Saranac Lake District Energy System

Draft Report

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Prepared for:

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1.0 EXECUTIVE SUMMARY

As a result of the passage of the Climate Leadership and Community Protection Act of 2019, there has been a renewed focus on how to decarbonize building heating at scale. By 2050, 85% of homes and commercial building space statewide will need to be electrified with energy efficient heat pumps. On an individual basis, converting existing buildings to electrified heating will be a challenge, as well as the aggregate effects on the electrical grid. This study aims to provide an alternative solution to traditional electrification approaches by proposing a district energy system to that would supply low-carbon heating to over 800,000 sf of office, multifamily, hotel, and retail space in downtown Saranac Lake.

The primary heat source would be ground heat exchangers with vertical geothermal bore fields located under the Dorsey Street parking lot, the Main Street lot, the police parking lot, and the Riverside Park. As a secondary source, the system could take advantage of an existing local resource, Lake Flower. The lake outlets into the Saranac River, which then flows through the Village. The temperatures would generally be considered cold or tepid water but are high enough to be source for water source heat pumps to efficiently operate. The DES would create an interface with the lake outlet and exchange heat between the lake water and a separate distribution loop that would extend downtown.

The study included 70 potential customers in the downtown area as well as Petrova Elementary School, future Emergency Services complex, and future Adirondack Park Agency. The design day heating load of the connected buildings served was estimated at 518,000 MBH with the design day cooling load estimated at 193,000 MBH.

The study considered the alternative solution to individually electrifying buildings. In many cases, retrofitting with an air source heat pump alternative is technically challenging due to the winter design conditions in Saranac Lake. Retrofitting with electric boilers is cost prohibitive due to high cost of operation.

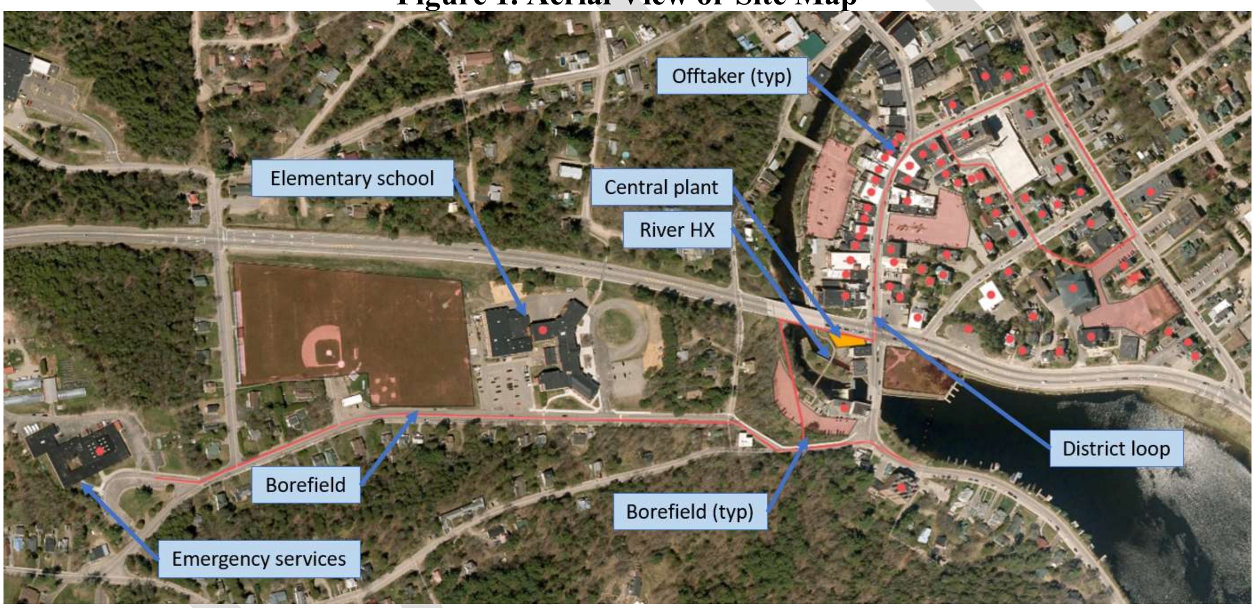
The initial primary customers of the system would be those with existing water source heat pump systems that could be easily connected to the district system, those that are geographically close to the first phase of distribution piping, and those with greatest building owner buy-in.

The project is estimated to have a total development and construction cost of $45M with projected building retrofit costs of $28M; cost estimates and financial assumptions can be found in Task 4. The 25-year net present value of the system including design and construction costs as well as direct benefits (avoided capital and operation costs of individual building owners, avoided delivered fuel and electric utility costs) is estimated at $5.5M. The district system is assumed to be financed over a 30-year period. Financing for a large-scale municipal project is expected to have more favorable terms in comparison to making individual building electrification HVAC upgrades.

Indirect benefits of the system include the social cost of the carbon emissions avoided of the 25-year study period as defined by the New York State Department of Environmental Conservation (DEC). A net present value (NPV) of $11.9M in avoided carbon emissions was calculated, however under current law and market conditions there is not an available avenue to monetize this value for the benefit of the project.

The project would face several challenges of coordination with existing subsurface utilities, securing commitments from future customers, project financing for customer retrofits, permitting and regulatory hurdles, and escalating construction costs. Solutions to each of the challenges listed will be the focus of the design detailed study.

Figure 1. Aerial View or Site Map



2.0 ESTABLISH BASELINE CONDITIONS

- *Describe the basis for a baseline condition and describe the characteristics of such baseline conditions.*

Downtown Saranac Lake contains over 800,000 square feet of commercial, residential and government spaces within a compact area of approximately 37 acres. Few existing buildings contain water source equipment. CHA has been able to characterize the existing systems in aggregate based on a number of site visits. Property tax records provide a totaling of floor area and space usage. The most predominant space use in buildings is small offices, followed by residential as many of the downtown buildings are mixed use with commercial spaces on the ground floor and residential spaces on upper levels. National Grid is the electric utility serving the area in which users pay into the system benefit charge (SBC). Buildings largely receive delivered fuel (fuel oil or propane) from Hyde Fuel, MX Fuels, or Suburban Propane. This study will focus on identifying the buildings with existing systems that would be compatible with an ambient loop system, such as water source heat pumps, water cooled chillers and low temperature hot water systems. See the appendix for the building list and associated details including location, building type, and square footage.

- *Review at least the most recent 12-months of utility bills to the extent that they are made available by the building owners.*

Utility bills were made available by the building owners for six potential community buildings, spanning between January 2019 and February 2023. The utility bills serve as a sample of the buildings that are included in the study, including office space, midrise apartment, and restaurant space. The utility bills are a small sample of the community buildings and used to model these building profiles accurately, as discussed later in this section of the report. Section 2.1 provides additional detail on the provided utility data and a discussion of the reasonableness of the load profile estimation of usage.

- *Use utility profiles to estimate the baseline environmental footprint.*

A baseline CO_2 equivalent footprint attributable to the NYISO electricity and on-site propane and fuel oil consumption in 2022 is calculated using the DOE's greenhouse gas equivalencies calculator[1]. Total cooling and heating consumptions are cumulative for all buildings and were determined from the estimated thermal load profiles developed. For this calculation it is assumed

[1] https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator

that the heating for 70% of the buildings is supplied by fuel oil and the remaining 30% of the buildings by propane. Future emissions profiles for grid supplied electricity will be developed assuming a straight-line reduction in emissions from current levels to the stated 2040 goal of zero direct emissions from electricity production.

Table 1. Phase A Baseline Environmental Footprint (2022)

	Energy (kWh)	Factor (metric tons/kWh)	Energy (MMBtu)	Factor (metric tons/MMBtu)	CO_2 (metric tons)
Cooling	635,563	0.0001054			67
Heating – Fuel Oil			41,699	0.07414	3,092
Heating – Propane			17,871	0.06288	1,124
Total	**635,563**		**59,570**		**4,282**

Based on the New York State Department of Environmental Conservation, the social cost of carbon for 2023 is $126 per metric ton CO_2. These Phase A baseline emissions equate to an annual social cost of carbon of $539,532.

- *Develop baseline equipment costs.*

An estimated HVAC equipment list was determined for the potential connected buildings. A building roof survey using satellite images was performed to assist in estimating the type of equipment serving each building. Baseline equipment costs included new equipment costs for boilers and terminal units in addition to operation and maintenance costs. Due to the age of building and available site information, it was assumed that boilers provide the heating load for most buildings since boilers are a common heat source for buildings with delivered fuel. Heating replacement costs are based on engineering experience and are estimated at $3.3 million, with cooling replacement costs estimated to be $1.2 million. See the baseline life cycle cost analysis for initial total cost and cost over the life of the equipment.

- *Estimate construction costs for replacement of existing HVAC with code-conforming in-kind equipment.*

Replacement costs of the existing HVAC equipment is the same as the developed baseline equipment costs. To account for the fact that replacement will likely occur in the future, an escalation rate of 2% per year was applied as part of the baseline life cycle cost analysis.

- *Establish electricity and thermal energy utility costs using published utility tariffs and/or existing data.*

National Grid is the electric utility in the Saranac Lake area. Fuel oil is delivered by Hyde Fuel Co and MX Fuels, and propane is delivered by Suburban Propane. The sample of utility rates are averaged for the building information available and are used to assess energy savings for the other connected buildings whose utility information is unknown. See Section 2.1 for annual consumption, cost, and rates for the provided buildings. The annual electric cooling and thermal energy costs for the entire set of community buildings were estimated using these average utility rates and the corresponding annual cooling and heating energy estimated from the thermal profiles.

Table 2. Phase A Baseline Annual Utility Costs

	Utility Cost ($)
Existing Heating Energy	$1,638,185
Existing Cooling Energy	$85,165

- *Generate life cycle cost for baseline consisting of maintaining the baseline energy system and operating it for a 25-year term.*

Life cycle cost analyses (LCCA) provide the cost of ownership of the baseline equipment over the life of the system. In this case, a life cycle of 25 years was utilized. The costs that are incorporated into the life cycle analysis are shown below and details are provided in Appendices B and C:

Electricity and Fuel Costs of System Operation

Previous sections above discuss the annual electricity and fuel costs for all buildings. Projected electric and distillate fuel price indices over the LCCA were based on the handbook published by the National Institute of Standards and Technology (NIST) and assumes a general price inflation rate of 3%. Also, a system efficiency degradation of 0.25% per year representing energy increases each year was also used in the analysis.

Operation, Maintenance, and Repair Costs

Boilers are more expensive to operate than water-source heat pumps connected to a district energy system. Boilers are typically serviced annually by an outside vendor, and operating costs include chemicals and makeup water. Chemicals and makeup water costs for boilers were considered negligible as part of this study. An escalation rate of 3% per year is used in the analysis.

Replacement Costs

Based on ASHRAE life expectancy, it is assumed that boilers have a useful lifespan of 25 years. It is reasonable to assume that the boilers have varying age and would need replacement before year 25. To account for this, it is assumed that boiler replacements occur at a 10% rate each year. Cooling equipment, which is largely window air conditioners, is also assumed to be replaced at a rate of 10% per year.

Net Present Value (NPV) Analysis Results

The NPV analysis provides a current value of the projected future total costs of ownership of the baseline systems in all buildings potentially connected to the proposed district system. This provides a single value in today's dollars so that it can be more readily compared to other scenarios (i.e, the proposed system) for business decisions. The NPV analysis shows existing systems have a baseline scenario of $42,233,000 using a discount rate of 7%. The baseline cashflows are inclusive of cooling equipment and boiler replacement costs, operation and maintenance costs, and electric and fuel costs. A present value analysis for the water source heat pumps versus the existing equipment will be provided during Task 4 – "Perform Economic and Financial Analysis". The final project cost summary utilizes each variable's first cost. The NPV of the baseline scenario is calculated in Appendix C.

- *Develop a preliminary thermal model which will be used to size baseline and proposed heating/cooling plant equipment and energy source.*

Heating and cooling loads were modeled using three approaches. For the building with available utility information, models were reconciled to the specific building footprint and energy consumption. Most other building were modeled using DOE reference models of various building types. For the last category of building that the DOE did not have reference models for, CHA developed typical building models.

The DOE 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 are as follows[2]:

- Utilized most populous cities in each climate zone.
- Separated by post-1980 construction, and pre-1980 construction.
    - Differences between time periods are reflected in insulation values, lighting levels, and HVAC equipment types and efficiencies per ASHRAE 90.1.
- Model inputs divided into four categories
    - Program (location, total area, occupancy, ventilation, operating schedule, etc.)
    - Form (# floors, floor height, window fraction and location, shading, etc.)
    - Fabric (walls, roof, floors, infiltration, windows, internal mass, etc.)
    - Equipment (lighting, HVAC type, water heating, refrigeration, efficiency, controls)

[2] In depth model details can be found in the report titled "U.S. Department of Energy Commercial Reference Building Models of the National Building Stock" https://www.nrel.gov/docs/fy11osti/46861.pdf

Of the building types represented in the DOE models, six building types were considered for this study with most of the buildings falling into three main categories: Stand Alone Retail, Small Office, and Full-Service Restaurant. Reference models used for the baseline were selected as "pre-1980" based on typical building age and construction in the Saranac Lake area. A list of the reference models used for the basis of the Saranac Lake buildings are as follows.

Table 3. Reference Building Types

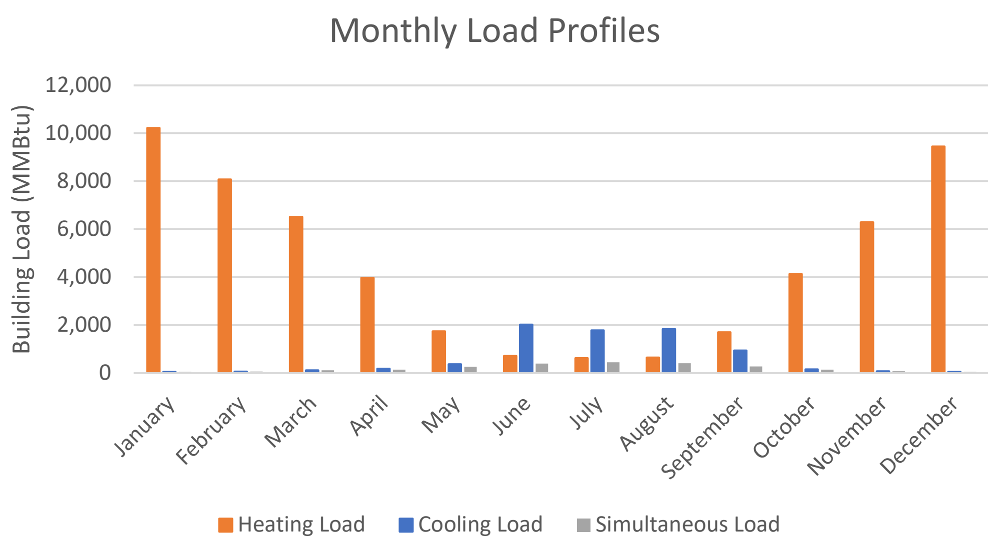
Source	Building Type	Floor Area (ft²)	# Floors
DOE	Small Office	5,500	1
DOE	Stand Alone Retail	24,962	1
DOE	Midrise Apartment	33,740	4
DOE	Full-Service Restaurant	5,500	1
DOE	Primary School	73,960	1
DOE	Warehouse	52,045	1
CHA	Church	4,727	1
CHA	Residential	2,910	2

CHA transformed the reference models into energy models specific to this study for all potential buildings in the community district system using the following approach:

1. DOE models were selected as reference buildings that most closely matched building construction/materials as the buildings in Saranac Lake and 6A climate zone based on ASHRAE 90.1.
2. The DOE model was loaded into Energy Plus software and model accuracy was verified by inputting standard climate zone weather conditions and comparing energy usage to the reference model.
3. 8,760 hourly simulations were performed using Saranac Lake, NY weather, which include heating, cooling, and domestic hot water loads.
4. A space ratio was applied to scale energy usages based on the buildings actual floor area compared to the DOE reference model. Some buildings contained multiple building types and the space ratio was applied proportionally (e.g., retail on ground floor and office space on upper floors).

The graphs below show aggregated monthly load profiles. The highest monthly load occurs in the month of January for heating, and June for cooling. The district system approach has minimal simultaneous load as shown below, limited largely by the cooling load. Heat removed from buildings with cooling loads can offset a portion of the heating load during the shoulder months. There are no buildings in this district configuration that have a substantial amount of heat rejection, thus the load flattening is minimal. The small amount of load flattening is due to the increased efficiency of the system. Attracting buildings that have more substantial heat rejection, such as a data center or grocery store, could provide system benefit during the heating seasons.

Figure 2. Phase A Monthly Load Profiles



Design of the proposed system is based on hourly load profiles during design days. Hourly profile graphs for all buildings combined across the entire year can be found in the load profile calculations. Hourly variation of the design days and the week containing the design day are more useful in demonstrating peak operation. Energy consumption, peak loads, and average loads during design days and weeks for heating and cooling are summarized in the following table.

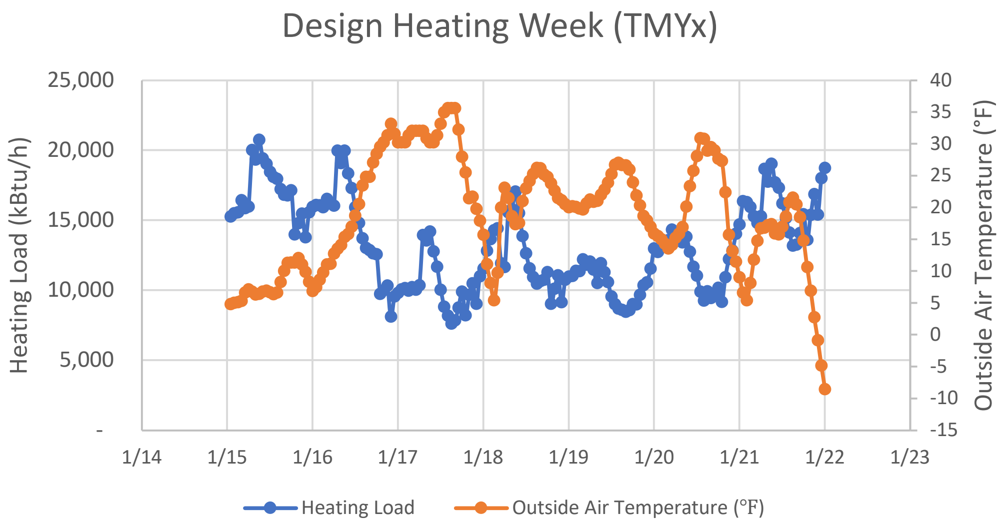
The reliance in the baseline methodology of using DOE reference buildings does tend to overstate the magnitude of the peak load due to building warmup for commercial buildings, since the models are defined using similar occupancy and usage schedules. In practice, building warm up periods will have variation in start times, duration and intensity due to differences in business hours. Therefore, peak loads aggregated by the models below are therefore conservatively estimated.

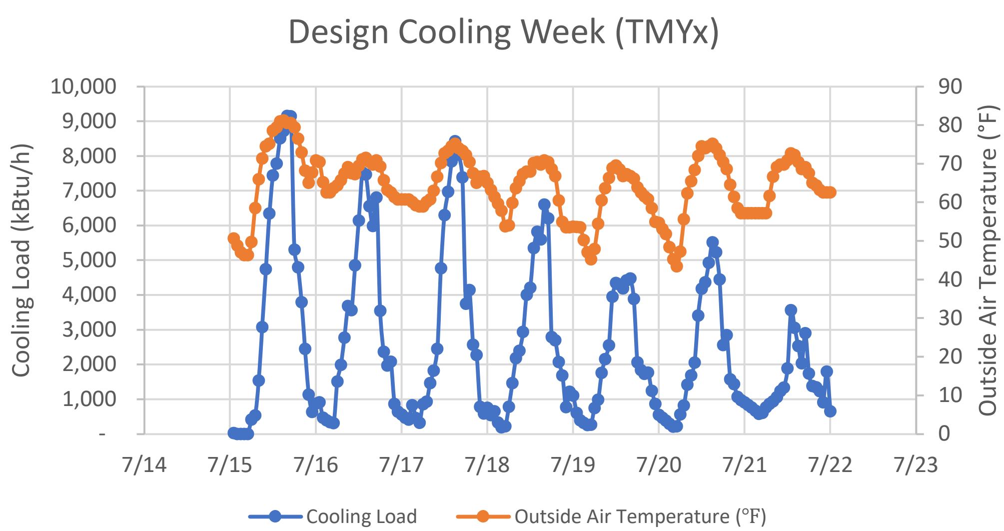
Table 4. Phase A Design Loads

	Design Week	Design Day
Total Heating (MMBtu)	2,218	518
Total Cooling (MMBtu)	432	193
Peak Heating Load (MBH)	30,083	
Peak Cooling Load (MBH)	18,079	
Avg Heating Load (MBH)	13,200	21,598
Avg Cooling Load (MBH)	2,575	8,033

The following graphs represent the hourly load variation for all buildings during design weeks. While a number of different building types are included in the profile, the peaks tend to be driven by the needs of commercial buildings due to their relative size and load density.

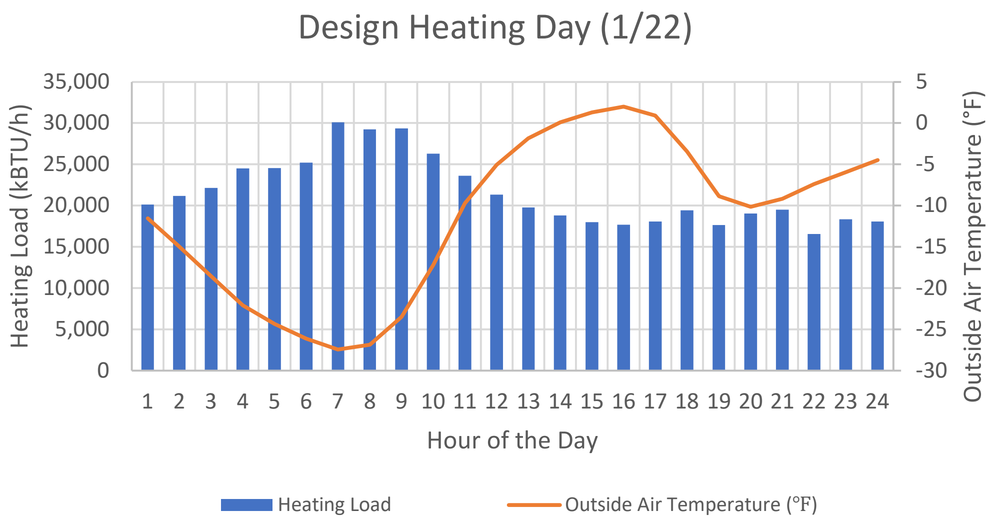
Figure 3. Design Week Load Profiles

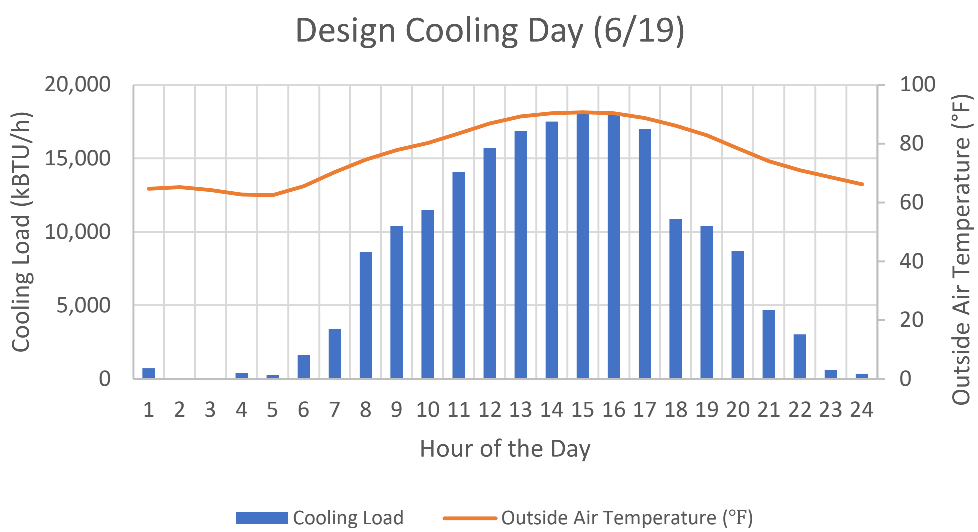




The following graphs represent the hourly load variation for all buildings during design days. Peak heating load occurs in the morning at 8:00am around a typical morning warmup cycle for commercial buildings. An increase in cooling load can be seen during typical occupancy hours for commercial buildings as well, with the peak load occurring during the late afternoon.

Figure 4. Design Day Load Profiles





2.1 UTILITY ANALYSIS

Utility bills were provided by six of the proposed community's building owners. The collected bills spanned from January 2019 through February 2023. Electricity is supplied and delivered by National Grid; propane is delivered by Suburban Propane and fuel oil is delivered by Hyde Fuel Co and MX Fuels.

The utility bills are a small sample of buildings and can be used to compare the model-predicted energy usage versus actual energy usage. There may be unique factors influencing energy usage for individual buildings that can deviate from the model. For this study, it is preferred to err as an understated energy model, which would be more conservative in the resulting cost/benefit analysis.

2.1.1 Electricity

A total of 12 months of data was generally available, while some buildings had a month or two missing from the provided data. Annual consumption totals and blended electric rates for each building are shown in Table 5 below.

Table 5. Total Annual Electric Usage

Building	Utility Bills		
	Annual Consumption (kWh)	Annual Cost ($)	Blended Rate ($/kWh)
Dechantal Apartments	492,600	$51,484	$0.10
Village Offices	66,364	$7,650	$0.12
Police Department & 17 Main St	176,080	$16,299	$0.11
Saranac Free Library	56,927	$8,724	$0.15
Waterhole Music Lounge	20,733	$3,946	$0.19

From these bills, the average blended electric rate was calculated to be $0.134/kWh.

2.1.2 Delivered Fuel

A total of 12 months of data was generally available, while some buildings had a month or two missing from the provided data. Annual consumption totals and fuel costs for each building are shown in Table 6 below.

Table 6. Total Annual Fuel Usage

Building	Fuel Type	Utility Bills		
		Annual Consumption (MMBtu)	Annual Cost ($)	Rate ($/MMBtu)
Dechantal Apartments	FO #2	3,583	$81,737	$22.82
Village Offices	FO #2	1,260	$21,077	$16.73
Police Department & 17 Main St	FO #2	957	$14,959	$15.63
Saranac Free Library	FO #2	307	$10,534	$34.31
Rice Furniture	FO #2	509	$14,375	$28.28
Waterhole Music Lounge	FO #2	217	$6,394	$47.36

From the annual consumption and costs on these bills, the average delivered fuel rate was calculated to be $27.50/MMBtu.

3.0 DEVELOP ENERGY PROFILE

- *Hourly building energy model of building archetypes based on DOE reference buildings. Assumed system configurations will be modified as needed to reflect system types found in target building types.*

The preliminary thermal model developed in Section 2.0 is an hourly energy model based on DOE reference buildings and includes variables such as climate zone, space type definition and assignment, and scaling based on building square footage. Load profiles were represented as the total monthly energy consumption, hourly loads over the span of a design week, and hourly loads over the span of a design day.

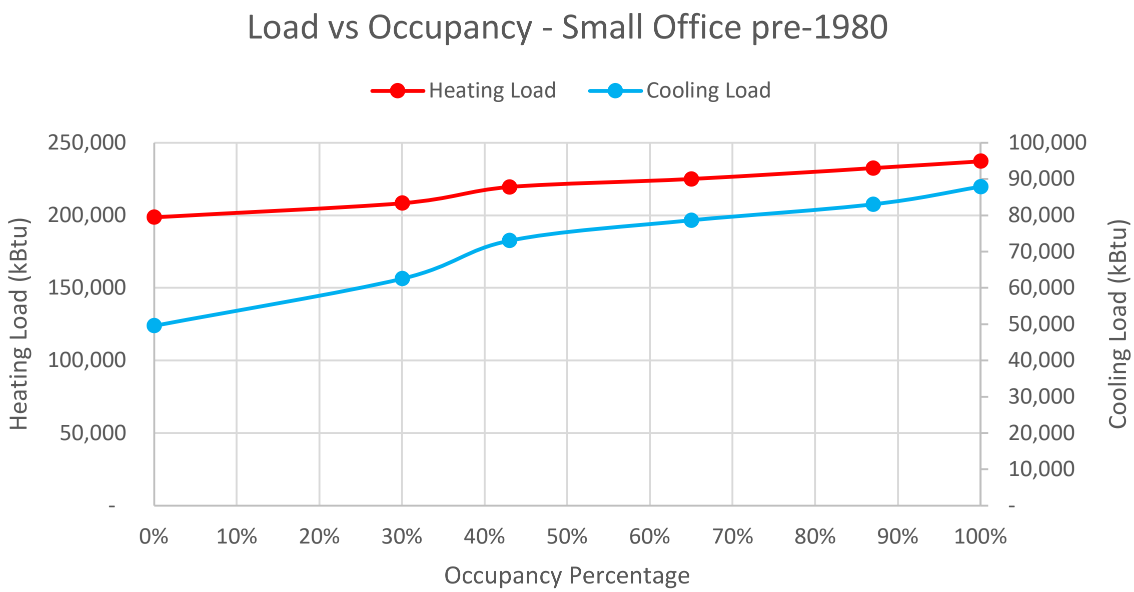
- *Utility bill reconciliation and scaling of loads on a square foot basis used to model a large number of individual buildings.*

Utility bills were provided by six of the proposed community's building owners and spanned from January 2019 through February 2023. The utility bills were utilized to reconcile the heating and cooling consumption for buildings modeled individually, with the bills summarized in Section 2.1 Table 5 (electric bills) and Table 6 (fuel bills). All buildings using the DOE reference models were scaled based on square footage and space type.

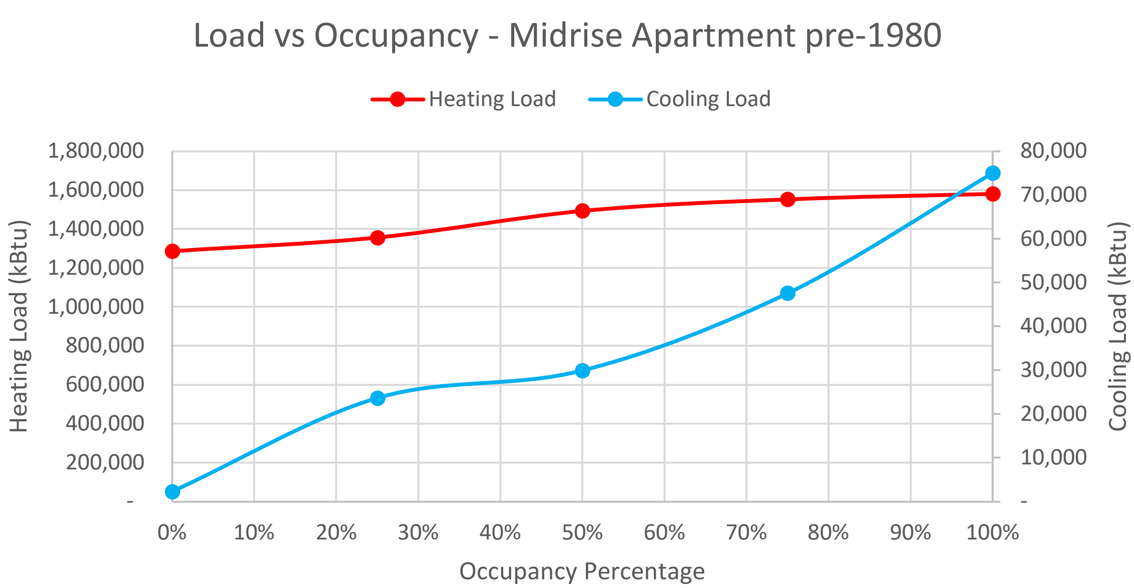
- *Determine the sensitivity of office building profiles to occupancy rates through running the typical office and multifamily building energy models with variable occupancy profiles.*

A sensitivity analysis was performed based on altering occupancy rates in two building types: Pre-1980 Small Office and pre-1980 Midrise Apartment. Occupancy rates from 0-100% were modeled as a variation in the number of total floors occupied. The impact of occupancy percentage on heating and cooling loads for each building type assessed is shown in the following graphs. Unoccupied floors were modeled with a constant setback temperature, minimal ventilation, lighting and plug loads turned off, and no internal heat gain from people or equipment.

