February
2026

# CLEAN ENERGY MASTER PLAN

*overview report*

## University at Buffalo
## North Campus

Presented by wendel

# CLEAN ENERGY MASTER PLAN

## VISION

The University at Buffalo understands the existential threat that climate change poses to our institution, our region, state, country, and planet. That is why we have doubled down on our commitment to becoming climate neutral. To achieve this, we are standing on the shoulders of five decades of environmental leadership and focusing our climate action work on a holistic solutions-orientated approach.

Over the past five years, the University at Buffalo has reduced its carbon footprint by an average of 35%. The University was recognized by the Times Higher Education Impact Rankings, which rated UB #1 among U.S. universities in taking urgent action to combat climate change. This progress has been made largely possible through a series of innovative renewable energy projects that now provide 100% clean electricity for our campus. From our early work with the creation of the most publicly accessible renewable energy landscape in the country (the UB Solar Strand) to scaling onsite solar across the campus (UB is now one of the largest producers of onsite solar across the higher-ed sector), we have methodically learned, continue to build upon our experiences and advance climate action across New York State and the nation. However, we recognize that these milestones are not the end, but rather the foundation to build upon as we progress to a carbon neutral future.

UB's 10 in 10 is our roadmap of 10 innovative, engaging, and digestible steps we are advancing to increase climate action throughout the University and put us on a path to net zero emissions by 2030. The strategy is holistic, inclusive, engages our broader community and leverages both a triple bottom line approach as well as the Sustainable Development Goals.

## MISSION

This Clean Energy Master Plan focused on a key strategy of UB's *10 in 10 Climate Action Plan* at the University at Buffalo's North Campus and complements the Clean Energy Master Plan for the South Campus. The North Campus was designed in 1967 to accommodate UB's growth after it joined the SUNY system and became the State University of New York at Buffalo (120 years after its original founding). The campus has 1,077 acres accommodating a daytime campus population of 35,500 students, faculty, and staff. Within North Campus are spaces dedicated to the following units, College of Arts and Sciences, The School of Engineering and Applied Sciences, The School of Social Work (*scheduled to move to the South Campus in 2027*), The School of Law, The School of Management, Undergraduate programs, Athletics, Student Life, Administration, and support services.

North Campus comprises 130 buildings totaling more than 7.1 million square feet with an annual energy cost of more than $16.6 million. Like all entities seeking to achieve long-term impacts on our environment, our desire for sustainable results is balanced by the scarcity of capital funding. This plan seeks to develop a strategy that will maximize the amount of construction that can be done by cost effectively implementing sustainable improvements, aligned with campus planning, to maximize the life cycle cost value to the University.

## GOAL

UB entered into this Clean Energy Master Plan with the goal of developing a strategy that will:

1. Lead to near term energy savings.
2. Provide a solution for the efficient electrification of heating systems on the North Campus.
3. Create a 30% reduction in energy usage for the North Campus.
4. Establish a decarbonization pathway for a carbon neutral campus.



## WHAT WE HAVE

The development of the Clean Energy Master Plan starts by assessing our current status. This takes three primary forms:

1. How we use energy and from what source (Utility)
2. What infrastructure is used to transform and transport energy through the campus (Plant)
3. How energy is consumed within our buildings (Load)

### How UB Uses Energy

North Campus has two primary energy sources, electricity provided by National Grid and natural gas provided by National Fuel.

We established the calendar year 2022 as the baseline period for the plan. This period would not be impacted by the pandemic and would reflect anticipated energy used for current facilities. The Environmental Protection Agency's eGRID 2022 data set was referenced to determine emission rates for electric utilities in Upstate New York. However, emission rates only tells part of the story. The University has also invested heavily in directly producing and procuring electrical energy from renewable energy sources for many years

### How UB Produces Energy

The University at Buffalo's journey into onsite renewable energy generation started nearly two decades ago with the Norton PV array. Today UB is recognized as a leader in renewable energy. In 2025 UB was listed as a top 5 College and University partner by the US EPA for annual green power consumption.

Figure 1: UB Solar Strand

To achieve this level of commitment to renewable energy, the University has taken a multifaceted approach. This strategy included the use of UB owned behind the meter PV systems, onsite systems with power purchase agreements (physical and virtual), offsite and systems connected through remote net metering leveraging power purchase agreements.

The total annual production of renewable energy from these systems equals 16,952,366 kWh as measured during the 2023/2024 period. All remaining electrical energy consumption on campus is offset by purchase of Renewable Energy Certificates (RECs).

| | Year | Annual Energy Usage | | Demand (kW) Peak | Demand (kW) Annual | Cost | Blended Rate[1] | Rate[2] Usage | Rate[2] Demand | Emissions CO2e |
|---|---|---|---|---|---|---|---|---|---|---|
| Electric | 2022 | 147,991,876 | kWh | 26,292 | 265,308 | $14,872,108 | $0.10 | N/A | N/A | 18,494 |
| Natural Gas | 2022 | 2,662,170 | therms | N/A | N/A | $1,819,054 | $0.68 | N/A | N/A | 14,125 |
| Total | 2022 | 771,165 | mmBtu | N/A | N/A | $16,691,162 | $21.64 | N/A | N/A | 32,620 |

[1] *Blended rate based on total cost ÷ usage*

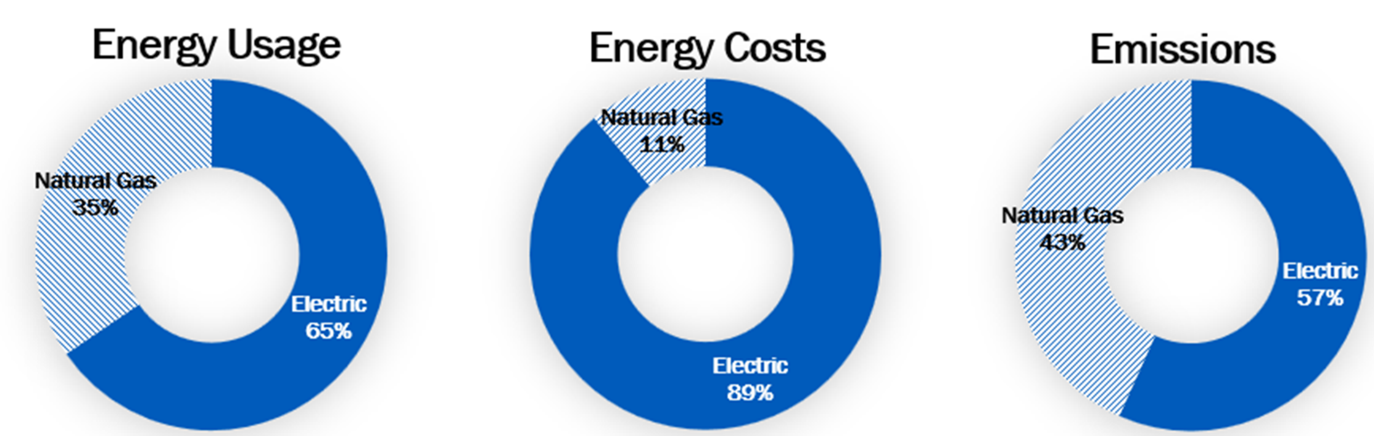



Figure 2: Baseline energy consumption, cost, and emissions for UB North Campus

## How UB Transforms Energy

North Campus has one major system for transforming energy and transporting it to the buildings-- the Baker Chilled Water Plant.

