Syracuse 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 $126.4 M as set forth in Table 5 below.

Table 5: Syracuse UTEN Pilot Design and Construction Cost Estimate

Construction Costs	
Project Component	Cost ($M)
Utility Owned Equipment	$81
Customer Owned Equipment	$12
Design & Project Development	$7.2
P80 Risk-Based Contingency	$20
Escalation	$6.2
Total	$126.4

The increase of $13.6 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 incentives for DHW for all customers, the inclusion of a thermal energy storage system, and a change in the retrofit approach for the Aquarium.

9.2 Operations and Maintenance ("O&M") Costs

For the Final Syracuse UTEN Pilot Proposal submitted by the Company for Stage 1 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 $19.9M, 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. The Preliminary O&M Cost Estimate did not include a thermal resource fee which NMPC would be required to pay for access to the thermal energy available at the Metro WWTP site. Since then, the Company has advanced the design of the Syracuse UTEN Pilot significantly, changed the scope of Company-owned assets, and has gained a better understanding of the system requirements. Based on the advanced design of assets to be owned by the Company, the Company has developed an updated estimate ("Detailed O&M Cost Estimate") of the costs to own, operate, and maintain these assets, 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 6 below sets forth the O&M costs estimated to be incurred during Pilot operation.

Table 6: O&M Costs During 5-Year Pilot Period

Operations & Maintenance Costs	
Project Component	Cost ($M)
Full-Time Employees & Upskilling	$5.17
Environmental Monitoring	$0.28
Property Taxes	$8.35
System O&M Requirements	$3.24
Selective 5% Contingency	$0.02
5-Year O&M Total	$17.06

The 5-year O&M total of $17.06 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 includes costs associated with environmental monitoring work that must be completed to satisfy NYSDEC requirements.

Currently, NMPC does not envision requiring environmental monitoring past the 5-year pilot term. Therefore, after the 5-year pilot is over, the on-going O&M cost for the UTEN would be reduced as this work would no longer be required. 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 PILOT agreement 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 $2.66 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 for the 5-year O&M cost estimate change is the inclusion of the thermal energy resource fee which NMPC will pay for access to the thermal energy available at the Metro WWTP site. This thermal energy resource fee had not been included in any previous versions of the operations and maintenance costs of the Syracuse UTEN Pilot.

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 7 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 Syracuse UTEN. The on-going O&M costs that NMPC will incur after the 5-year pilot period is expected to be lower due to lower property taxes and other factors previously discussed.

Table 7: Summary of Costs

Item	Cost ($M)
Project Development, Design, and Construction Costs	$126.4
5-Year Pilot O&M Costs	$17.06
Total Pilot Costs	$143.46

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 Syracuse 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. 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.

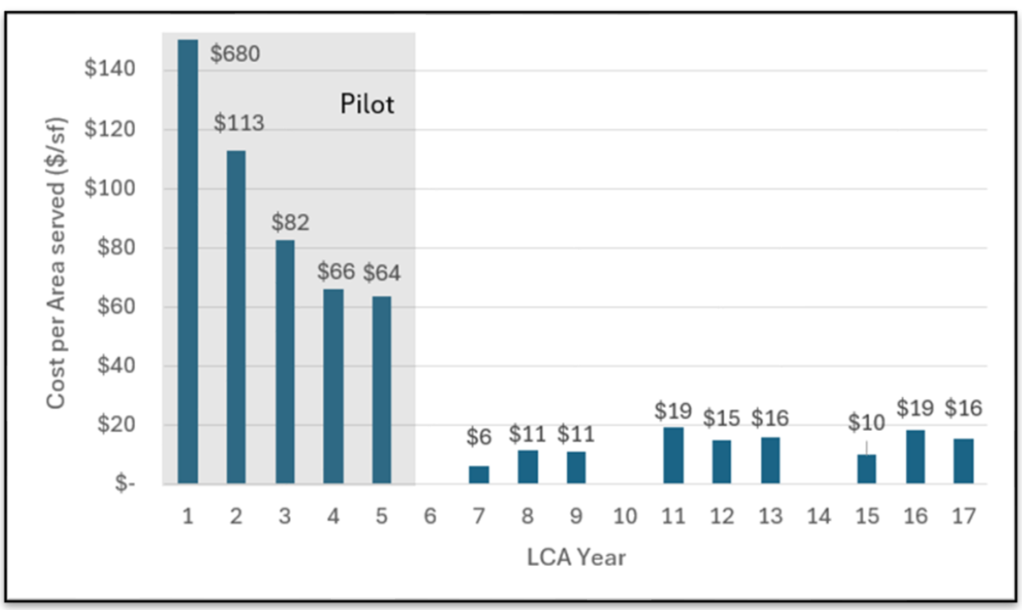
See Appendix I for more details of the Construction and O&M cost estimates for the Syracuse UTEN Pilot project costs.

9.4 Value of Oversizing for Future Expansion

As part of the design of the Pilot, there are several areas where a determination was made to oversize components for future expansion where it would be infeasible to increase the size later. This includes items like UDS piping installed under city streets and the directionally drilled UDS piping, construction of the Thermal Energy Resource connection, and the Energy Center. Equipment, such as additional pumps and heat exchangers, which can be added later to expand capacity were not included in the design of the Syracuse UTEN Pilot, and their costs are not represented in the Construction Cost Estimate. If NMPC were to design the system to meet the immediate system needs, the maximum pipe size of the system would only be 18". Pipe trench street restoration would still be similar in scope, as paving of a whole lane would be required in both cases to meet City of Syracuse road cut standards. The Energy Center would be reduced in size by 2,200 sf of mechanical space, which would slightly decrease the capital cost of the Energy Center.

The value of the oversized components is approximately 7% of the estimated construction costs. This oversizing would allow for additional load to be added to the system efficiently and with reasonable costs in the future. For the lifecycle cost analysis, presented in Section 12.5, a set of buildings based on long term plans from the City of Syracuse Economic Development Office to simulate how additional load could come on to the system after the pilot. A total of 1.25 million square feet of office, apartment, and retail space is programmed. This additional area would bring the total cooling load to 3,000 tons and the total system flow to about 9,000 GPM. This additional area could generate an additional $26 million in Thermal Energy Fee revenue for the system for an approximate cost of $18 M to connect these customers. Treatment of these costs and revenue rates would be the subject of a future rate case. Costs to connect customers are considerably lower after the pilot, as shown in the figure below. Costs include new pipe laterals down side streets, building connection, and heat exchangers. The cost of additional pumps and heat exchangers when the system capacity calls for it are also included.

Figure 10: Cost of Connecting to Customers Over Time



As shown in the figure above, by carefully designing certain system components to be larger than necessitated by the original customer base, NMPC has positioned the Syracuse UTEN Pilot to be easily expandable, both technically and economically. Compared to the initial buildout of the system, connection of future customers will be 36 – 113x more cost effective, depending on how many changes to the system are required by the connecting customers. In year 7 for example, the original pumps, pipes, and heat exchangers will be able to meet the expected growth of the system, therefore, NMPC will only need to construct new service lines and an ETS for new customers. This results in a cost of connection of $6 / sf served, which is 113x more cost effective than the initial cost of connection. In year 11, the cost of connection increases to $19 / sf served as a result of the system requiring increased pumping and heat exchanger capacity, in addition to the required service and ETS installations. This rate of $19 / sf served is still nearly 36x more cost effective than the cost of connection in year 1. The initial cost of connection, in year 1, is much higher than the cost of connection in year 6 and on because of the installation, and associated cost, of the baseline system, which is needed to enable future connections at such a cost-effective rate.