Figure 5. Load vs Occupancy Percentage



The small office building with the pre-1980 construction has a 16% decrease in heating load for a fully unoccupied scenario. There is a large amount of heating still required to overcome envelope losses. Occupancy has a greater effect on cooling load, though the magnitude is much less that the heating load. This can be attributed to both the lower occupied cooling setpoint but lower internal heat gains for lighting, plug loads, and people.



In comparison, the pre-1980 midrise apartment building has similar trends as above for heating and cooling as the occupancy percentage decreases. The envelope requires a large amount of heating even when the building is unoccupied. However, the cooling load is almost nonexistent at the unoccupied scenario, suggesting that most of the cooling is due to internal gains including people, lighting, and plug loads.

- *Define future potential phasing and associated load profiles for those buildings. Create aggregate thermal profiles per phase as applicable, and for the entire development at full build-out.*

Buildings were grouped into different phases based on type of building and location to optimize load density and capital costs. The buildings were grouped (phased) by considering:

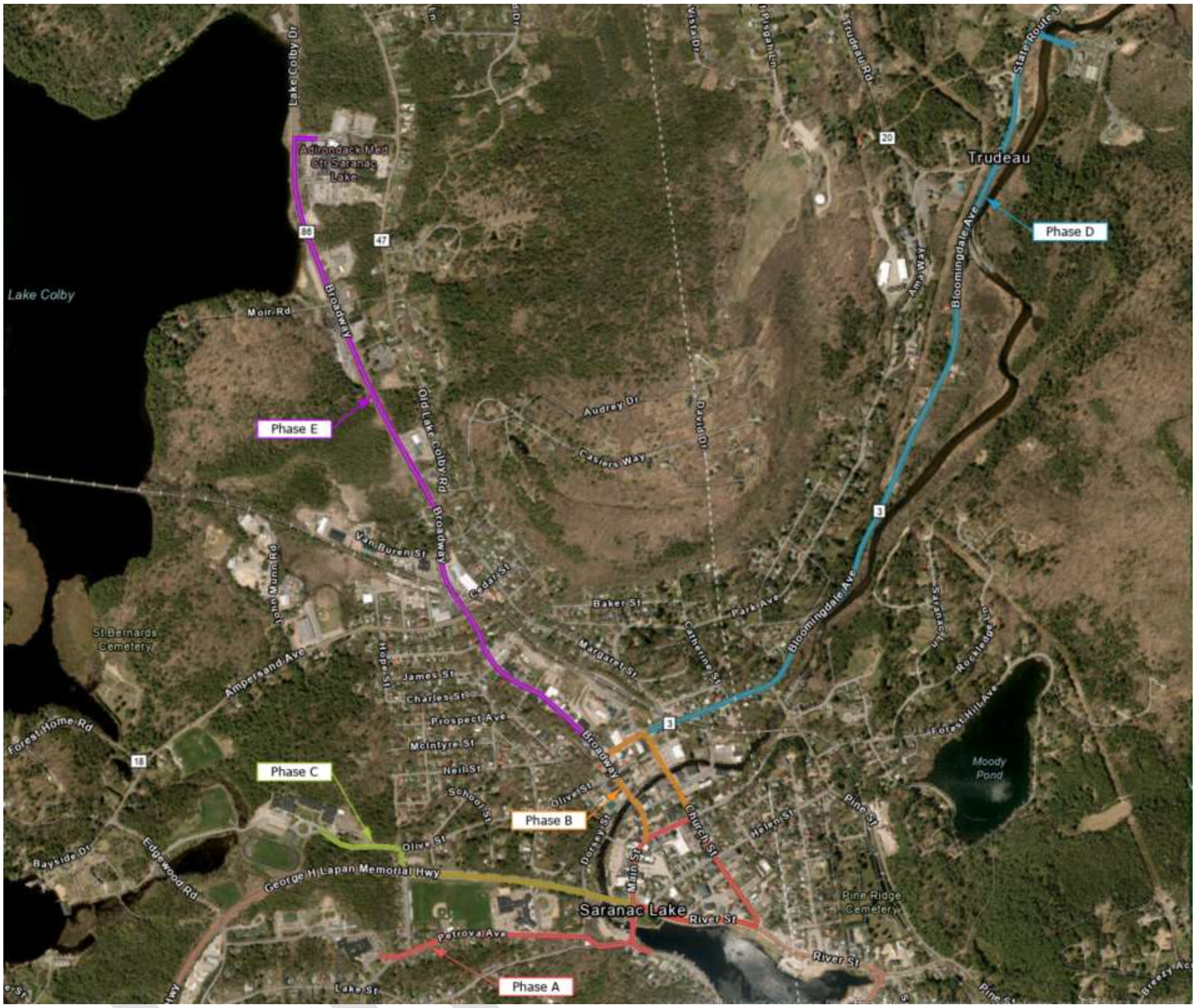
1. Proximity from potential heat sources
2. Proposed distribution main piping route
3. Additional branch loops off the main.

A five-phase approach is proposed for project implementation as follows and is shown in Figure 6 below:

- Phase A: Downtown Saranac Lake along the proposed main distribution pipe.
- Phase B: Broadway, across Bloomingdale Ave to Church St, along additional distribution branch loops.
- Phase C: Saranac High School
- Phase D: Route 3 to the Wastewater Treatment Plant
- Phase E: Broadway to Adirondack Medical Center

Please note that this report focuses on Phase A only. The financial analysis for the remaining phases will be completed following the approval of Phase A.

Figure 6. Phasing Map



- *Develop a preliminary electric model which will be used to forecast increases of electric load attributable to the proposed heating/cooling plant equipment.*

The anticipated electric load increase at the central plant for Phase A is estimated to be 580 kW. The electric load is inclusive of three downtown distribution pumps and two pumps to serve the Petrova Ave branch. The load would increase dramatically by any inclusion of electric boiler backup.

In addition, a generator should be considered for running the loop pumps to keep circulation during emergency situations.

4.0 DETERMINE OPTIMAL ENERGY SOURCE AND DEVELOP CONCEPTUAL DESIGN

- *Explore the technical and economic viability of using clean thermal energy resources consisting of [the air, ground source vertical boreholes (either as dedicated boreholes or as incorporated within thermal foundation piles), ornamental fountains, surface water bodies, flowing wastewater, and solar thermal], whether standalone or in combination, as potential thermal sinks and/or sources (hereinafter "thermal sinks/sources").*

<u>Vertical Bore Closed Loop System</u>

Vertical boreholes provide a passive source of heat and heat rejection from the ground. A 495-foot deep bore is proposed to stay within the NYS DEC's 500-ft regulations for deep wells. Deeper wells are possible and have been attempted elsewhere, however current regulatory restrictions create barriers by treating them as oil and gas wells with additional permitting and escrow accounts. There may be relief available to the escrow requitements for municipally owned borefields.

- Borehole Layout
  - Spacing of 20' on center in a grid pattern for boreholes typically provides an optimal trade-off between land area and performance. However, in land-constrained areas a staggered spacing, 15' on center, can be effective for siting additional boreholes in the same fixed area.
- Geology
  - A thermal conductivity test has not been completed at this time; however, a test bore is planned for a site four miles southeast of Saranac Lake in Ray Brook, NY.
- Grout
  - A graphite enhanced bentonite will be utilized to provide a minimum thermal conductivity of 1.2 Btu/hr-ft-°F.

<u>Lake Flower Outlet</u>

A municipally owned hydroelectric generating facility supplies fossil fuel-free electricity and is located on a dam at the mouth of the Saranac River. The outlet of the turbine is a 20-foot wide concrete channel, with two feet of concrete on either side. The flow does not freeze over due to its constant movement but is anticipated to be in the 33-35°F range during peak winter conditions. Two approaches were evaluated to quantify the potential heat add from the river:

- Indirect heat transfer

  Indirect heat transfer through a plate and frame heat exchangers was explored as a possibility to simplify the permitting process. The challenge with the approach is that due to the low approach temperatures the magnitude of heat that could be absorbed is limited. A scenario that used a water source heat pump to send 25°F chilled glycol to the heat exchanger could only absorb 300 MBH of heating per 2' H x 15' W' x 20' L. About four (4) 20 ft sections could fit readily downstream of the hydro generator, which would give 1200 MBH of absorption and a total heating capacity of about 1500 MBH from the heat pump. Limited information was available about the magnitude and variability of the flow and more investigation will be needed to prove out the concept. If the proposed configuration is found to be acceptable to the NYS DEC and the cost is shown to be less than the equivalent ground heat exchanger capacity cost, it may be a viable option to provide a small portion of the system capacity. Part of the choice of siting for the pump station was to be in proximity to the river in case the river HX was available option.

- Direct exchange

  An alternate approach could take water directly from either the outlet channel or a point within the turbine generator house to access the flow directly. Exchanging heat directly with the river medium allows for a much high magnitude of heat transfer than indirect transfer. This approach has a much higher permitting threshold as it would require a suction inlet in the flow as well as a diffuser outlet downstream of the intake. Reliable information on the magnitude and consistency of the flow as not available, though historical data from previous FERC permit applications indicated that the flow was likely in the 5,000-10,000 gpm range. As more detailed information is obtained, if the amount of heat and ability to access is at a lower cost per MBH of capacity than geothermal boreholes it will be worthwhile to pursue further.

- *Potential ground loop heat exchanger (GLHX) sites*

A number of open areas in and around downtown Saranac Lake provide capacity for Phase A borefields including:

1. Village-owned Dorsey Street lot
2. Village-owned Police Station lot
3. District-owned Petrova Elementary School fields
4. Privately-owned Main Street lot
5. Privately-owned St Bernard's Church lot
6. Village-owned Riverside Park

The map below shows the locations of sites, highlighted in red, identified for the installation of vertical bores. The number on the map corresponds to the numbering listed above. A total of six sites for vertical bores and one river water heat exchange site were identified. Note that Riverside Park may have historic foundations under the park that would impact drilling logistics. At this time the preferred locations for the borefields are Dorsey Street lot, Police Station lot, St Bernard's Church lot, and Petrova Elementary School fields.

Figure 7. Potential GLHX Locations

- *Define the conceptual design, including estimation of whether these clean energy resources could adequately meet instantaneous peak load without causing long-term thermal imbalance (i.e. year-after-year thermal accumulation, or year-after-year thermal depletion) in the ground source borehole resources.*

Overview

The design criteria of the central plant are to extract and reject heat from the distribution loop to the borefield and river water heat exchangers. The potential resources are outlined above. The central plant location is proposed as a new building on Main St, the Village owned parcel just north of 23 Main Street.

- *Preferred System Design*

Based on two Austrian district heating systems, Strasswalchen and Tamsweg, Winter et al.[3] described the diversity factor or simultaneity that the system sees when for a number of connected customers varying between 2 and 200. From this equation, the diversity factor for 70 buildings was determined to be about 66%; a diversity factor of 75% was used to be conservative.

From the modeled building profiles, the summed peak heating load for Phase A is 34,000 kBtu/h. Applying this diversity factor gives a system peak heating load of 26,000 kBtu/h.

[3] https://www.verenum.ch/Dokumente/2001_Winter-Gleichzeitig.pdf

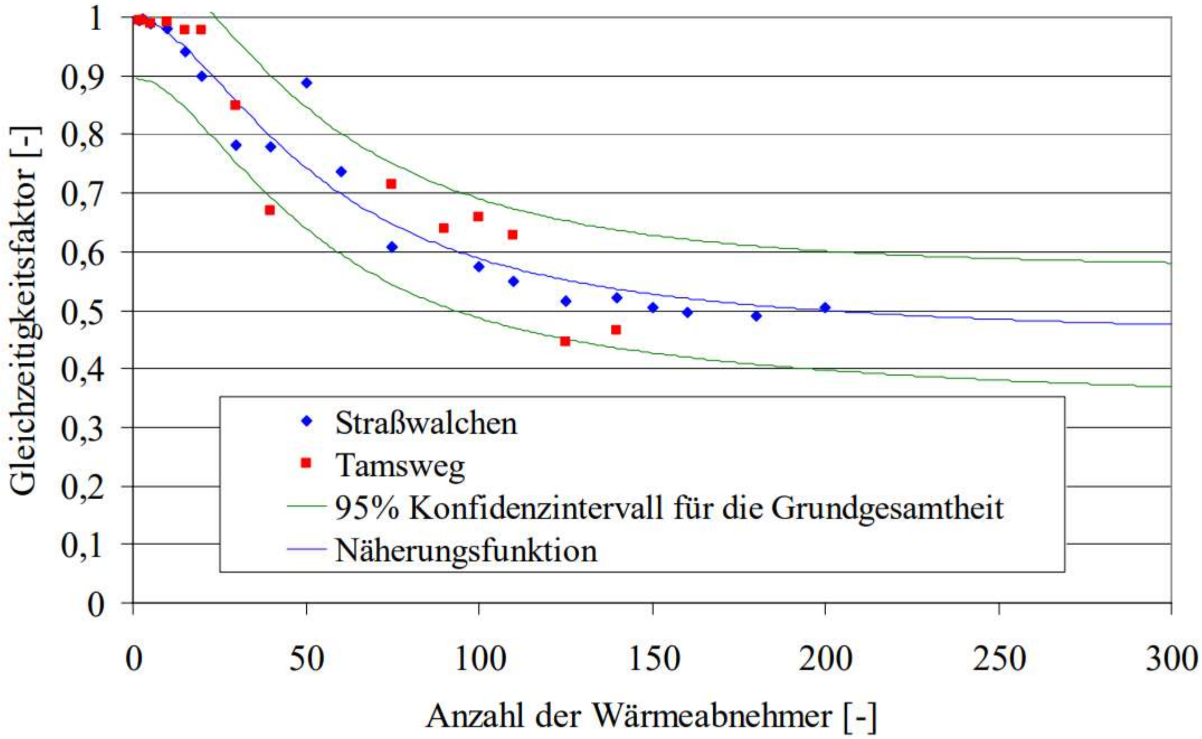


Figure 8. Trend for calculating the simultaneity factor depending on number of customers

The system is heating dominant and will need to maintain an annual thermal balance. One approach is to connect an electric boiler or air source heat pump to run in the winter to supplement the heating load. Alternatively, dry coolers could be installed and used in the summer to take the warm ambient air, transfer it to the geothermal loop through the dry cooler coils, and pump that heat into the bore field. To balance the loads on an annual basis, it is estimated that the dry coolers would need to be sized for 860 tons, running only at times when the ambient temperature is warmer than the loop temperature. Note that the dry coolers will need a large area on which to be sited; preliminary sizing requires three 290-ton units at 34 ft x 9 ft each.

The distribution pumps are sized at 8,000 gpm with 125 ft of head. Four 125-hp pumps would provide 8,000 gpm of flow with N+1 redundancy to serve the downtown section of the system. Three additional 200-hp pumps would provide 120 ft head with N+1 redundancy to serve the Petrova Ave branch with borefields at the police station and elementary school.

The proposed system will require additional electric load for the pumps and dry coolers. Electric power for the new loads would be supplied by a 4160V service. Review of the National Grid records for the feeder lists 33% of the 454A capacity as utilized in the summer. Currently the peak load from the plant is estimated at 964 kVA, which would require 134A at 4160V.

- *Preferred System Design: Distribution system.*

The distribution piping for the system would be provided by DR11 gauge high density polyethene (HDPE) piping, with the main being 16-18 inches in diameter. The piping would be direct buried in a crushed stone base with no insulation required due to the working temperature of the fluid. A loss of useful heating energy would be expected from uninsulated pipe in the winter but would be partially offset by an increase in beneficial heat rejection during summer conditions. The route would utilize pipes buried below the frost line and backfilled with stone and clean fill. Surface conditions would be restored to their pre-construction state.

The preferred route to serve these downtown Saranac Lake buildings is Main St, Academy St, Church St, and River St with a branch crossing the river to Lake St to serve the elementary school and emergency services complex on Petrova Ave and housing authority on Kiwassa Rd.

Figure 9. Preferred Routing Option

- *Two vs one pipe distribution*

Distribution systems fall into two categories, that are similar to building level distribution: a variable primary system requires 2 distribution pipes that provide a consistent supply temperature to customers and then return to a central location, or a primary-secondary configuration. In the primary-secondary configuration, a primary loop is routed to each load and source point, where each connection requires a close-coupled pumping connection. The hydraulic separation between the different loops reduces the size of the distribution pumps, as much of the pressure loss has been distributed to pumps located at the customer sites. These systems are often referred to as 1-pipe systems. In a 2-pipe distribution, each customer will have a similar delta-T as the system loop, whereas in a 1-pipe system, the system loop delta-T is distributed along the system, so the supply temperature continues to change temperature further along the distribution loop.

Many ambient loop systems take advantage of one-pipe distribution to lower the installation costs. The marginal equipment performance difference between a couple of degrees of loop temperature is minimal. The customer side looks a bit different since an additional pump is required to pull flow off the main header and then inject back into the main after flowing through a heat exchanger. Often to make the single pipe work, a longer length is required because the route needs to create a full loop, where a two-pipe system already has a supply and return and can have small branches directly to customers. Looking at a sample 16" line in an urban area, the cost for two-pipe distribution was estimated at $1,325/LF, whereas a similar one-pipe system was estimated at $1,250/LF. Therefore, if a similar piping length can be achieved, a 9% savings would result. In this scenario there is opportunity to have a system that includes a hybrid of both one pipe and two pipe distribution; this can be further studied during detailed design. The cost estimate of the project carries an assumption of a two-pipe distribution.

- *Evaluate the level of required redundancy to provide system resiliency.*

Emergency power would be provided by one 600-kW generator, which would be sufficient to run the three downtown distribution pumps and two Petrova Ave distribution pumps. In emergency mode, the pumps would still circulate water throughout the borefields to exchange heat with the ground and circulate water throughout the loop to serve the connected buildings. The loop could either be allowed to run at the lower temperature or arrangements could be made with certain off takers to provide reserve heating capacity from their equipment. The approach would depend on the time of year and the type of buildings connected. Most non-mission critical buildings could operate through a temporary derate of their equipment; note that currently no inpatient healthcare buildings are located near the distribution system but provisions for back up heat at the building level could be made if that type of building was to be included in the system.

- *Analyze and determine the available capacity during a year of each type of resource available to leverage as thermal sinks/sources.*

The primary resources being leveraged as the thermal sinks/sources are geothermal borefields. For boreholes spaced 20 ft on center, assuming 200 linear feet/ton, the proposed borefields are shown in the table below.

Table 7. Thermal Resources

Resource	Borehole Quantity	Capacity (tons)	Capacity (kBtu/h)
Dorsey Street	112	277	4,155
Petrova Elementary	457	1,129	16,940
St Bernard Church	84	208	3,120
Police Station	48	119	1,785
	701	**1,733**	**26,000**

These four borefields have the capacity to provide peak heating for Phase A of the system; the Petrova Elementary School borefield will be a cornerstone for the system. There is space for additional boreholes at the elementary school; this summary displays only the thermal resources needed to meet peak heating load.

- *Assess the implications of thermal storage, either at a centralized activity or at numerous disparate locations, or both.*

In the overall system sizing, peak heating capacity is at a premium value. While peak heating could be met by implementing a demand response program to turn on customer boilers during peak heating events, another approach would be to incorporate thermal storage into the system. Various approaches to thermal storage were reviewed with a leading manufacturer. Ice storage as a heating medium was the preferred approach based on cost. Phase change materials were investigated as there are some inherent advantages to storing heating at a temperature higher than 32°F but the material is still fairly expensive and has a stored energy density roughly half that of water, requiring additional storage. Ice storage would need to be paired with a water-to-water heat pump, energy available elsewhere would be used to melt ice, which the heat pump would then freeze at a later time, rejecting the heat of fusion and compression to the loop and providing heating to the connected buildings. If a river water solution is found to be viable, thermal storage could be used to further expand its capacity, as the river resource would be always available and may have further value as a trickle charge and dispatchable capacity. This concept will be explored further in the design study.

- *Assess the implications of sizing the clean thermal energy resource as first-call to meet a fraction of the overall thermal load up to an economically optimal point. Supplement with a conventional thermal system as second-call to be able to meet the highest demands.*

Due to the high cost of delivered fuels, the system will ideally have no reliance on propane or fuel oil. However, the high heating loads in the North County necessitate some means of meeting peak demand. It is estimated that for 122 hours of the year (1.4%), the heating load is above 20,000 kBtu/h; meeting these peak hours by some other means could decrease the required borefield size by 23%. One option would be to inject heat or offset system heating usage using existing on-call boilers from users like Dechantal Apartments or Hotel Saranac. A financial incentive would be provided to these customers for the use of their boilers at a rate high enough to offset fuel costs.

- *Determine the optimal number and site layout of the ground loop heat exchanger (GLHX).*

The four proposed GLHX sites were chosen based on available undeveloped real estate and proximity to off-takers. Downtown Saranac Lake has a few parking lots which could be used as sites for bore holes. Additionally, river heat exchange can be added at a further point in time to increase loop capacity, using the turbine outflow channel where water has already been screened to remove any debris or wildlife. This could potentially reduce the number of boreholes and therefore the project capital costs.

With the exception of the St Bernard's Church parking lot, all preferred proposed locations are owned by the Village of Saranac Lake or public entity. For the privately owned lot, a legal framework of how to lease the space underneath existing parking lots has yet to be determined.

- *Identify any sub-grade infrastructure that would impact bore field design.*

There are minimal utilities or sub-grade infrastructure at the sites of the proposed borefields. Coordination with the Village of Saranac Lake and borefield property owner will be conducted during design.

- *Analyze proposed system to obtain hourly intervals representing at minimum an 8,760-hour continuum and integrate results for display as monthly/annual energy consumption profiles.*

The central plant concept and preferred system design above included equipment sizing options based on the district characterization. The District Central Plant Calculator in Appendix E shows the pump energy for the hourly load profile and expands the profile to the required hourly heat absorption or rejection for the district loop.

Quantity and rated size of pumps from the system design allowed for the determination of pump speed and resulting pump demand. The following figures depict monthly and annual energy consumption profiles of the various proposed system components.

Figure 10. Monthly Proposed System Energy

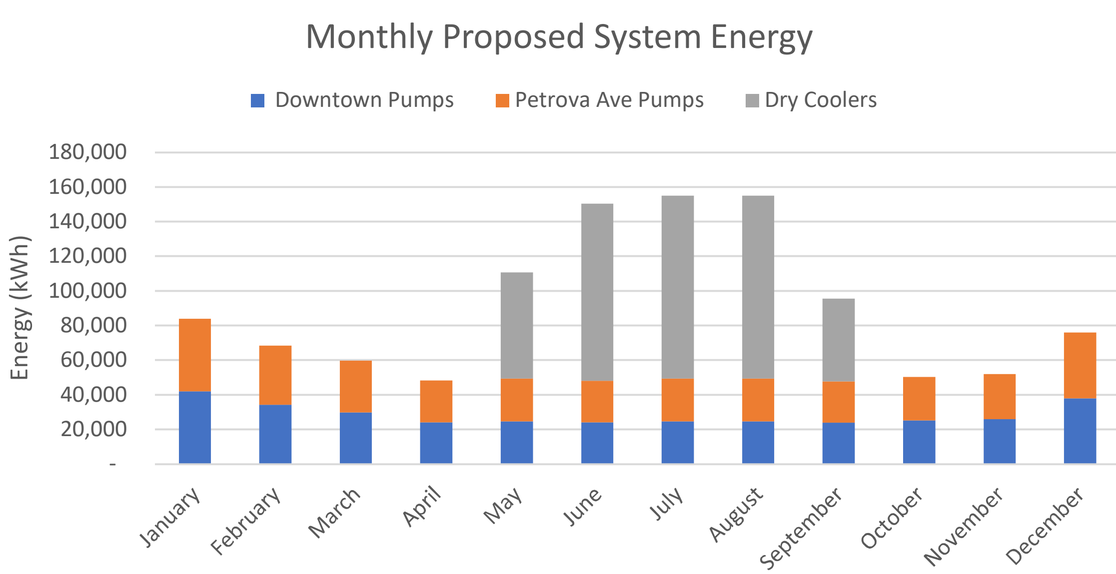
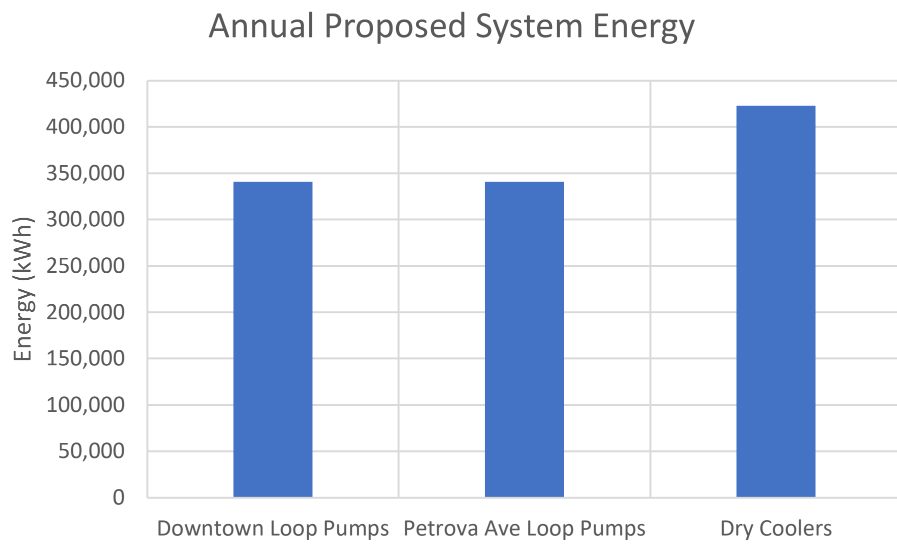


Figure 11. Annual Proposed System Energy



- *Integrate baseline system and desired mechanical system alternatives for comparison.*

Baseline operational costs, baseline heating and cooling equipment were either known or estimated based on the building category and fieldwork. A building survey using satellite images was performed to assist in estimating the type of equipment serving each building and thus the system type. It was assumed that boilers primarily provide the heating load for each building since boilers are a common heat source for older buildings with delivered fuel.

The system alternative to the baseline and preferred systems is a fully electrified heating system. In order to fully electrify buildings' heating systems, air source heat pumps (ASHPs) are not a feasible solution. The design heating temperature in Saranac Lake is -18°F and ASHPs, even cold climate models that can operate down to -20°F, derate losing both capacity and efficiency at these temperatures. Though ASHPs can be used for supplemental heating, perhaps to existing fuel oil boilers, they are unfavorable choices for full electrification. Thus, all buildings are assumed to replace fuel oil boilers in kind with electric boilers for the standalone electrification alternative. The alternative equipment model can be found in Appendix C.

- *Determine energy impact for each system alternative.*

A primary energy impact of the system alternatives to the existing system is that delivered fuel consumption will be eliminated in the interest of electrification. For existing systems utilizing fuel oil/propane boilers and heat pumps, the corresponding demand of the existing equipment is subtracted from demand of the alternative electric boiler to estimate the demand increase of the alternative electrification scenario. Use of electric boilers to electrify the system and the corresponding demand increase would have significant impact on grid infrastructure, projected to be 5.6 MW.

Energy impact of the preferred system for the central plant equipment includes central plant loop pumps and building heat pump demand. Dry cooler demand will occur at off peak hours, since usage will be in the summer. The anticipated added load is estimated to be 1.9 MW.

5.0 PERFORM ECONOMIC AND FINANCIAL ANALYSIS

- *Estimate associated annual utility and operating costs for the community heat pump system solution.*

The central plant is expected to have usage of 1,100,000 kWh per year based on the electric profile of the loop pumps and dry coolers. It is anticipated that the central plant will fall under National Grid's SC-3 Large customer rate structure, subject to change based on National Grid's evaluation. Electrical costs of approximately $147,000 were estimated based on the blended rate of $0.134/kWh, which is approximately the rate for primary transmission (13.2kV) customers. The cost is dominated by the demand costs as defined in the rate structure. This may be a point of negotiation with National Grid as to what rate the central plant is given. There may be opportunity to use the Village's hydroelectric turbine to power the system. Additionally, operations and maintenance of the equipment is estimated at $100,000 annually for a full time operator and maintenance activities.

- *Define the high-level projected construction costs for the preferred system capacity and distribution piping route.*

High level projected constructed costs are in Appendices F and G and include a 3,000 ft² central plant construction with electrical, water, and sanitary services, connection to the river heat pump, direct-buried piping distribution, expansion tank, and other equipment, and controls. The underground distribution piping is the most direct route that would reach 70 potential customers in the downtown area in the full project buildout scenario.

Table 8. Full Project Buildout – Opinion of Probable Cost

Item	Opinion of Cost
Central Plant	$2,390,000
Dry Coolers	$1,000,000
Generator	$400,000
Distribution Piping	$7,724,000
Mobilization	$500,000
M&P of Traffic	$500,000
Erosion Control	$100,000
Geothermal Borefields	$9,716,000
District Connections to Customer Bldgs	$2,555,000
Construction Subtotal	**$24,885,000**
Construction Contingency	$6,868,000
Engineering Design and Planning	$12,890,000
Total Project Cost	**$44,643,000**

- *Identify equipment near the end of its life cycle and develop a high-level avoided cost model including the following:*

- *Schematic-level construction cost estimates for each option*

The Main St loop is shown as the initial phase of Phase A because of its proximity to the primary borefield and the proposed pump house location. The initial cost would include the Dorsey St lot, police station lot, and St Bernard's Church borefields, serving the Harrietstown Housing Authority, Police Station, Village Offices, future APA building, Rice Furniture, Waterhole, Madden Transfer, and Hotel Saranac.

Table 9. Initial (Main Street) Project Buildout – Opinion of Probable Cost

Item	Opinion of Cost
Central Plant	$2,390,000
Dry Coolers	$1,000,000
Generator	$400,000
Distribution Piping	$2,639,000
Mobilization	$166,667
M&P of Traffic	$166,667
Erosion Control	$33,333
Geothermal Borefield	$3,643,000
District Connections to Customer Bldgs	$572,000
Construction Subtotal	**$11,011,000**
Construction Contingency	$3,039,000
Engineering Design and Planning	$5,704,000
Total Project Cost	**$19,754,000**

The next construction phase for Phase A involves extending the loop to Church St and Academy St. Additional customers at this stage may include St Bernard's Church and Dechantal Apartments.