The Baker Chilled Water Plant consumes electricity and utilizes water-cooled chillers to produce chilled water. The chilled water is provided to buildings via a large underground network of pipes. The chilled water cools the buildings and rejects the heat from the building to the atmosphere through cooling towers located at the plant.

Natural gas is provided to several localized boiler plants throughout the campus. The boilers produce hot water which is distributed to heat the buildings. This represents only a fraction of the heating load on campus. Much of the campus is heated by electric resistance heating. This form of energy utilizes electricity directly to heat the space.

## How UB Consumes Energy

Buildings primarily consume electricity, chilled water, and natural gas.

1. Electricity is used by lighting, computers, fans, pumps, heating, and local air conditioning units.
2. Natural gas is used by labs, kitchens, domestic water heaters, furnaces, and packaged boilers.
3. Chilled water is used by cooling systems.

A reduction in the energy consumed by the building systems outlined above will directly affect the overall energy consumption of the campus.

## University at Buffalo | North Campus | Existing Energy Flow

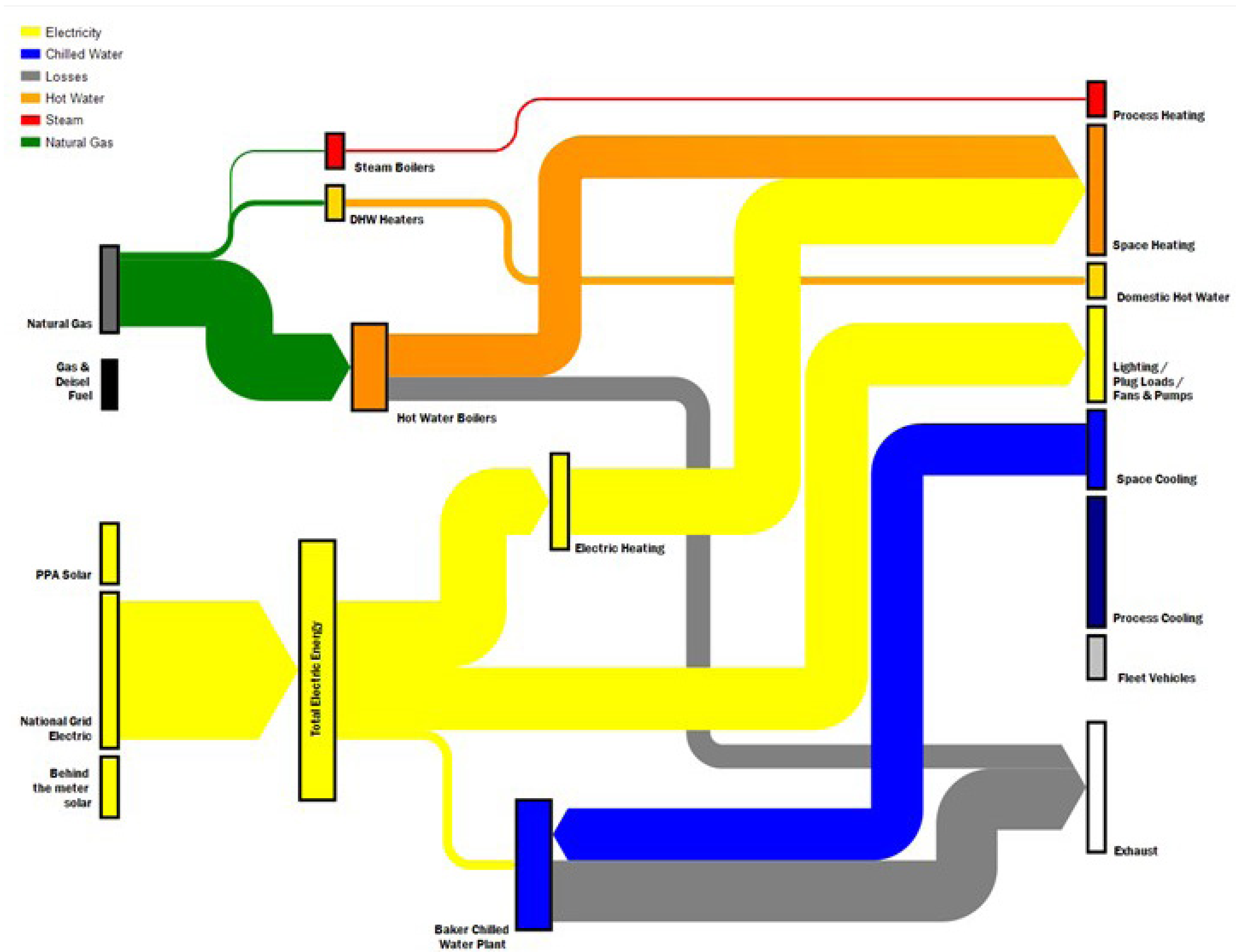



Figure 3: Sankey Chart showing energy flow (left to right) across North Campus



# KEY FEATURES

There are several unique features to UB's current North Campus energy infrastructure which have influenced the direction of this plan.

1. Electric resistance space heating
2. Chilled water distribution system (campus wide)
3. The Baker Chilled Water Plant
4. Electrical substation and direct 230KV grid connection

## Electric Space Heating

Built in the early 1970s, much of UB's North Campus was designed with electric resistance heating. Therefore, a large portion of the campus's heating systems are already "electrified." While this does give North Campus a head start on reducing campus fossil fuel usage compared to our peers, electric resistance heating is a much less efficient (and therefore more expensive) way to heat compared to modern heat pump alternatives.