9.5 Comparison to Alternate Thermal Energy Resources

To evaluate alternatives to the use of treated effluent from the Metro WWTP as the ambient loop Thermal Energy Resource for the Utility Thermal Energy Network, two closed-loop geothermal bore field configurations were analyzed. Each alternative is designed to meet the system's thermal performance needs and includes all capital costs, infrastructure, and utility oversight. It assumed for simplicity of comparison that the balance of the system would be comparable and only the Thermal Energy Resources would be compared, as the Transfer Fluid would still need to be pumped to each building and an Energy Center with pumps and heat exchangers would still be required to decouple the systems. This comparison is only to the pilot loads, with no additional credit given to the wastewater for the additional capacity for future expansion available.

The aggregate system thermal load is cooling dominant, with the cooling load 1.15x the heating load and the cooling loop load 2.1x the heating loop load. This is owing primarily to new construction buildings being constructed with modern building envelopes and airtightness standards. Geology in the area is challenging for geothermal boreholes. The area is within the Onondaga Lake trough, with loose/soft materials dominating the overburden materials for several hundred feet.

9.5.1 Alternative 1: Borefield Sized for 75°F EWT

This borefield matches the thermal profile of the WWTP effluent, at a summertime peak of 75°F over a 25-year period. Winter performance is similar as well with a minimum temperature of 48°F

- Estimated Total Cost (Before Incentives): $55.0 million
- Estimated Net Cost with Incentives (40% ITC): $37.3 million
- Key Assumptions and Costs include:
    - 900 boreholes at 750 ft (675,000 lf)
    - Borehole construction at $35/lf
    - Site piping, vaults, dewatering, excavation, restoration
    - Deep bedrock requires extensive steel casing (225,000 lf),
    - Land acquisition (5.7 acres), assuming that 2.5 acres are available by using adjacent parking lots.

- Two (2) 150 hp pumps and a 500 sf pump building
- 30% markup for utility oversight, design, and implementation

This scenario requires nearly 6 acres of contiguous, accessible open land—a significant constraint in developed areas. There is no guarantee that land in the correct location will be available, for sale, or affordable at a price that aligns with project feasibility. The challenge of securing this land would add significant siting uncertainty and financial risk.

9.5.2 Alternative 2: Borefield Sized for 85°F EWT

This reduced performance borefield is sized to match the cooling load at Air-Conditioning, Heating, and Refrigeration Institute ("AHRI") cooling tower conditions, supports basic thermal needs but offers limited reduced summer efficiency due to elevated loop temperatures. Winter minimum temperature also drops to 45°F over the 25-year period.

- Estimated Total Cost (Before Incentives): $38.0 million
- Estimated Net Cost with Incentives (40% Investment Tax Credit ("ITC")): $22.8 million
- Key Assumptions and Costs include:
    - 600 boreholes with a depth of 750 ft (450,000 lf)
    - Borehole construction at $35/lf
    - Site piping, vaults, dewatering, excavation, restoration
    - Deep bedrock would require extensive steel casing (175,000 lf),
    - Land acquisition (3 acres)
    - (2) 150 hp pumps and a 500 sf pump building
    - 30% markup for utility oversight, design, and implementation

9.5.3 Comparison to WWTP Effluent Thermal Energy Resource

The WWTP-based solution includes the cost of connection infrastructure, a dedicated pump station, and piping to the central Energy Center. It avoids the siting, permitting, and environmental complexities of borefield development while providing superior thermal characteristics.

- Estimated Total Cost (Before Incentives): $31.07 million
- Summary of Cost Comparison (Before Incentives):

  85°F EWT Borefield - $38.0 million

  75°F EWT Borefield - $55.0 million

- WWTP Effluent Connection with piping to Energy Center, $31.07 million

Although closed-loop geothermal systems are technically viable, they impose significant challenges in terms of land availability and acquisition cost, subsurface risk, and construction complexity. In contrast, the WWTP effluent source is already available, delivers high-quality thermal energy, requires no additional land, and provides the lowest risk and most scalable foundation for UTEN. It is the clearly preferred solution from both a performance and cost-effectiveness standpoint—particularly in built environments where land constraints limit other options.

9.6 Total Project Costs to Date

Table 8 below provides the total costs incurred through May 2025, for the design & project development of the Syracuse UTEN Pilot. An updated table displaying the total costs incurred through June 2025 will be included in the Company's July Utility Thermal Energy Network and Jobs Act Monthly Progress and Expenditure Report. For all costs incurred by the Company beyond June 2025, the Company shall continue to update its Utility Thermal Energy Network and Jobs Act Monthly Progress and Expenditure Report monthly in accordance with the guidelines presented in the Guidance Order. The expenditure shown in Table 8 below reflects the Company's ongoing commitment to thorough planning, development, coordination, and engineering efforts to ensure successful project implementation.

Table 8: Syracuse UTEN Pilot Costs incurred through May 2025

Cost Category	Expenditure to Date (September 2022 – May 2025)	
	CapEx ($M)	OpEx[13] ($M)
3rd Party Consulting[14]	$3.63	$0.19
NMPC Engineering	$0.29	$0.02
NMPC Legal	-	-
NMPC Administration[15]	$0.15	$0.01
Overheads	$0.07	$0.03
Subtotals	$4.13	$0.25
Grand Total	$4.38	

After submission of the Syracuse Stage 2 Filing, during the PSC review period, NMPC intends to prudently continue Stage 2 activities to advance the Syracuse UTEN Pilot in line with

[13] All costs related to the design, development, and construction of an asset that will not ultimately be owned by NMPC are tracked as OpEx.
[14] 3rd Party Consulting includes design consultant(s), test hole consultants, and other consultants hired to further the development of the Syracuse UTEN Pilot.
[15] NMPC Administration includes cost associated with project management, estimating, and other functions within NMPC.

the expectations of the Guidance Order. For example, NMPC will continue to progress the design of all system components towards 100%. Additionally, NMPC will work with WEP and the NYSDEC to continue to evaluate any modifications to WEP's existing SPDES permit necessitated by the Syracuse UTEN Pilot, as described in Sections 6 and 6.2. Similarly, since the Syracuse UTEN Pilot is based primarily around new construction, NMPC will maintain coordination with COR development and Onondaga County as their future buildings progress towards construction. Such tasks must be completed in the interim so that, following Commission approval to advance the Syracuse UTEN Pilot to Stage 3, NMPC will be well positioned to enroll customers and begin construction without delay.

9.7 Federal Investment Tax Credit

The Company is analyzing whether the Syracuse UTEN Pilot qualifies to claim federal tax credits to reduce overall projects costs. The two primary tax credits that may be applicable to this project are the Clean Energy Investment Tax Credit under Section 48 and the Clean Electricity ITC under Section 48E. Both credits if applicable will offer a base credit of 6%, which can increase to 30% if prevailing wage and apprenticeship requirements are met. Additionally, an extra bonus may apply for using domestic content, which could further enhance the project's financial benefits. The project area is within an energy community as defined in 2024 by the United States Department of Energy and if it qualifies for the ITC also could be eligible for an additional 10% credit, for a maximum potential credit of 50% of eligible costs.