Table 10. Secondary (Academy Street) Buildout – Opinion of Probable Cost

Item	Opinion of Cost
Distribution Piping	$2,437,000
Mobilization	$166,667
M&P of Traffic	$166,667
Erosion Control	$33,333
Geothermal Borefield	$0
District Connections to Customer Bldgs	$523,000
Construction Subtotal	**$3,327,000**
Construction Contingency	$918,000
Engineering Design and Planning	$1,723,000
Total Project Cost	**$5,968,000**

The final stage of construction for Phase A is continuing the piping route across the river and out to Petrova Ave, which has sizable off-takers and thermal resources. Included in this branch are the

Petrova Elementary School and Emergency Services building, as well as connecting all remaining downtown customers along the loop.

Table 11. Final (Petrova Ave) Buildout – Opinion of Probable Cost

Item	Opinion of Cost
Distribution Piping	$2,649,000
Mobilization	$166,667
M&P of Traffic	$166,667
Erosion Control	$33,333
Geothermal Borefield	$6,072,000
District Connections to Customer Bldgs	$1,460,000
Construction Subtotal	**$10,548,000**
Construction Contingency	$2,911,000
Engineering Design and Planning	$5,464,000
Total Project Cost	**$18,923,000**

- *Estimated equipment service life, associated maintenance costs, and replacement costs of the proposed system configuration*

The new equipment in the central plant is expected to have a service life of 25 years or longer, so replacement costs were not included in the net present value (NPV) analysis. Central plant maintenance costs are included within the O&M costs in the below Table 12.

- *Develop financial metrics including payback, and ROI utilizing projected inflation, energy escalation, and discounts rates*

Financial feasibility from the Village's perspective is important for developing a strong business case. However, implementation will have significant clean energy impacts to the greater community, which is a benefit that cannot be directly monetized by the developer under current state policy. Thus, the financials have been separated into the developer's perspective, customer perspective, and community perspective to capture the financial benefits for all project stakeholders.

The Village likely has access to 0% interest bonds to fund their portion of project. The project may also qualify for the Department of Energy's Innovative Clean Energy Loan Guarantee Program, which provides loans at an interest rate of 0-2% based on project credit rating.

Discount rate describes the rate of return available on alternative investments of comparable risk. Municipal, state, and federal government projects are generally analyzed at a 3% discount rate. The Village has stated that the discount rate used for projects is 1.5%. Customer financing was analyzed at a 7% discount rate, which is often used for commercial projects.

Through the "revolving line of credit" concept discussed below, this model assumes that the customer retrofit costs will be funded using zero interest loans borrowed from the Village's revenue from previous years.

The 25-year NPV analysis uses the following assumptions:

- Fuel oil inflation of 3% per NIST handbook
- Electricity inflation of 3% per NIST handbook
- General inflation of 3%
- Village discount rate of 1.5%
- Customer discount rate of 7%
- Interest rate of 0% for 30 years for central plant and distribution pipe investment
- Interest rate of 0% for 30 years for customer retrofit projects
- Thermal energy cost of $0.098/square foot/month with an inflation rate of 3%
- Dry coolers will be replaced after 20 years
- Inflation Reduction Act (IRA) tax credit applied at 40% of project cost
- NYSERDA Category B & C funding awarded for system design and construction

The table below shows the project costs from the perspective of the developer, in this case the Village. A benefit cost ratio (BCR) greater than 1.0 indicates that the project has a positive NPV.

Table 12. Net Present Value (Developer's Perspective)

	NPV (25 Year)
Costs	
Project Financing	$15,811,000
IRA Tax Credit (40%)	
NYSERDA Category B&C Award	
Central Plant Electric Consumption	$4,657,000
Central Plant O&M	$2,998,000
Total Costs	**$23,466,000**
Direct Benefits	
Thermal Energy Revenue from Customers	$27,398,000
Total Direct Benefits	**$27,398,000**
Net Direct Benefits	**$3,932,000**
BCR	**1.17**

The following table provides a sensitivity analysis for the financial rate of borrowed capital and developer's discount rate, and the resulting NPV.

Table 13. Sensitivity Analysis of Finance Rate Vs. Discount Rate (25-year Developer NPV, in thousands)

Finance Rate	Discount Rate: 1.5%	2%	2.5%	3%	3.5%	4%
0%	**$3,932**	$3,601	$3,300	$3,026	$2,777	$2,550
0.5%	$2,779	$2,512	$2,271	$2,052	$1,854	$1,673
1%	$1,569	$1,371	$1,192	$1,031	$886	$754
1.5%	$305	$177	$63	-$37	-$127	-$207
2%	-$1,015	-$1,069	-$1,114	-$1,152	-$1,184	-$1,209
2.5%	-$2,389	-$2,365	-$2,340	-$2,312	-$2,283	-$2,253
3%	-$3,815	-$3,712	-$3,613	-$3,517	-$3,425	-$3,337

The customer retrofit costs, below, assume that all non-compatible buildings, i.e. buildings with neither existing water source heat pumps nor water cooled cooling equipment, will be retrofit with water source heat pumps. The proposed retrofits increase the value of the systems by providing cooling as well as heating to buildings.

Electrifying individual buildings downtown will likely be possible with National Grid's existing infrastructure. Electrical upgrades may be necessary at a customer service level, but this will remain unknown until more information is available on a customer-by-customer basis.

It is assumed that the Inflation Reduction Act will provide a 40% tax credit for customer retrofit projects. There may be opportunity for additional incentives through National Grid's NYS Clean Heat Statewide Heat Pump Program to aid customers in financing HVAC retrofit projects. The utility incentives have not been included in this financial analysis.

Table 14. Net Present Value (Customer Perspective)

		NPV (25 Year)
Costs		
	Customer Retrofits	$6,286,000
	IRA Tax Credit (40%)	
	Customer O&M	$8,808,000
	HVAC Electric Utility Cost	$10,950,000
	Thermal Energy Cost	$14,457,000
	Total Costs	**$40,501,000**
Direct Benefits		
	Avoided Customer Equipment Recondition	$7,788,000
	Avoided O&M	$1,252,000
	Customer Energy Savings	$33,193,000
	Total Direct Benefits	**$42,233,000**
	Net Direct Benefits	**$1,732,000**
	BCR	**1.04**

The following table provides a sensitivity analysis for the inflation rate of fuel oil and customer discount rate, the resulting NPV.

Table 15. Sensitivity Analysis of Fuel Oil Inflation Vs. Discount Rate (25-year Customer NPV, in thousands)

		Discount Rate					
		2%	3%	4%	5%	6%	7%
Fuel Oil Inflation Rate	2%	-$4,021	-$3,290	-$2,672	-$2,146	-$1,696	-$1,310
	3%	$2,512	$2,265	$2,074	$1,928	$1,817	**$1,732**
	4%	$10,135	$8,729	$7,580	$6,639	$5,866	$5,228
	5%	$19,045	$16,261	$13,977	$12,096	$10,542	$9,253

- *Perform carbon reduction calculations based on baseline and proposed low-carbon solution.*

The New York State Department of Environmental Conservation has issued a social cost of carbon guide for policy decisions. In 2020, the value was calculated to be $126 per metric ton of CO_2 for 2023[4].

Table 16. Net Present Value (Community Perspective)

Indirect Benefits	
Carbon Reduction Social Benefit	$11,858,000
Total Indirect Benefits	**$11,858,000**
Net Direct + Indirect Benefits	**$17,522,000**
BCR	**1.27**

- *Specify a preferred business model and determine the annual costs to the site owner over the term of such arrangement.*

The selection of a business model for large infrastructure projects including district energy systems (DES) should mitigate several types of risk including objectives risk (governance structure), design risk (selection of technologies and equipment), construction risk (procurement, scheduling), operational risk (commissioning, maintenance), demand/market risk (customer acquisition, rate structure), and financial risk (ROI). A preferred business model will not only mitigate these various forms of risk but also establish mechanisms of control and impact the financing structure for the project.

A range of business models are available ranging from completely public-owned (i.e., public utility or municipal department-run) to completely privately-owned with a range of hybrid forms in between including concession, joint venture and special purpose vehicles. A review of the literature suggests that the most common business models for district energy systems include: public sector ownership and operation; public sector ownership with operation by a private energy company or utility; cooperative ownership; and private sector ownership and operation through either an existing energy utility or a new energy services firm. The choice of business model will affect the cost of capital as well as overall financing structure. It is also important to note that district energy systems are not only large and complex engineering projects but also dynamic businesses that are subject to change, innovation, and operating/market risk. Once established, the Saranac Lake DES business may evolve relative to the initial business case as new opportunities and circumstances arise.

[4] The $126 per metric ton figure assumes a discount rate of 2% and is based on an average of modeled results. Estimating the Value of Carbon: Two Approaches, NYSERDA & Resources for the Future 6 (Jan. 2021).

The preferred business model will involve the Village of Saranac Lake carrying responsibility for operations and maintenance of the thermal production and all related components of the system. Financial cost and benefit would be assigned by the square footage of each unit, with adjustments based on customer building retrofit costs necessary for connection. Cost per square foot per month would be calculated such that the annual spend would not exceed current utility costs.

Funding from NYSERDA PON4614 Category B and C programs and from the Inflation Reduction Act (IRA) tax credit are expected to decrease the total capital expenditure for the Village.

Public funds could be used to defray any costs to facilitate customer acquisition, since connection will require system retrofit for most buildings. Public debt may be used to establish a reserve account to cover the "under recovery" of revenue from reduced rates in the early years to be repaid in future years, along with a return on investment for this revenue gap. For example, the City of Vancouver created a Rate Stabilization Reserve for the Southeast False Creek Project. This pool of funds provided a "revolving line of credit" used to fund system development in early years and ensure stable rates and covered cumulative financial losses in the system's early years which were repaid from revenues in later years. Public sector loans thus allow for the recovery on initial capital investments as district energy rates increase over time, especially if the customer base or future energy prices grow at rates higher than initially forecast and thus generate increased revenue from district energy services.

The literature suggests that flexible public debt tools should be used, as opposed to providing direct grants and local tax subsidies. Public debt has several advantages over grants and tax incentives as it provides the potential to recapture and recycle funds and thus can be used to finance expansion of the system or development of new DES projects. It also creates the potential to access and leverage a larger range of funding sources.

Additional planning and research will be needed to determine the details of the business model and financing structure to address the capital needs of the Saranac Lake DES. However, it is clear that any strategy will require a pool of flexible and patient capital to finance long-term system capital investment.

6.0 PERFORM ASSESSMENT OF ADDITIONAL TECHNOLOGIES

- *Analyze the potential project value improvement and/or mitigating and/or exacerbating implications and technological and economic feasibility of additional technologies into a community heat pump system*

Solar PV, battery energy storage systems (BESS) and EV charging infrastructure were the additional technologies considered for project value improvement and economic feasibility analysis. With a project focus on electrification and decarbonization, the increase in electricity consumption can be offset by installing solar PV and BESS in strategic locations as well as EV charging infrastructure to support the project's vision.

6.1 LOCAL ELECTRIC GRID INFRASTRUCTURE CAPACITY

- *Discuss with the local electric utility the capacity of the local electric grid infrastructure to serve the Project Site(s) potentially increased electric load.*

The National Grid PV hosting capacity map was used to analyze the available capacity on the substation serving the project area. The project area is primarily served by two substations, Ray Brook ES TB 1 and Lake Colby TB 2. The local feeder level hosting capacity for PV is noted in the table below.

Table 17. National Grid PV Hosting Capacity

Substation Name	Feeder	Local Voltage (kV)	Local Max Hosting Capacity (MW)	Feeder DG Connected (MW)	Feeder DG in Queue (MW)
RAYBROOK ES TB 1	36_24_83951	13.2	10.0	0.36	0.04
LAKE COLBY TB 2	36_24_92758	13.2	0.10	1.67	0.05

Based on the distributed generator connected in these substations, only the Ray Brook ES TB1 substation has existing capacity to connect with distributed energy resources like solar PV.

6.2 CONCEPTUAL SOLAR PV DESIGN

- *Determine available rooftop/ground-mount area for solar PV*

Five locations were identified in the project area for installing solar PV arrays:

1) Petrova Elementary School roof
2) Petrova Elementary School parking lot
3) Village office building roof
4) Main St parking lot
5) Dorsey St parking lot

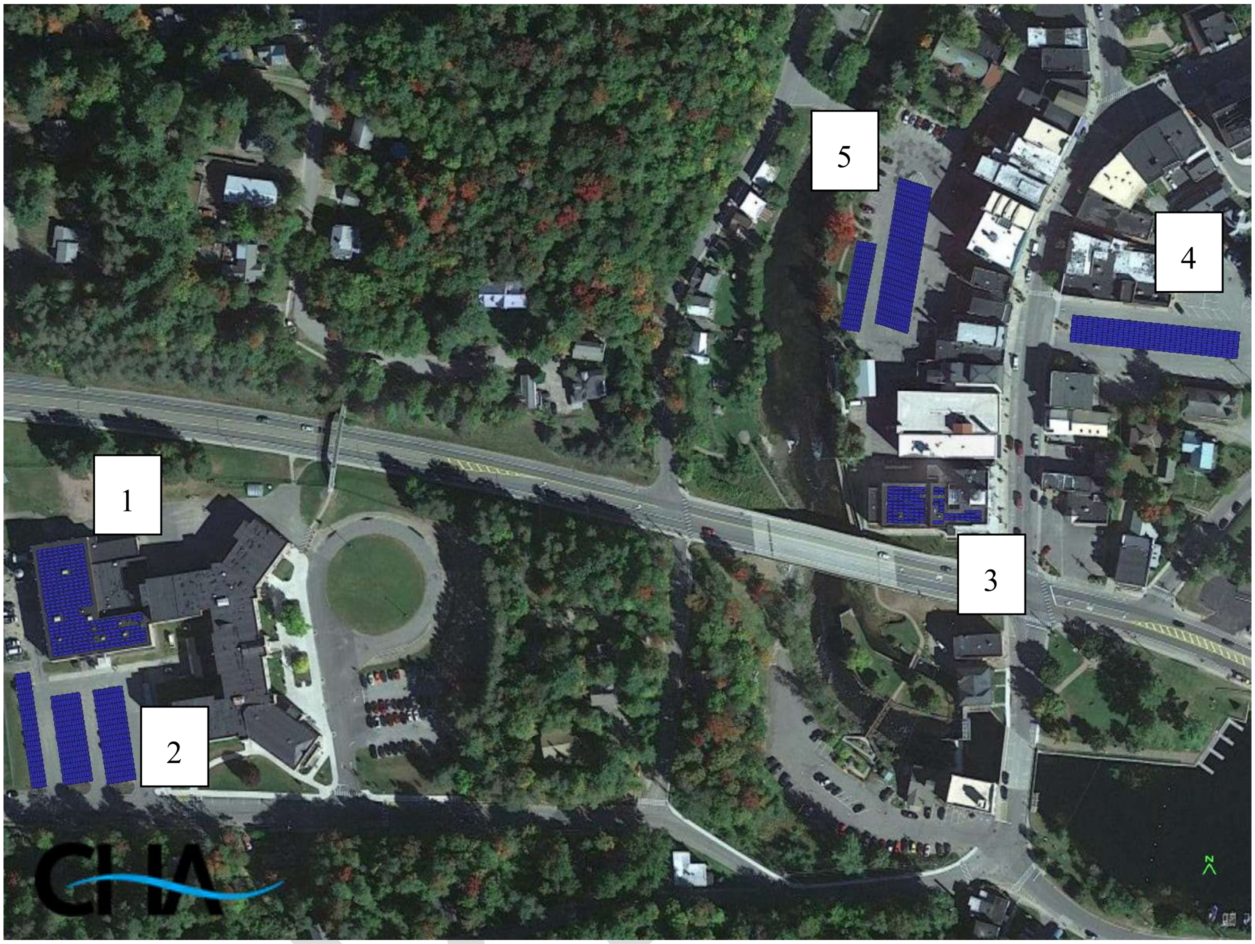


Figure 12. Potential Solar PV Locations

It is to be noted that the elementary school and the village offices are served by the Lake Colby substation, which does not have any solar PV hosting capacity. This will need to be evaluated further to see if there is an opportunity to interconnect with the Ray Brook substation from these locations.

- *Calculate optimum district solar PV capacity and electricity production*

Based on a solar PV model developed in Helioscope, the table below shows the district solar PV capacity and yearly electricity production.

Table 18. PV System Metrics

Module DC Nameplate	893.3 kW
Inverter AC Nameplate	730 kW
Load Ratio (DC/AC)	1.22
Annual Production	962,663 kWh

- *Evaluate regulatory requirements to interconnect solar PV system*

Projects in the range of 50 kW-5 MW seeking interconnection in the National Grid areas in New York will need to go through the "Complex Application Process". The steps involved in completing the "Complex Application Process" can be found on the National Grid website[5].

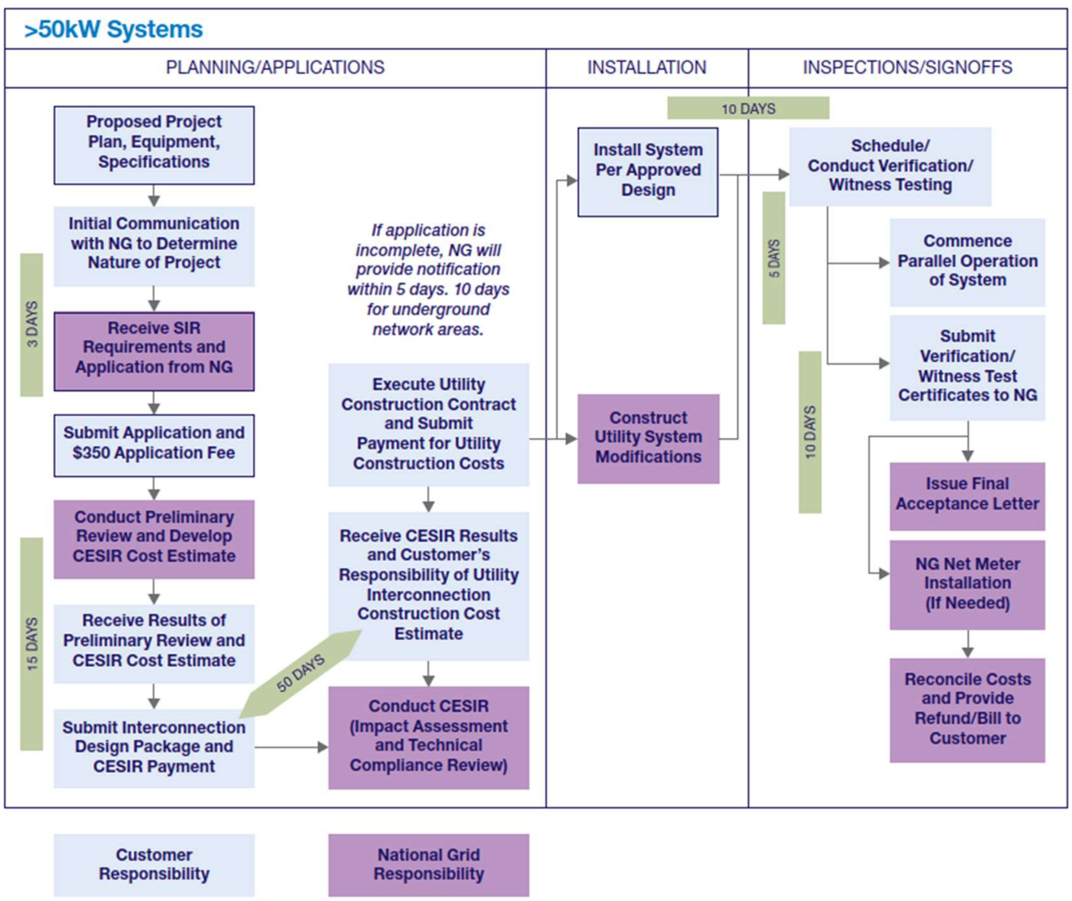


Figure 13. National Grid Application Process

[5] https://gridforce.my.site.com/s/article/NY-BUSINESS-Interconnection-Process

This project intends to register for net metering and register the interconnection of these systems to the same account as the district energy account so that the energy produced by the PV panels offset the energy consumption from the district energy system. If this arrangement is not feasible, the energy production will be sold back to the grid at the VDER rates. A VDER model calculation was run to find out the potential VDER rates for this project. It is estimated that the VDER rates will be around $0.09/kWh in 2023 decreasing to $0.08 by 2045.

- *Provide preliminary installation budgets for PV panels*

A preliminary cost estimate was developed for the solar PV identified above.

Table 19. Solar PV Cost Estimate

Cost Component	Estimated Preliminary Cost
1. Hardware and Materials Cost	
1.1 PV modules	$740,000
1.2 Inverters	$200,000
1.3 Carport System	$350,000
1.4 Electrical Balance of System (BOS)	$250,000
2. Development Costs	
2.2 Interconnection Infrastructure & Costs	$200,000
2.3 Installation Labor	$430,000
2.4 Predevelopment/Origination Costs	$120,000
2.5 Design & Engineering Costs	$120,000
3. Other BOS Cost Elements	
3.1 Contingency	$130,000
3.2 EPC Overhead	$280,000
3.3 Profit	$80,000
Total Costs:	**$2,900,000**

- *Provide quantification of the potential energy and environmental benefits*

From the solar PV model, the annual generation capacity of the solar PV was calculated to be 962,663 kWh per year. According to the US DOE's eGrid[6], the consumption of one kWh of

[6] https://www.epa.gov/egrid

electricity in the upstate NY region leads to the emission of 0.00010615 metric tons of CO_2. Using this number, the total environmental benefit solar PV leads to the avoidance of 102.2 tons of CO_2.

6.3 EV CHARGING

As a designated Clean Energy Community, the Village of Saranac Lake is committed to completing high impact actions to build a more sustainable community. They have already installed two Level 2 electric vehicle chargers for public use in a municipal lot and have purchased a plug-in hybrid vehicle for day-to-day operations use. Hotel Saranac has also installed two Level 2 chargers that are free to the public. There are seven other Level 2 chargers in Saranac Lake, outside the boundary of this project.

- *Estimate the number and type of EV chargers that are economically and technically feasible to serve the population at the Project Site*

The total population in the Village of Saranac Lake is around 5,000 with 2,400 households[7]. Assuming a 10% EV adoption rate per household, the number of expected EVs in the region is 240. New York State has an EV to charging outlet ratio of 16 for publicly available charging infrastructure[8]. Using this number, the Village would require at least 15 EV chargers strategically placed throughout the Village to enable EV owners to charge their vehicles in public areas. The downtown streets and the public parking lots with the most foot traffic would be the ideal location for these EV chargers.

Assuming patrons of the downtown businesses park in a location for an average of 2-4 hours, a mix of both level 2 and level 3 chargers would be required. Both the substations serving this area have sufficient EV load capacity headroom to install a mix of Level 2 and Level 3 chargers as shown in the table below.

Table 20. Substation EV Load Capacity Headroom

Substation Name	Feeder	Local Voltage (kV)	EV Load Capacity Headroom (MW)
RAYBROOK ES TB 1	36_24_83951	13.2	7.50
LAKE COLBY TB 2	36_24_92758	13.2	6.37

An EV charging energy consumption simulation was created in HOMER Grid software to estimate the potential energy consumption as well as the energy costs associated with the operation of EV

7 https://www.point2homes.com/US/Neighborhood/NY/Saranac-Lake-Demographics.html
8 https://evadoption.com/what-is-the-ideal-ratio-of-evs-to-charging-stations/

chargers. An arbitrary number of 12 Level 2 chargers and 4 Level 3 chargers was selected. The following assumptions were made in the simulation model:

Level 2 chargers:

- Charger output: 19.2 kW
- Number of chargers: 12
- Average number of charging sessions per day: 24
- Charging usage interval: 6 AM – 10 PM everyday
- Chargers used predominantly by sedans and SUVs.

Level 3 chargers:

- Charger output: 150 kW
- Number of chargers: 4
- Average number of charging sessions per day: 10
- Charging usage interval: 6 AM – 10 PM everyday
- Chargers used predominantly by pickup trucks

Table 21. EV Modeling Results

	Sessions per year	Annual energy served (kWh)	Utilization Factor (%)
Level 2	6,610	548,733	27.2
Level 3 DCFC	4,439	176,052	4.2
Total	**11,049**	**724,786**	**21.4**

Based on the SC3 tariff for National Grid, the total utility cost (consumption + demand + fixed charges) for these EV chargers will be $46,000 per year.

- *Evaluate the potential economic risks and benefits of using EV "charging as a service" business model*

The "charging as a service" or CAAS model presents both benefits and risks for the Village of Saranac Lake.

Benefits:

- The diversity of businesses around downtown allows patrons to spend multiple hours in the area, making it an optimal location to install chargers. This would attract multiple CAAS providers to bid and provide a competitive market to get the best services in this location.
- EV charging infrastructure imposes a large upfront cost. Turnkey install prices for Level 2 chargers can be between $10,000 - $15,000 per plug and for Level 3 chargers, it can be as high as $45,000 - $50,000 per plug. The CAAS model does not impose an upfront cost for

the Village; providers will be responsible for the maintenance and uptime of the chargers since that will dictate their revenue.

- The Village is a potential Environmental Justice area with multifamily housing with no existing EV charging infrastructure. CAAS can bring in that benefit to the community without any upfront investment.

Risks:

- The Village will not have a say in the charge to customers for the service since this is not a regulated space and has the potential for prices to be high. The cost of electricity will play a key role in the rate structure for the customers. Over the last couple of years, the increased cost of electricity has led to increased rates at the charging stations.

There are more benefits than risks for the Village to utilize the CAAS model by putting out a public RFP for the marketplace to bid and provide charging services to the residents and tourists in the region.

6.4 BATTERY ENERGY STORAGE

- *Evaluate the technical and economic feasibility of pairing electric battery storage with solar PV installation*

Based on the load profiles modeled and predicted for the district geothermal loop, the district loop pumps were sized at three (3) 125 HP pumps and two (2) 200 HP pumps. To provide BESS backup for this load along with auxiliary loads from the central plant building which would include lighting, HVAC and controls, the BESS would require to be at least 700 kW to cover to entire load. The most common discharge durations for commercially available behind the meter lithium ion BESS is 4 hours. The BESS would thus be sized at 700 kW – 2,800 kWh.

Given these expected peak loads, the tariff structure for the account which will be created to serve the central plant load is expected to be SC3 (Large General). The demand charge for the SC3 tariff is $11.38/kW. The advantage of implementing a battery energy storage system (BESS) is the demand charge reduction. However, with the high install costs of the battery system and the relatively low demand charges and no time of use rates, there is no economic advantage of BESS in this project. The only benefit to BESS would be fossil fuel free backup for the district energy plant for 4 hours.

- *Analyze the value proposition of pairing battery energy storage with available Community Distributed Generation or Value of Distributed Energy Resource (VDER) tariffs*

The project is not looking to co-locate BESS and solar PV due to the proposed locations of the solar PV and the geothermal central plant location. As mentioned in Section 6.2, the intention of the solar PV is to be net-metered to offset the district geothermal consumption from the loop pumps or be sold back to the grid for revenue from VDER tariffs.

- *Estimate the forecasted future scenario annual environmental footprint (at minimum the CO_2e footprint attributable to energy consumed from all sources including grid-supplied electricity, and if feasible also the site-emitted criteria pollutants).*

The estimated yearly energy consumption is estimated to be around 1.1 million kWh. The solar PV is estimated to produce 962,663 kWh which would offset 87.5% of the district energy consumption. The remaining 137,000 kWh would be responsible for 14.5 tons of CO_2e emissions per year.

7.0 CONDUCT PERMITTING & REGULATORY REVIEW (IDENTIFY HURDLES AND CHALLENGES)

- *Identify Authorities Having Jurisdiction (AHJs) and the associated permitting/approvals required*

A project of this magnitude and complexity will require permits and approvals from federal, state, and local government agencies and departments. This section discusses permit requirements and government agencies responsible for issuing them.

7.1 FEDERAL

Section 9 of the federal Endangered Species Act ("ESA") makes it unlawful for any person to harm any endangered or threatened species. 16 U.S.C. § 1538 "Harm" is broadly defined to include modifications of a species' habitat that would injure a member of the species by significantly impairing its feeding, breeding or other essential activities. See 50 C.F.R. § 17.3. However, the Fish & Wildlife Service, a division of the U.S. Department of Interior, may issue a permit for otherwise lawful activities that may impact an endangered or threatened species or its habitat. If any of the Project's construction activities will impact a federally listed endangered species anywhere along the proposed route, the project operator will be required to apply for this permit or to re-route the project away from the protected area. It is not known at this time whether the project may have any impact upon regulated species and further investigation will need to occur during later development phases.

7.2 STATE

The Project will require a series of state permits and approvals, the exact number and type of which will depend upon the Project's final design and its chosen route.

Any excavation or pipeline installation along or within the State Route 3 right of way will require a Highway Work Permit from the New York State Department of Transportation.

The State Environmental Quality Review Act (SEQRA) requires all New York State and local government entities approving, funding or undertaking a discretionary action to conduct an assessment of the environmental impacts of that action. All potential impacts are evaluated to identify which may be significant, then a further evaluation determines whether such impacts are unavoidable or can be mitigated to the point of non-significance. Projects of considerable size or extensive scope will generally require preparation of an Environmental Impact Statement (EIS), which is intended to assist agencies' decision making by detailing potential impacts and mitigation methods. In situations involving multiple permitting jurisdictions and agencies, SEQRA provides for the selection and establishment of a single "Lead Agency" that coordinates comments from all agencies and drives the review process toward issuance of a set of findings that must be considered during the remaining permit processes. No permits or approvals may be issued for a project until the SEQRA review process has been completed. It is not known at this time which government entities would be involved in SEQRA review or declare themselves Lead Agency, although it is reasonable to expect that the Village of Saranac Lake would be involved to some degree.

New York State, through authorization from the United States Environmental Protection Agency, manages the State Pollutant Discharge Elimination System (SPDES) program for all point source discharges to surface and groundwater within the State. Three phases of the project have SPDES implications - construction, operations, and discharge of the water following thermal harvesting. The discharge of the water following thermal harvesting will likely garner the greatest level of scrutiny from NYS DEC, depending on the final temperature of the water and the ultimate destination. New York has specific regulations governing “thermal discharges” which may change the temperature of water bodies. It is expected that the project sponsor/developer would be the party responsible for securing the required SPDES permits.

The Village of Saranac Lake is designated as a Hamlet land use class by the Adirondack Park Agency (APA). Most projects fall under local review and do not require a permit from the APA. The proposed project is not likely to trigger any thresholds for APA review. Work within the river for the installation of a heat exchanger will require permits from the NYS DEC Region 5 and the U.S. Army Corps of Engineers (USACE) New York District. The magnitude of the in-water work will determine the extent of the permitting effort but the following can be expected:

- Article 15 Protection of Waters Permit (NYS DEC)
- Section 401 Water Quality Certification (NYS DEC)
- Nationwide or Individual Permit under Section 10 of the 1899 Rivers and Harbors Act and Section 404 of the Clean Water Act.

The process for obtaining the required permits would involve the preparation of a Joint Permit application with supporting documentation and concurrence as necessary for the presence/absence of state and federally listed threatened and endangered species and historic/archaeological resources.

7.3 LOCAL

The Village of Saranac Lake falls within two counties (Franklin and Essex) and three towns (Harrietstown, St Armand, and North Elba). The project site for the initial phase (Phase A) will be entirely within the Town of Harrietstown and Franklin County.

Zone Change: Depending on the location of the central plant, the DES project may require a zone change by the local legislature to accommodate a commercial/industrial facility. In the zoning map dated February 2023[9], the expected location of the project's central plant next to Route 3 is zoned District E-2. The current zoning designation does not permit any industrial land use. However, with a site plan review the parcel could house a public utility facility. The E-2 zoning district does not have any minimum yard setbacks, with the maximum lot coverage to be determined in site plan review. The minimum shoreline setback for all structures in all districts is 50 feet unless otherwise noted.

