



DEPARTMENT OF ADMINISTRATIVE SERVICES

Milwaukee County

TO: All Interested Consultants

SUBJECT: Request for Information – Milwaukee County Community Reintegration Center Geothermal Full Engineering Feasibility Study

PROJECT NAME: CRC Geothermal Engineering Consultant

DATE: October 20, 2026

Milwaukee County is issuing this Request for Information (RFI) to obtain feedback from qualified firms regarding project scope, technical approach, schedule, risk factors, required disciplines, and potential cost ranges associated with a geothermal engineering feasibility study at the Community Reintegration Center.

This RFI is for planning purposes only and does not constitute a solicitation for bids or proposals. Responses will be used to inform and refine a potential future procurement.

I. INTRODUCTION

The Milwaukee County Department of Administrative Services, Facilities Management Division (DAS- FMD) and Community Reintegration Center (CRC) are requesting information for professional consulting services to scope and design a geothermal system replacement for legacy steam and chiller equipment. This replacement system is part of the implementation of the Climate Action 2050 Plan (“CA50”) for Milwaukee County (“County”) government operations as well as the Community Reintegration Center’s Facility Master Plan.

The CA50 outlines strategies for Milwaukee County to 1) achieve carbon neutral operations no later than 2050; 2) adapt and improve the resiliency of County operations and the local community to climate change; and 3) align climate initiatives to the County’s Vision to become the healthiest through racial equity.

Consultant responses are due by 3 p.m. CST on November 20, 2026.

II. BACKGROUND

ABOUT MILWAUKEE COUNTY:

Milwaukee County is one of the few fully incorporated counties in the United States and includes 19 municipalities that range from a large urban center in the City of Milwaukee with 563,561 residents to small villages such as River Hills with a population of 1,597.

Milwaukee County is governed by an elected County Executive and an 18-member elected County Board of Supervisors. Other County elected officials include a Register of Deeds, Treasurer, Comptroller, County Clerk, Clerk of Courts, District Attorney and Sheriff, who, in conjunction with administration, provide a full range of associated governmental services, including but not limited to: law enforcement, in-patient mental health, transit services, highways, courts, corrections, official record keeping, parks and recreation, international airport operations, jail and juvenile detention, public assistance programs, and a world-famous zoo.

In 2019, Milwaukee County launched its first strategic plan in 20 years. This plan explicitly recognizes that racism is a public health crisis and establishes the County's [Vision](#) that: By achieving racial equity, Milwaukee is the healthiest county in Wisconsin.

PROJECT BACKGROUND AND ORIGINATION:

Milwaukee County's Climate Action 2050 Plan directs departments to eliminate fossil fuel use and replace building equipment with low or no emission alternatives. End-of-life system replacement is one of the largest opportunities to do so cost-effectively. This type of large system replacement is also subject to and governed by our Sustainable Design Standards, referenced below. Any large system replacement would be required to meet standards of energy efficiency, emissions control, and climate resilience and adaptation.

The CRC serves the County's incarcerated population and comprises eleven buildings totaling 451,750 sq. ft. The Administration, 600- and 400-bed Dormitory buildings ("South Building") and the Dormitory Building and Boiler House ("North Building") house approximately 1,500 residents, with a maximum occupancy of 1,766. The South Building was built in 1997; the North Building nearly fifty years earlier, in 1946.

CRC's Mission: Promote successful community reintegration by providing programming and resources that comprehensively meet the needs of residents in our care, which support opportunities for positive change.

CRC VISION: We enhance public safety and quality of life through the successful reintegration of residents in our care.

The CRC campus is heated by steam boilers. The South Building is cooled by a chiller and cooling-tower system. The North building has HVAC units with mechanical cooling. The current chiller system is at end of life and has a pending capital project request, and the boiler plant is projected to reach end of life within the next three to five years.

CLIMATE AND OUR BUILDINGS (BUILT ENVIRONMENT)

In recent years, Milwaukee County has recognized the impact our building operations have in addressing and adapting to global climate change. Supporting policy documents include:

- Adopting a [policy](#) that Milwaukee County will support the principles and targets of the Paris Climate Agreement to keep global temperature increases below 2°C (3.8°F);
 - County-wide adoption of the [Sustainable Design Standards](#) governing choices in our building projects and major renovations and replacements.
 - Establishing a [policy](#) to achieving carbon neutrality in Milwaukee County facilities and operations no later than 2050; and
 - [Adopting Milwaukee County's Climate Action 2050 Plan](#); a strategic roadmap on how to achieve carbon neutrality in Milwaukee County facilities and operations no later than 2050
- 1) [Emissions Assessment](#) (June 2023)
 - 2) [Vulnerability Assessment](#) (July 2023)
 - 3) [Milwaukee County Climate Action 2050 \(CA50\) Plan Document](#) (April 2025)

III. RFI RESPONSE REQUIREMENTS

Milwaukee County is seeking industry input to help refine the scope, schedule, budget, and procurement strategy for a potential future geothermal engineering feasibility study at the Community Reintegration Center. Respondents are invited to provide information and recommendations in the areas outlined below.