The Clean Energy Investment Tax Credit under Section 48 relates to the installation of geothermal heat pump energy properties. The final regulations clarify that energy property includes equipment that uses the ground, groundwater, or other underground working fluids as a thermal energy source to heat a structure or as a thermal energy sink to cool a structure.

However, the regulations do not provide a specific example of "other underground working fluids." The Thermal Energy Storage Property ("TESP") credit under Section 48E is another significant tax credit for the Syracuse project. TESP would apply to the thermal energy storage system installed at the energy center, which includes a heat pump chiller, a thermal storage tank, associated pumps, piping and controls.

There is substantial uncertainty around which tax credits apply to the Syracuse UTEN Pilot and whether these tax credits will be available when the Syracuse UTEN pilot is placed into service. The Company has engaged a tax consultant to advise on the availability of claiming these tax credits.

9.8 Customer Reversion Budgetary Costs

As part of NMPC's Customer Agreement, which is discussed further in Section 11.2, 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 as detailed in this Syracuse Stage 2 Filing 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 ("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 costs 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 need to be incurred. The Company reserves the right to update the estimated cost of each customer reversion if needed after a complete and detailed design and estimate are developed. Table 9 summarizes the potential conceptual cost of converting each potential customer to an alternate heating and cooling system.

Table 9: Conceptual Customer Reversion Costs

Customer Name	Conversion Cost ($M)
Building 1b	$0.95
Building 2a	$0.6
Building 2b	$0.6
Building 2c	$0.6
Building 3	$0.275
Building 4a	$0.325
Building 4b	$0.325
Building 5	$0.275
Building 6a	$0.275
Building 6b	$0.275
Building 8b	$0.8
Building 10a	$1.65
Total	$6.675

It is important to note the following assumptions and exclusions:

- Any structural modifications required to support heavier equipment are not included.

- All UTEN equipment which would not obstruct the construction of the new necessary heating and cooling equipment would be abandoned in place.
- 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 system is not included.
- Requirements of any future regulations are not considered.

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

9.8.1 Aquarium Conversion

If the Aquarium were to withdraw due to poor system performance in accordance with the Customer Agreement, NMPC would decommission the aquarium Miniplant. As the Aquarium would already have a functioning system before the Pilot, that system would be maintained during the Pilot for redundancy, removal of the Pilot would force them to revert back to the original system equipment as the primary means of heating and cooling. The lease agreement with Onondaga County will allow for the building to be transferred to Onondaga County for their use, if desired. Otherwise, NMPC would be responsible for demolition and restoration of the site at cost to the project.

9.8.2 Future Building Conversion

For all other Customer buildings planning to connect to the UTEN, NMPC proposes to convert their buildings to a gas-fired heating system if they withdraw from the UTEN. This conversion strategy assumes that the existing hydronic piping and indoor units installed to connect to the UTEN will remain in place to serve the building once converted. Therefore, NMPC will install a gas-fired condensing boiler to meet the peak heating load and provide the building with heating hot water. The buildings would require a costly electric service upgrade to meet the peak heating load with an electric resistance boiler or an air-source heat pump. Additionally, the buildings would be expensive to operate if heated by an electrified alternative. Based on this conversion approach, NMPC has identified a conflict with the All-Electric Building Act, however, there is not clear guidance on this specific circumstance. Based on the information previously stated, which demonstrates the unreasonable, significant hardship that would be encountered to convert these buildings to an alternative electrified heating system, NMPC feels that an exemption to the All-Electric Building Act will be provided for these buildings. NMPC proposes to convert their cooling system to an air-cooled fluid cooler.

10. Cost Recovery

If the NMPC Syracuse UTEN Pilot is approved by the Commission, the Company requests 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 incurred on behalf of customers for customer-owned assets ("Customer Construction Costs"), offset by the Thermal Energy Fees collected from NMPC 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:

i. Recovery of Stage 1 and Stage 2 pre-commissioning OpEx and Customer Construction Costs initially will be set based on the amortization schedule of projected costs. Recovery will be through a UTEN surcharge to firm gas customers under the existing Delivery Service Adjustment mechanism ("DSA") and electric customers under the Other Delivery Surcharge ("ODS Statement"). Costs between gas and electric customers will be allocated 17.79 percent and 82.21, respectively, based on the general allocator G114 currently used to allocate common plant between the electric and gas businesses.

c. All post-commissioning OpEx 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.

d. Carrying charges for the recovery of all NMPC Syracuse 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.

The Company's cost recovery proposal in this Syracuse Stage 2 Filing includes two notable changes from the preliminary cost recovery approach included in its January 9 UTEN Pilot Proposal. First, 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.

Second, the Company proposed that all costs of the Syracuse UTEN Pilot be allocated and recovered from firm gas customers only and not from electric customers in accordance with the Commission's Initiating Order. After further consideration of the Pilot learnings, it was determined that both electric and gas customers will derive benefits from the implementation of this Pilot. Further, except for the Aquarium, the customers that will be served by the UTEN are not currently and will not be NMPC gas customers for heating or DHW in the future; rather they will be NMPC electric customers. For these primary reasons, the Company revised its approach and is requesting that the Pilot costs be recovered from both its electric and gas customers as set forth above and in the Draft Tariffs in Appendix J.

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 recover through the UTEN Surcharge. If the Pilot receives approval to proceed to Stage 3 and ends at any point 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 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 customers.

10.2 Revenue Requirement and Bill Impacts

The revenue requirements for the Syracuse UTEN Pilot based on the cost recovery mechanism discussed above, and levelized over the ten years are summarized in Table 10a below and are presented in Appendix K. The associated bill impacts to typical Electric and Gas customers are presented below in Table 10b and Table 10c, respectively, and presented in Appendix K.

Table 10a: Summary of the Revenue Requirements

Units: ($000's)	FY29	FY30	FY31	FY32	FY33
Return on Net Plant ADIT and OpEx	$18,977	$18,977	$18,977	$18,977	$18,977
Regulatory Asset Amortization	$1,193	$1, 193	$1, 193	$1, 193	$1, 193
Total Revenue Requirement	$20,170	$20,170	$20,170	$20,170	$20,170
Electric Allocation (84%)	$16,582	$16,582	$16,582	$16,582	$16,582
Gas Allocation (16%)	$3,588	$3,588	$3,588	$3, 588	$3,588

Table 10b: Average Monthly Bill Impacts to Electric Customers

	UTEN Surcharge	Delivery Bill Impact	Total Bill Impact
Service Classification No. 1	$0.00103	0.70%	0.45%
Service Classification No. 1C	$0.00025	0.40%	0.17%
Service Classification 2ND	$0.00137	0.72%	0.51%
Service Classification 2D	$0.16	0.63%	0.33%
Service Classification No. 3 Sec	$0.12	0.52%	0.23%
Service Classification No. 3 Pri	$0.11	0.54%	0.21%
Service Classification No. 3 Sub	$0.04	0.41%	0.10%
Service Classification No. 3 Tran	$0.04	0.42%	0.09%
Service Classification No. 3A Sec	$0.10	0.45%	0.17%
Service Classification No. 3A Pri	$0.10	0.45%	0.18%
Service Classification No. 3A Sub	$0.03	0.28%	0.06%
Service Classification No. 3A Tran	$0.02	0.25%	0.05%

Table 10c: Average Monthly Bill Impacts to Gas Customers

	UTEN Surcharge	Delivery Bill Impact	Total Bill Impact
Service Classification 1	$0.00505	0.48%	0.34%
Service Classification 2	$0.00226	0.37%	0.22%
Service Classification 5	$0.00062	0.40%	0.11%
Service Classification 7	$0.00096	0.36%	0.14%
Service Classification 8	$0.00046	0.33%	0.09%

11. 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.