Building Permit: The construction of any structure within a municipality will trigger a building permit. Such permits are ministerial (non-discretionary), but typically require an inspection upon completion by the local codes office. Municipalities may offer expedited review of building permits as a non-financial incentive for existing building owners to connect to the district system. It should be noted that the exact location of existing underground infrastructure, particularly within public rights of way, is not known and limited information exists. Therefore, it is expected that installing the DES project's distribution infrastructure (underground piping) will require construction permits and extensive coordination with the state, county, village, and National Grid.

Site Plan Approval: The central plant will typically require site plan approval by the local planning board to ensure compliance with the local zoning requirements and the aesthetic concerns of the neighborhood.

Excavation Work: Any excavation or pipeline installation along or within the street right of way will require a Street and Sidewalk Opening Permit from the Town of Harrietstown.

- *Provide an estimated timeframe for permitting approval*

The timeframe for permitting approval will be dependent on actual permits required and the time it takes for the AHJ to review, which often do not have set timeframes. Permitting requirements will become more apparent during the detailed design stage of the project, and AHJs should be engaged as early in the process as possible to avoid potential critical path delays.

- *Identify any potential risks for additional permitting restrictions or delays where this type of project is not contemplated adequately within current rules or processes and/or there is rulemaking in progress*

The financial analysis for the DES project was conducted using assumptions such as cost of energy, value of emission reduction, incentives, finance rates, inflation rates, and scoping-level cost estimates. These variables were developed with the intent of predicting future conditions. However, in recent months the economic climate has seen a spike in real inflation, interest rates, energy costs, and material lead times. Supply chains disruptions for construction materials which

[9] https://ecode360.com/attachment/SA0109/SA0109-106c%20Zoning%20Map.pdf

have extended construction timelines. The financial analysis may need to be reevaluated if instability persists long term.

Customer enrollment and participation will be critical for the project viability. Phasing of the project should include an initial group of off-takers that can connected with the least amount of construction cost (minimum viable). Generally, off-takers near the central plant, large thermal loads capable of load-flattening, and new construction projects will offer the highest cost/benefit advantages. Depending on the funding source, a proof of concept may need to be established with a defined initial phase milestone before proceeding subsequent phases and customer enrollment.

Identify any additional unique regulatory obstacles to the project as they relate to the distribution of non-utility-generated electricity and thermal energy, including those related to, but not limited to, the following:

- *Utility franchise rights*
- *Issues attributable to the preferred business model*
- *Project phasing*
- *Regulatory proceedings which are still to be determined*

Regulatory obstacles will be dependent on the final business model and implementation partner responsible for construction. As with any community or district heat pump project, the sponsor/developer of the Saranac Lake DES project will be required to obtain easements in order to install underground distribution piping as crossing property lines, streets, and existing utility infrastructure all will require approval by the responsible parties. The Saranac Lake DES will require approvals for drilling since the system will require geothermal bore holes for its operation.

The development of the Saranac Lake DES may benefit from co-location of distribution piping with the planned water main replacements to be installed in Main St. While co-location would result in significant cost savings, it would require extensive coordination with, and support from, the state and local authorities and presents a unique regulatory obstacle for the DES project. Associated risks will likely take the form of both additional time and costs for organization staff and legal professionals to procure rights and coordinate construction activities. These costs may exceed those typically accounted for in routine project contingencies.

Legislation recently enacted in New York, which amends the state's Public Service Law to authorize investor-owned utilities to own and operate thermal energy networks, has addressed one of the regulatory obstacles to the development of a Saranac Lake DES project. The Utility Thermal Energy Network and Jobs Act, signed by Governor Hochul in July 2022, also charges the Public Service Commission (PSC) with initiating proceedings to support and regulate thermal energy network development. Specifically, the PSC is required to:

- Direct utilities to commence thermal energy network pilot programs in every utility territory in the State;

- Develop a regulatory structure to scale up thermal energy network deployment, coordinate the activities of utilities and other market and public actors, and protect consumers;
- Formulate labor policies that ensure the development and maintenance of a highly-skilled, well-paid thermal energy network workforce, including by applying or incorporating existing state labor policies and programs;
- Exempt small-scale, non-utility-owned thermal energy networks from PSC regulation; and
- Create fair market access rules for utility-owned thermal energy networks to accept low-emissions thermal energy produced by third parties, and otherwise facilitate market competition that benefits consumers and supports State emissions-reduction goals.

At this time, it is not known what exactly these regulations will allow or require, and the development of the Saranac Lake DES and specifically the identification of a project sponsor/developer may be impacted by the timeline of the PSC regulatory process. Issues such as customer service requirements, operating standards, any government mandated price ceilings that may be established in the forthcoming regulation will likely affect the project's business model and level of perceived risk for potential equity investors and debt providers.

Another noteworthy regulatory obstacle for the Saranac Lake DES is the creation of a policy mechanism to require customers to pay the social cost of carbon for their emissions through a tax, penalty, or carbon trading scheme. While this issue is not unique to the Saranac Lake DES, as noted above this project is sensitive to such policy and any associated incentives that may be available to the sponsor/developer of low-carbon DES projects. While the New York State Department of Environmental Conservation has adopted a social cost of carbon to guide policy decisions, with a 2023 central value of $126 per metric ton of CO_2, it is not known at this time what action the State's Climate Action Council may take to implement such policy on a broader level to affect private market investments.

APPENDIX A

Load Profiles

Available in Excel by request

APPENDIX B

Baseline Equipment Costs

Saranac Lake District Energy
CHA Project #76472

	Address	Square Feet	Space Type	Peak Cooling (tons)	Annual ton-hrs	Annual Cooling (MMBtu)	Annual Cooling (kWh)	Window AC Est #	Window AC Est. Tons	ASHPs #	ASHPs Est. Tons	RTUs #	RTUs Est. Tons	Peak Heating (MMBtu/hr)	Annual Heating (MMBtu)
Dechantel Apartments	60 Church St	102,578	*model*	110.0	31,660	380		110	1.0				0.0	2.811	4,774
First United Methodist Church	63 Church St	6,939	Church	31.4	8,643	104		32	1.0					0.901	964
St Bernard's Church & School	61 River St	35,068	Church/School	148.1	40,311	484		149	1.0					3.508	3,998
St Bernard's Residential	63 River St	2,740	Residential	3.2	961	12		4	1.0					0.090	202
(House)	49 Church St	1,742	Residential	2.1	611	7		3	1.0					0.057	128
(House)	45 Church St	4,738	Residential	5.6	1,662	20		6	1.0					0.155	349
North Country Home Services	25 Church St	5,302	pre-1980 Small Office	9.6	7,063	85		10	1.0					0.271	232
Wilkens Agency	83 River St	1,758	pre-1980 Small Office	3.2	2,342	28		4	1.0					0.090	77
ADK Express / Sav Real Estate	19 Church St	2,394	pre-1980 Small Office/Residential	3.6	2,072	25		4	1.0					0.101	139
(House)	61 River St	2,740	Residential	3.2	961	12		4	1.0					0.090	202
(House)	49 River St	3,192	Residential	3.8	1,120	13		4	1.0					0.104	235
Samaritan House	37 River St	3,586	Residential	4.3	1,258	15		5	1.0					0.117	264
(House)	31 River St	1,446	Residential	1.7	507	6		2	1.0					0.047	106
Lake Flour Bakery	23 River St	1,229	pre-1980 Full Service Restaurant	5.9	2,002	24		6	1.0					0.098	231
Falling Leaf Properties Apartments	9 River St	6,811	pre-1980 Midrise Apartment	6.4	1,262	15		7	1.0					0.162	391
(House)	52 St Bernard St	675	Residential	0.8	237	3		1	1.0					0.022	50
Animal Connection Training	48 St Bernard St	2,240	Residential	2.7	786	9		3	1.0					0.073	165
(House)	46 St Bernard St	1,670	Residential	2.0	586	7		2	1.0					0.055	123
Saranac Lake Church	44 St Bernard St	4,238	Church	19.2	5,279	63		20	1.0					0.551	589
Health Department	41 St Bernard st	10,032	pre-1980 Small Office	18.2	13,363	160		19	1.0					0.513	439
The Campbell Group	36 St Bernard St	2,211	pre-1980 Small Office/Residential	3.2	1,704	20		4	1.0					0.090	134
(House)	34-35 St Bernard St	3,432	Residential	4.1	1,204	14		5	1.0					0.112	253
Bike Adirondacks	40 Academy St	3,828	pre-1980 Small Office/Residential	5.7	3,221	39		6	1.0					0.160	225
(House)	34 Academy St	3,257	Residential	3.9	1,143	14		4	1.0					0.107	240
Adirondack Audit Company / Leonard A Sauers CPA	30 Academy St	5,118	pre-1980 Small Office/Residential	7.0	3,235	39		7	1.0					0.194	333
AscentCare	20 Academy St	3,132	pre-1980 Stand Alone Retail/Residential	4.9	1,609	19		5	1.0					0.109	219
Black Mountain Architecture	16 Academy St	1,014	pre-1980 Small Office	1.8	1,351	16		2	1.0					0.052	44
(House)	14 Academy St	1,840	Residential	2.2	645	8		3	1.0					0.060	135
Danielle Carr. Counselor	12 Academy St	3,334	Residential	4.0	1,170	14		4	1.0					0.109	245
Genuine Adirondack	8 Academy St	1,218	pre-1980 Small Office, Residential	1.8	1,022	12		2	1.0					0.051	72
(House)	33 Academy St	2,197	Residential	2.6	771	9		3	1.0					0.072	162
(House)	18 St Bernard St	2,441	Residential	2.9	856	10		3	1.0					0.080	180
NYS OPWDD State Operated Individual Residential Alternatives	12 St Bernard St	3,276	pre-1980 Midrise Apartment	3.1	607	7		4	1.0					0.078	188
Adirondack Research	73 Church St	3,144	pre-1980 Small Office, pre-1980 Stand Alone Retail, Residential	5.3	2,327	28		6	1.0					0.119	188
(Former Paul Smith's dorm)	81 Church St	17,350	pre-1980 Midrise Apartment	16.3	3,216	39						1	34.3	0.412	995
The Saranac Laboratory Museum	118 Main St	3,796	pre-1980 Small Office	6.9	5,057	61		7	1.0					0.194	166
The Trudeau Building	118 Main St	7,035	pre-1980 Small Office	12.8	9,371	112		13	1.0					0.360	308
(House)	121 Main St	4,169	Residential	4.9	1,463	18		5	1.0					0.136	307
(Office/House)	115 Main St	3,740	pre-1980 Small Office, Residential	5.3	2,729	33		6	1.0					0.149	232
Saranac Free Library	109 Main St	14,674	*model*	13.3	2,738	33			0.0	1	5.0	1	29.1	0.409	406
Bear Essentials / The Community Store	97 Main St	8,449	pre-1980 Full Service Restaurant/pre-1980 Stand Alone Retail/Residential	26.1	8,926	107		27	1.0					0.446	936
NorthWind Fine Arts Gallery	85 Main St	2,964	pre-1980 Stand Alone Retail, Residential	4.8	1,589	19		5	1.0					0.104	206
Blue Line Archery and Firearms	81 Main St	5,280	pre-1980 Stand Alone Retail, pre-1980 Office	12.3	5,400	65		13	1.0					0.225	298
T F Finnigan's	79 Main St	5,208	pre-1980 Stand Alone Retail , Residential	8.5	2,792	34		9	1.0					0.182	362
Origin Coffee Co / Bike Shop	77 Main St	5,636	pre-1980 Stand Alone Retail, Residential	11.5	3,976	48		12	1.0					0.209	370
Key Bank	75 Main St	10,212	pre-1980 Small Office	18.6	13,603	163		19	1.0					0.522	447
SLove Health Club	69 Main St	7,440	*model*	10.0	1,599	19		10	1.0					0.196	297
Adirondack Bank	67 Main St	8,282	*model*	23.5	13,574	163						1	31.9	0.383	297
Lotus Barbery	63 Main St	8,250	pre-1980 Stand Alone Retail, pre-1980 Full Service Restaurant, Residential	16.2	5,216	63		17	1.0					0.343	759
Post Office Pharmacy (closed)	59 Main St	1,882	pre-1980 Stand Alone Retail	4.7	1,706	20		5	1.0					0.074	115
Ayres Realty	57 Main St	6,231	pre-1980 Small Office	11.3	8,300	100		12	1.0					0.318	273
Blue Moon Café	55 Main St	2,294	pre-1980 Full Service Restaurant	11.1	3,737	45		12	1.0					0.182	432
Owl's Nest Pizza Parlor/Grizle T's	51 Main St	8,506	pre-1980 Full Service Restaurant, Residential	27.4	9,051	109		28	1.0					0.500	1,170
Saranac Lake Wine & Liquor Madden's Transfer & Storage Adirondacks Hamlets to Huts	47 Main St	16,218	*model*	20.0	3,668	44		15.0	1.0	1	5.0			0.620	955
Rice Furniture	43 Main St	14,224	*model*	19.0	5,559	67		19	1.0					0.376	484
Village Offices	39 Main St	31,492	*model*	55.0	24,925	299		55	1.0					0.932	1,133
Police Station & 17 Main St	1-3 Main St, 17 Main St	14,310	*model*	21.5	6,241	75								0.400	581
Harrietstown Housing Authority	14 Kiwassa Rd	59,094	*model*	78.0	14,769	177		78	1.0					1.809	2,118
Verizon Authorized Stand Alone Retailer	38 Main St	2,458	pre-1980 Stand Alone Retail	6.2	2,228	27		7	1.0					0.097	150
Compass Printing Plus	42 Main St	5,349	pre-1980 Stand Alone Retail (1,149 sf) pre-1980 Warehouse (1,232 sf) Residential (2,968 sf)	6.5	2,114	25		7	1.0					0.187	342
Waterhole Music Lounge	48 Main St	4,273	*model*	10.0	3,841	46		10	1.0					0.208	492
Adirondack Artists Guild Gallery / Ampersound	52 Main St	7,840	pre-1980 Stand Alone Retail, Residential	12.8	4,203	50		13	1.0					0.274	545
ADK ArtRise	62 Main St	12,190	pre-1980 Stand Alone Retail, pre-1980 Office	30.3	11,286	135		31	1.0					0.487	737
Downhill Grill	74 Main St	3,638	pre-1980 Full Service Restaurant	17.6	5,927	71		18	1.0					0.289	685
Liz Company / Higher Peaks Glassworks / The Small Fortune Studio	84 Main St	10,680	pre-1980 Stand Alone Retail, Residential	22.4	7,798	94		23	1.0					0.399	696
Surgical Eye Care (for sale)	86 Main St	11,900	pre-1980 Small Office	21.6	15,852	190		22	1.0					0.608	520
Tri-Lakes Center for Dentistry	90 Main St	7,035	pre-1980 Office, Residential	9.8	4,761	57		10	1.0					0.273	448
Hotel Saranac	100 Main St	53,112	*model*	102.0	40,886	491								2.403	3,273
Petrova Elementary School	141 Petrova Ave	105,680	pre-1980 Primary School	393.9	104,747	1,257						3	149.1	5.367	7,694
(Reno/Addition) Emergency Services	33 Petrova Ave	68,900	*model*	104.8	35,488	426						3	57.3	2.063	3,702
Adirondack Park Agency		25,000	NC Medium Office	40.0	97,378	1,169						3	15.2	0.546	1,186
		825,351		1,654	639,261	7,671	0						Total Peak Load	33.9	MMBtu
															50,390

COOLING

	Window AC Equip	ASHPs Equip	ASHPs Install	ASHPs Maint	Air Cooled Chiller Equip	Air Cooled Chiller Install	Air Cooled Chiller Maint	Total
Dechantel Apartments	$49,830	$0	$0	$0				$49,830
First United Methodist Church	$14,496	$0	$0	$0				$14,496
St Bernard's Church & School	$67,497	$0	$0	$0				$67,497
St Bernard's Residential	$1,812	$0	$0	$0				$1,812
(House) 49 Church St	$1,359	$0	$0	$0				$1,359
(House) 45 Church St	$2,718	$0	$0	$0				$2,718
North Country Home Services	$4,530	$0	$0	$0				$4,530
Wilkens Agency	$1,812	$0	$0	$0				$1,812
ADK Express / Sav Real Estate	$1,812	$0	$0	$0				$1,812
(House) 61 River St	$1,812	$0	$0	$0				$1,812
(House) 49 River St	$1,812	$0	$0	$0				$1,812
Samaritan House	$2,265	$0	$0	$0				$2,265
(House) 31 River St	$906	$0	$0	$0				$906
Lake Flour Bakery	$2,718	$0	$0	$0				$2,718
Falling Leaf Properties Apartments	$3,171	$0	$0	$0				$3,171
(House) 52 St Bernard St	$453	$0	$0	$0				$453
Animal Connection Training	$1,359	$0	$0	$0				$1,359
(House) 46 St Bernard St	$906	$0	$0	$0				$906
Saranac Lake Church	$9,060	$0	$0	$0				$9,060
Health Department	$8,607	$0	$0	$0				$8,607
The Campbell Group	$1,812	$0	$0	$0				$1,812
(House) 34-35 St Bernard St	$2,265	$0	$0	$0				$2,265
Bike Adirondacks	$2,718	$0	$0	$0				$2,718
(House) 34 Academy St	$1,812	$0	$0	$0				$1,812
Adirondack Audit Company / Leonard A Sauers CPA	$3,171	$0	$0	$0				$3,171
AscentCare	$2,265	$0	$0	$0				$2,265
Black Mountain Architecture	$906	$0	$0	$0				$906
(House) 14 Academy St	$1,359	$0	$0	$0				$1,359
Danielle Carr. Counselor	$1,812	$0	$0	$0				$1,812
Genuine Adirondack	$906	$0	$0	$0				$906
(House) 33 Academy St	$1,359	$0	$0	$0				$1,359
(House) 18 St Bernard St	$1,359	$0	$0	$0				$1,359
NYS OPWDD State Operated Individual Residential Alternatives	$1,812	$0	$0	$0				$1,812
Adirondack Research	$2,718	$0	$0	$0				$2,718
(Former Paul Smith's dorm)	$0	$0	$0	$0				$0
The Saranac Laboratory Museum	$3,171	$0	$0	$0				$3,171
The Trudeau Building	$5,889	$0	$0	$0				$5,889
(House) 121 Main St	$2,265	$0	$0	$0				$2,265
(Office/House)	$2,718	$0	$0	$0				$2,718
Saranac Free Library	$0	$2,083	$5,000	$200				$7,083
Bear Essentials / The Community Store	$12,231	$0	$0	$0				$12,231
NorthWind Fine Arts Gallery	$2,265	$0	$0	$0				$2,265
Blue Line Archery and Firearms	$5,889	$0	$0	$0				$5,889
T F Finnigan's	$4,077	$0	$0	$0				$4,077
Origin Coffee Co / Bike Shop	$5,436	$0	$0	$0				$5,436
Key Bank	$8,607	$0	$0	$0				$8,607
SLove Health Club	$4,530	$0	$0	$0				$4,530
Adirondack Bank	$0	$0	$0	$0	$28,600	$8,580	$2,000	$37,180
Lotus Barbery	$7,701	$0	$0	$0				$7,701
Post Office Pharmacy (closed)	$2,265	$0	$0	$0				$2,265
Ayres Realty	$5,436	$0	$0	$0				$5,436
Blue Moon Café	$5,436	$0	$0	$0				$5,436
Owl's Nest Pizza Parlor/Grizle T's	$12,684	$0	$0	$0				$12,684
Saranac Lake Wine & Liquor / Madden's Transfer & Storage / Adirondacks Hamlets to Huts	$6,795	$2,083	$5,000	$200				$13,878
Rice Furniture	$8,607	$0	$0	$0				$8,607
Village Offices	$24,915	$0	$0	$0				$24,915
Police Station & 17 Main St	$0	$0	$0	$0				$0
Harrietstown Housing Authority	$35,334	$0	$0	$0				$35,334
Verizon Authorized Stand Alone Retailer	$3,171	$0	$0	$0				$3,171
Compass Printing Plus	$3,171	$0	$0	$0				$3,171
Waterhole Music Lounge	$4,530	$0	$0	$0				$4,530
Adirondack Artists Guild Gallery / Ampersound	$5,889	$0	$0	$0				$5,889
ADK ArtRise	$14,043	$0	$0	$0				$14,043
Downhill Grill	$8,154	$0	$0	$0				$8,154
Liz Company / Higher Peaks Glassworks / The Small Fortune Studio	$10,419	$0	$0	$0				$10,419
Surgical Eye Care (for sale)	$9,966	$0	$0	$0				$9,966
Tri-Lakes Center for Dentistry	$4,530	$0	$0	$0				$4,530
Hotel Saranac	$0	$0	$0	$0				$0
Petrova Elementary School	$0	$0	$0	$0				$0
(Reno/Addition) Emergency Services	$0	$0	$0	$0				$0
Adirondack Park Agency	$0	$0	$0	$0				$0
	$435,333	$4,166	$10,000	$400			$2,000	$486,679

HEATING

	Boilers Equip	Boilers Install	Boilers Total	Electric Resistance Equip	Electric Resistance Install	Electric Resistance Total	# Boilers	Boiler Maint Cost	Elec Resist (ft)	Elec Resist Maint Cost
Dechantel Apartments	$78,054	$25,758	$103,812	$0	$0	$0	4	$20,000		$0
First United Methodist Church	$31,223	$10,304	$41,527	$0	$0	$0	2	$1,200		$0
St Bernard's Church & School	$88,842	$29,318	$118,160	$0	$0	$0	4	$4,000		$0
St Bernard's Residential	$3,040	$1,003	$4,043	$0	$0	$0	1	$600		$0
(House) 49 Church St	$2,651	$875	$3,526	$0	$0	$0	1	$600		$0
(House) 45 Church St	$3,818	$1,260	$5,078	$0	$0	$0	1	$600		$0
North Country Home Services	$5,198	$1,715	$6,913	$0	$0	$0	1	$600		$0
Wilkens Agency	$3,042	$1,004	$4,046	$0	$0	$0	1	$600		$0
ADK Express / Sav Real Estate	$3,180	$1,049	$4,230	$0	$0	$0	1	$600		$0
(House) 61 River St	$3,040	$1,003	$4,043	$0	$0	$0	1	$600		$0
(House) 49 River St	$3,216	$1,061	$4,277	$0	$0	$0	1	$600		$0
Samaritan House	$3,370	$1,112	$4,481	$0	$0	$0	1	$600		$0
(House) 31 River St	$2,536	$837	$3,373	$0	$0	$0	1	$600		$0
Lake Flour Bakery	$3,134	$1,034	$4,168	$0	$0	$0	1	$600		$0
Falling Leaf Properties Apartments	$3,897	$1,286	$5,184	$0	$0	$0	1	$1,000		$0
(House) 52 St Bernard St	$2,236	$738	$2,974	$0	$0	$0	1	$600		$0
Animal Connection Training	$2,845	$939	$3,784	$0	$0	$0	1	$600		$0
(House) 46 St Bernard St	$2,623	$866	$3,489	$0	$0	$0	1	$600		$0
Saranac Lake Church	$10,497	$3,464	$13,961	$0	$0	$0	2	$2,000		$0
Health Department	$25,208	$8,319	$33,526	$0	$0	$0	2	$2,000		$0
The Campbell Group	$3,041	$1,004	$4,045	$0	$0	$0	1	$600		$0
(House) 34-35 St Bernard St	$3,310	$1,092	$4,402	$0	$0	$0	1	$600		$0
Bike Adirondacks	$3,883	$1,281	$5,164	$0	$0	$0	1	$1,000		$0
(House) 34 Academy St	$3,241	$1,070	$4,311	$0	$0	$0	1	$600		$0
Adirondack Audit Company / Leonard A Sauers CPA	$4,287	$1,415	$5,702	$0	$0	$0	1	$600		$0
AscentCare	$3,266	$1,078	$4,344	$0	$0	$0	1	$600		$0
Black Mountain Architecture	$2,590	$855	$3,444	$0	$0	$0	1	$600		$0
(House) 14 Academy St	$2,690	$888	$3,577	$0	$0	$0	1	$600		$0
Danielle Carr. Counselor	$3,271	$1,080	$4,351	$0	$0	$0	1	$600		$0
Genuine Adirondack	$2,580	$851	$3,431	$0	$0	$0	1	$600		$0
(House) 33 Academy St	$2,829	$933	$3,762	$0	$0	$0	1	$600		$0
(House) 18 St Bernard St	$2,924	$965	$3,888	$0	$0	$0	1	$600		$0
NYS OPWDD State Operated Individual Residential Alternatives	$2,899	$957	$3,855	$0	$0	$0	1	$600		$0
Adirondack Research	$3,390	$1,119	$4,509	$0	$0	$0	1	$600		$0
(Former Paul Smith's dorm)	$23,647	$7,803	$31,450	$0	$0	$0	2	$2,000		$0
The Saranac Laboratory Museum	$4,282	$1,413	$5,695	$0	$0	$0	1	$1,000		$0
The Trudeau Building	$6,252	$2,063	$8,315	$0	$0	$0	1	$1,000		$0
(House) 121 Main St	$3,597	$1,187	$4,783	$0	$0	$0	1	$600		$0
(Office/House)	$3,745	$1,236	$4,981	$0	$0	$0	1	$600		$0
Saranac Free Library	$6,840	$2,257	$9,097	$0	$0	$0	1	$1,000		$0
Bear Essentials / The Community Store	$7,282	$2,403	$9,685	$0	$0	$0	1	$1,000		$0
NorthWind Fine Arts Gallery	$3,206	$1,058	$4,264	$0	$0	$0	1	$600		$0
Blue Line Archery and Firearms	$4,652	$1,535	$6,187	$0	$0	$0	1	$1,000		$0
T F Finnigan's	$4,140	$1,366	$5,506	$0	$0	$0	1	$1,000		$0
Origin Coffee Co / Bike Shop	$4,456	$1,470	$5,926	$0	$0	$0	1	$1,000		$0
Key Bank	$8,184	$2,701	$10,885	$0	$0	$0	1	$1,000		$0
SLove Health Club	$4,305	$1,292	$5,597	$0	$0	$0	1	$1,000		$0
Adirondack Bank	$0	$0	$0	$0	$0	$0		$0		$0
Lotus Barbery	$6,049	$1,815	$7,864	$0	$0	$0	1	$1,000		$0
Post Office Pharmacy (closed)	$2,857	$857	$3,713	$0	$0	$0	1	$600		$0
Ayres Realty	$5,763	$1,729	$7,492	$0	$0	$0	1	$1,000		$0
Blue Moon Café	$4,140	$1,242	$5,382	$0	$0	$0	1	$1,000		$0
Owl's Nest Pizza Parlor/Grizle T's	$7,921	$2,376	$10,297	$0	$0	$0	1	$1,000		$0
Saranac Lake Wine & Liquor / Madden's Transfer & Storage / Adirondacks Hamlets to Huts	$9,350	$2,805	$12,154	$0	$0	$0	1	$1,000		$0
Rice Furniture	$6,445	$1,934	$8,379	$0	$0	$0	1	$1,000		$0
Village Offices	$13,061	$3,918	$16,979	$0	$0	$0	1	$1,000		$0
Police Station & 17 Main St	$6,733	$2,020	$8,753	$0	$0	$0	1	$1,000		$0
Harrietstown Housing Authority	$9,564	$2,869	$12,433	$1,705,770	$206,760	$1,912,530	1	$1,000	25845	$2,585
Verizon Authorized Stand Alone Retailer	$3,127	$938	$4,065	$0	$0	$0	1	$600		$0
Compass Printing Plus	$4,199	$1,260	$5,458	$0	$0	$0	1	$1,000		$0
Waterhole Music Lounge	$4,442	$1,333	$5,775	$0	$0	$0	1	$600		$0
Adirondack Artists Guild Gallery / Ampersound	$5,235	$1,571	$6,806	$0	$0	$0	1	$600		$0
ADK ArtRise	$16,179	$4,854	$21,033	$0	$0	$0	1	$600		$0
Downhill Grill	$5,410	$1,623	$7,033	$0	$0	$0	1	$600		$0
Liz Company / Higher Peaks Glassworks / The Small Fortune Studio	$14,804	$4,441	$19,245	$0	$0	$0	1	$600		$0
Surgical Eye Care (for sale)	$9,211	$2,763	$11,975	$0	$0	$0	1	$600		$0
Tri-Lakes Center for Dentistry	$5,224	$1,567	$6,791	$0	$0	$0	1	$600		$0
Hotel Saranac	$30,569	$9,171	$39,739	$0	$0	$0	1	$600		$0
Petrova Elementary School	$0	$0	$0	$0	$0	$0	0	$0		$0
(Reno/Addition) Emergency Services	$0	$0	$0	$0	$0	$0	0	$0		$0
Adirondack Park Agency	$0	$0	$0	$0	$0	$0	0	$0		$0
	$580,721	$186,400	$767,122	$1,705,770	$206,760	$1,912,530		$76,200		$2,585

HEATING & COOLING

	Rooftop Units Equip	Rooftop Units Install	Rooftop Units Maint	Water Source Heat pumps Equip	Water Source Heat pumps Install	Water Source Heat pumps Maint	Total
Dechantel Apartments	$0	$0	$0				$0
First United Methodist Church	$0	$0	$0				$0
St Bernard's Church & School	$0	$0	$0				$0
St Bernard's Residential	$0	$0	$0				$0
(House) 49 Church St	$0	$0	$0				$0
(House) 45 Church St	$0	$0	$0				$0
North Country Home Services	$0	$0	$0				$0
Wilkens Agency	$0	$0	$0				$0
ADK Express / Sav Real Estate	$0	$0	$0				$0
(House) 61 River St	$0	$0	$0				$0
(House) 49 River St	$0	$0	$0				$0
Samaritan House	$0	$0	$0				$0
(House) 31 River St	$0	$0	$0				$0
Lake Flour Bakery	$0	$0	$0				$0
Falling Leaf Properties Apartments	$0	$0	$0				$0
(House) 52 St Bernard St	$0	$0	$0				$0
Animal Connection Training	$0	$0	$0				$0
(House) 46 St Bernard St	$0	$0	$0				$0
Saranac Lake Church	$0	$0	$0				$0
Health Department	$0	$0	$0				$0
The Campbell Group	$0	$0	$0				$0
(House) 34-35 St Bernard St	$0	$0	$0				$0
Bike Adirondacks	$0	$0	$0				$0
(House) 34 Academy St	$0	$0	$0				$0
Adirondack Audit Company / Leonard A Sauers CPA	$0	$0	$0				$0
AscentCare	$0	$0	$0				$0
Black Mountain Architecture	$0	$0	$0				$0
(House) 14 Academy St	$0	$0	$0				$0
Danielle Carr. Counselor	$0	$0	$0				$0
Genuine Adirondack	$0	$0	$0				$0
(House) 33 Academy St	$0	$0	$0				$0
(House) 18 St Bernard St	$0	$0	$0				$0
NYS OPWDD State Operated Individual Residential Alternatives	$0	$0	$0				$0
Adirondack Research	$0	$0	$0				$0
(Former Paul Smith's dorm)	$9,650	$41,194	$1,000				$50,844
The Saranac Laboratory Museum	$0	$0	$0				$0
The Trudeau Building	$0	$0	$0				$0
(House) 121 Main St	$0	$0	$0				$0
(Office/House)	$0	$0	$0				$0
Saranac Free Library	$8,297	$34,900	$1,000				$43,197
Bear Essentials / The Community Store	$0	$0	$0				$0
NorthWind Fine Arts Gallery	$0	$0	$0				$0
Blue Line Archery and Firearms	$0	$0	$0				$0
T F Finnigan's	$0	$0	$0				$0
Origin Coffee Co / Bike Shop	$0	$0	$0				$0
Key Bank	$0	$0	$0				$0
SLove Health Club	$0	$0	$0				$0
Adirondack Bank	$9,025	$38,290	$1,000				$47,315
Lotus Barbery	$0	$0	$0				$0
Post Office Pharmacy (closed)	$0	$0	$0				$0
Ayres Realty	$0	$0	$0				$0
Blue Moon Café	$0	$0	$0				$0
Owl's Nest Pizza Parlor/Grizle T's	$0	$0	$0				$0
Saranac Lake Wine & Liquor / Madden's Transfer & Storage / Adirondacks Hamlets to Huts	$0	$0	$0				$0
Rice Furniture	$0	$0	$0				$0
Village Offices	$0	$0	$0				$0
Police Station & 17 Main St	$0	$0	$0				$0
Harrietstown Housing Authority	$0	$0	$0	$64,500	########	$1,431	$178,980
Verizon Authorized Stand Alone Retailer	$0	$0	$0				$0
Compass Printing Plus	$0	$0	$0				$0
Waterhole Music Lounge	$0	$0	$0				$0
Adirondack Artists Guild Gallery / Ampersound	$0	$0	$0				$0
ADK ArtRise	$0	$0	$0				$0
Downhill Grill	$0	$0	$0				$0
Liz Company / Higher Peaks Glassworks / The Small Fortune Studio	$0	$0	$0				$0
Surgical Eye Care (for sale)	$0	$0	$0				$0
Tri-Lakes Center for Dentistry	$0	$0	$0				$0
Hotel Saranac	$0	$0	$0	########	########	$5,311	$730,896
Petrova Elementary School	########	$178,886	$3,000				$296,646
(Reno/Addition) Emergency Services	$46,734	$68,767	$3,000				$115,500
Adirondack Park Agency	$14,111	$18,190	$3,000				$32,301
	########	$380,226	$12,000			$6,742	$1,495,678