## Chilled Water Distribution

The campus was designed with an intricate and resilient chilled water distribution system. This network of underground pipes provides chilled water in the summer at a temperature of 42°F. In the winter, the loop circulates neutral temperature water between buildings at around 62°F. This temperature allows buildings with datacenters or kitchen equipment to leverage necessary cooling while other buildings such as labs can use the same loop to preheat cold winter outdoor air that is necessary to ventilate research spaces.

This intricate network of pipes is starting to show its age. Nearly all of the underground pipes are almost 60 years old and in the next decade will be nearing the end of their useful life.

## Baker Chilled Water Plant

The central feature of the Campus's energy systems is the Baker Chilled Water Plant. The plant is the primary source of cooling for all of the North Campus. It has nearly 11,000 tons of cooling capacity with an average equipment age of 35 years. The age of equipment coupled with outdated electrical infrastructure makes the Baker Chilled Water Plant a critical asset in need of support.

Figure 4: Existing Chillers within Baker Chilled Water Plant

## Electric Substation

The University is connected directly into a high voltage transmission network along the I-290 resulting in the University receiving power at transmission voltage (230,000 volts). UB is the only off taker in this part of the state to receive power like this. This unique arrangement provides reliability and versatility regarding input electrical power and capacity.

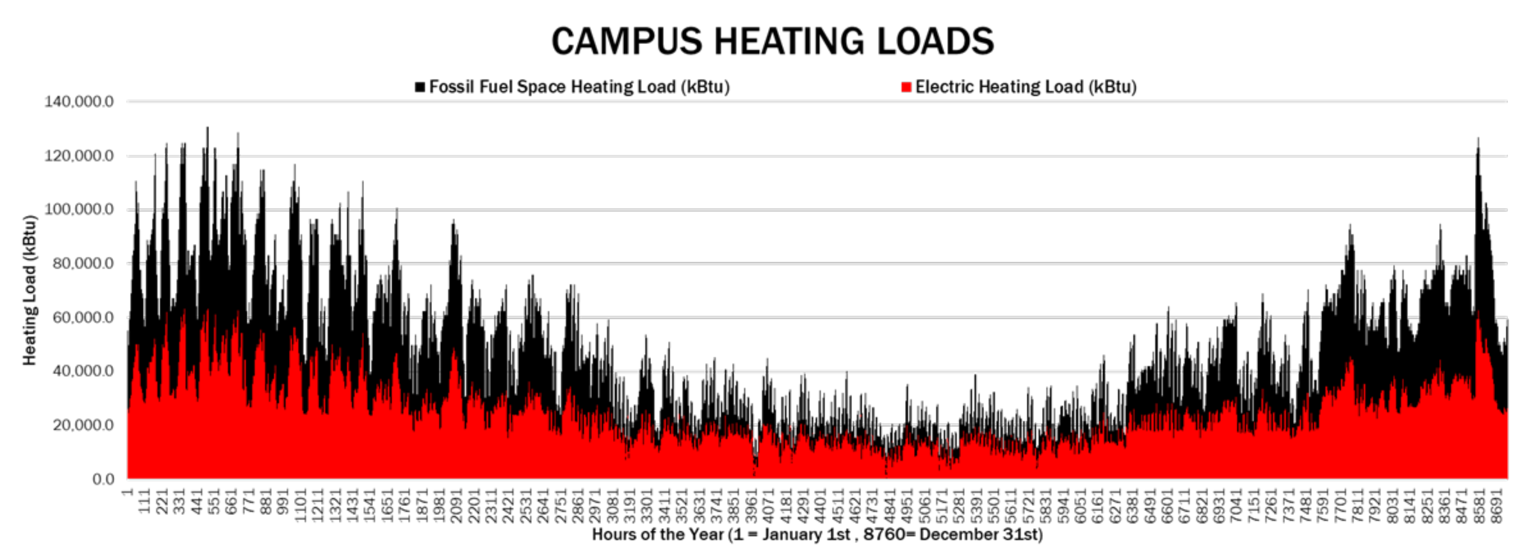



Figure 5: Campus heating loads by hour for a full year. Stacked graph showing electric and fossil fuels.

# DYNAMIC

The University at Buffalo's North Campus is on the precipice of an amazing transformation. With upcoming projects such as Agrusa Hall (new engineering building), Empire AI Data Center, and other new buildings and major renovations, the campus is transforming—in fact over the next decade nearly $2B in capital construction is scheduled to occur. This transformation will not only impact students and research, but also how the campus uses energy.

## New Buildings & Renovations

New buildings coming to campus are the physical embodiment of the ever-expanding talent, skills, and passion within the University. These new facilities bring new energy both figuratively and literally to campus. Under state policy, no new facility can be constructed or renovated and utilize fossil fuels. This aligns well with UB's existing climate neutrality strategy through its 10 in 10 strategy.

As part of this planning effort, we need to consider:

1. The timing and sequencing of the new projects.
2. The thermal loads associated with the new construction.
3. Alignment of the development with the overall vision of the plan.

This coordination and collaboration was critical. As the plan was developing in parallel with project designs, multiple project teams had to coordinate to align current projects with an ever-evolving long term strategy of the campus's energy infrastructure. This greatly added to creating a more responsive and adaptable plan.

## Datacenter

While all buildings will impact energy usage, no building would present a bigger impact and opportunity than the Empire AI datacenter. This state-of-the-art facility will house up to 15MW of advanced AI computing system (one of the largest higher education systems in the country). This facility will undoubtedly dramatically increase the electrical consumption of the campus.

However, Empire AI, the mission of which is to foster public-good innovation, economic growth, and leadership in responsible AI development, also presents an innovative opportunity to recover waste heat and use that energy to heat the rest of the campus. Empire AI can not only provide computational solutions to advance research, but it can also provide an efficient and fossil fuel free source of heat for the campus. Moreover, the recovery and reutilization of energy generated by the Empire AI datacenter will optimize the overall efficiency of the initiative, while mitigating prospective capital expenditures associated with constructing additional geothermal wellfields or augmenting electrical infrastructure to deliver equivalent energy capacity.

Figure 6: Rendering of Agrusa Hall

# SOLUTIONS

The pathway to achieving our goals must overcome several challenges. The solutions to achieving these goals can be categorized as follows:

1. Energy Efficiency Measures
2. End of Life Equipment
3. Electrification Make Ready Work
4. District Plant & Distribution Systems

## Energy Efficiency Measures

**30%** REDUCTION IN ENERGY USE

Energy efficiency measures are strategies or upgrades that reduce the amount of thermal energy required to heat, cool, or ventilate spaces without compromising comfort or safety. These measures often involve improving airflow management, optimizing heating and cooling systems, and enhancing control technologies. Examples include replacing constant air volume (CAV) with variable air volume (VAV) systems in both lab and non-lab areas, upgrading HVAC controls through direct digital control (DDC) conversion, and implementing retro-commissioning (Retro-Cx) to fine-tune existing systems.