11.1 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, and 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.

NMPC also plans to utilize space at the Onondaga County Aquarium to house an informational display, which will be used to educate the public about the UTEN and its merits. According to Onondaga County, 450,000 - 500,000 visitors per year are expected to visit. As a publicly accessible and municipally owned facility, each of these visitors represents both a customer and provides an opportunity to educate the public. As a science-based facility, the atmosphere is ripe for explanation of how the system works, sharing data about the performance of the system.

The additional pilot customers will be tenants of COR development. COR development is also the property owner of the leased parcel on which the Syracuse UTEN Energy Center will be built. COR is supportive of this technology and would like to showcase its features to its tenants and customers. The Company has produced an informational website that, in its present form (https://www.nationalgridus.com/geothermal-energy-hub/Projects/New-York/Syracuse), explains the background of the legislation, provides links to relevant documents, and includes an interactive graphic that explains how the proposed system operates. This website will be shared in all stakeholder outreach efforts and will be updated throughout construction and pilot operation.

The Stakeholder Outreach Plan is provided herein as Appendix L.

11.2 Customer Agreement

The proposed Utility Thermal Energy Network Customer Agreement ("Customer Agreement") included herein as Appendix M outlines the terms and conditions for customers participating in the Syracuse UTEN Pilot. The Customer Agreement follows the PSC's requirements, providing comprehensive coverage of all mandated elements. It addresses customer protections, rights, responsibilities, exit options, billing, privacy, and legal compliance, ensuring that pilot participants are fully informed and protected throughout their participation in the UTEN pilot program. Prior to enrolling, potential customers also will be provided with a Summary of the Customer Agreement, attached as Appendix N, 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 will detail 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 air source heat pump, individual ground source heat pump, or return to original heating system where applicable). It outlines the process for customer-initiated termination and the responsibilities of both parties.

d. Home Energy Fair Practices Act 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. The Customer Agreement will authorize 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 stipulates 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 that the Company 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 termination/withdrawal option selected. 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 a Customer chooses to terminate for reasons not covered by the Customer Agreement or otherwise does 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 (HEFPA) 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.

Customer Thermal Energy Fee

NMPC intends to charge all participating customers a flat Thermal Energy Fee which is not based on actual capital or operating costs of the UTEN. The Thermal Energy Fee will be calculated individually for each participant in the Syracuse UTEN Pilot. To calculate the Thermal Energy Fee, NMPC completed extensive energy modeling for each building, as discussed in more detail in Section 4.2. The energy modeling created two scenarios for each building; a baseline scenario which modeled the buildings' energy usage if it did not connect to the UTEN and a UTEN scenario which modeled the buildings' energy usage as a participant. Since all buildings that will connect to the Syracuse UTEN are currently not operational, NMPC did not have current HVAC system information or existing utility bills to calibrate its energy modeling. NMPC assumed that all buildings, besides the Aquarium, would have installed an air-source heat pump-based system as their baseline scenario. NMPC was able to generate a baseline model for the Aquarium based on the current HVAC plans for the building. Based on the models, NMPC calculated what each customer's annual energy cost would have been for both scenarios by applying the appropriate electric and gas rate classes for each customer. The current project schedule places the in-service date for the Syracuse 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. 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 updated energy models, using data collected from the first year of Pilot operation. 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 an equal amount of energy usage. 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 proposes 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 11.3.1, 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.

For all buildings planning to connect to the UTEN, other than the Aquarium, NMPC proposes to charge 80% of available savings 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.

The Aquarium is the largest single customer planning to connect to the Syracuse UTEN, representing nearly 30% of the peak and annual load NMPC intends to serve during the 5-year Pilot lifetime. Furthermore, the Aquarium will be connected to the UTEN via a 4-pipe system and will receive finished heating hot water and chilled water. This is different than how NMPC will serve other customers, who will be delivered ambient temperature Transfer Fluid. As such, NMPC proposes to charge the Aquarium with a Thermal Energy Fee that is structured differently than the Thermal Energy Fee the rest of the customers will pay. To calculate the exact Thermal Energy Fee that the Aquarium will be required to pay, NMPC calculated the baseline and UTEN annual energy costs as described above. From the available savings, NMPC intends to charge the Aquarium the annual operating cost of the Miniplant, as a pass-through, which will serve the Aquarium with finished heating hot water and chilled water. The annual operating cost of the

Miniplant includes the cost of electricity to operate the UTEN coupled, heat pump chiller which will generate the finished commodities. It also includes a lease payment which NMPC expects to pay to Onondaga County (the owner of the Aquarium) for the real estate rights to the land which the Miniplant will be built upon. Normalizing the annual operating costs of the Miniplant by the volume of energy the Aquarium is modeled to consume, NMPC has produced a heating hot water rate of $15.90 / MMBtu and a chilled water rate of $0.19 / ton-hr. Comparing the annual operating cost of the Miniplant to the available savings predicted by the energy modeling, NMPC expects the Aquarium to be able to reduce its energy costs as a UTEN participant.

Based on the current models, no customer is predicted to see an annual energy cost increase compared to their baseline as a UTEN participant. However, if updated 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.

11.2.1 Shadow Billing

NMPC will employ shadow billing during the Syracuse 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.

12. Project Impacts

The Syracuse UTEN Pilot project will be a source of decarbonized heating and cooling for the redeveloped Inner Harbor neighborhood, will minimize greenhouse gas emissions and 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 DOE Report, Cost and Total Emissions Reductions Through Mass Deployment of Geothermal Heat Pumps for Building Heating and Cooling Electrification in the United States[16] 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 Syracuse UTEN Pilot.

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.

12.1 Pilot Benefits

12.1.1 Brownfield/DAC Neighborhood Redevelopment

The Final Syracuse UTEN Pilot Proposal stands out as one of the few UTENJA pilot projects anchored by new construction buildings. The Inner Harbor area, where the project is located, has a long history of industry, pollution, and urban decay, and NYSERDA classifies the project area in Syracuse as a DAC. This area is now slated for redevelopment, with COR Development Co. and other developers having shared their development plans and their desire to be customers of the UTEN system. Syracuse faces a growing housing shortage, and the redevelopment of this

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[16] 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.

area is crucial to addressing this issue. The system enables the transformation of this historically blighted area into a vibrant community anchored by a UTEN system providing heating and cooling with no on-site emissions to an area that has been significantly burdened by pollution in the past. This approach sets a precedent for other new developments in the region, demonstrating how sustainable energy solutions can drive urban renewal. The area at large will benefit from workforce development that the project brings, including the labor required for system construction, operation, and maintenance. Additionally, a living lab will help educate community members on urban design and technology solutions for sustainable communities.