A. Recommended Project Approach

Describe how you would validate the existing screening-level analysis, evaluate the preferred hybrid cooling-led ground-source heat pump configuration, and compare it with other viable alternatives.

B. Recommended Scope and Deliverables

Describe proposed tasks, investigations, analyses, deliverables, and decision points. Respondents should distinguish essential work from optional or contingent work.

C. Preliminary Fee Estimate

Provide an estimated fee range by task, with major assumptions, anticipated reimbursable expenses, subcontractor costs, and excluded services clearly identified.

D. Schedule Assumptions, Risks, and Dependencies

Provide a realistic timeline, critical-path activities, required County support, site access needs, and potential schedule risks.

E. Relevant Qualifications and Additional Considerations

Share examples of comparable institutional geothermal projects and identify the disciplines needed, such as mechanical engineering, geothermal design, hydrogeology,

controls, and energy modeling.

This request seeks pricing and approach information from firms with experience designing and installing ground-source heat pumps at large campuses such as the CRC. The convergence of two aging systems presents a critical decision point. A like-for-like replacement would continue business as usual (BAU). Alternatively, the County can replace these systems with a renewable, lower-emission option like geothermal that advances its adopted climate goals while remaining cost-competitive.

A screening-level feasibility study has been conducted and determined a geothermal system is economically competitive with BAU replacement. The final deliverables of this study have been appended to this Request.

The screening level analysis found that a Hybrid Cooling-Led ground-source heat pump is the recommended path and likely the most cost effective. It is the only scenario that beat like-for-like replacement on 30-year lifecycle cost. At the same time, it covers the full cooling load and 94% of the heating load. Annually, it cuts campus emissions by roughly 13% and natural gas usage by 41%.

The urgency is rooted in climate and equity goals and in a closing federal funding window: the 30% Investment Tax Credit (ITC) for geothermal projects begins to sunset after 2032, with maximum benefit requiring construction to commence before January 1, 2032. These tax credits are a critical piece of the return on investment of this project.

IV. POTENTIAL SCOPE AREAS FOR FUTURE PROCUREMENT

This RFI is not asking for this section's deliverables; this section is an example of scope items, at a minimum, to include for the Response's Recommended Approach and Fee Estimate.

EXAMPLE TASK 1:

Provide a full engineering feasibility study, including a clear project design, scope and equipment cost estimate to confirm the screening-level findings and advance the project toward design.

Potential Deliverable: Engineering Study with project design, equipment and construction cost estimates.

EXAMPLE TASK 2:

Confirm Cost Saving Measures Identified in Screening Study

- **Reuse of the existing chilled water coils:** Verify the condition and compatibility of the coils in the South Building. The South Building's AHU coils may be reusable with the GSHP, which would avoid their replacement cost.
- **Repurposing the existing 1,800-ft well:** Confirm through testing whether the well on site can be reused, and what the cost savings would be of doing so. If the 1948 well can serve as a production borehole for an aquifer-based system, it could substantially reduce cost

during construction.

- **Additional cost-saving measures as recommended:** At Respondent's discretion, suggest proven, innovative methods to save on costs or combine projects. These could include a deep aquifer well plus traditional earth-battery geothermal configuration, waste heat capture within the buildings, or on-site solar PV as a complement to the geothermal system.

Potential Deliverable: A list of cost saving measures with estimated savings amounts, compared to total estimated project costs, including but not limited to, reuse of existing chilled water coils and repurposing the 1,800 ft well.