Additional measures such as lab airflow optimization, demand-controlled ventilation, and enthalpy economizers help minimize unnecessary heating and cooling loads. Advanced solutions like window sash sensor controls, analytics systems, SCR controls, refrigeration and kitchen hood controls, and variable refrigerant flow (VRF) replacements further improve thermal efficiency by ensuring systems operate only when needed and at optimal performance levels.

Collectively, these measures reduce energy waste, lower operating costs, and support sustainability goals. By reducing energy consumed within existing facilities less fossil fuel will need to be offset by an electrical energy source.

## End of Life Building Equipment

HVAC equipment reaches the end of its useful life when it can no longer operate efficiently, reliably, or safely due to age, wear, and outdated technology. Over time, components degrade, leading to higher energy consumption, frequent breakdowns, and increased maintenance costs. Older systems often fail to meet current efficiency standards and may use refrigerants that are no longer environmentally compliant (which have a massive and disproportionate ghg rating). Replacing end-of-life HVAC equipment ensures improved energy performance, reduced operating costs, enhanced indoor comfort, and compliance with modern sustainability and safety regulations.

## Electrification Make Ready Work

Electrification make-ready work involves preparing a building's HVAC system for the transition from steam or fossil fuel-based heating to modern, efficient electric or low-temperature hot water systems. This process includes upgrading or replacing key components to ensure compatibility with electrified heating and cooling technologies.

Typical improvements include low-temperature hot water/glycol conversions, unit heater and furnace replacements, and adiabatic humidification for efficient moisture control. Additional measures such as autoclave replacement, air handling unit (AHU) heat recovery modifications, steam-to-glycol heat exchanger replacements, and domestic hot water (DHW) heater upgrades help optimize thermal performance.

Removing outdated systems like clean steam generators, updating lab and cooking equipment or replacing furnaces in apartments with cold weather air source heat pumps, are all methods for removing fossil fuels from building end-uses. These upgrades are essential for achieving electrification goals, lowering carbon emissions, and supporting long-term sustainability.

## District Plant & Distribution

Currently, the campus has an interconnected cooling system. The Baker Chilled Water Plant and its distribution network connect multiple buildings to share chilled water for cooling. In the future, UB plans to expand this concept to incorporate heating as well.

Why does this matter? Sharing heating and cooling between buildings is a smart way to save energy and money. For example, if one building needs cooling while another needs heating, a shared thermal network can transfer energy between them instead of each building buying extra energy separately.

At the heart of this network is the district energy plant. This can be one large plant or several smaller ones working together. On the North Campus, the Baker Chilled Water Plant is the main plant today. To provide heating, we will convert this plant from chillers to heat pumps.

Heat pumps are key to transitioning away from fossil fuels. They use electricity to move heat instead of burning fuel to create it. This makes them 3–4 times more efficient than traditional boilers or furnaces, reducing energy use and costs.

However, heat pumps need a source of heat to work. Two common sources are:

- Heat recovery – capturing waste heat from processes like datacenters.
- Geothermal wellfields – using stable underground temperatures.

These steps will make the campus energy system cleaner, more efficient, and ready for a fossil fuel-free future.

# STRATEGY

The strategy to transition to a zero-carbon energy system for the North Campus will focus on four elements:

1. Address the thermal energy needs of near-term new construction and major renovation projects on North Campus.
2. Reduce energy consumption by increasing building energy efficiency.
3. Take advantage of site specific thermal energy characteristics such as heat recovery.
4. Create flexibility to adapt to a dynamic campus environment and the needs of aging infrastructure.

## Phase 0 | Bridge To Baker

The initial phase, currently underway, will enable the transfer of thermal energy from the chilled water system—traditionally used for heat recovery during winter—into a sustainable energy source that will support upcoming new construction and major renovation projects. This phase is referred to as the "Bridge to Baker" since this is intended to only operate as a temporary solution until Phase 1 of the project is completed.

## Phase 1 | Baker Heat Recovery & Geothermal

Over the next five years, UB will construct several new facilities and complete major renovations along the academic spine, all of which are being constructed with fossil-free energy sources. However, it is preferable to avoid installing large geothermal wellfields near these buildings, as it would limit future development, interfere with utility and transit planning and be costly.

The Baker Phase 1 project provides a sustainable solution by delivering clean energy through UB's existing chilled water network without placing wells on the campus spine. This approach leverages geothermal technology and recovers waste heat from the Empire AI Datacenter, reducing the number of wells required, lowering capital costs, and preserving critical campus space. In addition to supporting new construction and renovations, the project will expand cooling capacity at the Baker Chilled Water Plant, enable thermal energy storage, reduce annual energy costs, lower carbon emissions, and position UB's infrastructure for future phases.

Two new 30-inch neutral temperature water pipes will connect the Baker Chilled Water Plant to the new Empire AI Datacenter (about a half mile away) (item 3 on the rendering). The new pipes will transfer waste heat from the datacenter in the winter to the Baker Chilled Water Plant.

Within the Baker Chilled Water Plant (item 8 on the rendering) new heat exchangers and heat pumps located in the plant will use the recovered heat from the datacenter, along with thermal energy from geothermal wells (item 7 on the rendering) to heat the campus. Thermal energy from the Baker Chilled Water Plant will be transferred to buildings throughout the campus in the winter via the chilled water network (item 10 on the rendering) which will now operate as a neutral temperature loop (55°F to 65°F) in the winter.