12.1.2 Avoided Electric Grid Upgrades

The CLCPA requires new, large buildings such as those which will be customers of the Syracuse UTEN to be built using electric systems for their heating needs. If these buildings were not on the UTEN, they'd likely use ASHPs to serve this purpose. ASHPs are less efficient than WSHPs, and would have a higher electric demand and consume more energy to provide heating, cooling, and domestic hot water than WSHPs. Logically, it follows that if ASHPs were selected, the impact to the electric grid would be higher 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 Syracuse 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 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 Syracuse UTEN Pilot highlights the potential to avoid building new grid infrastructure, as opposed to individual building electrification.

12.1.3 Future Expansion Potential

Due to the substantial thermal energy capacity of the wastewater effluent available at the Metro WWTP site and the strategic design choices made during the project's planning phase, future expansion to serve additional Inner Harbor buildings will be operationally obtainable and economically feasible. The project anticipates a potential expansion of approximately 3.5 times its initial capacity, ensuring that the benefits of the UTEN can be extended to more buildings and residents in the area. This scalability is crucial for maximizing the project's impact, especially given the certainty of surrounding area development. The most significant effort in installing a UTEN involves the initial excavation of the street and the installation of the main UDS pipe. By strategically oversizing this system at this stage, we enable cost-effective future expansion and eliminate the need for redundant labor- and capital-intensive efforts. As discussed in Sections 9.4, the cost of upsizing the system for expansion and onboarding customers in the future is proportionally miniscule in comparison with the initial capital investment required to construct the system. Industry leaders and experts, including those who presented at the technical conference, hosted by the New York State Department of Public Service in March 2025, emphasize that designing thermal energy networks with future expansion in mind is critical to maximizing their benefits, both in terms of economic and energy efficiency, and NMPC has designed the Syracuse pilot project with this guidance in mind.

12.2 Key Learnings

12.2.1 UTEN Systems Suitability for New Development

The Syracuse UTEN system is the only proposed UTEN pilot project that will support newly developed buildings in compliance with CLCPA and All-Electric Buildings Act[17] requirements that new buildings use electricity for heating systems. Professionals experienced in the development of UTEN systems typically agree new development areas are the building environments most suited for thermal energy networks. By collaborating with COR in parallel with their building development projects, the Syracuse UTEN Pilot can serve as a case study for how to implement UTENs in conjunction with areas undergoing development. This project could serve as a basis for future legislative approaches that encourage or require large developments subject to the CLCPA to utilize thermal energy networks, regulations which some environmental advocates see as crucial for ensuring decarbonization happens at pace and at scale.

12.2.2 Phased Onboarding of Customers

At the start of the Syracuse UTEN Pilot Project, there will be one existing building which will be retrofitted and then connected to the UTEN system, with five additional buildings under construction and expected to be completed concurrently with the UTEN infrastructure. After two years of operation, seven additional buildings are scheduled to complete construction and will connect to the UTEN. This phased approach allows for comprehensive data collection on system

[17] See Senate Bill 4006C/Part RR of Chapter 56 of the Laws of 2023 which amended the Energy Law and directed changes to the State Uniform Fire Prevention and Building Code and State Energy Conservation Construction Code prohibiting the installation of fossil-fuel equipment and building systems, in any new building not more than seven stories in height, except for a new commercial or industrial building greater than one hundred thousand square feet in conditioned floor area, on or after December 31, 2025, and the installation of fossil-fuel equipment and building systems, in all new buildings after December 31, 2028.

performance as the load changes and new customers are added. Observing the system's behavior under varying conditions will provide critical insights into operational dynamics and efficiency. Additionally, this approach will help the Company learn how to effectively onboard customers to an existing system, informing best practices for future expansions. Furthermore, if approved to continue operating the Syracuse UTEN after the Pilot term, NMPC will seek to expand the system again to connect to even more buildings in the surrounding area, with a potential total expansion factor of nearly 3.5x the Pilot phase.

12.2.3 Benefits of Using Wastewater Effluent

One of the primary benefits of the Syracuse UTEN Pilot is the utilization of wastewater effluent as a Thermal Energy Resource. This approach not only reduces the need for drilled boreholes but also showcases the environmental and economic advantages of repurposing waste products. By using wastewater effluent, the project demonstrates a sustainable alternative that can be replicated in other major cities with wastewater treatment plants. The U.S. Department of Energy estimates that approximately 350 GWh[18] of thermal energy in hot water is flushed down the drain annually in the United States, showcasing the immense potential for waste heat capture and reuse in the country. Additionally, wastewater effluent has advantages as a Thermal Energy Resource over other Thermal Energy Resources, like a borefield; it's not subject to thermal drift over time. This makes load balancing and adjusting design or operational capacity to meet shifting customer demand easier. This also avoids the need to implement a new construction project and install a borefield on undisturbed land. However, very few projects exist in North

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[18] See "Modelling of Wastewater Heat Recovery Heat Pump Systems" in Journal of Sustainable Development of Energy, Water and Environment, Year 2021, Volume 9, Issue 1, 1080330.

America to capitalize on using this prevalently available resource. The core concepts of this project, including the use of wastewater effluent as a Thermal Energy Resource, provide a model that can be adapted to various urban settings. This project will provide system performance data showing how wastewater effluent can be an adequate Thermal Energy Resource for large scale thermal energy networks. It will also provide a framework for other projects utilizing wastewater treatment facility effluent as a thermal resource to follow in the permitting process. The Syracuse UTEN Pilot demonstrates a replicable system that can be applied in all major cities with wastewater treatment plants. This replicability is crucial for scaling clean energy solutions and promoting sustainable urban development. The opportunity to use wastewater effluent as a valuable Thermal Energy Resource has already been demonstrated in projects like the Olympic Village in Vancouver, British Columbia.

12.2.4 Thermal Energy Resource Owned by Third Party

The Syracuse Pilot shares similarities with NMPC's Troy project in that both projects will utilize Thermal Energy Resources owned by third parties. However, unlike the Troy project, which requires the development of a new Thermal Energy Resource, the Syracuse UTEN Pilot focuses on installing equipment to capture and utilize an existing resource which is currently not used. The process involves securing access to the wastewater effluent, obtaining the necessary permits, and negotiating a Thermal Energy Resource Fee for the use of this Thermal Energy Resource. This approach aligns with the current utility model, where utilities act as distributors and suppliers of energy rather than energy generators. By repurposing the wastewater effluent, the Syracuse UTEN Pilot not only addresses the inefficiency of wasted heat but also supports sustainable energy practices and reduces environmental impact of new construction. This innovative use of existing resources sets a precedent for future projects, demonstrating how thermal energy networks can effectively harness third-party Thermal Energy Resources to enhance energy distribution and supply.

12.2.5 Hybrid Ambient/Four-Pipe System

The Syracuse Pilot is distinguished by its use of a four-pipe system, a feature that sets it apart from most other pilot projects. While the primary system operates as an ambient temperature heating loop, the Aquarium will receive direct supply heating hot water and chilled water from a utility-owned modular heat recovery chiller. This unique setup necessitates a different billing structure for the Aquarium compared to other customers connected to the ambient loop. This configuration allows for a comparative analysis of the system performance and billing structure between the direct supply portion serving the Aquarium and the ambient loop serving other customers. By evaluating the level of service provided to the Aquarium against that of other customers and other UTEN pilot projects, the project will gather valuable data on the efficiency and effectiveness of different system designs. In technical conferences, the DPS has expressed the effectiveness of 4-pipe systems and has encouraged utilities to consider 4-pipe systems and central plant designs for UTENs. This project presents the opportunity to compare the performance of 2-pipe systems versus 4-pipe systems with data obtained from the construction and operation of both types of systems.