Total Annual O&M	$99,927

Total Heating Replacement Cost	$3,427,491
Total Cooling Replacement Cost	$1,234,518

Saranac Lake District Energy
CHA Project #76472

	Address	Square Feet	Space Type	Peak Cooling	Annual	Annual Cooling		Window AC		Condensing Units		RTUs		Peak Heating	Annual Heating	Existing System			Electrified System					
				(tons)	ton-hrs	(MMBtu)	(kWh)	#	Est. Tons	#	Est. Tons	#	Est. Tons	(MMBtu/hr)	(MMBtu)	Heating	Cooling	Confidence	Electrified Heating System	Peak Heating Elec Boiler (kW)	ASHP (kW)	Replacement Cost Equip	Install	Total
Dechantel Apartments	60 Church St	102,578	model	110.0	31,660	380		110	1.0	0	0.0	0	0.0	2.811	4,774	Boiler	Window AC	1	Electric boiler	824		$133,459	$40,038	$173,496
First United Methodist Church	63 Church St	6,939	Church	31.4	8,643	104		32	1.0	0	0.0	0	0.0	0.901	964	Boiler	Window AC	2	Electric boiler	264		$42,794	$12,838	$55,632
St Bernard's Church & School	61 River St	35,068	Church/School	148.1	40,311	484		149	1.0	0	0.0	0	0.0	3.508	3,998	Boiler	Window AC	2	Electric boiler	1,028		$166,545	$49,964	$216,509
St Bernard's Residential	63 River St	2,740	Residential	3.2	961	12		4	1.0	0	0.0	0	0.0	0.090	202	Boiler	Window AC	2	Electric boiler	26		$4,257	$1,277	$5,534
(House)	49 Church St	1,742	Residential	2.1	611	7		3	1.0	0	0.0	0	0.0	0.057	128	Boiler	Window AC	2	Electric boiler	17		$2,707	$812	$3,519
(House)	45 Church St	4,738	Residential	5.6	1,662	20		6	1.0	0	0.0	0	0.0	0.155	349	Boiler	Window AC	2	Electric boiler	45		$7,362	$2,208	$9,570
North Country Home Services	25 Church St	5,302	pre-1980 Small Office	9.6	7,063	85		10	1.0	0	0.0	0	0.0	0.271	232	Boiler	Window AC	2	Electric boiler	79		$12,867	$3,860	$16,727
Wilkens Agency	83 River St	1,758	pre-1980 Small Office	3.2	2,342	28		4	1.0	0	0.0	0	0.0	0.090	77	Boiler	Window AC	2	Electric boiler	26		$4,266	$1,280	$5,546
ADK Express / Say Real Estate	19 Church St	2,394	pre-1980 Small Office/Residential	3.6	2,072	25		4	1.0	0	0.0	0	0.0	0.101	139	Boiler	Window AC	2	Electric boiler	30		$4,816	$1,445	$6,261
(House)	61 River St	2,740	Residential	3.2	961	12		4	1.0	0	0.0	0	0.0	0.090	202	Boiler	Window AC	2	Electric boiler	26		$4,257	$1,277	$5,534
(House)	49 River St	3,192	Residential	3.8	1,120	13		4	1.0	0	0.0	0	0.0	0.104	235	Boiler	Window AC	2	Electric boiler	31		$4,959	$1,488	$6,447
Samaritan House	37 River St	3,586	Residential	4.3	1,258	15		5	1.0	0	0.0	0	0.0	0.117	264	Boiler	Window AC	2	Electric boiler	34		$5,572	$1,671	$7,243
(House)	31 River St	1,446	Residential	1.7	507	6		2	1.0	0	0.0	0	0.0	0.047	106	Boiler	Window AC	2	Electric boiler	14		$2,247	$674	$2,921
Lake Flour Bakery	23 River St	1,229	pre-1980 Full Service Restaurant	5.9	2,002	24		6	1.0	0	0.0	0	0.0	0.098	231	Boiler	Window AC	2	Electric boiler	29		$4,632	$1,390	$6,022
Falling Leaf Properties Apartments	9 River St	6,811	pre-1980 Midrise Apartment	6.4	1,262	15		7	1.0	0	0.0	0	0.0	0.162	391	Boiler	Window AC	2	Electric boiler	47		$7,678	$2,303	$9,981
(House)	52 St Bernard St	675	Residential	0.8	237	3		1	1.0	0	0.0	0	0.0	0.022	50	Boiler	Window AC	2	Electric boiler	6		$1,049	$315	$1,363
Animal Connection Training	48 St Bernard St	2,240	Residential	2.7	786	9		3	1.0	0	0.0	0	0.0	0.073	165	Boiler	Window AC	2	Electric boiler	21		$3,480	$1,044	$4,524
(House)	46 St Bernard St	1,670	Residential	2.0	586	7		2	1.0	0	0.0	0	0.0	0.055	123	Boiler	Window AC	2	Electric boiler	16		$2,595	$778	$3,373
Saranac Lake Church	44 St Bernard St	4,238	Church	19.2	5,279	63		20	1.0	0	0.0	0	0.0	0.551	589	Boiler	Window AC	2	Electric boiler	161		$26,136	$7,841	$33,977
Health Department	41 St Bernard st	10,032	pre-1980 Small Office	18.2	13,363	160		19	1.0	0	0.0	0	0.0	0.513	439	Boiler	Window AC	2	Electric boiler	150		$24,345	$7,304	$31,649
The Campbell Group	36 St Bernard St	2,211	pre-1980 Small Office/Residential	3.2	1,704	20		4	1.0	0	0.0	0	0.0	0.090	134	Boiler	Window AC	2	Electric boiler	26		$4,261	$1,278	$5,539
(House)	34-35 St Bernard St	3,432	Residential	4.1	1,204	14		5	1.0	0	0.0	0	0.0	0.112	253	Boiler	Window AC	2	Electric boiler	33		$5,332	$1,600	$6,932
Bike Adirondacks	40 Academy St	3,828	pre-1980 Small Office/Residential	5.7	3,221	39		6	1.0	0	0.0	0	0.0	0.160	225	Boiler	Window AC	2	Electric boiler	47		$7,619	$2,286	$9,904
(House)	34 Academy St	3,257	Residential	3.9	1,143	14		4	1.0	0	0.0	0	0.0	0.107	240	Boiler	Window AC	2	Electric boiler	31		$5,060	$1,518	$6,579
Adirondack Audit Company / Leonard A Sauers CPA	30 Academy St	5,118	pre-1980 Small Office/Residential	7.0	3,235	39		7	1.0	0	0.0	0	0.0	0.194	333	Boiler	Window AC	2	Electric boiler	57		$9,233	$2,770	$12,002
AscentCare	20 Academy St	3,132	pre-1980 Stand Alone Retail/Residential	4.9	1,609	19		5	1.0	0	0.0	0	0.0	0.109	219	Boiler	Window AC	2	Electric boiler	32		$5,159	$1,548	$6,707
Black Mountain Architecture	16 Academy St	1,014	pre-1980 Small Office	1.8	1,351	16		2	1.0	0	0.0	0	0.0	0.052	44	Boiler	Window AC	2	Electric boiler	15		$2,461	$738	$3,199
(House)	14 Academy St	1,840	Residential	2.2	645	8		3	1.0	0	0.0	0	0.0	0.060	135	Boiler	Window AC	2	Electric boiler	18		$2,859	$858	$3,716
Danielle Carr, Counselor	12 Academy St	3,334	Residential	4.0	1,170	14		4	1.0	0	0.0	0	0.0	0.109	245	Boiler	Window AC	2	Electric boiler	32		$5,180	$1,554	$6,734
Genuine Adirondack	8 Academy St	1,218	pre-1980 Small Office, Residential	1.8	1,022	12		2	1.0	0	0.0	0	0.0	0.051	72	Boiler	Window AC	2	Electric boiler	15		$2,421	$726	$3,148
(House)	33 Academy St	2,197	Residential	2.6	771	9		3	1.0	0	0.0	0	0.0	0.072	162	Boiler	Window AC	2	Electric boiler	21		$3,414	$1,024	$4,438
(House)	18 St Bernard St	2,441	Residential	2.9	856	10		3	1.0	0	0.0	0	0.0	0.080	180	Boiler	Window AC	2	Electric boiler	23		$3,793	$1,138	$4,930
S OPWDD State Operated Individual Residential Alternat	12 St Bernard St	3,276	pre-1980 Midrise Apartment	3.1	607	7		4	1.0	0	0.0	0	0.0	0.078	188	Boiler	Window AC	2	Electric boiler	23		$3,693	$1,108	$4,801
Adirondack Research	73 Church St	3,144	mall Office, pre-1980 Stand Alone Retail,	5.3	2,327	28		6	1.0	0	0.0	0	0.0	0.119	188	Boiler	Window AC	2	Electric boiler	35		$5,653	$1,696	$7,349
(Former Paul Smith's dorm)	81 Church St	17,350	pre-1980 Midrise Apartment	16.3	3,216	39		0	0.0	0	0.0	1	34.3	0.412	995	RTU	RTU	1	Electric boiler	121		$19,558	$5,867	$25,425
The Saranac Laboratory Museum	118 Main St	3,796	pre-1980 Small Office	6.9	5,057	61		7	1.0	0	0.0	0	0.0	0.194	166	Boiler	Window AC	2	Electric boiler	57		$9,212	$2,764	$11,975
The Trudeau Building	118 Main St	7,035	pre-1980 Small Office	12.8	9,371	112		13	1.0	0	0.0	0	0.0	0.360	308	Boiler	Window AC	2	Electric boiler	105		$17,072	$5,122	$22,194
(House)	121 Main St	4,169	Residential	4.9	1,463	18		5	1.0	0	0.0	0	0.0	0.136	307	Boiler	Window AC	2	Electric boiler	40		$6,477	$1,943	$8,421
(Office/House)	115 Main St	3,740	pre-1980 Small Office, Residential	5.3	2,729	33		6	1.0	0	0.0	0	0.0	0.149	232	Boiler	Window AC	2	Electric boiler	44		$7,072	$2,121	$9,193
Saranac Free Library	109 Main St	14,674	model	13.3	2,738	33		0	0.0	1	5.0	1	29.1	0.409	406	RTU/ASHP	RTU/ASHP	1	Electric boiler	120		$19,418	$5,825	$25,244
Bear Essentials / The Community Store	97 Main St	8,449	rvice Restaurant/pre-1980 Stand Alone R	26.1	8,926	107		27	1.0	0	0.0	0	0.0	0.446	936	Boiler	Window AC	2	Electric boiler	131		$21,182	$6,355	$27,536
NorthWind Fine Arts Gallery	85 Main St	2,964	pre-1980 Stand Alone Retail, Residential	4.8	1,589	19		5	1.0	0	0.0	0	0.0	0.104	206	Boiler	Window AC	2	Electric boiler	30		$4,921	$1,476	$6,397
Blue Line Archery and Firearms	81 Main St	5,280	e-1980 Stand Alone Retail, pre-1980 Offi	12.3	5,400	65		13	1.0	0	0.0	0	0.0	0.225	298	Boiler	Window AC	2	Electric boiler	66		$10,687	$3,206	$13,893
T F Finnigan's	79 Main St	5,208	pre-1980 Stand Alone Retail , Residential	8.5	2,792	34		9	1.0	0	0.0	0	0.0	0.182	362	Boiler	Window AC	2	Electric boiler	53		$8,646	$2,594	$11,240
Origin Coffee Co / Bike Shop	77 Main St	5,636	pre-1980 Stand Alone Retail, Residential	11.5	3,976	48		12	1.0	0	0.0	0	0.0	0.209	370	Boiler	Window AC	2	Electric boiler	61		$9,905	$2,971	$12,876
Key Bank	75 Main St	10,212	pre-1980 Small Office	18.6	13,603	163		19	1.0	0	0.0	0	0.0	0.522	447	Boiler	Window AC	2	Electric boiler	153		$24,782	$7,435	$32,216
SLove Health Club	69 Main St	7,440	model	10.0	1,599	19		10	1.0	0	0.0	0	0.0	0.196	297	Boiler	Window AC	2	Electric boiler	57		$9,306	$2,792	$12,097
Adirondack Bank	67 Main St	8,282	model	23.5	13,574	163		0	0.0	0	0.0	1	31.9	0.383	297	Boiler	Air cooled chiller	1	Electric boiler	112		$18,179	$5,454	$23,633
Lotus Barbery	63 Main St	8,250	lone Retail, pre-1980 Full Service Restau	16.2	5,216	63		17	1.0	0	0.0	0	0.0	0.343	759	Boiler	Window AC	2	Electric boiler	100		$16,262	$4,879	$21,141
Post Office Pharmacy (closed)	59 Main St	1,882	pre-1980 Stand Alone Retail	4.7	1,706	20		5	1.0	0	0.0	0	0.0	0.074	115	Boiler	Window AC	2	Electric boiler	22		$3,525	$1,058	$4,583
Ayres Realty	57 Main St	6,231	pre-1980 Small Office	11.3	8,300	100		12	1.0	0	0.0	0	0.0	0.318	273	Boiler	Window AC	2	Electric boiler	93		$15,121	$4,536	$19,657
Blue Moon Café	55 Main St	2,294	pre-1980 Full Service Restaurant	11.1	3,737	45		12	1.0	0	0.0	0	0.0	0.182	432	Boiler	Window AC	2	Electric boiler	53		$8,646	$2,594	$11,240
Owl's Nest Pizza Parlor/Grizle T's	51 Main St	8,506	re-1980 Full Service Restaurant, Resident	27.4	9,051	109		28	1.0	0	0.0	0	0.0	0.500	1,170	Boiler	Window AC	2	Electric boiler	146		$23,730	$7,119	$30,849
ne & LiquorMadden's Transfer & StorageAdirondacks H	47 Main St	16,218	model	20.0	3,668	44		15	1.0	1	5.0	0	0.0	0.620	955	Boiler	Window AC	2	Electric boiler	182		$29,430	$8,829	$38,259
Rice Furniture	43 Main St	14,224	model	19.0	5,559	67		19	1.0	0	0.0	0	0.0	0.376	484	Boiler	Window AC	2	Electric boiler	110		$17,842	$5,353	$23,195
Village Offices	39 Main St	31,492	model	55.0	24,925	299		55	1.0	0	0.0	0	0.0	0.932	1,133	Boiler	Window AC	2	Electric boiler	273		$44,237	$13,271	$57,508
Police Station & 17 Main St	1-3 Main St, 17 Main St	14,310	model	21.5	6,241	75		0	0.0	0	0.0	0	0.0	0.400	581	Boiler	Heat exchanger	1	Electric boiler	59		$9,495	$2,849	$12,344
Harrietstown Housing Authority	14 Kiwassa Rd	59,094	model	78.0	14,769	177		78	1.0	0	0.0	0	0.0	1.809	2,118	Electric resistance, propane boiler	Window AC	1	Electric boiler	18		$2,849	$855	$3,703
Verizon Authorized Stand Alone Retailer	38 Main St	2,458	pre-1980 Stand Alone Retail	6.2	2,228	27		7	1.0	0	0.0	0	0.0	0.097	150	Boiler	Window AC	2	Electric boiler	28		$4,604	$1,381	$5,985
Compass Printing Plus	42 Main St	5,349	ail (1,149 sf)pre-1980 Warehouse (1,232	6.5	2,114	25		7	1.0	0	0.0	0	0.0	0.187	342	Boiler	Window AC	2	Electric boiler	55		$8,879	$2,664	$11,543
Waterhole Music Lounge	48 Main St	4,273	model	10.0	3,841	46		10	1.0	0	0.0	0	0.0	0.208	492	Boiler	Window AC	1	Electric boiler	61		$9,852	$2,955	$12,807
Adirondack Artists Guild Gallery / Ampersound	52 Main St	7,840	pre-1980 Stand Alone Retail, Residential	12.8	4,203	50		13	1.0	0	0.0	0	0.0	0.274	545	Boiler	Window AC	2	Electric boiler	80		$13,015	$3,905	$16,920
ADK ArtRise	62 Main St	12,190	re-1980 Stand Alone Retail, pre-1980 Off	30.3	11,286	135		31	1.0	0	0.0	0	0.0	0.487	737	Boiler	Window AC	2	Electric boiler	143		$23,138	$6,941	$30,079
Downhill Grill	74 Main St	3,638	pre-1980 Full Service Restaurant	17.6	5,927	71		18	1.0	0	0.0	0	0.0	0.289	685	Boiler	Window AC	2	Electric boiler	85		$13,712	$4,114	$17,825
mpany / Higher Peaks Glassworks / The Small Fortune S	84 Main St	10,680	pre-1980 Stand Alone Retail, Residential	22.4	7,798	94		23	1.0	0	0.0	0	0.0	0.399	696	Boiler	Window AC	2	Electric boiler	117		$18,921	$5,676	$24,597
Surgical Eye Care (for sale)	86 Main St	11,900	pre-1980 Small Office	21.6	15,852	190		22	1.0	0	0.0	0	0.0	0.608	520	Boiler	Window AC	2	Electric boiler	178		$28,878	$8,663	$37,542
Tri-Lakes Center for Dentistry	90 Main St	7,035	pre-1980 Office, Residential	9.8	4,761	57		10	1.0	0	0.0	0	0.0	0.273	448	Boiler	Window AC	2	Electric boiler	80		$12,971	$3,891	$16,862
Hotel Saranac	100 Main St	53,112	model	102.0	40,886	491		0	0.0	0	0.0	0	0.0	2.403	3,273	Boiler	Cooling tower	1	Electric boiler	352		$57,044	$17,113	$74,157
Petrova Elementary School	141 Petrova Ave	105,680	pre-1980 Primary School	393.9	104,747	1,257		0	0.0	0	0.0	3	149.1	5.367	7,694	RTU	RTU	3	Heat pump		629	$286,875	$86,063	$372,938
(Reno/Addition) Emergency Services	33 Petrova Ave	68,900	model	104.8	35,488	426		0	0.0	0	0.0	3	57.3	2.063	3,702	RTU	RTU	3	Heat pump		242	$110,280	$33,084	$143,364
Adirondack Park Agency		25,000	NC Medium Office	40.0	97,378	1,169		0	0.0	0	0.0	3	15.2	0.546	1,186	RTU	RTU	3	Heat pump		64	$29,170	$8,751	$37,921
		825,351		1,654	639,261		0					Total Peak Load		33.9	MMBtu				0	6,671	935	$1,507,052	$452,116	$1,959,168
															50,390						$7,606			
		#REF!																						

New Heat Pump COP	2.5	
Conversion	293.07	kWh per MMBtu

APPENDIX C

Baseline Life Cycle Cost Analysis

District Geothermal
CHA Project #76472

Baseline LCA Calculation

Total buildings square footage	Blended Electric Rate ($/kWh)	Fuel Rate ($/therm)
814,000	$0.134	$2.75

System Efficiency Degradation/year	0.25%
Inflation Rate (%)	3.0%

25 Year Energy Cost
$76,318,166

25 Year Energy Consumption Comparison (system efficiency deteriorates by 0.25% every year)

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Total	Average
Baseline scenario Fuel energy consumption (Therms)	595,704	597,193	598,686	600,182	601,683	603,187	604,695	606,207	607,722	609,242	610,765	612,292	613,822	615,357	616,895	618,438	619,984	621,534	623,087	624,645	626,207	627,772	629,342	630,915	632,492	15,348,048	613,922
Baseline scenario Cooling electric energy consumption (kWh)	635,563	637,152	638,745	640,341	641,942	643,547	645,156	646,769	648,386	650,007	651,632	653,261	654,894	656,531	658,173	659,818	661,468	663,121	664,779	666,441	668,107	669,777	671,452	673,130	674,813	16,375,004	655,000
Fuel Rate ($/Therm)	$2.75	$2.82	$3.04	$3.24	$3.42	$3.62	$3.77	$3.91	$4.02	$4.18	$4.33	$4.47	$4.61	$4.76	$4.93	$5.12	$5.31	$5.48	$5.69	$5.89	$6.07	$6.30	$6.55	$6.78	$7.03		$4.72
Electric Utility Rate ($/kWh)	$0.134	$0.141	$0.144	$0.149	$0.155	$0.161	$0.168	$0.173	$0.178	$0.184	$0.191	$0.199	$0.209	$0.215	$0.222	$0.229	$0.235	$0.244	$0.254	$0.261	$0.272	$0.282	$0.288	$0.298	$0.308		$0.21
Fuel Cost ($)	$1,638,185	$1,685,053	$1,818,624	$1,943,100	$2,057,070	$2,181,962	$2,280,877	$2,368,150	$2,445,775	$2,544,447	$2,641,786	$2,735,585	$2,830,346	$2,930,670	$3,043,650	$3,167,904	$3,290,147	$3,408,721	$3,544,943	$3,678,705	$3,803,795	$3,953,356	$4,120,218	$4,276,667	$4,445,100	$72,834,836	$2,913,393.45
Electric Cost ($)	$85,165	$89,660	$92,293	$95,686	$99,439	$103,813	$108,146	$112,213	$115,167	$119,597	$124,139	$130,007	$136,843	$141,287	$146,006	$151,250	$155,577	$162,105	$168,560	$173,945	$181,417	$188,986	$193,551	$200,620	$207,859	$3,483,330	$139,333.21
Total Cost ($)	$1,723,350	$1,774,713	$1,910,917	$2,038,786	$2,156,509	$2,285,775	$2,389,023	$2,480,362	$2,560,942	$2,664,044	$2,765,925	$2,865,593	$2,967,189	$3,071,957	$3,189,656	$3,319,154	$3,445,724	$3,570,826	$3,713,503	$3,852,650	$3,985,212	$4,142,342	$4,313,769	$4,477,287	$4,652,959	$76,318,166	$3,052,726.66

Distillate Oil Rate Escalation Factor	1.00	1.03	1.10	1.18	1.24	1.32	1.37	1.42	1.46	1.52	1.57	1.62	1.68	1.73	1.79	1.86	1.93	1.99	2.07	2.14	2.21	2.29	2.38	2.46	2.56
Electricity Rate Escalation Factor	1.00	1.05	1.08	1.12	1.16	1.20	1.25	1.29	1.33	1.37	1.42	1.49	1.56	1.61	1.66	1.71	1.76	1.82	1.89	1.95	2.03	2.11	2.15	2.22	2.30

Operations and Maintenance

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Total Cost	Average
Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25		
O&M - Baseline Scenario	$76,200	$78,486	$80,841	$83,266	$85,764	$88,337	$90,987	$93,716	$96,528	$99,424	$102,406	$105,479	$108,643	$111,902	$115,259	$118,717	$122,279	$125,947	$129,725	$133,617	$137,626	$141,754	$146,007	$150,387	$154,899	$2,778,196	$111,128

Equipment Replacement Cost at the End of Equipment Life

	Total Cost of Replacement	At 10% per Year
Cooling Costs - Baseline Scenario	$1,234,518	$123,452
Heating Costs - Baseline Scenario	$3,367,444	$336,744

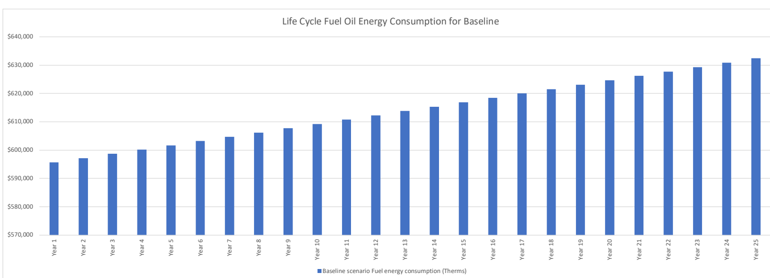
Replacement Cost at the End of Equipment Life

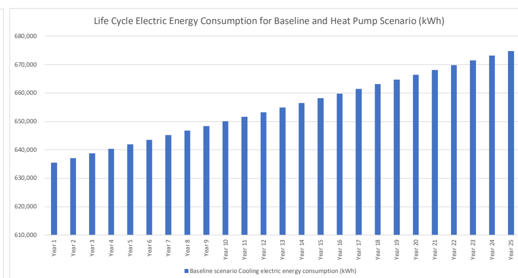
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Total Cost
Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
Cooling Replacement Costs - Baseline	$127,155	$130,970	$134,899	$138,946	$143,114	$147,408	$151,830	$156,385	$161,077	$165,909	$170,886	$176,013	$181,293	$186,732	$192,334	$198,104	$204,047	$210,168	$216,473	$222,968	$229,657	$236,546	$243,643	$250,952	$258,481	$4,635,991
Heating Replacement Costs - Baseline	$346,847	$357,252	$367,970	$379,009	$390,379	$402,090	$414,153	$426,578	$439,375	$452,556	$466,133	$480,117	$494,521	$509,356	$524,637	$540,376	$556,587	$573,285	$590,483	$608,198	$626,444	$645,237	$664,594	$684,532	$705,068	$12,645,777

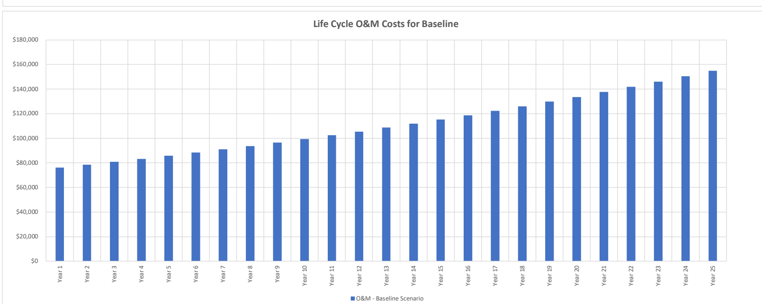
= 10% of the units being replaced that year

Baseline Cashflow	$2,273,552	$2,341,421	$2,494,626	$2,640,006	$2,775,766	$2,923,610	$3,045,993	$3,157,042	$3,257,922	$3,381,933	$3,505,350	$3,627,201	$3,751,646	$3,879,947	$4,021,886	$4,176,351	$4,328,637	$4,480,226	$4,650,185	$4,817,433	$4,978,938	$5,165,880	$5,368,013	$5,563,158	$5,771,407	$96,378,130

Discount Rate	7.0%
Initial Capital Investment - Year 1	$2,273,552
Net Present Value Life Cycle Cost	$42,233,447







APPENDIX D

DES Life Cycle Cost Analysis

Saranac Lake District Energy
CHA Project #76472

DES LCA Calculation

Total buildings square footage	Blended Electric Rate	Fuel Rate	Central Plant Electric Rate
	($/kWh)	($/therm)	($/kWh)
814,000	$0.134	$2.75	$0.134

Seasonal Heating COP proposed	4.0
Cooling COP proposed	7.3
System Efficiency Degredation/year	0.25%
General Inflation Rate (%)	3.0%
Financing - interest	0%
Financing - years	30
DES rate ($/SF/mo)	0.098

CO2 Emissions	
Electric	Fuel
tons/kWh	tons/therm
0.0001054	0.0070762

25 Year Energy Cost	25 Year tCO2e
$25,758,436	9,861

25 Year Proposed Energy Consumption (system efficiency deteriorates by 0.25% every year)

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13
Customer Fuel Energy Consumption (Therms)	402,491	342,372	0	0	0	0	0	0	0	0	0	0	0
Customer Electric Cooling Energy Consumption (kWh)	621,493	588,759	309,098	309,871	310,645	311,422	312,200	312,981	313,763	314,548	315,334	316,122	316,913
Customer Electric Heating Energy Consumption (kWh)	1,155,421	1,658,846	4,537,117	4,548,459	4,559,830	4,571,230	4,582,658	4,594,115	4,605,600	4,617,114	4,628,657	4,640,228	4,651,829
System Electric Energy Consumption (kWh)	0	0	0	0	0	0	0	0	0	0	0	0	0
System Electric Utility Rate ($/kWh)	$0.13	$0.14	$0.14	$0.15	$0.15	$0.16	$0.17	$0.17	$0.18	$0.18	$0.19	$0.20	$0.21
Electric Utility Rate ($/kWh)	$0.134	$0.141	$0.144	$0.149	$0.155	$0.161	$0.168	$0.173	$0.178	$0.184	$0.191	$0.199	$0.209
Fuel Cost ($)	$53,934	$48,179	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Electric Cost ($)	$238,106	$316,283	$700,234	$725,981	$754,451	$787,636	$820,513	$851,368	$873,785	$907,391	$941,852	$986,378	$1,038,242
Total Cost ($)	$292,040	$364,461	$700,234	$725,981	$754,451	$787,636	$820,513	$851,368	$873,785	$907,391	$941,852	$986,378	$1,038,242

	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Total	Average
Customer Fuel Energy Consumption (Therms)	0	0	0	0	0	0	0	0	0	0	0	0	744,863	29,795
Customer Electric Cooling Energy Consumption (kWh)	317,705	318,499	319,296	320,094	320,894	321,696	322,501	323,307	324,115	324,925	325,738	326,552	8,518,471	340,739
Customer Electric Heating Energy Consumption (kWh)	4,663,459	4,675,117	4,686,805	4,698,522	4,710,268	4,722,044	4,733,849	4,745,684	4,757,548	4,769,442	4,781,365	4,793,319	110,088,527	4,403,541
System Electric Energy Consumption (kWh)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
System Electric Utility Rate ($/kWh)	$0.22	$0.22	$0.23	$0.24	$0.24	$0.25	$0.26	$0.27	$0.28	$0.29	$0.30	$0.31		$0.21
Electric Utility Rate ($/kWh)	$0.215	$0.222	$0.229	$0.235	$0.244	$0.254	$0.261	$0.272	$0.282	$0.288	$0.298	$0.308		$0.21
Fuel Cost ($)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$102,112	$4,084.49
Electric Cost ($)	$1,071,955	$1,107,762	$1,147,551	$1,180,378	$1,229,909	$1,278,879	$1,319,737	$1,376,425	$1,433,854	$1,468,486	$1,522,121	$1,577,048	$25,656,323	$1,026,252.93
Total Cost ($)	$1,071,955	$1,107,762	$1,147,551	$1,180,378	$1,229,909	$1,278,879	$1,319,737	$1,376,425	$1,433,854	$1,468,486	$1,522,121	$1,577,048	$25,758,436	$1,030,337.42