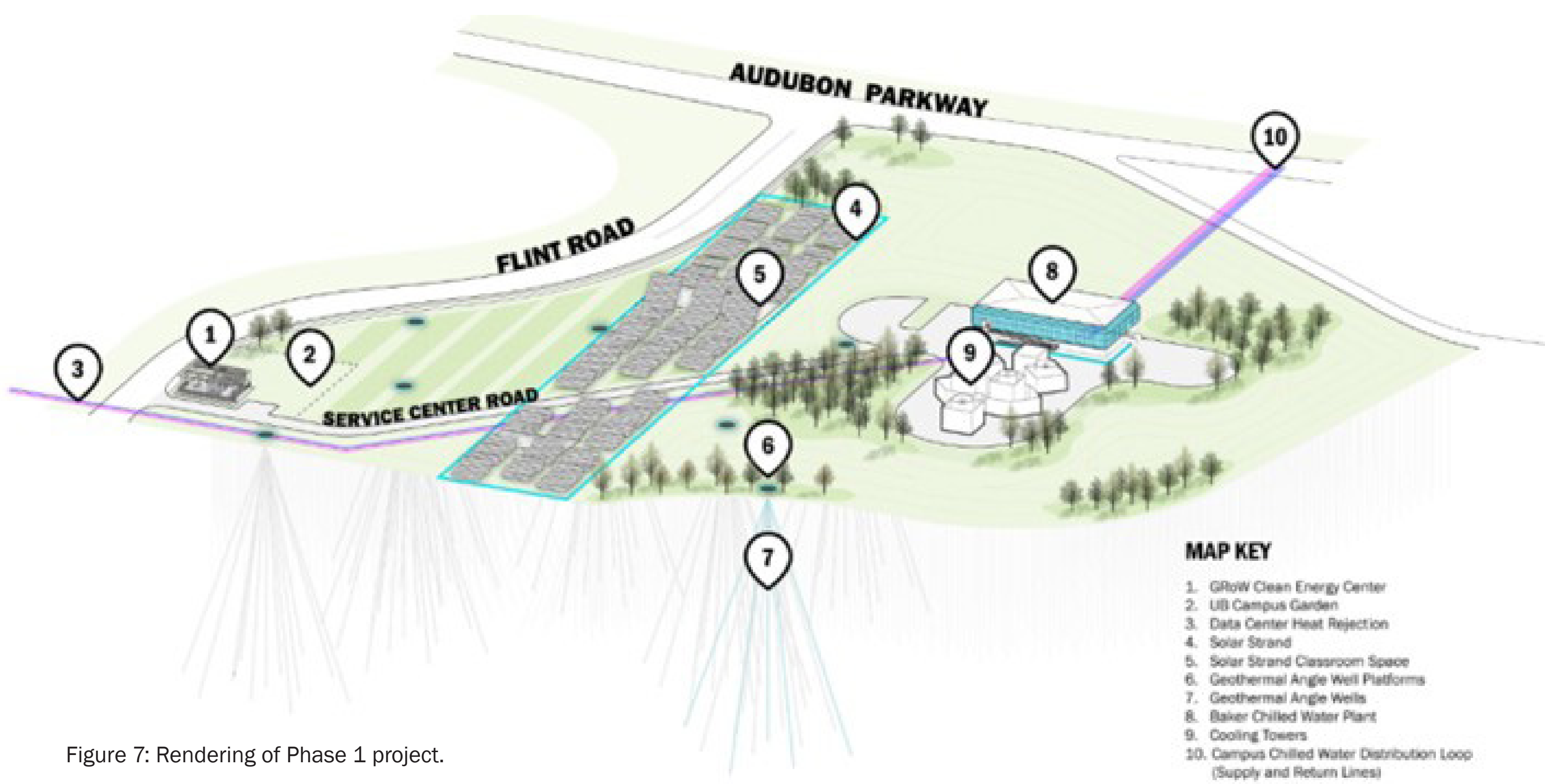


Figure 7: Rendering of Phase 1 project.



## Phase 2 | Baker Chiller Plant Expansion

The Baker Chiller Plant upgrade is a strategic investment that addresses aging infrastructure while improving safety, reliability, and efficiency. By replacing end-of-life chillers with modern chillers and heat pumps, UB will enhance cooling capacity and introduce sustainable heating options, reducing long-term energy costs. Upgrading the electrical system from 4,160V to 480V creates a more maintainable operating environment and aligns with current industry standards and reduces compliance risks. New 480V pumps will improve system reliability and reduce downtime, while expanding overall plant capacity to ensure that UB can meet growing campus demands without costly emergency measures. These improvements not only extend the life of critical infrastructure but also reduces operational expenses, and positions UB for future growth, all while delivering a return on investment through energy savings and reduced maintenance costs.

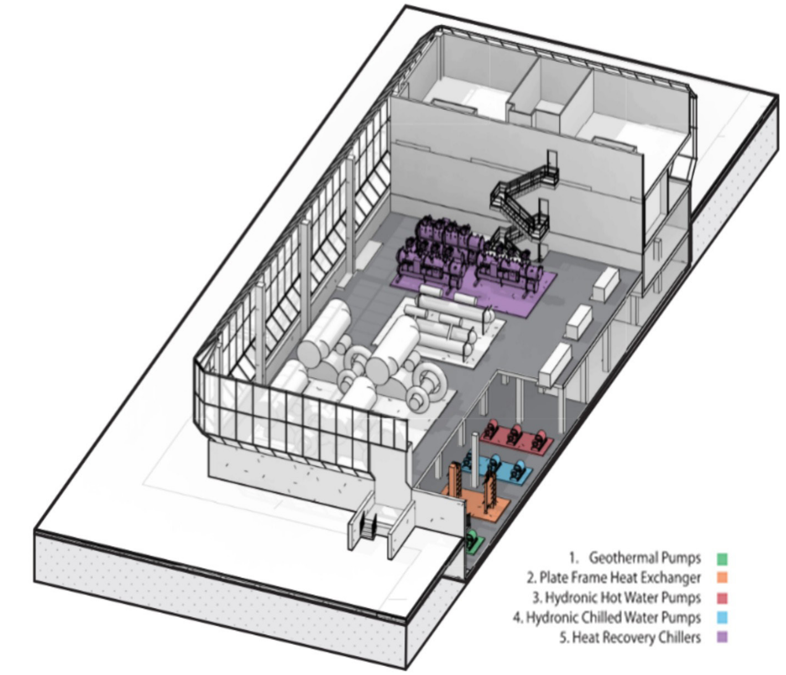


Figure 8: Rendering of Baker Chilled Water Plant with Heat Pumps

## Phase 3 Option A Generation 5 Hybrid Distribution System

To address fossil fuel energy usage for the rest of North Campus, the University may take a phased approach that leverages existing infrastructure while preparing for future growth. The plan begins with a hybrid system. Heat pumps located at the Baker Chilled Water Plant will work with the current chilled water network, which continues to operate as a neutral temperature loop during the heating season. New heat pump cluster plants will be installed in strategic locations across campus to serve groups of nearby buildings. These plants will connect to the chilled water loop to reject and absorb heat, while providing hot water and chilled water locally to the buildings in the cluster. This allows heating and cooling loads to be shared efficiently. This strategy reduces the need for extensive piping and enables upgrades to occur gradually, minimizing disruption to campus operations.

As the number of electrified buildings on campus expands, additional heating capacity will be required. To meet this demand, additional thermal energy sources will be available via the Baker Chilled Water Plant. These are either heat recovered from the planned 15 MW Empire AI Datacenter or energy from the new ground-source geothermal heat pump system surrounding the Plant. Certain areas of the campus, such as the Ellicott Complex, Governors Complex, and athletic facilities, will likely require their own dedicated geothermal heat pump plants. These will be discussed in Phase 4.