12.2.6 Comparative Analysis Opportunity

Once constructed, Building 1b will be an exact replicate of an existing COR building served by a standalone geothermal system. This presents a unique opportunity to compare the performance of a thermal energy network to more conventional geothermal systems. The comparative analysis will provide valuable insights into the efficiency, cost-effectiveness, and overall performance of thermal energy networks versus standalone geothermal systems. COR development has indicated they would support this analysis by sharing the existing building's system performance data. By completing this comparative analysis with real data, NMPC will be able to calibrate the results of the Lifecycle Cost Analysis submitted here within and determine how modeled results compare to reality. No other UTEN pilot proposal offers this unique opportunity.

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

Through the Syracuse UTEN Pilot, the Company will evaluate the effects of being served by a UTEN system against other alternative scenarios. In the Syracuse 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 Syracuse UTEN participants alone. Through the Syracuse UTEN Pilot, the Company will explore Cost Contributions, 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 Syracuse 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.

12.2.8 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 Syracuse 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.

12.3 Lessons Learned To Date

12.3.1 Permitting with the Metro WWTP and NYSDEC

NMPC and WEP are working together through the NYSDEC permitting process to determine what modifications to WEP's existing SPDES permit will be required to permit the exchange of thermal energy with the wastewater effluent that's discharged to Onondaga Lake through Outfall

#001. NMPC and their consultants have furnished initial engineer reports and analysis describing the impacts of the thermal exchange on the effluent temperature. After this initial review, additional engineering reports and analysis describing the effects of the project on lake surface temperatures were requested to demonstrate compliance with NYCCR Part 704.2.

Through this experience, NMPC has learned what specific modeling and reports the NYSDEC requires to mitigate their concerns about the effects thermal exchange projects may have on operations at a SPDES permitted wastewater treatment plant. For future projects, NMPC can include all reports and analysis required to meet DEC requirements in the scope of work for consultants from the onset. This familiarity with the DEC's requirements will help streamline the permitting process for future projects.

12.3.2 Design Flexibility From New Construction and Wastewater Effluent Thermal Resource

Designing a UTEN system with a borefield as the primary Thermal Energy Resource is complex and requires a balanced approach. A heating-dominant customer profile can cool the ground over time, reducing the heating efficiency of the ground source heat pumps ("GSHPs"). Likewise, a cooling-dominant customer profile can heat the ground over time, also reducing the cooling efficiency of connected GSHPs. Borefield-based UTEN systems require careful customer selection, limiting their ability to expand to a wider customer base, as too many customers with similar energy usage behavior cannot be connected to the same system. UTEN systems which utilize waste energy from constantly renewing processes, like wastewater, can be customer energy behavior agnostic, allowing them to easily connect to any and all customers, irrespective of their heating and cooling profiles.

The current project development process implemented by the UTENJA is challenging because customer enrollment isn't finalized until Stage 3a. This creates a challenging nuance in the design process: a complete system design is necessary to be approved for Stage 3, however, it is difficult to optimally design a borefield based system without certainty in which customers will connect to the system. The approach to deal with this challenge is to enlist customers to provide noncommittal letters of intent without guaranteeing the system will be implemented, making it difficult to keep customers engaged. This also exposes designers to the risk that pivotal customers, who heavily influence the design of the system, will not agree to participate during Stage 3a. This can result in the requirement to update design plans after customer enrollment to reflect the updated customer list. UTENs which utilize waste energy from constantly renewing processes, like wastewater, can once again mitigate this risk because the design of such systems is not as heavily influenced by the types of customers who plan to connect.

Retrofitting existing buildings is challenging and costly. For example, small residential or commercial customers often lack the space required for heat pump based hot water systems, which require more room than, similar capacity, gas-fired water heaters. This was a significant issue for the Company's downstate affiliate KEDNY's pilot project.

During the design phase of all three of the Company proposed UTEN pilots, the Company began evaluating how to provide decarbonized DHW to all customers to comply with the UTENJA's requirement to eliminate all on-site greenhouse gas ("GHG") emissions associated with comfort heating and cooling, domestic hot water, and refrigeration. This required a careful examination of each proposed pilot project to assess if the Thermal Energy Resource design capacity would be sufficient to meet the additional DHW load. Additionally, the Company had to investigate each customer's building to determine if sufficient space for new equipment was available.

For the KEDNY project, converting some customers to DHW was too difficult and costly, which resulted in them being eliminated from potential participation in the project. For the NMPC Troy project, a central ASHP was added to the design of the system to help balance the disproportionally heating dominated load.

In contrast, adjusting the design of the Syracuse UTEN Pilot to incorporate decarbonized DHW for all customers has been relatively simple. The Company did not encounter the same customer building space constraints as it did for the other two projects since all buildings will be new construction. Therefore, property developers can set aside space in the building's programming to accommodate the larger heat pump based DHW systems ahead of time. Additionally, wastewater effluent provides a constantly renewing Thermal Energy Resource, negating the requirement to carefully balance loads which connect to the system, allowing NMPC to easily handle the increased load on the system associated with GSHP based DHW systems.

12.3.3 Infrastructure Siting

The siting of the Energy Center has been an ongoing challenge, and the final location was secured after two prior attempts to secure a suitable location. Some of the complications are due to the contamination that exists in the area, making environmental assessments and potential remediation a key activity to consider on any property. Each assessment requires an access agreement with the owner which can cause significant delays. The design of the Utility Distribution System places the piping along the most cost-efficient path to connect each customer building to the available Thermal Energy Resources. Any deviations from this routing will result in increased costs and decreased performance. This limits the number of cost-effective, suitable sites that can be used to construct the Energy Center. The perception of limited options can have a negative impact on negotiations for option or leasing of land for market rates. The financial incentive to inflate land prices are compounded by the amount of land speculation that has occurred in Onondaga County after the announcement of the Micron development in Clay, NY. The project was benefitted in the end by the availability of land owned by COR whose buildings are also connecting to the system.

12.4 GHG Emission Reductions

To compare the environmental impact of the baseline heating, cooling, and DHW systems to the UTEN heating, cooling, and DHW systems, greenhouse gas emissions were calculated for both scenarios. The appropriate emissions factors for each fuel type were determined from Table 2 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 both scenarios. The table below reports the total emissions in metric tons of carbon dioxide equivalent (“$MTCO_2e$”).

Table 11: Greenhouse Gas Emissions ($MTCO_2e$)

	Year 1	Year 5 Cumulative	Year 25 Cumulative
Baseline	1,703	16,348	38,513
UTEN	931	10,523	19,567
Savings	771	5,825	18,946

12.5 Lifecycle Cost Analysis

A lifecycle cost analysis (“LCCA”) was performed for the (1) baseline, business-as-usual (“BAU”) case wherein all buildings except the Aquarium are modeled as adopting ASHPs, (2) an individual ground source heat pump case wherein each building has its own individual geothermal system, and (3) the UTEN case.