Distillate Oil Rate Escalation Factor	1.00	1.03	1.10	1.18	1.24	1.32	1.37	1.42	1.46	1.52	1.57	1.62	1.68
Electricity Rate Escalation Factor	1.00	1.05	1.08	1.12	1.16	1.20	1.25	1.29	1.33	1.37	1.42	1.49	1.56

Distillate Oil Rate Escalation Factor	1.73	1.79	1.86	1.93	1.99	2.07	2.14	2.21	2.29	2.38	2.46	2.56
Electricity Rate Escalation Factor	1.61	1.66	1.71	1.76	1.82	1.89	1.95	2.03	2.11	2.15	2.22	2.30

Operations and Maintenance

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13
Year	1	2	3	4	5	6	7	8	9	10	11	12	13
Customer O&M	$138,000	$259,560	$618,000	$636,540	$655,636	$675,305	$695,564	$716,431	$737,924	$760,062	$782,864	$806,350	$830,540

	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Total Cost	Average
Year	14	15	16	17	18	19	20	21	22	23	24	25		
Customer O&M	$855,457	$881,120	$907,554	$934,780	$962,824	$991,709	$1,021,460	$1,052,104	$1,083,667	$1,116,177	$1,149,662	$1,184,152	$20,453,442	

Carbon Emissions

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13
	1	2	3	4	5	6	7	8	9	10	11	12	13
CO_2 Emissions - Electricity(tons)	197	224	457	431	405	379	353	327	300	274	247	220	193
CO_2 Emissions - Fuel(tons)	2,848	2,423	0	0	0	0	0	0	0	0	0	0	0
Total	3,045	2,647	457	431	405	379	353	327	300	274	247	220	193
Social Cost of Carbon	$383,702	$338,832	$58,956	$56,489	$53,496	$50,813	$48,008	$44,752	$41,666	$38,410	$35,051	$31,586	$28,015
Social Cost of Carbon Reduction	$155,869	$210,221	$495,313	$507,315	$515,562	$527,833	$540,256	$548,827	$560,717	$571,933	$583,278	$594,753	$606,358

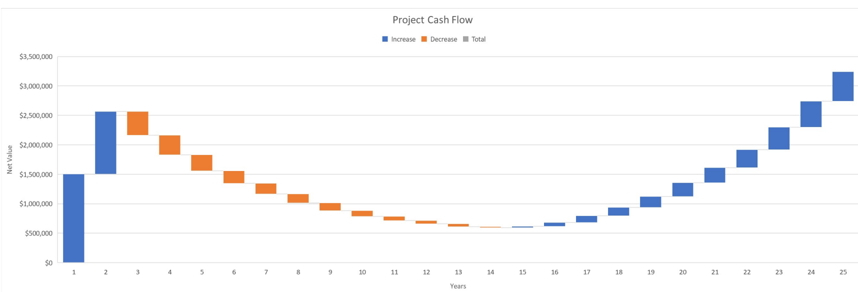
	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	
	14	15	16	17	18	19	20	21	22	23	24	25	
CO_2 Emissions - Electricity(tons)	166	139	111	84	56	28	0	0	0	0	0	0	
CO_2 Emissions - Fuel(tons)	0	0	0	0	0	0	0	0	0	0	0	0	
Total	166	139	111	84	56	28	0	0	0	0	0	0	
Social Cost of Carbon	$24,339	$20,554	$16,662	$12,662	$8,552	$4,331	$0	$0	$0	$0	$0	$0	$1,296,875
Social Cost of Carbon Reduction	$618,094	$629,961	$641,962	$654,096	$666,364	$678,767	$691,306	$700,124	$708,982	$717,880	$719,674	$721,474	

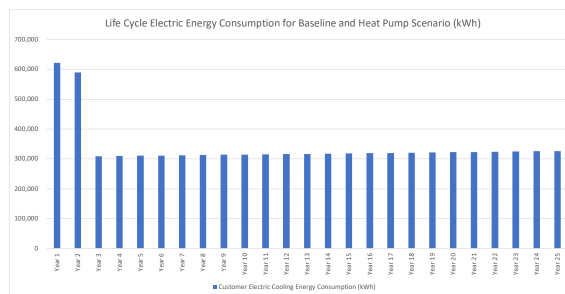
Central Plant Equipment Installation

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13
	1	2	3	4	5	6	7	8	9	10	11	12	13
Customer Cost Share	(3,608,119)	(3,511,150)	(9,807,214)										
Total Installation Cost	(6,013,532)	(5,851,916)	(16,345,357)										
Bundled Incentives	(2,405,413)	(2,340,766)	(6,538,143)										
	(28,210,805)												
Financing	(120,272)	(237,313)	(564,225)	(564,225)	(564,225)	(564,225)	(564,225)	(564,225)	(564,225)	(564,225)	(564,225)	(564,225)	(564,225)
Repayment Schedule Phase 1	(120,272)	(120,272)	(120,272)	(120,272)	(120,272)	(120,272)	(120,272)	(120,272)	(120,272)	(120,272)	(120,272)	(120,272)	(120,272)
Repayment Schedule Phase 2	-	(117,040)	(117,040)	(117,040)	(117,040)	(117,040)	(117,040)	(117,040)	(117,040)	(117,040)	(117,040)	(117,040)	(117,040)
Repayment Schedule Phase 3	-	-	(326,912)	(326,912)	(326,912)	(326,912)	(326,912)	(326,912)	(326,912)	(326,912)	(326,912)	(326,912)	(326,912)
	0.098	0.101	0.104	0.107	0.110	0.114	0.117	0.121	0.124	0.128	0.132	0.136	0.140
Revenue - existing $/sf/mo between .08 and .24 $	(220,171)	(414,112)	(1,015,561)	(1,046,028)	(1,077,409)	(1,109,731)	(1,143,023)	(1,177,314)	(1,212,633)	(1,249,012)	(1,286,483)	(1,325,077)	(1,364,830)
Cashflow	$1,503,069	$1,065,975	($403,394)	($332,767)	($275,954)	($213,287)	($177,332)	($152,296)	($130,646)	($98,757)	($70,073)	($54,828)	($46,190)

	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	
	14	15	16	17	18	19	20	21	22	23	24	25	
Customer Cost Share													
Total Installation Cost													
Bundled Incentives													
Financing	(564,225)	(564,225)	(564,225)	(564,225)	(564,225)	(564,225)	(564,225)	(564,225)	(564,225)	(564,225)	(564,225)	(564,225)	
Repayment Schedule Phase 1	(120,272)	(120,272)	(120,272)	(120,272)	(120,272)	(120,272)	(120,272)	(120,272)	(120,272)	(120,272)	(120,272)	(120,272)	
Repayment Schedule Phase 2	(117,040)	(117,040)	(117,040)	(117,040)	(117,040)	(117,040)	(117,040)	(117,040)	(117,040)	(117,040)	(117,040)	(117,040)	
Repayment Schedule Phase 3	(326,912)	(326,912)	(326,912)	(326,912)	(326,912)	(326,912)	(326,912)	(326,912)	(326,912)	(326,912)	(326,912)	(326,912)	
	0.144	0.148	0.153	0.157	0.162	0.167	0.172	0.177	0.182	0.188	0.193	0.199	
Revenue - existing $/sf/mo between .08 and .24	(1,405,774)	(1,447,948)	(1,491,386)	(1,536,128)	(1,582,212)	(1,629,678)	(1,678,568)	(1,728,925)	(1,780,793)	(1,834,217)	(1,889,243)	(1,945,921)	
Cashflow	($17,463)	$20,832	$65,636	$113,127	$141,057	$185,695	$233,443	$257,260	$303,341	$384,909	$437,907	$500,062	$3,239,324

Discount Rate	7.0%
Net Present Value Life Cycle Cost (w/o Emissions)	$1,732,463
Net Present Value Life Cycle Cost	$1,732,463





Saranac Lake District Energy
CHA Project #76472

DES LCA Calculation

Total buildings square footage	Blended Electric Rate	Fuel Rate	Central Plant Electric Rate
	($/kWh)	($/therm)	($/kWh)
814,000	$0.134	$2.75	$0.134

Seasonal Heating COP proposed	4.0
Cooling COP proposed	7.3
System Efficiency Degredation/year	0.25%
General Inflation Rate (%)	3.0%
Financing - interest	0.0%
Financing - years	30

CO2 Emissions	
Electric	Fuel
tons/kWh	tons/therm
0.0001054	0.0070762

25 Year Energy Cost	25 Year tCO2e
$5,836,757	1,040

25 Year Proposed Energy Consumption (system efficiency deteriorates by 0.25% every year)

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Total	Average
System Fuel Energy Consumption (Therms)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
System Electric Energy Consumption (kWh)	300,000	601,500	1,102,750	1,105,507	1,108,271	1,111,041	1,113,819	1,116,603	1,119,395	1,122,193	1,124,999	1,127,811	1,130,631	1,133,458	1,136,291	1,139,132	1,141,980	1,144,835	1,147,697	1,150,566	1,153,442	1,156,326	1,159,217	1,162,115	1,165,020	26,974,599	1,078,984
System Electric Utility Rate ($/kWh)	$0.134	$0.141	$0.144	$0.149	$0.155	$0.161	$0.168	$0.173	$0.178	$0.184	$0.191	$0.199	$0.209	$0.215	$0.222	$0.229	$0.235	$0.244	$0.254	$0.261	$0.272	$0.282	$0.288	$0.298	$0.308		$0.21
Electric Utility Rate ($/kWh)	$0.134	$0.141	$0.144	$0.149	$0.155	$0.161	$0.168	$0.173	$0.178	$0.184	$0.191	$0.199	$0.209	$0.215	$0.222	$0.229	$0.235	$0.244	$0.254	$0.261	$0.272	$0.282	$0.288	$0.298	$0.308		$0.21
Electric Cost ($)	$40,200	$84,643	$159,337	$165,196	$171,674	$179,226	$186,707	$193,728	$198,829	$206,476	$214,317	$224,449	$236,251	$243,922	$252,070	$261,124	$268,593	$279,864	$291,007	$300,305	$313,204	$326,272	$334,152	$346,357	$358,855	$5,836,757	$233,470.27
Total Cost ($)	$40,200	$84,643	$159,337	$165,196	$171,674	$179,226	$186,707	$193,728	$198,829	$206,476	$214,317	$224,449	$236,251	$243,922	$252,070	$261,124	$268,593	$279,864	$291,007	$300,305	$313,204	$326,272	$334,152	$346,357	$358,855	$5,836,757	$233,470.27

Distillate Oil Rate Escalation Factor	1.00	1.03	1.10	1.18	1.24	1.32	1.37	1.42	1.46	1.52	1.57	1.62	1.68	1.73	1.79	1.86	1.93	1.99	2.07	2.14	2.21	2.29	2.38	2.46	2.56
Electricity Rate Escalation Factor	1.00	1.05	1.08	1.12	1.16	1.20	1.25	1.29	1.33	1.37	1.42	1.49	1.56	1.61	1.66	1.71	1.76	1.82	1.89	1.95	2.03	2.11	2.15	2.22	2.30

Operations and Maintenance

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Total Cost	Average
Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25		
System O&M	$100,000	$103,000	$106,090	$109,273	$112,551	$115,927	$119,405	$122,987	$126,677	$130,477	$134,392	$138,423	$142,576	$146,853	$151,259	$155,797	$160,471	$165,285	$170,243	$175,351	$180,611	$186,029	$191,610	$197,359	$203,279	$3,645,926	$145,837

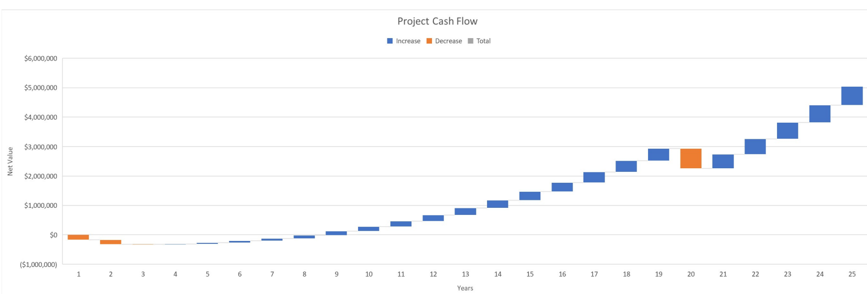
Carbon Emissions

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
CO_2 Emissions - Electricity(tons)	32	60	104	98	92	86	80	74	68	62	56	50	44	38	32	25	19	13	6	0	0	0	0	0	0	
CO_2 Emissions - Fuel(tons)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total	32	60	104	98	92	86	80	74	68	62	56	50	44	38	32	25	19	13	6	0	0	0	0	0	0	
Social Cost of Carbon	$3,984	$7,688	$13,415	$12,854	$12,173	$11,562	$10,924	$10,183	$9,481	$8,740	$7,976	$7,187	$6,375	$5,538	$4,677	$3,792	$2,881	$1,946	$986	$0	$0	$0	$0	$0	$0	$142,363
Social Cost of Carbon Reduction	$535,586	$541,365	$540,853	$550,950	$556,885	$567,083	$577,340	$583,396	$592,901	$601,603	$610,353	$619,151	$627,998	$636,894	$645,839	$654,833	$663,876	$672,970	$682,113	$691,306	$700,124	$708,982	$717,880	$719,674	$721,474	

Central Plant Equipment Installation

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
Village Cost Share	(7,652,254)	(3,580,202)	(11,353,746)																							
Total Installation Cost	(19,753,756)	(5,967,004)	(18,922,910)																	(1,125,509)						
Bundled Incentives	(12,101,502)	(2,386,802)	(7,569,164)																							
-22,057,468	(44,643,670)																									
Financing	-255,075	-374,415	-752,873	-752,873	-752,873	-752,873	-752,873	-752,873	-752,873	-752,873	-752,873	-752,873	-752,873	-752,873	-752,873	-752,873	-752,873	-752,873	-752,873	-1,878,382	-752,873	-752,873	-752,873	-752,873	-752,873	
Repayment Schedule Phase 1	(255,075)	(255,075)	(255,075)	(255,075)	(255,075)	(255,075)	(255,075)	(255,075)	(255,075)	(255,075)	(255,075)	(255,075)	(255,075)	(255,075)	(255,075)	(255,075)	(255,075)	(255,075)	(255,075)	(255,075)	(255,075)	(255,075)	(255,075)	(255,075)	(255,075)	
Repayment Schedule Phase 2		(119,340)	(119,340)	(119,340)	(119,340)	(119,340)	(119,340)	(119,340)	(119,340)	(119,340)	(119,340)	(119,340)	(119,340)	(119,340)	(119,340)	(119,340)	(119,340)	(119,340)	(119,340)	(119,340)	(119,340)	(119,340)	(119,340)	(119,340)	(119,340)	
Repayment Schedule Phase 3			(378,458)	(378,458)	(378,458)	(378,458)	(378,458)	(378,458)	(378,458)	(378,458)	(378,458)	(378,458)	(378,458)	(378,458)	(378,458)	(378,458)	(378,458)	(378,458)	(378,458)	(378,458)	(378,458)	(378,458)	(378,458)	(378,458)	(378,458)	
Revenue - existing $/sf/mo between .08 and .24	$ 220,171	$ 414,112	$ 1,015,561	$ 1,046,028	$ 1,077,409	$ 1,109,731	$ 1,143,023	$ 1,177,314	$ 1,212,633	$1,249,012	$ 1,286,483	$1,325,077	$ 1,364,830	$ 1,405,774	$ 1,447,948	$1,491,386	$1,536,128	$ 1,582,212	$ 1,629,678	$ 1,678,568	$ 1,728,925	$ 1,780,793	$ 1,834,217	$ 1,889,243	$ 1,945,921	33,592,178
Cashflow	($175,104)	($147,946)	($2,739)	$18,686	$40,311	$61,705	$84,038	$107,726	$134,254	$159,186	$184,900	$209,332	$233,130	$262,126	$291,746	$321,592	$354,190	$384,189	$415,554	($675,469)	$482,237	$515,618	$555,581	$592,655	$630,913	$9,482,683

Discount Rate	1.5%
Net Present Value Life Cycle Cost (w/o Emissions)	**$3,848,017**
Net Present Value Life Cycle Cost	**$3,848,017**
NPV O&M	$128,536



Saranac Lake District Energy
CHA Project #76472

DES LCA Calculation

Total buildings square footage	Blended Electric Rate	Fuel Rate
	($/kWh)	($/therm)
814,000	$0.134	$2.75

Heating COP proposed	1.0
Cooling COP proposed	2.9
System Efficiency Degredation/year	0.25%
General Inflation Rate (%)	2.0%

CO2 Emissions	
Electric	Fuel
tons/kWh	tons/therm
0.0001054	0.0070762

25 Year Energy Cost	25 Year tCO2e
$91,069,729	17,779

25 Year Proposed Energy Consumption (system efficiency deteriorates by 0.25% every year)

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12
Electrified Scenario Fuel Consumption (Therms)	0	0	0	0	0	0	0	0	0	0	0	0
Electrified Scenario Electric Cooling Energy Consumption (kWh)	776,165	778,106	780,051	782,001	783,956	785,916	787,881	789,850	791,825	793,805	795,789	797,779
Electrified Scenario Electric Heating Energy Consumption (kWh)	15,840,270	15,879,870	15,919,570	15,959,369	15,999,267	16,039,266	16,079,364	16,119,562	16,159,861	16,200,261	16,240,761	16,281,363
Electric Utility Rate ($/kWh)	$0.134	$0.141	$0.144	$0.149	$0.155	$0.161	$0.168	$0.173	$0.178	$0.184	$0.191	$0.199
Fuel Cost ($)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Electric Cost ($)	$2,226,602	$2,344,107	$2,412,945	$2,501,664	$2,599,770	$2,714,123	$2,827,414	$2,933,738	$3,010,984	$3,126,786	$3,245,539	$3,398,969
Total Cost ($)	$2,226,602	$2,344,107	$2,412,945	$2,501,664	$2,599,770	$2,714,123	$2,827,414	$2,933,738	$3,010,984	$3,126,786	$3,245,539	$3,398,969

	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Total	Average
Electrified Scenario Fuel Consumption (Therms)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Electrified Scenario Electric Cooling Energy Consumption (kWh)	799,773	801,773	803,777	805,786	807,801	809,820	811,845	813,875	815,909	817,949	819,994	822,044	824,099	19,997,568	799,903
Electrified Scenario Electric Heating Energy Consumption (kWh)	16,322,067	16,362,872	16,403,779	16,444,788	16,485,900	16,527,115	16,568,433	16,609,854	16,651,379	16,693,007	16,734,740	16,776,576	16,818,518	408,117,811	16,324,712
Electric Utility Rate ($/kWh)	$0.209	$0.215	$0.222	$0.229	$0.235	$0.244	$0.254	$0.261	$0.272	$0.282	$0.288	$0.298	$0.308		$0.21
Fuel Cost ($)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0.00
Electric Cost ($)	$3,577,688	$3,693,861	$3,817,247	$3,954,357	$4,067,476	$4,238,158	$4,406,903	$4,547,697	$4,743,036	$4,940,934	$5,060,270	$5,245,093	$5,434,367	$0	$3,642,789.14
Total Cost ($)	$3,577,688	$3,693,861	$3,817,247	$3,954,357	$4,067,476	$4,238,158	$4,406,903	$4,547,697	$4,743,036	$4,940,934	$5,060,270	$5,245,093	$5,434,367	$91,069,729	$3,642,789.14

Distillate Oil Rate Escalation Factor	1.00	1.08	1.22	1.34	1.44	1.54	1.61	1.69	1.76	1.84	1.92	1.99	2.07
Electricity Rate Escalation Factor	1.00	1.05	1.08	1.12	1.16	1.20	1.25	1.29	1.33	1.37	1.42	1.49	1.56

Distillate Oil Rate Escalation Factor	2.14	2.21	2.29	2.37	2.47	2.55	2.65	2.76	2.86	2.97	3.07	3.16
Electricity Rate Escalation Factor	1.61	1.66	1.71	1.76	1.82	1.89	1.95	2.03	2.11	2.15	2.22	2.30

Operations and Maintenance

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12
Year	1	2	3	4	5	6	7	8	9	10	11	12
Equipment O&M	$76,200	$77,724	$79,278	$80,864	$82,481	$84,131	$85,814	$87,530	$89,280	$91,066	$92,887	$94,745

	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Total Cost	Average
Year	13	14	15	16	17	18	19	20	21	22	23	24	25		
Equipment O&M	$96,640	$98,573	$100,544	$102,555	$104,606	$106,698	$108,832	$111,009	$113,229	$115,494	$117,804	$120,160	$122,563	$2,440,709	$97,628

Carbon Emissions

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12
	1	2	3	4	5	6	7	8	9	10	11	12
CO_2 Emissions - Electricity(tons)	1,751	1,663	1,575	1,486	1,397	1,307	1,216	1,126	1,034	943	851	758
CO_2 Emissions - Fuel(tons)	0	0	0	0	0	0	0	0	0	0	0	0
Total	1,751	1,663	1,575	1,486	1,397	1,307	1,216	1,126	1,034	943	851	758
Social Cost of Carbon	$220,673	$212,908	$203,157	$194,657	$184,343	$175,097	$165,430	$154,212	$143,576	$132,358	$120,781	$108,842
Social Cost of Carbon Reduction	$318,898	$336,145	$351,112	$369,147	$384,715	$403,548	$422,834	$439,368	$458,806	$477,985	$497,547	$517,496

	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	
	13	14	15	16	17	18	19	20	21	22	23	24	25	
CO_2 Emissions - Electricity(tons)	665	571	477	383	288	192	96	0	0	0	0	0	0	
CO_2 Emissions - Fuel(tons)	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total	665	571	477	383	288	192	96	0	0	0	0	0	0	
Social Cost of Carbon	$96,539	$83,869	$70,829	$57,417	$43,631	$29,468	$14,925	$0	$0	$0	$0	$0	$0	$2,412,712
Social Cost of Carbon Reduction	$537,834	$558,564	$579,687	$601,207	$623,127	$645,448	$668,173	$691,306	$700,124	$708,982	$717,880	$719,674	$721,474	

Central Plant Equipment Installation

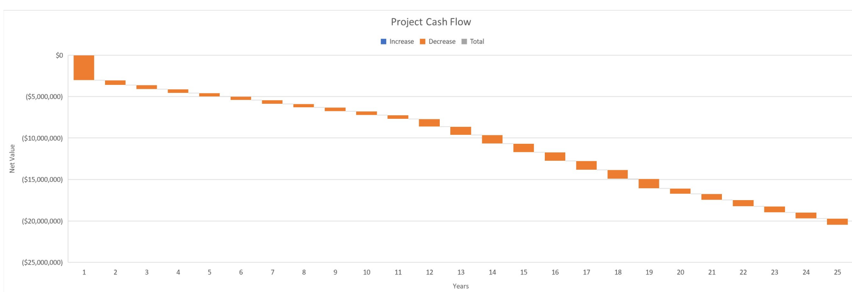
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12
	1	2	3	4	5	6	7	8	9	10	11	12
Electric Boiler Scenario	-2,554,949											(405,037)
Total Installation Cost	-3,193,686											
Bundled Incentives	(638,737)											

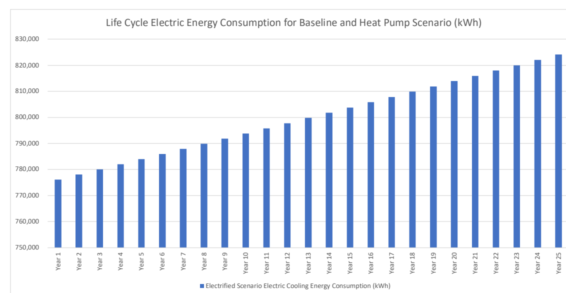
	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25
	13	14	15	16	17	18	19	20	21	22	23	24	25
Electric Boiler Scenario	(413,137)	(421,400)	(429,828)	(438,425)	(447,193)	(456,137)	(465,260)						
Total Installation Cost													
Bundled Incentives													

Cashflow	($3,058,201)	($568,632)	($500,466)	($460,476)	($439,978)	($424,142)	($433,218)	($447,189)	($442,795)	($454,385)	($470,095)	($927,679)

Cashflow	($1,011,633)	($1,029,975)	($1,042,704)	($1,057,465)	($1,051,272)	($1,104,220)	($1,137,767)	($672,439)	($733,428)	($772,332)	($718,298)	($737,579)	($749,071)	$93,510,437

Discount Rate	7.0%
Net Present Value Life Cycle Cost (w/o Emissions)	($10,526,358)
Net Present Value Life Cycle Cost	($10,526,358)





APPENDIX E

District Central Plant Calculator

District Central Plant Calculator

							MBH	MBH	MBH		
Pick (Max)					Max		30,083	18,079	18,079		
Average					Avg		6,170	877	877		
Annual Energy					Sum		54,047,131	7,679,678	7,679,678		
DATE/TIME							**LOADS**				
Date	**Month**	**Day**	**Hour**	**Day of Year**	**Hour of Year**	**Dry Bulb Temperature (°F)**	**Heating Load (MBH)**	**Heat Pump Cooling Load (MBH)**	**Total Cooling Load (MBH)**	**Total Load (MBH)**	**Mode (Heating/ Cooling)**
1/1/2007 1:00	1	1	1	1	1	10.9	14,914	0	0	14,914	Heating
1/1/2007 2:00	1	1	2	1	2	12.7	14,777	0	0	14,777	Heating
1/1/2007 3:00	1	1	3	1	3	13.6	14,373	0	0	14,373	Heating
1/1/2007 4:00	1	1	4	1	4	15.1	14,445	0	0	14,445	Heating
1/1/2007 5:00	1	1	5	1	5	15.9	14,031	0	0	14,031	Heating
1/1/2007 6:00	1	1	6	1	6	14.7	15,133	0	0	15,133	Heating
1/1/2007 7:00	1	1	7	1	7	12.9	14,308	0	0	14,308	Heating
1/1/2007 8:00	1	1	8	1	8	10.7	14,623	0	0	14,623	Heating
1/1/2007 9:00	1	1	9	1	9	10.2	15,758	2	2	15,756	Heating
1/1/2007 10:00	1	1	10	1	10	10.4	14,734	3	3	14,731	Heating
1/1/2007 11:00	1	1	11	1	11	10.4	14,187	2	2	14,184	Heating
1/1/2007 12:00	1	1	12	1	12	10.4	13,714	0	0	13,714	Heating
1/1/2007 13:00	1	1	13	1	13	11.6	13,042	3	3	13,039	Heating
1/1/2007 14:00	1	1	14	1	14	12.3	12,618	3	3	12,616	Heating
1/1/2007 15:00	1	1	15	1	15	12.2	12,624	2	2	12,622	Heating
1/1/2007 16:00	1	1	16	1	16	11.1	12,853	1	1	12,852	Heating
1/1/2007 17:00	1	1	17	1	17	10.3	13,207	0	0	13,207	Heating
1/1/2007 18:00	1	1	18	1	18	9.2	13,810	2	2	13,807	Heating
1/1/2007 19:00	1	1	19	1	19	8.6	12,294	2	2	12,292	Heating
1/1/2007 20:00	1	1	20	1	20	8.6	12,892	2	2	12,890	Heating
1/1/2007 21:00	1	1	21	1	21	7.5	13,431	0	0	13,431	Heating
1/1/2007 22:00	1	1	22	1	22	6.8	13,828	0	0	13,828	Heating
1/1/2007 23:00	1	1	23	1	23	7.9	14,866	0	0	14,866	Heating
1/2/2007 0:00	1	2	0	2	24	8.6	14,886	0	0	14,886	Heating
1/2/2007 1:00	1	2	1	2	25	7.7	16,232	0	0	16,232	Heating
1/2/2007 2:00	1	2	2	2	26	5.8	16,659	0	0	16,659	Heating
1/2/2007 3:00	1	2	3	2	27	5.1	16,792	0	0	16,792	Heating
1/2/2007 4:00	1	2	4	2	28	5.3	17,610	0	0	17,610	Heating
1/2/2007 5:00	1	2	5	2	29	6.7	16,884	0	0	16,884	Heating
1/2/2007 6:00	1	2	6	2	30	7.4	16,844	0	0	16,844	Heating
1/2/2007 7:00	1	2	7	2	31	7.0	21,259	14	14	21,246	Heating
1/2/2007 8:00	1	2	8	2	32	6.8	20,338	13	13	20,326	Heating
1/2/2007 9:00	1	2	9	2	33	9.3	20,935	0	0	20,935	Heating
1/2/2007 10:00	1	2	10	2	34	12.8	19,030	37	37	18,993	Heating
1/2/2007 11:00	1	2	11	2	35	16.3	17,745	80	80	17,665	Heating
1/2/2007 12:00	1	2	12	2	36	19.9	16,063	108	108	15,956	Heating
1/2/2007 13:00	1	2	13	2	37	23.0	14,666	119	119	14,547	Heating
1/2/2007 14:00	1	2	14	2	38	24.5	13,974	123	123	13,851	Heating
1/2/2007 15:00	1	2	15	2	39	24.8	13,409	123	123	13,286	Heating
1/2/2007 16:00	1	2	16	2	40	24.8	12,958	124	124	12,834	Heating
1/2/2007 17:00	1	2	17	2	41	24.8	13,135	125	125	13,011	Heating
1/2/2007 18:00	1	2	18	2	42	24.6	13,373	125	125	13,248	Heating
1/2/2007 19:00	1	2	19	2	43	24.7	10,328	125	125	10,203	Heating
1/2/2007 20:00	1	2	20	2	44	24.8	10,920	124	124	10,796	Heating
1/2/2007 21:00	1	2	21	2	45	24.8	11,440	123	123	11,316	Heating
1/2/2007 22:00	1	2	22	2	46	24.8	9,646	122	122	9,524	Heating
1/2/2007 23:00	1	2	23	2	47	24.8	11,109	162	162	10,947	Heating
1/3/2007 0:00	1	3	0	3	48	24.8	11,087	83	83	11,005	Heating
1/3/2007 1:00	1	3	1	3	49	24.8	11,366	37	37	11,330	Heating
1/3/2007 2:00	1	3	2	3	50	24.1	11,538	48	48	11,489	Heating
1/3/2007 3:00	1	3	3	3	51	23.2	11,784	60	60	11,723	Heating
1/3/2007 4:00	1	3	4	3	52	22.3	12,714	39	39	12,675	Heating
1/3/2007 5:00	1	3	5	3	53	22.6	12,404	55	55	12,350	Heating