EXAMPLE TASK 3:

Design Questions to Resolve and Technical Verification to Perform

- **The viability of a phased approach within the ITC window:** Determine whether the project can be phased (ex. building-by-building) while still commencing construction before the 2032 deadline.
- **Whether the Full Heating premium is worth it:** Determine whether a system based on full heating load would be worth additional cost. More granular design and precise cost estimate can allow decision-makers to more carefully weigh whether the full geothermal system is worth the added cost.
- **Domestic Hot Water capacity:** Examine the campus' full systems and loads, since the screening focused on heating and cooling. There is significant hot water demand on campus that an appropriately sized ground-source heat pump system could meet, as well as waste heat to capture.
- **Add sub-metering to confirm the North and South load split:** Confirm the building-by-building electricity loads. The split is currently assumed to be proportional to floor area, at roughly 69% North and 31% South.
- **Confirmation of the cooling load:** Use the submetering data to tighten the 490 to 530-ton estimate that drives the system sizing in the screening study. The cooling regression in the screening study carries only medium confidence, with an R^2 of approximately 0.64.
- **A performance check.** Confirm the ground-loop performance assumptions, which currently rely on estimates and the 1948 geologic logs.
- **Impact report for the Hunger Task Force Farm Fish Hatchery:** Further study the potential impacts to the fish hatchery and if use of the well would significantly alter the water temperature.

Potential Deliverable: Inclusion of answers to all Task 3's design questions and technical verification in dedicated portion of engineering study final report.

V. GENERAL REQUIREMENTS

- A. The response will conform with all attached documents. All responses should use this RFI and its attachments as the sole basis for the information. The issuance of a written addendum is the only official method through which interpretation, clarification or additional information will be given.

- B. The purpose of this RFI is to provide Milwaukee County with information only on pathways and cost estimates for this project. This RFI will not result in a sole-source selection of a specific supplier, manufacturer or brand. No work is guaranteed from this RFI. Based on a combination of the information provided through this RFI and the project requirements, Milwaukee County will attempt to develop further project action.

VI. RFI SCHEDULE

CRC Geothermal Engineering RFI	
RFI Issuance	October 20, 2026
Virtual Pre Proposal Meeting	October 27, 2026 (9-10am CST)
RFI Final Questions Due	November 03, 2026 (3:00pm CST)
RFI Final Addendum Issued	November 10, 2026
RFI Responses Due	November 20, 2026 (3:00pm CST)

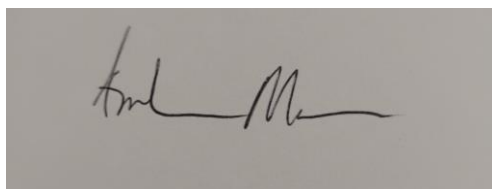
Current anticipated schedule subject to change via Addendum

There will be an optional pre-proposal meeting on Microsoft TEAMS on 10/27/26 at 9 AM. Please email Amber Mose amber.mose@milwaukeecountywi.gov for an invitation.

Please email a PDF version of your response no later than 3 p.m. on Friday, November 20, 2026 to amber.mose@milwaukeecountywi.gov and alex.roberts@milwaukeecountywi.gov. Responses submitted by any means other than email attachment, including via cloud service link, will be rejected.

Please direct any questions about this RFI by 3 p.m. Tuesday, November 3, 2026 to amber.mose@milwaukeecountywi.gov and alex.roberts@milwaukeecountywi.gov. No phone calls please.

Sincerely,

A handwritten signature in dark ink, appearing to read 'Amber Mose', is displayed on a light gray rectangular background.

Amber Mose
Energy Program Manager – Office of Sustainability
Milwaukee County
Department of Administrative Services, Facilities Management Division

Attachments:

1. Community Reintegration Center Geothermal Feasibility Report

A. Roberts, CRC

B. Smith, CRC

A. Kropidlowski, CRC

C. Jewell, CRC

S. Fenceroy, CRC

K. Sullivan, CRC

L. Tardiff, CRC

K. Kastenson, CRC

D. Watson, CRC

S. Hayes, DAS-FMD

G. Helle, DAS-FMD

A. Mose, DAS-FMD

M. Brill, DAS-FMD

ATTACHMENT 1

COMMUNITY REINTEGRATION CENTER GEOTHERMAL FEASIBILITY REPORT

Community Reintegration Center Geothermal Feasibility

Milwaukee County
Environmental Defense Fund
Climate Corps 2026
August 21, 2026



Climate Corps® embeds trained graduate students in organizations to advance climate solutions and accelerate progress toward organizational sustainability goals.

The following report is the result of a 12-week Climate Corps fellowship at Milwaukee County.