12.5.1 LCCA Assumptions

For all scenarios, the LCCA makes the following assumptions:

- Analysis is for 25 years of operation 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[19]
- The LCCA was conducted with a 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
- All cases are conducted in nominal dollars, which are inclusive of general inflation
- A factor of 30% was added to the alternate cases that would represent design and construction contingencies, contractor overhead and profit, and construction inflation
- A sales tax of 8% was included for all cases

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[19] https://pages.nist.gov/eerc/

12.5.2 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 specifics of which are still being estimated at the time of this Syracuse Stage 2 Filing. It is anticipated that the baseline case, with the highest electric demand will require the higher cost upgrades than the UTEN case.
- The baseline case is focused on mechanical systems; a detailed analysis of its impact on each building's electrical system, as a whole, has not been completed at this time.
- 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
- 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.

12.5.3 Baseline, Business-As-Usual (All-Electric + Aquarium Natural Gas Continuation)

Assumptions applicable to the baseline case are as follows:

- Financing for equipment is at a rate of 10.15% over 20 years
- Due to the All-Electric Buildings Act, which requires all new construction buildings under seven stories to adopt electrified heating systems, this baseline case assumes all

new construction buildings are electrified. The owner has indicated that their intent is to provide all electric buildings.

- Details of heating and cooling systems for connected customers are shown in Tables 12a, 12b, and 12c below, including assumed efficiency and useful life.

Table 12a: All- Electric Baseline Assumptions – Aquarium

Metric	Assumption	Source
Space Type	Aquarium	N/A
System Type	ASHP + Electric Boiler	N/A
ASHP Heating efficiency (COP, >34F)	2.44	Equipment selection
Boiler heating efficiency, <34F)	1.0	Equipment selection
Cooling efficiency (EER)	9.3	Equipment selection
Life Expectancy (years)	35 (WSHP), 35 (Fossil Boiler), 25 (CT)	LCCA Workbook - Table 1

Table 12b: All-Electric Baseline Assumptions – Apartment

Metric	Assumption	Source
Space Type	Apartment	N/A
System Type	Split ASHP	N/A
Heating efficiency (“HSPF”)	7.7	ASHRAE 90.1 2019, Minimum Efficiency Requirements
Cooling efficiency (“SEER”)	13.0	ASHRAE 90.1 2019, Minimum Efficiency Requirements
Domestic HW	1	Electric Resistance
Life Expectancy (years)	20	LCCA Workbook – Table 1

Table 12c: All-Electric Baseline Assumptions – Hotel

Metric	Assumption	Source
Space Type	Hotel	N/A
System Type	VRF	N/A
Heating efficiency (%COP)	2.92	ASHRAE 90.1 2019, Minimum Efficiency Requirements
Cooling efficiency (IEER)	13.9	ASHRAE 90.1 2019, Minimum Efficiency Requirements
Life Expectancy (years)	20	LCCA Workbook – Table 1

12.5.4 Individual GSHP Case

Including a scenario where each building is served by an individually sized ground source heat pump system with its own borefield is not considered viable in this analysis. In the urban environment of the project area, most buildings lack access to sufficient on-site or adjacent land under common ownership to support the necessary borefield infrastructure. Even where land is available, it is often encumbered by subsurface utilities or prohibitively expensive. Additionally, individual systems would forgo the economies of scale, operational efficiencies, and load diversity benefits provided by a shared thermal energy network. As such, this alternative was excluded from consideration as it is neither technically feasible nor economically justifiable within the context of this project.

A more detailed analysis of the geothermal alternate for the project is included under Section 9.5.

12.5.5 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 10.15%.
- 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 10.15%.
- Customer connection costs and incremental domestic hot water equipment costs will be covered by NMPC.
- Financing for customer equipment is at a rate of 5% over 25 years

- Details of heating and cooling systems for connected customers are shown in Tables 13a, 13b, and 13c below, including assumed efficiency and useful life.

Table 13a: UTEN Pilot Assumptions – Aquarium

Metric	Assumption	Source
Space Type	Aquarium	N/A
System Type	Heat Recovery Chiller	N/A
Heating efficiency (COP)	3.5	Equipment selection
Cooling efficiency (EER)	17.3	Equipment selection
Life Expectancy (years)	35	LCCA Workbook – Table 1

Table 13b: UTEN Assumptions – Apartment

Metric	Assumption	Source
Space Type	Apartment	N/A
System Type	GSHP	N/A
Heating efficiency (COP)	4.44	Equipment selection
Cooling efficiency (EER)	15.0	Equipment selection
Domestic HW	4.5	Equipment selection
Life Expectancy (years)	30	LCCA Workbook – Table 1

Table 13c: UTEN Assumptions – Hotel

Metric	Assumption	Source
Space Type	Hotel	N/A
System Type	GSHP	N/A
Heating efficiency (COP)	4.44	Equipment selection
Cooling efficiency (EER)	15.0	Equipment selection
Domestic HW	4.5	Equipment selection
Life Expectancy (years)	30	LCCA Workbook – Table 1