	MBH	MBH	MBH	MBH								kW	kW	kW	kW	kW
Pick (Max)	26,543.8	26,543.8	22,096.8	22,096.8	5,309							162.5	63.5	0.0	0.0	162.5
Average	5,193	5,193	905	905	1.3							38.7	0.2	0.0	0.0	38.9
Annual Energy	45,494,197	45,494,197	7,926,019	7,926,019								339,194	1,720	0	0	340,915
	Heating		**Cooling**		**LOOP FLOW**		**LOOP PUMP OPERATION/SPEED**					**LOOP PUMP DEMAND**				
Date	**Heat Required from Loop (MBH)**	**Heat Absorbed from WWTP Outfall (MBH)**	**Heat Rejected to District Loop (MBH)**	**Heat Rejected to WWTP Outfall (MBH)**	**Loop Flow (GPM)**	**% Loop Design Flow**	**Loop No. Pumps Operating**	**Loop Pump 1 Speed**	**Loop Pump 2 Speed**	**Loop Pump 3 Speed**	**Loop Pump 4 Speed**	**Loop Pump 1 Demand (kW)**	**Loop Pump 2 Demand (kW)**	**Loop Pump 3 Demand (kW)**	**Loop Pump 4 Demand (kW)**	**Total Loop Pump Demand (kW)**
1/1/2007 1:00	13,159.6	13,159.6	0.0	0.0	2,631.9	33%	1	66%	0%	0%	0%	62.2	0.0	0.0	0.0	62.2
1/1/2007 2:00	13,038.8	13,038.8	0.0	0.0	2,607.8	33%	1	65%	0%	0%	0%	60.9	0.0	0.0	0.0	60.9
1/1/2007 3:00	12,682.3	12,682.3	0.0	0.0	2,536.5	32%	1	63%	0%	0%	0%	57.2	0.0	0.0	0.0	57.2
1/1/2007 4:00	12,746.0	12,746.0	0.0	0.0	2,549.2	32%	1	64%	0%	0%	0%	57.8	0.0	0.0	0.0	57.8
1/1/2007 5:00	12,380.5	12,380.5	0.0	0.0	2,476.1	31%	1	62%	0%	0%	0%	54.1	0.0	0.0	0.0	54.1
1/1/2007 6:00	13,352.7	13,352.7	0.0	0.0	2,670.5	33%	1	67%	0%	0%	0%	64.4	0.0	0.0	0.0	64.4
1/1/2007 7:00	12,625.1	12,625.1	0.0	0.0	2,525.0	32%	1	63%	0%	0%	0%	56.6	0.0	0.0	0.0	56.6
1/1/2007 8:00	12,902.7	12,902.7	0.0	0.0	2,580.5	32%	1	65%	0%	0%	0%	59.5	0.0	0.0	0.0	59.5
1/1/2007 9:00	13,901.9	13,901.9	0.0	0.0	2,780.4	35%	1	70%	0%	0%	0%	70.6	0.0	0.0	0.0	70.6
1/1/2007 10:00	12,998.0	12,998.0	0.0	0.0	2,599.6	32%	1	65%	0%	0%	0%	60.5	0.0	0.0	0.0	60.5
1/1/2007 11:00	12,515.7	12,515.7	0.0	0.0	2,503.1	31%	1	63%	0%	0%	0%	55.5	0.0	0.0	0.0	55.5
1/1/2007 12:00	12,100.6	12,100.6	0.0	0.0	2,420.1	30%	1	61%	0%	0%	0%	51.3	0.0	0.0	0.0	51.3
1/1/2007 13:00	11,505.1	11,505.1	0.0	0.0	2,301.0	30%	1	58%	0%	0%	0%	45.7	0.0	0.0	0.0	45.7
1/1/2007 14:00	11,131.4	11,131.4	0.0	0.0	2,226.3	30%	1	56%	0%	0%	0%	42.4	0.0	0.0	0.0	42.4
1/1/2007 15:00	11,136.7	11,136.7	0.0	0.0	2,227.3	30%	1	56%	0%	0%	0%	42.4	0.0	0.0	0.0	42.4
1/1/2007 16:00	11,339.9	11,339.9	0.0	0.0	2,268.0	30%	1	57%	0%	0%	0%	44.2	0.0	0.0	0.0	44.2
1/1/2007 17:00	11,652.9	11,652.9	0.0	0.0	2,330.6	30%	1	58%	0%	0%	0%	47.1	0.0	0.0	0.0	47.1
1/1/2007 18:00	12,182.7	12,182.7	0.0	0.0	2,436.5	30%	1	61%	0%	0%	0%	52.1	0.0	0.0	0.0	52.1
1/1/2007 19:00	10,846.0	10,846.0	0.0	0.0	2,169.2	30%	1	54%	0%	0%	0%	39.9	0.0	0.0	0.0	39.9
1/1/2007 20:00	11,373.3	11,373.3	0.0	0.0	2,274.7	30%	1	57%	0%	0%	0%	44.5	0.0	0.0	0.0	44.5
1/1/2007 21:00	11,851.2	11,851.2	0.0	0.0	2,370.2	30%	1	59%	0%	0%	0%	48.9	0.0	0.0	0.0	48.9
1/1/2007 22:00	12,201.5	12,201.5	0.0	0.0	2,440.3	31%	1	61%	0%	0%	0%	52.3	0.0	0.0	0.0	52.3
1/1/2007 23:00	13,117.3	13,117.3	0.0	0.0	2,623.5	33%	1	66%	0%	0%	0%	61.8	0.0	0.0	0.0	61.8
1/2/2007 0:00	13,134.4	13,134.4	0.0	0.0	2,626.9	33%	1	66%	0%	0%	0%	62.0	0.0	0.0	0.0	62.0
1/2/2007 1:00	14,322.2	14,322.2	0.0	0.0	2,864.4	36%	1	72%	0%	0%	0%	75.6	0.0	0.0	0.0	75.6
1/2/2007 2:00	14,699.5	14,699.5	0.0	0.0	2,939.9	37%	1	73%	0%	0%	0%	80.3	0.0	0.0	0.0	80.3
1/2/2007 3:00	14,816.2	14,816.2	0.0	0.0	2,963.2	37%	1	74%	0%	0%	0%	81.8	0.0	0.0	0.0	81.8
1/2/2007 4:00	15,537.8	15,537.8	0.0	0.0	3,107.6	39%	1	78%	0%	0%	0%	91.2	0.0	0.0	0.0	91.2
1/2/2007 5:00	14,897.3	14,897.3	0.0	0.0	2,979.5	37%	1	74%	0%	0%	0%	82.8	0.0	0.0	0.0	82.8
1/2/2007 6:00	14,862.5	14,862.5	0.0	0.0	2,972.5	37%	1	74%	0%	0%	0%	82.3	0.0	0.0	0.0	82.3
1/2/2007 7:00	18,746.3	18,746.3	0.0	0.0	3,749.3	47%	1	94%	0%	0%	0%	140.4	0.0	0.0	0.0	140.4
1/2/2007 8:00	17,934.4	17,934.4	0.0	0.0	3,586.9	45%	1	90%	0%	0%	0%	126.8	0.0	0.0	0.0	126.8
1/2/2007 9:00	18,472.0	18,472.0	0.0	0.0	3,694.4	46%	1	92%	0%	0%	0%	135.8	0.0	0.0	0.0	135.8
1/2/2007 10:00	16,758.4	16,758.4	0.0	0.0	3,351.7	42%	1	84%	0%	0%	0%	108.5	0.0	0.0	0.0	108.5
1/2/2007 11:00	15,587.0	15,587.0	0.0	0.0	3,117.4	39%	1	78%	0%	0%	0%	91.9	0.0	0.0	0.0	91.9
1/2/2007 12:00	14,078.6	14,078.6	0.0	0.0	2,815.7	35%	1	70%	0%	0%	0%	72.7	0.0	0.0	0.0	72.7
1/2/2007 13:00	12,835.3	12,835.3	0.0	0.0	2,567.1	32%	1	64%	0%	0%	0%	58.8	0.0	0.0	0.0	58.8
1/2/2007 14:00	12,221.9	12,221.9	0.0	0.0	2,444.4	31%	1	61%	0%	0%	0%	52.5	0.0	0.0	0.0	52.5
1/2/2007 15:00	11,722.9	11,722.9	0.0	0.0	2,344.6	30%	1	59%	0%	0%	0%	47.7	0.0	0.0	0.0	47.7
1/2/2007 16:00	11,324.2	11,324.2	0.0	0.0	2,264.8	30%	1	57%	0%	0%	0%	44.1	0.0	0.0	0.0	44.1
1/2/2007 17:00	11,479.9	11,479.9	0.0	0.0	2,296.0	30%	1	57%	0%	0%	0%	45.5	0.0	0.0	0.0	45.5
1/2/2007 18:00	11,689.1	11,689.1	0.0	0.0	2,337.8	30%	1	58%	0%	0%	0%	47.4	0.0	0.0	0.0	47.4
1/2/2007 19:00	9,002.6	9,002.6	0.0	0.0	1,800.5	30%	1	50%	0%	0%	0%	33.1	0.0	0.0	0.0	33.1
1/2/2007 20:00	9,526.0	9,526.0	0.0	0.0	1,905.2	30%	1	50%	0%	0%	0%	33.1	0.0	0.0	0.0	33.1
1/2/2007 21:00	9,985.1	9,985.1	0.0	0.0	1,997.0	30%	1	50%	0%	0%	0%	33.1	0.0	0.0	0.0	33.1
1/2/2007 22:00	8,403.6	8,403.6	0.0	0.0	1,680.7	30%	1	50%	0%	0%	0%	33.1	0.0	0.0	0.0	33.1
1/2/2007 23:00	9,659.5	9,659.5	0.0	0.0	1,931.9	30%	1	50%	0%	0%	0%	33.1	0.0	0.0	0.0	33.1
1/3/2007 0:00	9,709.9	9,709.9	0.0	0.0	1,942.0	30%	1	50%	0%	0%	0%	33.1	0.0	0.0	0.0	33.1
1/3/2007 1:00	9,996.7	9,996.7	0.0	0.0	1,999.3	30%	1	50%	0%	0%	0%	33.1	0.0	0.0	0.0	33.1
1/3/2007 2:00	10,137.6	10,137.6	0.0	0.0	2,027.5	30%	1	51%	0%	0%	0%	34.2	0.0	0.0	0.0	34.2
1/3/2007 3:00	10,344.2	10,344.2	0.0	0.0	2,068.8	30%	1	52%	0%	0%	0%	35.8	0.0	0.0	0.0	35.8
1/3/2007 4:00	11,183.5	11,183.5	0.0	0.0	2,236.7	30%	1	56%	0%	0%	0%	42.8	0.0	0.0	0.0	42.8
1/3/2007 5:00	10,896.7	10,896.7	0.0	0.0	2,179.3	30%	1	54%	0%	0%	0%	40.3	0.0	0.0	0.0	40.3

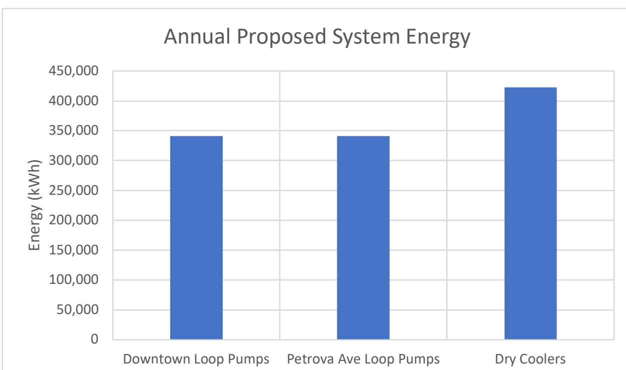
	MBH	MBH							kW	kW	kW	kW	kW
Pick (Max)	27,086	21,655	10,834.2						0.0	0.0	0.0	0.0	162.5
Average			2,230.6						0.0	0.0	0.0	0.0	38.9
Annual Energy			19,539,997						71	71	71	214	341,129
			OUTFALL FLOW		**OUTFALL PUMP OPERATION/SPEED**				**OUTFALL PUMP DEMANDS**				
Date	**Heat Absorbed from WWTP Outfall (MBH)**	**Heat Rejected to WWTP Outfall (MBH)**	**Outfall Flowrate (GPM)**	**% Outfall Design Flow**	**Outfall No. Pumps Operating**	**Outfall Pump 1 Speed**	**Outfall Pump 2 Speed**	**Outfall Pump 3 Speed**	**Outfall Pump 1 Demand (kW)**	**Outfall Pump 2 Demand (kW)**	**Outfall Pump 3 Demand (kW)**	**Total Outfall Pump Demand (kW)**	**Total Electric Demand (kW)**
1/1/2007 1:00	13,428.2	0.0	5,371.3	53712753%	3	100%	100%	100%	0.0	0.0	0.0	0.0	62.3
1/1/2007 2:00	13,304.9	0.0	5,322.0	53219538%	3	100%	100%	100%	0.0	0.0	0.0	0.0	61.0
1/1/2007 3:00	12,941.1	0.0	5,176.4	51764489%	3	100%	100%	100%	0.0	0.0	0.0	0.0	57.2
1/1/2007 4:00	13,006.1	0.0	5,202.4	52024468%	3	100%	100%	100%	0.0	0.0	0.0	0.0	57.9
1/1/2007 5:00	12,633.2	0.0	5,053.3	50532629%	3	100%	100%	100%	0.0	0.0	0.0	0.0	54.1
1/1/2007 6:00	13,625.2	0.0	5,450.1	54500915%	3	100%	100%	100%	0.0	0.0	0.0	0.0	64.4
1/1/2007 7:00	12,882.8	0.0	5,153.1	51531192%	3	100%	100%	100%	0.0	0.0	0.0	0.0	56.6
1/1/2007 8:00	13,166.1	0.0	5,266.4	52664226%	3	100%	100%	100%	0.0	0.0	0.0	0.0	59.5
1/1/2007 9:00	14,185.6	0.0	5,674.3	56742521%	3	100%	100%	100%	0.0	0.0	0.0	0.0	70.6
1/1/2007 10:00	13,263.3	0.0	5,305.3	53053052%	3	100%	100%	100%	0.0	0.0	0.0	0.0	60.5
1/1/2007 11:00	12,771.1	0.0	5,108.4	51084416%	3	100%	100%	100%	0.0	0.0	0.0	0.0	55.5
1/1/2007 12:00	12,347.6	0.0	4,939.0	49390375%	3	100%	100%	100%	0.0	0.0	0.0	0.0	51.3
1/1/2007 13:00	11,739.9	0.0	4,695.9	46959480%	3	100%	100%	100%	0.0	0.0	0.0	0.0	45.7
1/1/2007 14:00	11,358.5	0.0	4,543.4	45434129%	3	100%	100%	100%	0.0	0.0	0.0	0.0	42.4
1/1/2007 15:00	11,364.0	0.0	4,545.6	45455806%	3	100%	100%	100%	0.0	0.0	0.0	0.0	42.4
1/1/2007 16:00	11,571.3	0.0	4,628.5	46285266%	3	100%	100%	100%	0.0	0.0	0.0	0.0	44.2
1/1/2007 17:00	11,890.7	0.0	4,756.3	47562841%	3	100%	100%	100%	0.0	0.0	0.0	0.0	47.1
1/1/2007 18:00	12,431.4	0.0	4,972.5	49725478%	3	100%	100%	100%	0.0	0.0	0.0	0.0	52.1
1/1/2007 19:00	11,067.4	0.0	4,427.0	44269547%	3	100%	100%	100%	0.0	0.0	0.0	0.0	39.9
1/1/2007 20:00	11,605.4	0.0	4,642.2	46421658%	3	100%	100%	100%	0.0	0.0	0.0	0.0	44.5
1/1/2007 21:00	12,093.0	0.0	4,837.2	48372119%	3	100%	100%	100%	0.0	0.0	0.0	0.0	48.9
1/1/2007 22:00	12,450.5	0.0	4,980.2	49802047%	3	100%	100%	100%	0.0	0.0	0.0	0.0	52.3
1/1/2007 23:00	13,385.0	0.0	5,354.0	53539957%	3	100%	100%	100%	0.0	0.0	0.0	0.0	61.8
1/2/2007 0:00	13,402.4	0.0	5,361.0	53609679%	3	100%	100%	100%	0.0	0.0	0.0	0.0	62.0
1/2/2007 1:00	14,614.5	0.0	5,845.8	58457921%	3	100%	100%	100%	0.0	0.0	0.0	0.0	75.6
1/2/2007 2:00	14,999.5	0.0	5,999.8	59997885%	3	100%	100%	100%	0.0	0.0	0.0	0.0	80.3
1/2/2007 3:00	15,118.6	0.0	6,047.4	60474335%	3	100%	100%	100%	0.0	0.0	0.0	0.0	81.8
1/2/2007 4:00	15,854.9	0.0	6,342.0	63419571%	3	100%	100%	100%	0.0	0.0	0.0	0.0	91.2
1/2/2007 5:00	15,201.3	0.0	6,080.5	60805327%	3	100%	100%	100%	0.0	0.0	0.0	0.0	82.8
1/2/2007 6:00	15,165.8	0.0	6,066.3	60663281%	3	100%	100%	100%	0.0	0.0	0.0	0.0	82.4
1/2/2007 7:00	19,128.9	0.0	7,651.6	76515554%	3	100%	100%	100%	0.0	0.0	0.0	0.0	140.5
1/2/2007 8:00	18,300.4	0.0	7,320.2	73201700%	3	100%	100%	100%	0.0	0.0	0.0	0.0	126.9
1/2/2007 9:00	18,849.0	0.0	7,539.6	75395952%	3	100%	100%	100%	0.0	0.0	0.0	0.0	135.8
1/2/2007 10:00	17,100.4	0.0	6,840.2	68401766%	3	100%	100%	100%	0.0	0.0	0.0	0.0	108.6
1/2/2007 11:00	15,905.1	0.0	6,362.0	63620361%	3	100%	100%	100%	0.0	0.0	0.0	0.0	91.9
1/2/2007 12:00	14,365.9	0.0	5,746.4	57463769%	3	100%	100%	100%	0.0	0.0	0.0	0.0	72.7
1/2/2007 13:00	13,097.2	0.0	5,238.9	52388977%	3	100%	100%	100%	0.0	0.0	0.0	0.0	58.8
1/2/2007 14:00	12,471.3	0.0	4,988.5	49885249%	3	100%	100%	100%	0.0	0.0	0.0	0.0	52.5
1/2/2007 15:00	11,962.1	0.0	4,784.8	47848464%	3	100%	100%	100%	0.0	0.0	0.0	0.0	47.7
1/2/2007 16:00	11,555.3	0.0	4,622.1	46221258%	3	100%	100%	100%	0.0	0.0	0.0	0.0	44.1
1/2/2007 17:00	11,714.2	0.0	4,685.7	46856917%	3	100%	100%	100%	0.0	0.0	0.0	0.0	45.5
1/2/2007 18:00	11,927.7	0.0	4,771.1	47710688%	3	100%	100%	100%	0.0	0.0	0.0	0.0	47.4
1/2/2007 19:00	9,186.3	0.0	3,674.5	36745342%	3	100%	100%	100%	0.0	0.0	0.0	0.0	33.1
1/2/2007 20:00	9,720.4	0.0	3,888.2	38881687%	3	100%	100%	100%	0.0	0.0	0.0	0.0	33.1
1/2/2007 21:00	10,188.9	0.0	4,075.6	40755520%	3	100%	100%	100%	0.0	0.0	0.0	0.0	33.1
1/2/2007 22:00	8,575.1	0.0	3,430.0	34300420%	3	100%	100%	100%	0.0	0.0	0.0	0.0	33.1
1/2/2007 23:00	9,856.6	0.0	3,942.6	39426405%	3	100%	100%	100%	0.0	0.0	0.0	0.0	33.1
1/3/2007 0:00	9,908.0	0.0	3,963.2	39632086%	3	100%	100%	100%	0.0	0.0	0.0	0.0	33.1
1/3/2007 1:00	10,200.8	0.0	4,080.3	40803051%	3	100%	100%	100%	0.0	0.0	0.0	0.0	33.1
1/3/2007 2:00	10,344.5	0.0	4,137.8	41378063%	3	100%	100%	100%	0.0	0.0	0.0	0.0	34.2
1/3/2007 3:00	10,555.3	0.0	4,222.1	42221332%	3	100%	100%	100%	0.0	0.0	0.0	0.0	35.8
1/3/2007 4:00	11,411.7	0.0	4,564.7	45646877%	3	100%	100%	100%	0.0	0.0	0.0	0.0	42.8
1/3/2007 5:00	11,119.1	0.0	4,447.6	44476211%	3	100%	100%	100%	0.0	0.0	0.0	0.0	40.3

Peak Bore Field Heating Load	26,544	MBH
Peak Bore Field Cooling Load	22,097	MBH
Total Bore Field Heating Energy		MMbtu
Total Bore Field Cooling Energy		MMbtu
Total Bore Field Annual Energy		MMbtu
Loop Heat Pump Annual Electric Consumption	0	kWh
Loop Pumps Annual Electric Consumption	340,915	kWh
Bore Field Pumps Annual Electric Consumption	214	kWh
Total Annual Electric Consumption	341,129	kWh
Total Annual Electric Consumption	1,164	MMBtu
Total Annual Electric Cost	$36,314	

Heating		
Design Day	01/22	
Design Day of Year	22	of 365
Design Day Heating Load	26,544	MBH
Design Day Min Heating Load	14,617	MBH
Diversity Factor	55%	
Average Geo-Loop Heating Season Load	6,342	MBH
Avg Bore Field Jan Load	12,039	MBH
Avg Bore Field Feb Load	10,516	MBH
Avg Bore Field Mar Load	7,591	MBH
Avg Bore Field Nov Load	7,598	MBH
Avg Bore Field Dec Load	11,132	MBH
Total Buildling Load (Heating)	54,047	MMBTU
Total Buildling Load (Cooling)	7,680	MMBTU
Total Heat Moved	61,727	MMBTU
Delievery Rate	$0.59	MMBTU

Cooling		
Design Day	06/19	
Design Day of Year	170	of 365
Design Day Heating Load	21,655	MBH
Design Day Min Heating Load	21,655	MBH
Diversity Factor	100%	

Downtown Loop Pumps	340,915
Petrova Ave Loop Pumps	340,915
Dry Coolers	422726



APPENDIX F

Opinion of Probable Cost

PON4614
Saranac Lake, NY

$ 76,354,476

Phase 1 Customer Connection

Customer Connection/Retrofit		Cost ($/ton)	Load (tons)		Subtotal ($)	
Scenario 1 - Existing RTU	$	3,827	26	$	97,712	Adirondack Bank
Water Source Equipment Retrofit	$	3,827				
Airside modifications	$	-				
Scenario 2 - Existing WSHP System	$	-	187	$	-	Hotel Saranac, Police
Water Source Equipment Retrofit	$	-				
Airside modifications	$	-				
Scenario 3 - Existing Non Compatible System	$	8,388	263	$	3,217,801	Village Offices, Waterhole, Madden Transfer, Rice Furniture, HHA
Water Source Equipment Retrofit	$	5,552				
Airside modifications	$	2,836				
Scenario 4 - New Construction	$	7,896	40	$	315,847	APA
Water Source Equipment	$	5,301				
Balance of HVAC System	$	2,595				
Subtotal				$	3,631,360	

Direct Trade Costs Subtotal		**$**	**3,631,360**	$	4.78					
Design Contingency	20%	$	726,272			$	12,890,424	$ 6,473,494	$ 19,363,918
Overhead & Profit	15%	$	653,645			$	6,868,257	$ 4,701,801	$ 11,570,058
Total Project Construction Cost		**$**	**5,011,277**			$	44,603,681		
Construction Contingency	10%	$	501,128						
Cost Escalation - Start Construction Q1 2024	10%	$	501,128				44,646,000		
Total Escalated Project Construction Cost		**$**	**6,013,532**	$	7.91				
Customer Share (20%)		**$**	**1,202,706**						
Grant Share (80%)		**$**	**4,810,826**						

Phase 1 District Energy System

Connection to DES		Cost ($/ton)	Load (tons)		Subtotal ($)
Scenario 1 - Existing RTU	$	2,625	25.5	$	67,021
Scenario 2 - Existing WSHP System	$	537	187	$	100,326
Scenario 3 - Existing Non Compatible System	$	1,241	263	$	326,370
Scenario 4 - New Construction	$	1,967	40	$	78,673
				$	572,391

Distribution System

Connection to DES	$	572,391	
Distribution Piping	$	2,638,955	Main St, River Crossing

Mobilization		$	166,667
M&P of Traffic		$	166,667
Erosion Control		$	33,333
Thermal Generation			
Geothermal Borefields		$	3,643,000
Central Utility Plant		$	2,390,000
Emergency Generator		$	400,000
Dry Coolers		$	1,000,000
Direct Trade Costs Subtotal		**$**	**11,011,013**
Design Contingency	20%	$	2,202,203
Overhead & Profit	15%	$	1,981,982
Total Project Construction Cost		**$**	**15,195,197**
Construction Contingency	10%	$	1,519,520
Cost Escalation - Start Construction Q1 2024	10%	$	1,519,520
Total Escalated Project Construction Cost		**$**	**18,234,237**
Soft Costs			
Engineering Fees	8%	$	1,215,616
Permitting	2%	$	303,904
Phase 1 Total DES Project Cost		**$**	**19,753,756**

$ 25,767,289

Phase 2 Customer Connection

Customer Connection/Retrofit	Cost ($/ton)		Load (tons)	Subtotal ($)		
Scenario 1 - Existing RTU	$	3,827	0	$	-	
Water Source Equipment Retrofit	$	3,827				
Airside modifications	$	-				
Scenario 2 - Existing WSHP System	$	-	0	$	-	
Water Source Equipment Retrofit	$	-				
Airside modifications	$	-				
Scenario 3 - Existing Non Compatible System	$	8,388	421	$	3,533,766	St Bernards, Dechantal
Water Source Equipment Retrofit	$	5,552				
Airside modifications	$	2,836				
Scenario 4 - New Construction	$	7,896	0	$	-	
Water Source Equipment	$	5,301				
Balance of HVAC System	$	2,595				
Subtotal				$	3,533,766	

Direct Trade Costs Subtotal		**$**	**3,533,766**	$	4.65
Design Contingency	20%	$	706,753		
Overhead & Profit	15%	$	636,078		
Total Project Construction Cost		**$**	**4,876,596**		
Construction Contingency	10%	$	487,660		
Cost Escalation - Start Construction Q1 2024	10%	$	487,660		
Total Escalated Project Construction Cost		**$**	**5,851,916**	$	7.70
Customer Share (20%)		**$**	**1,170,383**		
Grant Share (80%)		**$**	**4,681,533**		

Phase 2 District Energy System

Connection to DES	Cost ($/ton)		Load (tons)	Subtotal ($)	
Scenario 1 - Existing RTU	$	2,625	0.0	$	-
Scenario 2 - Existing WSHP System	$	537	0	$	-
Scenario 3 - Existing Non Compatible System	$	1,241	421	$	522,772
Scenario 4 - New Construction	$	1,967	0	$	-
				$	522,772

Distribution System					
Connection to DES		$	522,772		
Distribution Piping		$	2,436,651		
Mobilization		$	166,667		
M&P of Traffic		$	166,667		
Erosion Control		$	33,333		
Thermal Generation					
Geothermal Borefields		$	-		
Central Utility Plant		$	-		
Emergency Generator		$	-		
Direct Trade Costs Subtotal		**$**	**3,326,089**		
Design Contingency	20%	$	665,218		
Overhead & Profit	15%	$	598,696		
Total Project Construction Cost		**$**	**4,590,003**		
Construction Contingency	10%	$	459,000		
Cost Escalation - Start Construction Q1 2024	10%	$	459,000		
Total Escalated Project Construction Cost		**$**	**5,508,004**		
Soft Costs					
Engineering Fees	8%	$	367,200		
Permitting	2%	$	91,800		
Phase 2 Total DES Project Cost		**$**	**5,967,004**	$	11,818,920

Phase 3 Customer Connection

Customer Connection/Retrofit	Cost ($/ton)	Load (tons)	Subtotal ($)
Scenario 1 - Existing RTU	$ 3,827	0	$ -
Water Source Equipment Retrofit	$ 3,827		
Airside modifications	$ -		
Scenario 2 - Existing WSHP System	$ -	0	$ -
Water Source Equipment Retrofit	$ -		
Airside modifications	$ -		
Scenario 3 - Existing Non Compatible System	$ 8,388	1,177	$ 9,870,385
Water Source Equipment Retrofit	$ 5,552		
Airside modifications	$ 2,836		
Scenario 4 - New Construction	$ 7,896	0	$ -
Water Source Equipment	$ 5,301		
Balance of HVAC System	$ 2,595		
Subtotal			$ 9,870,385

Elementary School, Emergency Services
Remainders downtown

Direct Trade Costs Subtotal		**$ 9,870,385**	$ 12.99
Design Contingency	20%	$ 1,974,077	
Overhead & Profit	15%	$ 1,776,669	
Total Project Construction Cost		**$ 13,621,131**	
Construction Contingency	10%	$ 1,362,113	
Cost Escalation - Start Construction Q1 2024	10%	$ 1,362,113	
Total Escalated Project Construction Cost		**$ 16,345,357**	$ 21.51
Customer Share (20%)		**$ 3,269,071**	
Grant Share (80%)		**$ 13,076,286**	

Phase 3 District Energy System

Connection to DES	Cost ($/ton)	Load (tons)	Subtotal ($)
Scenario 1 - Existing RTU	$ 2,625	0	$ -
Scenario 2 - Existing WSHP System	$ 537	0	$ -
Scenario 3 - Existing Non Compatible System	$ 1,241	1,177	$ 1,460,187
Scenario 4 - New Construction	$ 1,967	0	$ -
			$ 1,460,187

Distribution System

Connection to DES	$ 1,460,187
Distribution Piping	$ 2,648,533
Mobilization	$ 166,667

M&P of Traffic		$	166,667		
Erosion Control		$	33,333		
Thermal Generation					
Geothermal Borefields		$	6,072,500		
Central Utility Plant		$	-		
Emergency Generator		$	-		
Direct Trade Costs Subtotal		**$**	**10,547,887**		
Design Contingency	20%	$	2,109,577		
Overhead & Profit	15%	$	1,898,620		
Total Project Construction Cost		**$**	**14,556,085**		
Construction Contingency	10%	$	1,455,608		
Cost Escalation - Start Construction Q1 2024	10%	$	1,455,608		
Total Escalated Project Construction Cost		**$**	**17,467,301**		
Soft Costs					
Engineering Fees	8%	$	1,164,487		
Permitting	2%	$	291,122		
Phase 3: Total DES Project Cost		**$**	**18,922,910**	$	35,268,267
1 MW Solar PV		**$**	**3,500,000**	$	3,500,000

Saranac District Energy Loop

	Item Description	Unit	QTY		Cost/Unit	Item Total	
1	Borefields	EA	1	$	9,715,500	$	9,715,500
2	Central Plant	EA	1	$	2,390,000	$	2,390,000
3	River HX	EA	1	$	-	$	-
4	Distribution Piping	LF	5,820		varies	$	7,724,139
5	600 kW Emergency Generator	EA	1	$	400,000	$	400,000
6	Mobilization	LS	1	$	500,000	$	500,000
7	M&P of Traffic	Allowance	1	$	500,000	$	500,000
8	Erosion Control	LS	1	$	100,000	$	100,000
					Construction Sub Total	**$**	**21,329,639**

		Open Paved Area Pipe Run LF	Congested Paved Area Pipe Run LF	Basement Area Pipe Run LF	Fixed Cost	Notes	Cost
	Cost per LF	$ 1,324.27	$ 2,167.80	$ 243.33			
1	**Main St 2 pipe**	1080			25,000	Route 3 crossing	$ 1,455,208
2	**Church St 1 pipe**	1000					$ 1,324,267
3	**Academy St 1 pipe**	840					$ 1,112,384
4	**River Crossing 2 pipe**	800		100	100,000	River crossing	$ 1,183,747
5	**Petrova Ave 2 pipe**	2000					$ 2,648,533
	Total Pipe (LF)	5,720	0	100			
		$ 7,574,805	$ -	$ 24,333	125,000		**$ 7,724,139**
	Grand Total (LF)	5,820					