Table of Contents

Definitions.....	3
Purpose.....	4
Existing CRC Systems	4
Site Assessment	5
Energy Analysis	5
System Sizing.....	7
Scenarios Modeled.....	8
System Recommendation	9
Emissions and Climate Impact	9
Additional Benefits	10
Recommendation.....	10
Considerations for the Feasibility Study	10
Cost Saving Measures to Confirm	11
Design Questions to Resolve	11
Technical Verification to Perform	11
Appendix – Supporting Information.....	13
Key Modeling Assumptions	13
Potential Geothermal Sites – CRC Map	14

Definitions

Term	Definition
Cooling degree day (CDD)	A measure of how hot a day is, indicating how much air conditioning is needed to keep a building cool (EIA).
Heating degree day (HDD)	A measure of how cold a day is, indicating how much heating is needed to keep a building warm (EIA).
Coefficient of performance (COP)	The units of heating (or cooling) delivered per unit of electricity consumed. A COP of 3.5 means one unit of electricity moves 3.5 units of heat.
Business as usual (BAU)	In this study, a like-for-like replacement of existing gas boilers and chillers at end of life.
Ground-source heat pump (GSHP)	A system that heats and cools by exchanging heat with the earth.
Federal Investment Tax Credit (ITC)	A federal incentive that reimburses a share of qualifying clean-energy project cost.
Net present value (NPV)	The value today of a stream of future costs, discounted to reflect the time value of money.

Background

The County's Climate Action 2050 Plan directs projects to eliminate fossil fuel use and replace equipment with low carbon alternatives. End-of-life system replacement as one of the largest opportunities to do so cost-effectively.

The Community Reintegration Center (CRC) serves the County's incarcerated population with a focus on rehabilitation and accounts for roughly 5% of County-wide emissions. The campus comprises eleven buildings totaling 451,750 sq. ft. The Admin, 600- and 400-bed Dormitory buildings ("South Building") and the Dormitory Building and Boiler House ("North Building") house approximately 1,500 residents, with a maximum occupancy of 1,766. The South Building was built in 1997; the North Building nearly fifty years earlier, in 1946.

The entire CRC campus is heated by steam boilers and has no central cooling system. The South Building is cooled by a chiller and cooling-tower system; the North Building relies on individual window units and a supplemental cooling condenser. The current chiller system is at end of life and has a pending capital project request, and the boiler plant is projected to reach end of life within the next three to five years.

This convergence of two aging systems presents a critical decision point. A like-for-like replacement would continue business as usual (BAU). Alternatively, the County can replace these systems with a renewable, lower-emission option like geothermal that advances its adopted climate goals while remaining cost-competitive.

Purpose

This project, conducted as part of the Environmental Defense Fund Climate Corps Fellowship, evaluates the feasibility of installing a ground-source heat pump to provide heating and cooling in place of the CRC's aging systems. The analysis is a screening-level study that is intended to determine whether geothermal is economically competitive enough with BAU replacement.

The urgency is rooted in climate and equity goals and in a closing federal funding window: the 30% Investment Tax Credit (ITC) for geothermal projects begins to sunset after 2032, with maximum benefit requiring construction to commence before January 1, 2032.

Existing CRC Systems

While the CRC campus consists of eleven buildings, this analysis focuses on the North and South buildings, which represent most of the campus' energy use and where residents spend the majority of their time.

The most important structural consideration is the piece-wise nature of these systems. A single boiler house with three natural gas boilers provides steam to the entire campus for space heating, domestic hot water, and other end uses. The buildings differ in how they distribute that heat: the South Building uses steam-to-hot-water exchangers feeding hot-water coils in its air-handling units (AHUs), while the North Building uses steam radiators. Cooling is also different throughout the campus: the South Building is served by two water-cooled centrifugal chillers plus a cooling tower, while the North Building uses a supplemental cooling condenser and individual mini-split units.

Lastly, the nameplate boiler plant capacity is far greater than the campus's actual estimated peak heating load of approximately 11.9 MMBtu/hr (see Energy Analysis). Although the boiler does serve other loads, the system is still likely significantly oversized.

Table 1. Boiler Plant

Equipment / Role	# Units	Capacity
Bryan water-tube boiler (winter)	2	21,000 MBH ea.
Kewanee fire-tube boiler (summer)	1	16,738 MBH
Total installed plant capacity	3	58,738 MBH

Table 2. Building Systems Summary

Building	Heating	Cooling	Distribution	Known Issues
North	Steam boilers	Window units + supplemental condenser (no central cooling)	Steam radiators (constant-volume)	No central cooling; constant-volume distribution is inefficient
South	Steam boilers	Two 380-ton water-cooled chillers + cooling tower	Steam-to-hot-water exchangers feeding AHU hot-water coils (variable-volume)	Chiller system reaching end of life

Site Assessment

The Community Reintegration Center is located in Franklin, WI, on a 451,751 sq. ft. campus. According to FEMA flood maps, the site is not in a flood hazard zone.