The clustered approach offers several advantages. By grouping buildings based on proximity and load profiles, the system can share heating and cooling demands, improving efficiency, and reducing energy waste. Each cluster will include geothermal wellfields for heat absorption and rejection, as well as backup condensing hot water boilers to maintain reliability during power outages. This phased strategy provides a practical path toward a sustainable, electrified heating system while modernizing aging infrastructure and supporting the University's long-term growth.

**The use of Empire AI Heat Recovery will reduce the number of required Geothermal Wells by 89%.**


Figure 9: Geothermal Test Well at North Campus

## Phase 3 Option B Generation 4 Central Distribution System

Another option for the North Campus is to install a centralized geothermal heat pump system at the existing Baker Chilled Water Plant. This approach would place most of the critical equipment in one location, making it easier to maintain and manage. From this central plant, heating and cooling could be distributed across the campus using electrified systems. In addition to supporting the University's long-term sustainability and carbon reduction goals, this strategy would improve overall system efficiency.

A centralized system offers several benefits. It requires less equipment than a clustered approach, uses less space in individual buildings, and has quicker response time during outages. It also minimizes disruption for building occupants. The existing chilled water piping can likely be reused, and there appears to be enough space at the Baker plant for the new heat pumps. However, this option does have challenges. It would require installing new low-temperature hot water piping to every building, and if the central plant experiences a failure, the entire campus would be affected. Implementing this system in phases would also be more difficult compared to a clustered approach, however it would address the potential risks associated with aging underground infrastructure by replacing it.

To support the heat pumps, geothermal wellfields would be added to provide a source for heat absorption and rejection when heating and cooling demands do not occur at the same time. Similar to the hybrid approach, the integration of the Empire AI Datacenter would help reduce the number of wells needed, making the system more efficient and cost-effective.

Finally, the central plant would include backup condensing hot water boilers connected to the new hot water loop. These boilers would ensure that buildings continue to receive heat in the event of a power outage, providing reliability and resilience for campus operations.

## Comparison of PHASE 3A VS PHASE 3B

The University can postpone the decision between moving forward with either Phase 3A or Phase 3B (both of which would leverage Phase 0, 1 and 2). Over the next five years, key factors such as aging infrastructure in the chilled water distribution system and potential changes to the campus transit system (potential NFTA expansion to the North Campus) are likely to play a significant role in shaping this choice. The following table summarizes tradeoffs between the two options.

| FEATURE | PHASE 3A HYBRID GEN 4 / GEN 5 (CLUSTERED) | PHASE 3B CENTRALIZED HEAT PUMP SYSTEM |
|---|---|---|
| **Location of Equipment** | Multiple clusters across campus | Single location at Baker Chilled Water Plant |
| **Maintenance** | More complex (multiple sites) | Easier (centralized) |
| **Space in Buildings** | Requires space for cluster equipment | Minimal impact on individual buildings |
| **Phasing & Flexibility** | Easier to implement in stages | Difficult phase; large upfront investment |
| **Impact During Outage** | Limited to affected cluster | Entire campus impacted if central plant fails |
| **Distribution Piping** | Less new piping required | Requires new low-temperature hot water piping campus-wide |
| **Equipment Quantity** | Higher (multiple clusters) | Lower (centralized system) |
| **Integration with AI Data Center** | Supports integration; reduces wellfield size | Supports integration; reduces wellfield size |
| **Geothermal Wellfields** | Located at Baker & required for each cluster | Located at Baker & required for central plant |
| **Backup Heating** | Boilers at each cluster | Central boilers at Baker plant |
| **Financial Impact** | Medium | High |
| **Campus Disruption** | Manageable during upgrades | Moderate during upgrades |

Table 1: Decision matrix between Phase 3 A and Phase 3 B



## Phase 4 | Student Life Plants

Certain areas of the campus require their own geothermal heat pump plants because of their distance from the Baker Chilled Water Plant. Specifically, the Ellicott and Governors complexes will be developed as stand-alone Gen 4 heat pump plants. This approach ensures these buildings have reliable heating and cooling while reducing strain on the Baker plant. By breaking these areas out into independent systems, the University can alleviate future capacity concerns related to the cooling load at the Baker Chilled Water Plant and maintain flexibility for campus growth.

Since these buildings currently use electric resistance heating, the transition to geothermal heat pumps will only occur during major renovation projects that also add cooling capabilities (which currently does not exist). This phased approach minimizes disruption and aligns upgrades with planned building improvements, making the process more cost-effective and practical.

## Energy Conservation & Make Ready Work

Regardless of the path forward (Option 3A or 3B), Energy Conservation and Electrification Make Ready Work within existing buildings will be necessary to achieve the goals of this plan. These improvements can be made in parallel with the phases outlined above and start today.

There are three strategies the University can employ to execute this work within buildings.

1. Implement projects as part of either routine or deferred maintenance cycles.
2. Identify projects with favorable return on investments and package the projects together for implementation under an alternative project delivery model.
3. Identify major assets or equipment that have reached the end of their useful life and prepare capital projects to address these needs.