12.5.6 Results

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

Figure 11: Societal LCCA Results

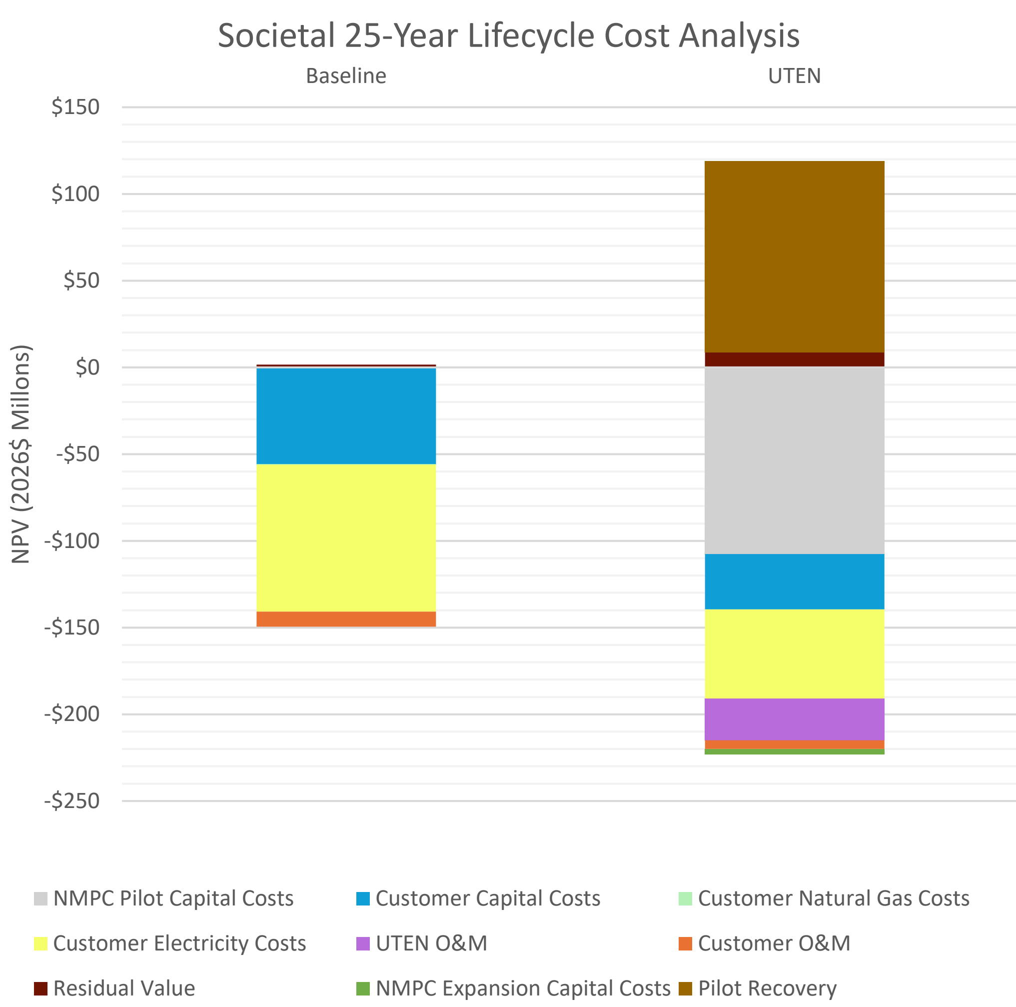

Table 14: Societal LCCA Results

Societal LCCA Results (2026$ Million)		
	Baseline	UTEN
NMPC Capital Costs	$0	-$107.54
NMPC Expansion Capital Costs	$0	-$3.10
Cost Recovery	$0	$110.13
Customer Capital Costs	-$55.77	-$32.03
Customer Natural Gas Costs	-$0.37	$0
Customer Electricity Costs	-$84.65	-$51.51
UTEN O&M	$0	-$23.86
Customer O&M	-$8.65	-$5.10
Residual Value	$1.59	$8.62
Total	-$147.84	-$104.39

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

Figure 12: Customer LCCA Results

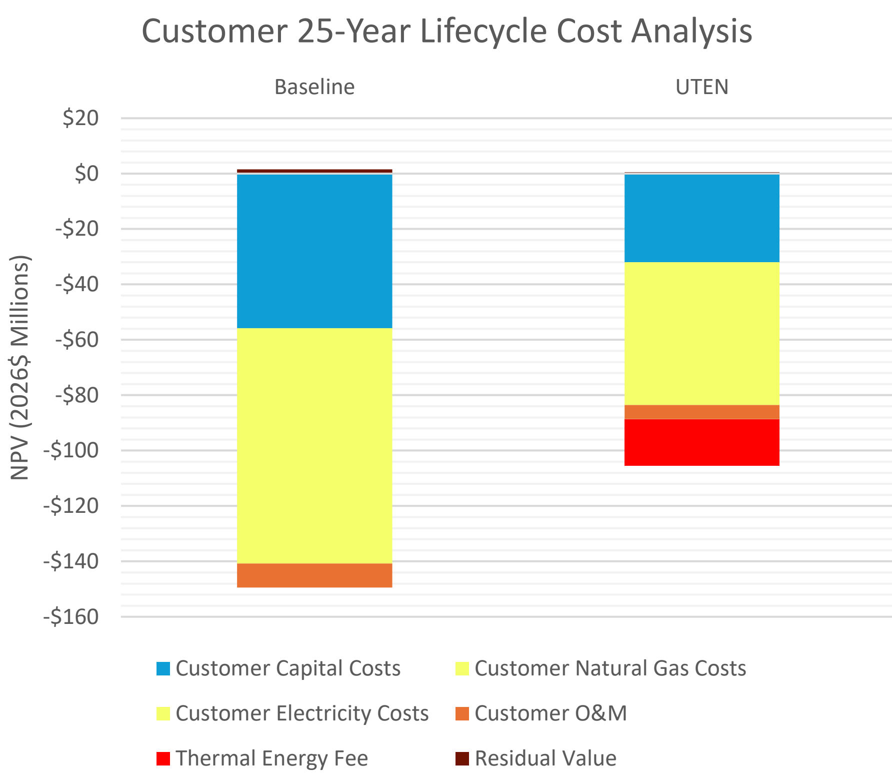

Table 15: Customer LCCA Results

Customer LCCA Results (2026$ Million)		
	Baseline	UTEN
Customer Capital Costs	-$55.77	-$32.03
Customer Natural Gas Costs	-$0.37	$0
Customer Electricity Costs	-$84.65	-$51.51
Customer O&M	-$8.65	-$5.10
Thermal Energy Fee	-$0	-$16.70
Residual Value	$1.59	$0.45
Total	-$1747.84	-$104.90

For more details on the LCCA please see Appendix O.

13. 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.

13.1 Workforce Development

The Company is committed to ensuring that our internal workforce is equipped to handle the additional skills and resources required by the Syracuse 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 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 & Regulation ("I&R") department. Specifically, NMPC's I&R team will need to shadow a contractor with experience in thermal energy systems to ensure job tasks can be brought in-house after the pilot period concludes.

NMPC's I&R team trust that their skills align well with UTEN operational requirements. In instances where a current skill set is not available, a vendor will be engaged 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

Supervisory Control and Data Acquisition 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 Syracuse 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.

13.2 Labor Peace Agreements

In coordination with the Labor and Relations group, 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. The Company is dedicated to ensuring that its construction and installation work complies with New York State Labor Laws concerning prevailing wage and is fully committed to adhering to these regulations and providing training opportunities for current employees.

The Instrumentation and Regulation 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, new titles and job descriptions could be required along with wage scales.

14. Conclusion

As set forth above, NMPC has submitted decision quality final project engineering design for the Syracuse UTEN Pilot including the WWTP connection, the Energy Center, the UDS, and the customer equipment, has also developed a plan for obtaining permits, property rights, a thermal energy resource agreement with WEP, and other documents needed to commence construction of the Syracuse UTEN Pilot project and also developed a project specific Customer Protection Plan, all in accordance with the Commission's Guidance Order. The Company also has conducted initial stakeholder and community outreach and has been coordinating and collaborating with pilot participants. 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 Syracuse UTEN Pilot project in its Guidance Order;
2. NMPC's cost recovery mechanism and draft tariffs proposed and provided in this Stage 2 Syracuse Filing;
3. The Syracuse UTEN Pilot project to progress to Stage 3 as set forth in the Commission's Guidance Order;
4. The total Syracuse UTEN Pilot funding of $143.46 million as estimated in this Syracuse Stage 2 Filing;
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.

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15. Appendices

Appendix A: City of Syracuse Letter of Support

Appendix B: COR Customer Letter of Intent with Proposed Inner Harbor Building Inventory

Appendix C: Aerial Site Plan of Area (Historical, Current, and Future)

Appendix D: Syracuse UTEN Pilot Full Design Plan Set (Redacted)

Appendix E: Basis of Design Report

Appendix F: Technical Memoranda- Hydraulic and Temperature Analyses at the Metro WWTP

Appendix G: Onondaga County Letter of Intent for Thermal Energy Resource

Appendix H: Pilot Project Schedule

Appendix I: Construction and O&M Estimate Details Project (Redacted)

Appendix J: Draft Tariffs

Appendix K: Revenue Requirement Schedules

Appendix L: Stakeholder Outreach Plan

Appendix M: Customer Agreement

Appendix N: Summary of UTEN Customer Agreement

Appendix O: LCCA Calculations and LCCA Workbook