Multipliers	
Material:	1.00
Labor:	1.00
Equipment:	1.00

Phase 1

WSHP District Energy

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
Geothermal Well Install - Dorsey St									$ 1,685,000	
Hardscape Restoration	0	LF			$ 150	$ -	$ -	$ -	$ -	
Dorsey St Parking Lot Restoration	43000	SF			$ 5.0	$ -	$ -	$ 215,000	$ 215,000	
Geothermal Boreholes (112 Boreholes x 500 ft)	56000	LF			$ 25	$ -	$ -	$ 1,400,000	$ 1,400,000	
Commissioning	1	LS		$ 10,000		$ -	$ 10,000	$ -	$ 10,000	
Manifold Vault	1	LS	$ 50,000			$ 50,000	$ -	$ -	$ 50,000	
8" Valve Station	1	LS	$ 10,000			$ 10,000	$ -	$ -	$ 10,000	
Geothermal Well Install - Elementary School									$ 6,072,500	
Hardscape Restoration	0	LF			$ 150	$ -	$ -	$ -	$ -	
Elementary School Field Restoration	200000	SF			$ 1.0	$ -	$ -	$ 200,000	$ 200,000	
Geothermal Boreholes (457 Boreholes x 500 ft)	228500	LF			$ 25	$ -	$ -	$ 5,712,500	$ 5,712,500	
Manifold Vault	3	LS	$ 50,000			$ 150,000	$ -	$ -	$ 150,000	
Commissioning	1	LS		$ 10,000		$ -	$ 10,000	$ -	$ 10,000	
Geothermal Well Install - St Bernards Church									$ 1,228,000	
Hardscape Restoration	0	LF			$ 150	$ -	$ -	$ -	$ -	
St Bernards Lot Restoration	33600	SF			$ 5.0	$ -	$ -	$ 168,000	$ 168,000	
Geothermal Boreholes (84 Boreholes x 500 ft)	42000	LF			$ 25	$ -	$ -	$ 1,050,000	$ 1,050,000	
Commissioning	1	LS		$ 10,000		$ -	$ 10,000	$ -	$ 10,000	
						$ -	$ -	$ -	$ -	
Geothermal Well Install - Police Station									$ 730,000	
Hardscape Restoration	0	LF			$ 150	$ -	$ -	$ -	$ -	
Police Lot Restoration	24000	SF			$ 5.0	$ -	$ -	$ 120,000	$ 120,000	
Geothermal Boreholes (48 Boreholes x 500 ft)	24000	LF			$ 25	$ -	$ -	$ 600,000	$ 600,000	
Commissioning	1	LS		$ 10,000		$ -	$ 10,000	$ -	$ 10,000	
						$ -	$ -	$ -	$ -	
Mechanical Systems									$ 2,390,000	
Central Plant Building	3000	SF			$ 300	$ -	$ -	$ 900,000	$ 900,000	
Central Plant Pumps	7	EA			$ 70,000	$ -	$ -	$ 490,000	$ 490,000	
Central Plant Equipment	1	LS			$ 1,000,000	$ -	$ -	$ 1,000,000	$ 1,000,000	
						$ -	$ -	$ -	$ -	
River Heat Exchanger						$ -	$ -	$ -	$ -	
Direct connection, covered in CUP										
						$ -	$ -	$ -	$ -	

Geothermal Side Totals (Includes contractor O&P)

$ 10,147,500		Subtotal
$ 2,029,500	20%	Contingency
$ -	0%	Contractor O&P
$ 1,217,700	10%	Engineering
$ 13,394,700		**Total**

River HX side totals

$ -		Subtotal
$ -	20%	Contingency
$ -	20%	Contractor O&P
$ -	10%	Engineering
$ -		**Total**

Basement						
Production			120	LF/Day		

Crew	Rate			Hrs	Daily Cost	
Operators	$	125.00	2	8	$	2,000.00
Laborers	$	100.00	3	8	$	2,400.00
Foreman	$	150.00	1	8	$	1,200.00

Equipment	$/Hr		Qty	Hrs		
Loader	$	95.00	0	0	$	-
Dozer	$	65.00	0	0	$	-
Roller	$	50.00	0	0	$	-
Trucks	$	110.00	0	8	$	-
Misc. Dewatering/MPT/	$	55.00	0	0	$	-
				Daily Cost	$	5,600.00
				LF/Day		120
				$/LF	$	46.67

Materials:	$/Unit		Units	Qty	Total	
16" HDPE DR 11	$	100.00	LF	1	$	100.00
Supports	$	50.00	LF	1	$	50.00
				Total	$	150.00
				LF		1
				$/LF	$	196.67

Paved Open Area Direct Bury						
Production			60	LF/Day		

Crew	Rate			Hrs	Daily Cost	
Operators	$	125.00	4	8	$	4,000.00

Laborers	$ 100.00	6	8	$	4,800.00
Foreman	$ 150.00	1	8	$	1,200.00

Equipment	$/Hr	Qty	Hrs		
Excavators Lg	$ 150.00	2	8	$	2,400.00
Loader	$ 95.00	2	8	$	1,520.00
Dozer	$ 65.00	1	8	$	520.00
Roller	$ 50.00	1	8	$	400.00
Road Saw	$ 25.00	1	8	$	200.00
Trucks	$ 110.00	12	8	$	10,560.00
Misc. Dewatering/MPT/	$ 55.00	1	8	$	440.00
Pick-up	$ 15.00	3	8	$	360.00
Trench box	$ 32.00	1	8	$	256.00
			Daily Cost	$	26,656.00
			LF/Day		60
			$/LF	$	444.27

Materials:	$/Unit	Units	Qty	Total	
16" HDPE DR 11	$ 175.00	LF	1	$	175.00
Bedding	$ 15.00	LF	1	$	15.00
Coarse backfill	$ 15.00	LF	1	$	15.00
Tracer Wire	$ 5.00	LF	1	$	5.00
Compact Fill	$ 20.00	LF	1	$	20.00
Asphalt	$ 650.00	LF	1	$	650.00
			Total	$	880.00
			LF		1
			$/LF	$	880.00

Paved Congested Area Direct Bury

Production 20 LF/Day

Crew	Rate	Hrs	Daily Cost

Operators	$ 125.00	4	8	$	4,000.00
Laborers	$ 100.00	7	8	$	5,600.00
Foreman	$ 150.00	1	8	$	1,200.00

Equipment	$/Hr	Qty	Hrs		
Excavators Lg	$ 150.00	2	8	$	2,400.00
Loader	$ 85.00	2	8	$	1,360.00
Roller	$ 50.00	2	8	$	800.00
Road Saw	$ 25.00	1	8	$	200.00
Trucks	$ 110.00	12	8	$	10,560.00
Misc. Dewatering/Road Plates	$ 65.00	1	8	$	520.00
Pick-up	$ 15.00	3	8	$	360.00
Trench box	$32	1	8	$	256.00
			Daily Cost	$	27,256.00
			LF/Day		20
			$/LF	$	1,362.80

Materials:	$/Unit	Units	Qty	Subtotal	
16" HDPE DR 11	$ 100.00	LF	1	$	100.00
Bedding	$ 15.00	LF	1	$	15.00
Coarse backfill	$ 15.00	LF	1	$	15.00
Tracer Wire	$ 5.00	LF	1	$	5.00
Compact Fill	$ 20.00	LF	1	$	20.00
Asphalt	$ 650.00	LF	1	$	650.00
			Total	$	805.00
			LF Total		1
			$/LF	$	805.00

Assumes no replacement, installation of curbs.

30.25 CF/LF

APPENDIX G

Customer Connection Cost

PON 4614
Saranac Lake

Existing System	Subtotal ($/ton)	20% Contingency	Total ($/ton)
1. RTU Retrofit	$ 6,452	$ 1,290	$ 7,742
Customer Connection	$ 2,625	$ 525	$ 3,150
Water Source Equipment Retrofit	$ 3,827	$ 765	$ 4,592
Airside Modifications	$ -	$ -	$ -
2. WSHP Retrofit	$ 537	$ 107	$ 644
Customer Connection	$ 537	$ 107	$ 644
Water Source Equipment Retrofit	$ -	$ -	$ -
Airside Modifications	$ -	$ -	$ -
3. Non-Compatible System Retrofit	$ 9,629	$ 1,926	$ 11,555
Customer Connection	$ 1,241	$ 248	$ 1,489
Water Source Equipment Retrofit	$ 5,552	$ 1,110	$ 6,663
Airside Modifications	$ 2,836	$ 567	$ 3,403
4. New Construction	$ 9,863	$ 1,973	$ 11,836
Customer Connection	$ 1,967	$ 393	$ 2,360
Water Source Equipment	$ 5,301	$ 1,060	$ 6,362
Balance of HVAC System	$ 2,595	$ 519	$ 3,114

Tons		Total ($) w/o contingency
25.53	**RTU**	
	Customer Connection	$ 67,021
	Water Source Equipment Retrofit	$ 97,712
	Airside Modifications	$ -
186.87	**WSHP**	
	Customer Connection	$ 100,326
	Water Source Equipment Retrofit	$ -
	Airside Modifications	$ -
1,860.93	**Non-Compatible**	
	Customer Connection	$ 2,309,330
	Water Source Equipment Retrofit	$ 10,332,329
	Airside Modifications	$ 5,277,978
40.00	**New Construction**	
	Customer Connection	$ 78,673
	Water Source Equipment	$ 212,056
	Balance of HVAC System	$ 103,790
	Customer Connection	**$ 2,555,350**
	Water Source Equipment	**$ 10,642,097**
	Airside	**$ 5,381,769**

Notes: 3 gpm/ton or 3 gpm/15 MBH
delta T heating 5F
delta T cooling 10F
25 ft head system side
19 W/gpm building side, 60 ft head

Type	tons	Retrofit Cost	Retrofit Cost
New Construction	40.00	$ 394,520	$ 473,423
Air Cooled Chiller	25.53	$ 164,733	$ 197,680
WSHP	186.87	$ 100,326	$ 120,392
Non-Compatible	1,860.93	$ 17,919,637	$ 21,503,564
		$ -	$ -
		$ -	$ -
		$ -	$ -
		$ -	$ -
		$ -	$ -
	Total	$ 18,579,216	$ 22,295,060

	Area (sf)	Heating tons		Cooling tons		Cost per Ton Used	Max Tons	Total Cost
RTU	**7,573**				**26**			
Adirondack Bank	7,573	26		23.5	26	$7,742	26	$197,680
WSHP	**67,422**				**187**			
Hotel Saranac	53,112	160		102	160	$644	160	$103,211
Police	14,310	27		21.5	27	$644	27	$17,180
Non-Compatible	**662,770**				**1,861**			
Village Offices	31,492	62		55	62	$11,555	62	$717,967
Rice Furniture	14,224	25		19	25	$11,555	25	$289,652
Madden Transfer	16,218	41		20	41	$11,555	41	$477,617
Owl's Nest Pizza	8,506	33		27.4	33	$11,555	33	$385,175

Blue Moon Café	2,294	12	11.1	12	$11,555	12	$140,204		
Ayers Realty	6,231	21	11.3	21	$11,555	21	$244,971		
Post Office Pharmacy	1,882	5	4.7	5	$11,555	5	$57,006		
Lotus Barbery	8,250	23	16.2	23	$11,555	23	$264,230		
Slove Health Club	7,440	13	10	13	$11,555	13	$150,989		
Key Bank	10,212	35	18.6	35	$11,555	35	$402,123		
Origin Coffee Co	5,636	14	11.5	14	$11,555	14	$161,003		
TF Finnigans	5,208	12	8.5	12	$11,555	12	$140,204		
Blue Line Archery	5,280	15	12.3	15	$11,555	15	$173,329		
Northwind Gallery	2,964	7	4.8	7	$11,555	7	$80,116		
Bear Essentials	8,449	30	26.1	30	$11,555	30	$343,576		
Saranac Free Library	14,674	27	13.3	27	$11,555	27	$315,073		
115 Main	3,740	10	5.3	10	$11,555	10	$114,782		
121 Main	4,169	9	4.9	9	$11,555	9	$104,768		
The Trudeau Building	7,035	24	12.8	24	$11,555	24	$277,326		
Saranac Lab Museum	3,796	13	6.9	13	$11,555	13	$149,448		
Former Paul Smith's dorm	17,350	27	16.3	27	$11,555	27	$317,384		
Adirondack Research	3,144	8	5.3	8	$11,555	8	$91,672		
Dechantal	102,578	187	110	187	$11,555	187	$2,165,455		
Methodist Church	6,939	60	31.4	60	$11,555	60	$694,086		
St Bernard's Church & School	35,068	234	148.1	234	$11,555	234	$2,702,390	2806.4	
St Bernard's Residential	2,740	6	3.2	6	$11,555	6	$69,332		
NYS OPWDD	3,276	5	3.1	5	$11,555	5	$60,087		
Bike Adirondacks	3,828	11	5.7	11	$11,555	11	$123,256		
34 Academy	3,257	7	3.9	7	$11,555	7	$82,428		
Adirondack Audit	5,118	13	7	13	$11,555	13	$149,448		
AscentCare	3,132	7	4.9	7	$11,555	7	$83,968		
Black Mountain Architecture	1,014	3	1.8	3	$11,555	3	$40,058		
14 Academy	1,840	4	2.2	4	$11,555	4	$46,221		
12 Academy	3,334	7	4	7	$11,555	7	$83,968		
Genuine Adirondack	1,218	3	1.8	3	$11,555	3	$39,288		
33 Academy	2,197	5	2.6	5	$11,555	5	$55,465		
Tri Lakes Dentistry	7,035	18	9.8	18	$11,555	18	$210,306		
Surgical Eye Care	11,900	41	21.6	41	$11,555	41	$468,373		
Higher Peaks Glassworks	10,680	27	22.4	27	$11,555	27	$307,370		
Downhill Grill	3,638	19	17.6	19	$11,555	19	$222,631		
ADK ArtRise	12,190	32	30.3	32	$11,555	32	$375,161		
Ampersound	7,840	18	12.8	18	$11,555	18	$211,076		
Waterhole	4,273	14	10	14	$11,555	14	$160,233		
Compass Printing Plus	5,349	12	6.5	12	$11,555	12	$144,056		
Verizon	2,458	6	6.2	6	$11,555	6	$74,724		
Harrietstown Housing Authority	59,094	121	78	121	$11,555	121	$1,393,564		
Petrova Elementary	105,680	358	394	394	$11,555	394	$4,552,772		
Emergency Services	68,900	138	104.8	138	$11,555	138	$1,589,233		
New Construction	**25,000**			**40**					$19,355
APA	25,000	36.4	40	40					

RTU Retrofit

Sample Building:
Address:
Area (sq ft):

Peak Heating (kBtu/hr):	383	26 tons		
Equipment sizing (MBH):	479	32 tons	95.75	gpm
Peak Cooling (tons):	23.5			
Equipment sizing (tons):	27.03		81.08	gpm

			Unit Costs		Subtotal Costs			
Description	**Qty**	**Unit**	**Material**	**Labor**	**Material**	**Labor**	**Total Cost**	**Cost/Ton**
Customer Connection							*$ 83,777*	*$ 2,625*
6" HDPE DR 11	70	LF	$ 11	$ 29	$ 780	$ 1,999	$ 2,778	
Fittings - 30%	1	LS	$ 833	$ -	$ 833	$ -	$ 833	
Bedding	30	LF	$ 15	$ -	$ 450	$ -	$ 450	
Coarse backfill	30	LF	$ 15	$ -	$ 450	$ -	$ 450	
Tracer Wire	60	LF	$ 5	$ -	$ 300	$ -	$ 300	
Compact fill	30	LF	$ 20	$ -	$ 600	$ -	$ 600	
Asphalt	10	LF	$ 250	$ -	$ 2,500	$ -	$ 2,500	
Sidewalk/Curb Restoration	10	LF	$ 1,000	$ -	$ 10,000	$ -	$ 10,000	
Heat Exchanger - 100 gpm	1	EA	$ 9,300	$ 447	$ 9,300	$ 447	$ 9,747	
Inline 1.5 HP Pump, 25 ft	2	EA	$ 10,000	$ 2,500	$ 20,000	$ 5,000	$ 25,000	
Housekeeping Pad	1	EA	$ 50	$ 68	$ 50	$ 68	$ 118	
Inline 5 HP Pump, 60 ft	2	EA	$ 13,000	$ 2,500	$ 26,000	$ 5,000	$ 31,000	
Water Source Equipment							*$ 122,140*	*$ 3,827*
Existing RTU Removal	1	EA	$ -	$ 700	$ -	$ 700	$ 700	
Piping Disconnection	1	EA	$ -	$ 50	$ -	$ 50	$ 50	
Electrical Disconnection	1	EA	$ -	$ 50	$ -	$ 50	$ 50	
Pipe Allowance	1	LS	$ 5,000	$ -	$ 5,000	$ -	$ 5,000	
Unitary WSHP - 20 ton	2	EA	$ 44,000	$ 13,000	$ 88,000	$ 26,000	$ 114,000	
Piping Connections	2	EA	$ 120	$ 150	$ 240	$ 300	$ 540	
Electrical Connections	2	EA	$ 800	$ 100	$ 1,600	$ 200	$ 1,800	
				Total			$ 205,917	
				$/ton:			$ 6,452	

WSHP Retrofit

Sample Building:	Hotel Saranac			
Address:	100 Main St			
Area (sq ft):	50,809			
Peak Heating (kBtu/hr):	2,403	160 tons		
Equipment sizing (MBH):	3,004	200 tons	600.75	gpm
Peak Cooling (tons):	102		353	gpm
Equipment sizing (tons):	118			

			Unit Costs		Subtotal Costs			
Description	**Qty**	**Unit**	**Material**	**Labor**	**Material**	**Labor**	**Total Cost**	**Cost/Ton**
Customer Connection							*$ 107,512*	*$ 537*
6" HDPE DR 11	70	LF	$ 11	$ 29	$ 780	$ 1,999	$ 2,778	
Fittings - 30%	1	LS	$ 833	$ -	$ 833	$ -	$ 833	
Bedding	30	LF	$ 15	$ -	$ 450	$ -	$ 450	
Coarse backfill	30	LF	$ 15	$ -	$ 450	$ -	$ 450	
Tracer Wire	60	LF	$ 5	$ -	$ 300	$ -	$ 300	
Compact fill	30	LF	$ 20	$ -	$ 600	$ -	$ 600	
Asphalt	10	LF	$ 250	$ -	$ 2,500	$ -	$ 2,500	
Sidewalk/Curb Restoration	10	LF	$ 1,000	$ -	$ 10,000	$ -	$ 10,000	
Heat Exchanger - 600 gpm	1	EA	$ 55,800	$ 2,682	$ 55,800	$ 2,682	$ 58,482	
Inline 5 HP Pump, 25 ft	2	EA	$ 13,000	$ 2,500	$ 26,000	$ 5,000	$ 31,000	
Housekeeping Pad	1	EA	$ 50	$ 68	$ 50	$ 68	$ 118	
Inline 15 HP Pump, 60 ft	0	EA	$ 18,000	$ 5,000	$ -	$ -	$ -	
Water Source Equipment							*$ -*	*$ -*
Decommission Cooling Tower	0	EA	$ -	$ 2,144	$ -	$ -	$ -	
Piping Disconnection	0	EA	$ -	$ 50	$ -	$ -	$ -	
Electrical Disconnection	0	EA	$ -	$ 50	$ -	$ -	$ -	
Existing Boiler Removal	0	EA	$ -	$ 2,000	$ -	$ -	$ -	
Piping Disconnection	0	EA	$ -	$ 50	$ -	$ -	$ -	
Electrical Disconnection	0	EA	$ -	$ 50	$ -	$ -	$ -	
Existing MAU Removal	0	EA	$ -	$ 700	$ -	$ -	$ -	
Piping Disconnection	0	EA	$ -	$ 50	$ -	$ -	$ -	
Electrical Disconnection	0	EA	$ -	$ 50	$ -	$ -	$ -	
Existing WSHP Removal	0	EA	$ -	$ 1,221	$ -	$ -	$ -	
Piping Disconnection	0	EA	$ -	$ 50	$ -	$ -	$ -	
Electrical Disconnection	0	EA	$ -	$ 50	$ -	$ -	$ -	
WSHP - 29 MBH / 5 ton	0	EA	$ 3,333	$ 1,250	$ -	$ -	$ -	
Piping Connections	0	EA	$ 120	$ 150	$ -	$ -	$ -	
Electrical Connections	0	EA	$ 50	$ 100	$ -	$ -	$ -	
WSHP - DOAS 10 ton	0	EA	$ 7,000	$ 2,400	$ -	$ -	$ -	
Piping Connections	0	EA	$ 120	$ 150	$ -	$ -	$ -	
Electrical Connections	0	EA	$ 50	$ 100	$ -	$ -	$ -	
				Total			$ 107,512	
				$/ton:			$ 537	

Non-Compatible system Retrofit

Sample Building:	Village Offices		
Address:	39 Main St		
Area (sq ft):	29,219		
Peak Heating (kBtu/hr):	932	62 tons	
Equipment sizing (MBH):	1165	78 tons	233 gpm
Peak Cooling (tons):	55		190 gpm
Equipment sizing (tons):	63		

			Unit Costs		Subtotal Costs			
Description	**Qty**	**Unit**	**Material**	**Labor**	**Material**	**Labor**	**Total Cost**	**Cost/Ton**
Customer Connection							*$ 96,381*	*$ 1,241*
4" HDPE DR 11	70	LF	$ 5.24	$ 23	$ 367	$ 1,610	$ 1,977	
Fittings - 30%	1	LS	$ 593	$ -	$ 593	$ -	$ 593	
Bedding	30	LF	$ 15	$ -	$ 450	$ -	$ 450	
Coarse backfill	30	LF	$ 15	$ -	$ 450	$ -	$ 450	
Tracer Wire	60	LF	$ 5	$ -	$ 300	$ -	$ 300	
Compact fill	30	LF	$ 20	$ -	$ 600	$ -	$ 600	
Asphalt	10	LF	$ 250	$ -	$ 2,500	$ -	$ 2,500	
Sidewalk/Curb Restoration	10	LF	$ 1,000	$ -	$ 10,000	$ -	$ 10,000	
Heat Exchanger - 240 gpm	1	EA	$ 22,320	$ 1,073	$ 22,320	$ 1,073	$ 23,393	
Inline 1.5 HP Pump, 25 ft	2	EA	$ 10,000	$ 2,500	$ 20,000	$ 5,000	$ 25,000	
Housekeeping Pad	1	EA	$ 50	$ 68	$ 50	$ 68	$ 118	
Inline 5 HP Pump, 60 ft	2	EA	$ 13,000	$ 2,500	$ 26,000	$ 5,000	$ 31,000	
Water Source Equipment							*$ 431,223*	*$ 5,552*
Existing Boiler Removal	2	EA	$ -	$ 2,000	$ -	$ 4,000	$ 4,000	
Existing Window AC Removal	25	EA	$ -	$ 50	$ -	$ 1,250	$ 1,250	
Existing Steam Piping Removal	2,600	LF	$ -	$ 4.00	$ -	$ 10,400	$ 10,400	
Existing Fin Tube Removal	1,300	LF	$ -	$ 60	$ -	$ 77,766	$ 77,766	
WSHP - 29 MBH / 5 ton	40	EA	$ 3,333	$ 1,250	$ 133,320	$ 50,000	$ 183,320	
Piping Connections	40	EA	$ 120	$ 150	$ 4,800	$ 6,000	$ 10,800	
Electrical Connections	40	EA	$ 50	$ 100	$ 2,000	$ 4,000	$ 6,000	
4" HDPE DR 11	345	LF	$ 5.24	$ 23	$ 1,808	$ 7,935	$ 9,743	
3" HDPE DR 11	685	LF	$ 3.71	$ 21	$ 2,541	$ 14,248	$ 16,789	
2" HDPE DR 11	2400	LF	$ 1.95	$ 19	$ 4,680	$ 44,880	$ 49,560	
Fittings - 30%	1	LS	$ 22,828	$ -	$ 22,828	$ -	$ 22,828	
1/2" Pipe Insulation	3431	LF	$ 0.66	$ 5.90	$ 2,264	$ 20,243	$ 22,507	
WSHP - DOAS	3	EA	$ 4,000	$ 1,000	$ 12,000	$ 3,000	$ 15,000	
Piping Connections	3	EA	$ 120	$ 150	$ 360	$ 450	$ 810	
Electrical Connections	3	EA	$ 50	$ 100	$ 150	$ 300	$ 450	
Airside Modifications							*$ 220,278*	*$ 2,836*
Supply Ductwork - 14"	330	LF	$ 4.96	$ 30	$ 1,637	$ 9,735	$ 11,372	
Supply Ductwork - 10"	650	LF	$ 3.06	$ 15	$ 1,989	$ 9,555	$ 11,544	
Supply Ductwork - 8"	650	LF	$ 2.86	$ 12	$ 1,859	$ 7,638	$ 9,497	
Supply Ductwork - 6"	1645	LF	$ 1.74	$ 8.44	$ 2,862	$ 13,884	$ 16,746	
1" Insulation - 14" SA	1210	SF	$ 0.26	$ 4.64	$ 318	$ 5,612	$ 5,930	
1" Insulation - 10" SA	1702	SF	$ 0.26	$ 4.64	$ 448	$ 7,896	$ 8,343	
1" Insulation - 8" SA	1361	SF	$ 0.26	$ 4.64	$ 358	$ 6,317	$ 6,675	
1" Insulation - 6" SA	2584	SF	$ 0.26	$ 4.64	$ 680	$ 11,990	$ 12,669	
Volume Damper - 6"	300	EA	$ 41.84	$ 23.67	$ 12,552	$ 7,101	$ 19,653	
Supply Terminals	300	EA	$ 73	$ 33	$ 21,900	$ 9,900	$ 31,800	
Return Ductwork - 14"	330	LF	$ 4.96	$ 30	$ 1,637	$ 9,735	$ 11,372	
Return Ductwork - 10"	650	LF	$ 3.06	$ 15	$ 1,989	$ 9,555	$ 11,544	
Return Terminals	150	EA	$ 49	$ 33	$ 7,350	$ 4,950	$ 12,300	
Additional Retrofit Contingency - 30%	1	LS	$ 50,833	$ -	$ 50,833	$ -	$ 50,833	
				Total			$ 747,882	
				$/ton:			$ 9,629	

New Construction

Sample Building:	New Construction		
Address:	Saranac Lake, NY		
Area (sq ft):	25,000		
Peak Heating (kBtu/hr):	546	36.4 tons	
Equipment sizing (MBH):	683	45.5 tons	136.5 gpm
Peak Cooling (tons):	40		138 gpm
Equipment sizing (tons):	46		

			Unit Costs		Subtotal Costs			
Description	**Qty**	**Unit**	**Material**	**Labor**	**Material**	**Labor**	**Total Cost**	**Cost/Ton**
Customer Connection							*$ 89,490*	*$ 1,967*
4" HDPE DR 11	70	LF	$ 5	$ 23	$ 367	$ 1,610	$ 1,977	
Fittings - 30%	1	LS	$ 593	$ -	$ 593	$ -	$ 593	
Bedding	30	LF	$ 15	$ -	$ 450	$ -	$ 450	
Coarse backfill	30	LF	$ 15	$ -	$ 450	$ -	$ 450	
Tracer Wire	60	LF	$ 5	$ -	$ 300	$ -	$ 300	
Compact fill	30	LF	$ 20	$ -	$ 600	$ -	$ 600	
Asphalt	10	LF	$ 250	$ -	$ 2,500	$ -	$ 2,500	
Sidewalk/Curb Restoration	10	LF	$ 1,000	$ -	$ 10,000	$ -	$ 10,000	
Heat Exchanger - 150 gpm	1	EA	$ 13,950	$ 671	$ 13,950	$ 671	$ 14,621	
Inline 2 HP Pump, 25 ft	2	EA	$ 11,000	$ 2,500	$ 22,000	$ 5,000	$ 27,000	
Inline 5 HP Pump, 60 ft	2	EA	$ 13,000	$ 2,500	$ 26,000	$ 5,000	$ 31,000	
Water Source Equipment							*$ 241,214*	*$ 5,301*
WSHP - 29 MBH / 5 ton	24	EA	$ 3,333	$ 1,250	$ 79,992	$ 30,000	$ 109,992	
Piping Connections	24	EA	$ 120	$ 150	$ 2,880	$ 3,600	$ 6,480	
Electrical Connections	24	EA	$ 50	$ 100	$ 1,200	$ 2,400	$ 3,600	
4" HDPE DR 11	270	LF	$ 5.24	$ 23	$ 1,415	$ 6,210	$ 7,625	
3" HDPE DR 11	530	LF	$ 3.71	$ 21	$ 1,966	$ 11,024	$ 12,990	
2" HDPE DR 11	1,785	LF	$ 1.95	$ 19	$ 3,481	$ 33,380	$ 36,860	
Fittings - 30%	1	LS	$ 17,243	$ -	$ 17,243	$ -	$ 17,243	
1/2" Pipe Insulation	2,586	LF	$ 0.66	$ 5.90	$ 1,707	$ 15,257	$ 16,964	
WSHP - DOAS	3	EA	$ 7,000	$ 2,400	$ 21,000	$ 7,200	$ 28,200	
Piping Connections	3	EA	$ 120	$ 150	$ 360	$ 450	$ 810	
Electrical Connections	3	EA	$ 50	$ 100	$ 150	$ 300	$ 450	
Balance of HVAC System							*$ 118,062*	*$ 2,595*
Supply Ductwork - 14"	265	LF	$ 4.96	$ 30	$ 1,314	$ 7,818	$ 9,132	
Supply Ductwork - 10"	530	LF	$ 3.06	$ 15	$ 1,622	$ 7,791	$ 9,413	
Supply Ductwork - 8"	530	LF	$ 2.86	$ 12	$ 1,516	$ 6,228	$ 7,743	
Supply Ductwork - 6"	1,320	LF	$ 1.74	$ 8.44	$ 2,297	$ 11,141	$ 13,438	
1" Insulation - 14" SA	971	SF	$ 0.26	$ 4.64	$ 255	$ 4,507	$ 4,762	
1" Insulation - 10" SA	1,388	SF	$ 0.26	$ 4.64	$ 365	$ 6,438	$ 6,803	
1" Insulation - 8" SA	1,110	SF	$ 0.26	$ 4.64	$ 292	$ 5,151	$ 5,442	
1" Insulation - 6" SA	2,073	SF	$ 0.26	$ 4.64	$ 545	$ 9,621	$ 10,166	
Volume Damper - 6"	145	EA	$ 41.84	$ 23.67	$ 6,067	$ 3,432	$ 9,499	
Supply Terminals	145	EA	$ 73	$ 33	$ 10,585	$ 4,785	$ 15,370	
Return Ductwork - 14"	265	LF	$ 4.96	$ 30	$ 1,314	$ 7,818	$ 9,132	
Return Ductwork - 10"	620	LF	$ 3.06	$ 15	$ 1,897	$ 9,114	$ 11,011	
Return Terminals	75	EA	$ 49	$ 33	$ 3,675	$ 2,475	$ 6,150	
				Total			$ 448,766	
				$/ton:			$ 9,862.99	

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