## OVERARCHING NORTH CAMPUS CEMP PHASES & TIMELINE

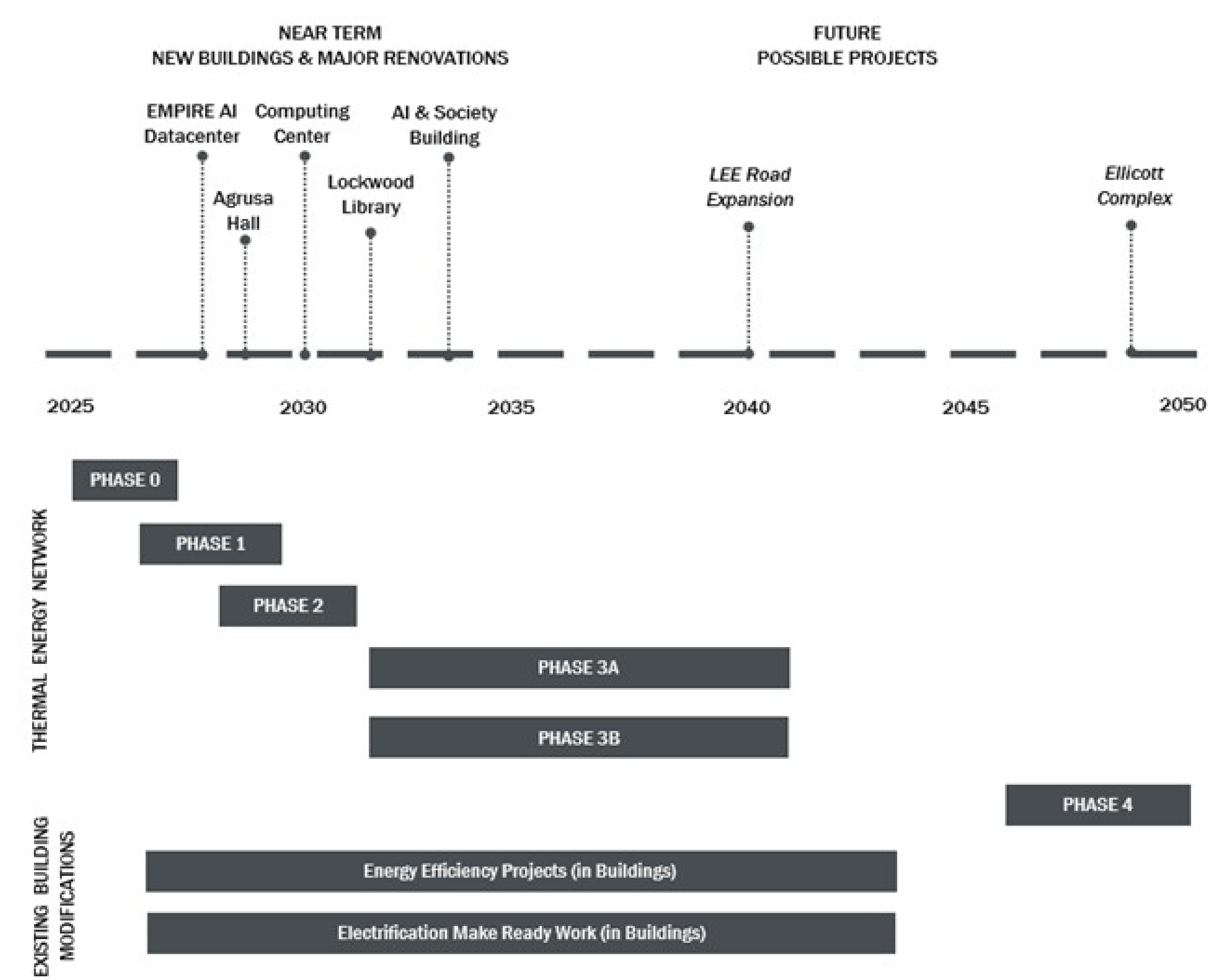



Figure 10: Timeline and phasing the plan

# ECONOMICS

To start our economic analysis, it is important to discuss what we are comparing our plan against. The baseline is the period from which we pulled existing operational and cost data. This is a fixed point in time to which we can compare. However, the campus is dynamic. With an ever-changing campus we need to consider a future scenario that runs in parallel to our plan and takes into consideration the future growth of the campus that the current baseline does not. This is referred to as the business-as-usual (BAU) scenario.

There are several factors to assessing the financial impact of this plan on the University. These are as follows:

1. Capital Cost
2. Operating Costs
3. Policy Requirements
4. The cost of doing nothing is not zero

## Capital Cost

CAPITAL COSTS are the actual cost of implementing a project. The value presented within is inclusive of all material, labor, fees, and contingencies.

The capital cost of a project may be offset by INCENTIVES and grants. For example, the Investment Tax Credit (ITC) provides a pathway for public universities to receive between 6% to 50% funding for geothermal systems as direct payment from the federal government. Other local incentive programs exist through the state and local utilities that could support the initiatives outlined within this plan.

The implementation of the plan will also address DEFERRED MAINTENANCE COST. By upgrading systems that are nearing or at the end of their useful life, this project addresses aging and deferred maintenance items that would be incurred by the University over the next 10 to 15 years. To say this another way, **THE COST OF DOING NOTHING IS NOT ZERO.**

Finally, there are items we would consider, AVOIDED COSTS, for instance, by leveraging heat recovery from Empire AI, we are avoiding having to install thousands of geothermal wells. These comparative capital costs assist in assessing the plan relative to a likely business as usual scenario.

Both deferred maintenance cost and avoided costs are viewed as capital cost under the BAU scenario.

## Operating Costs

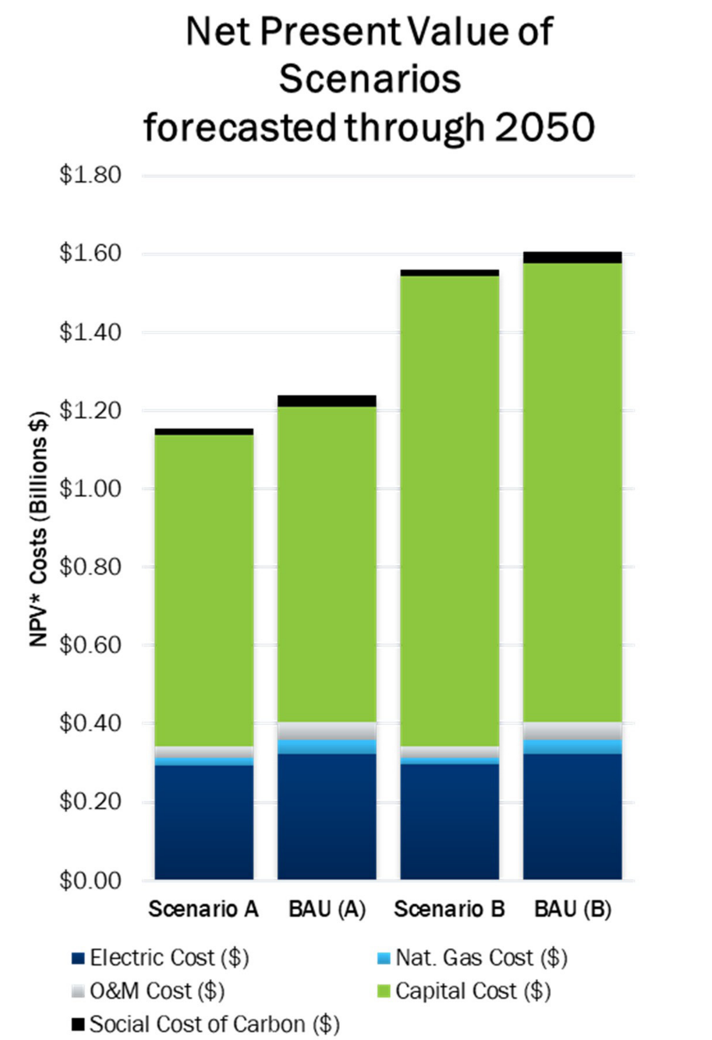
The operation costs are defined as annual recurring costs to the University. This project will impact both energy costs as well as operation and maintenance (O&M) costs. While overall energy consumption will be lower compared to the business-as-usual scenario, the proportional impact on energy cost will be different due to the variation in the cost of natural gas compared to electric utilities.

Under a business-as-usual scenario it is assumed new buildings would be built with electric resistance systems and existing natural gas energy usage would not be addressed unless a major renovation was planned.

## Policy Requirements

The New York State Climate Leadership and Community Protection Act drives state agencies to electrify their utility systems. As part of this policy, New York State has outlined the requirements for incorporating the social cost of carbon into the financial assessment of projects. Please note that this takes into consideration that all electrical energy for the University is sourced from Renewable Energy Generating Sources.

Beyond state policy, the University's 2030 vision sets aggressive targets to reduce carbon emissions and decarbonize. The combination of both State and University policy creates a present and future where a business-as-usual energy system using fossil fuels is no longer acceptable.




*NPV calculated at a 5.5% discount rate.
**Scenarios are inclusive of phases outlined previously.

Figure 11: Comparative summary of the NPV for various scenarios

# CONCLUSION

This Clean Energy Master Plan outlines a feasible, efficient, and cost-effective strategy to achieving UB's clean energy objectives. The approach will allow UB to invest in its infrastructure today, using proven technology with low risk.

The plan will enable UB to make smart and well-informed investments over time balancing funding, impact on students, and accommodate future University growth. This plan provides an approach that will also offer UB the opportunity to address deferred maintenance items and end-of-life equipment.

**This approach allows UB to integrate Empire AI into UB's energy ecosystem. Through this process we have positioned the new datacenter as a change agent that will help facilitate a fossil fuel free energy system for North Campus.**

As planning for the long-term future of the campus continues, parallel efforts related to an on-campus light rail system and the long-term viability of the aging underground chilled water network will influence the decision between selecting either scenario A or scenario B presented in this plan. This strategy has outlined both pathways with a recommendation for University decision makers to consider both options as well as other outside considerations and select a path forward within the next five years.

In conclusion we believe this plan outlines a path forward to a clean energy future for our University. One that is achievable and adaptable to our needs. In our conclusions, we should emphasize that doing nothing carries a real cost, and in both scenarios, investing in new zero-carbon, cutting-edge research infrastructure is actually more cost-effective than continuing with the Business-as-Usual approach.

Figure 12: Empire AI Alpha Phase

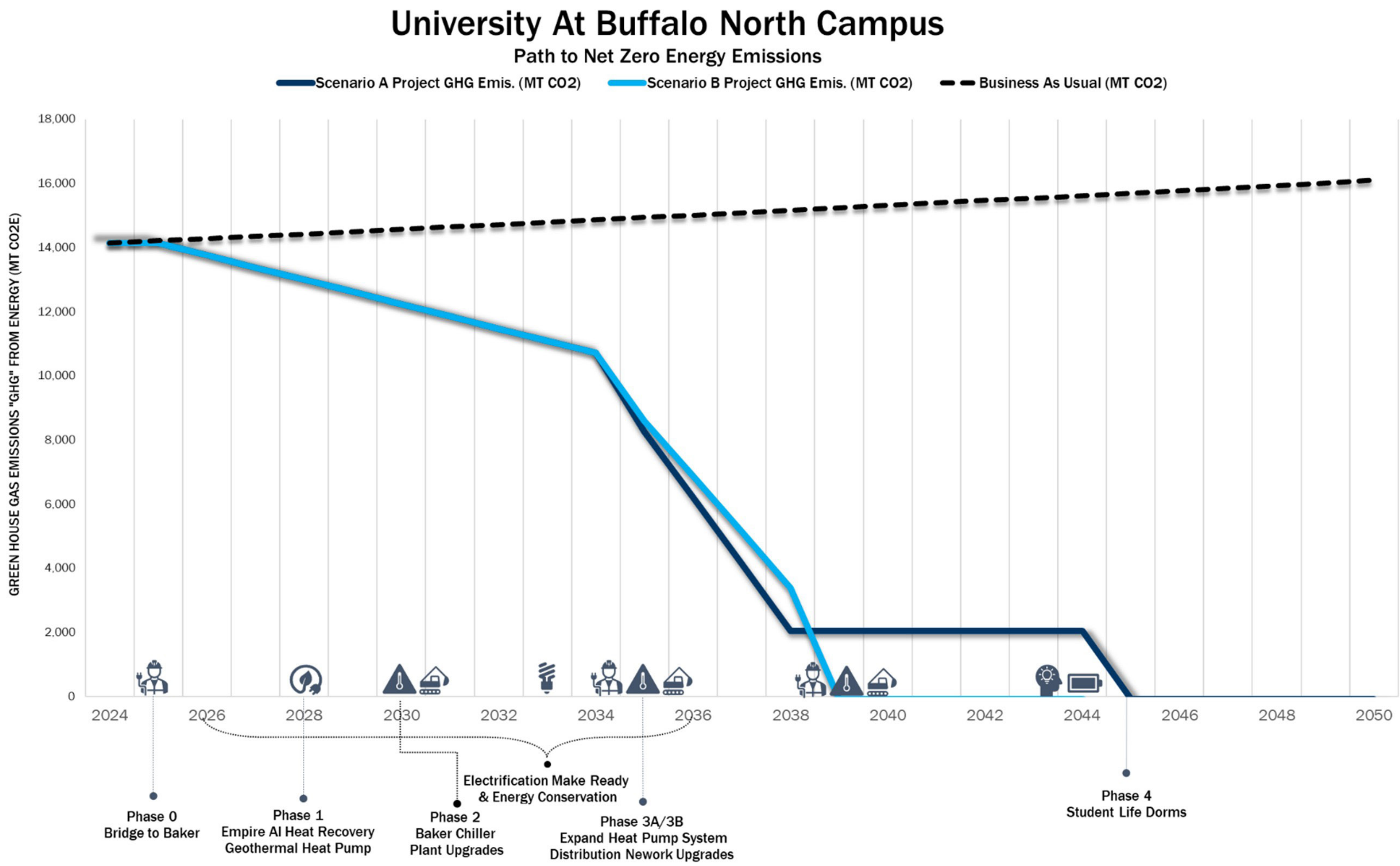



Figure 13: Projected emissions reduction over time as project are implemented.

# Acknowledgement


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Figure 14: Working session with stakeholders.



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