Geology is a key driver of both feasibility and cost. In 1948, a well was drilled on-site to provide drinking water, and the drilling documents provide geologic data to a depth of 1,800 feet. Because Wisconsin's soil and rock composition varies considerably, the existence of these logs is a genuine site advantage. These logs provide substantial insight into subsurface conditions and can reduce or eliminate the need for a test well. The well is no longer used for drinking water and now serves an adjacent fish hatchery, which opens the possibility of repurposing it as a borehole for an aquifer-based GSHP system.

Candidate drilling zones have been mapped on the campus (See Appendix). The available areas are located adjacent to the boiler house and chiller plant.

Energy Analysis

The campus heating and cooling loads were isolated using degree-day regression analysis on the 2022 to 2024 electricity and natural gas data from EnergyCAP, paired with daily climate data from the Wisconsin State Climatology Office for Milwaukee Mitchell Airport, the closest weather station to the CRC. This

method regresses monthly energy use against heating and cooling degree days to separate the weather-driven loads from the non-weather baseload.

Heating. Heating degree days explain 85% of the variance in natural gas use, which allows for confidence in the heating load estimate. The regression was extrapolated to ASHRAE 99.6% design conditions to estimate the peak heating load, which is approximately 11.9 MMBtu/hr. This value was used to size the full geothermal system.

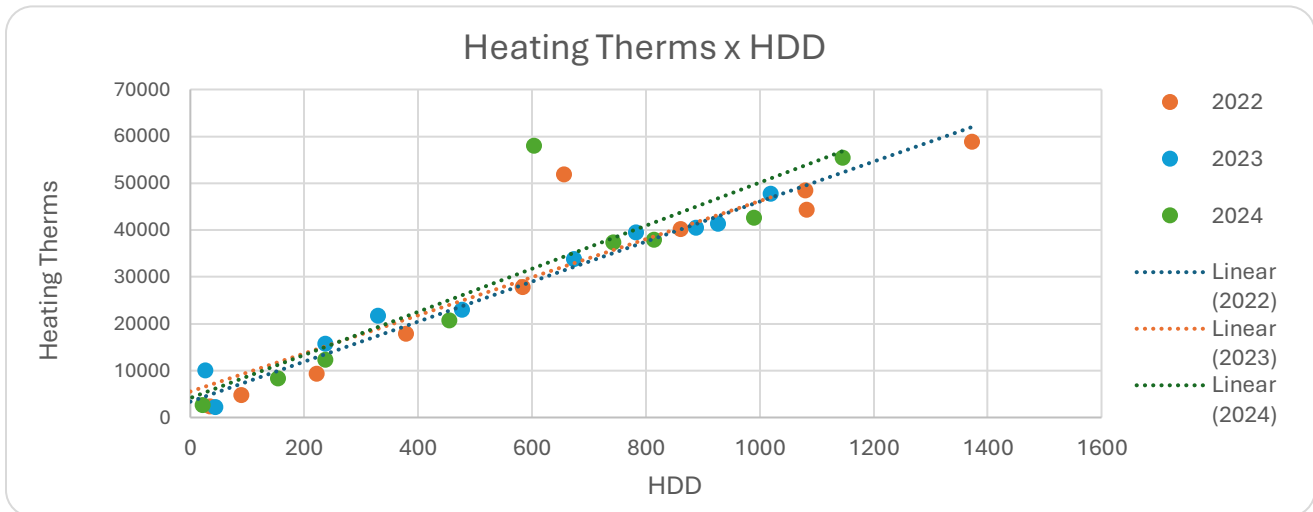


Figure 1. Relationship between heating therms and heating degree days.

Cooling. The same method was applied to the electricity data, but it produced a weaker fit. Cooling degree days explain 64% of the variance. This is likely because whole-building electricity serves many end uses at once, and these cannot be cleanly attributed to the chillers from a single meter. The estimate was instead anchored to the observed peak cooling month and adjusted for chiller efficiency and a peak-demand multiplier. This gives a peak cooling load of approximately 490 to 530 tons. This estimate carries medium confidence and was used to size the hybrid geothermal system. Sub-metering in a later phase would be required to confirm it.

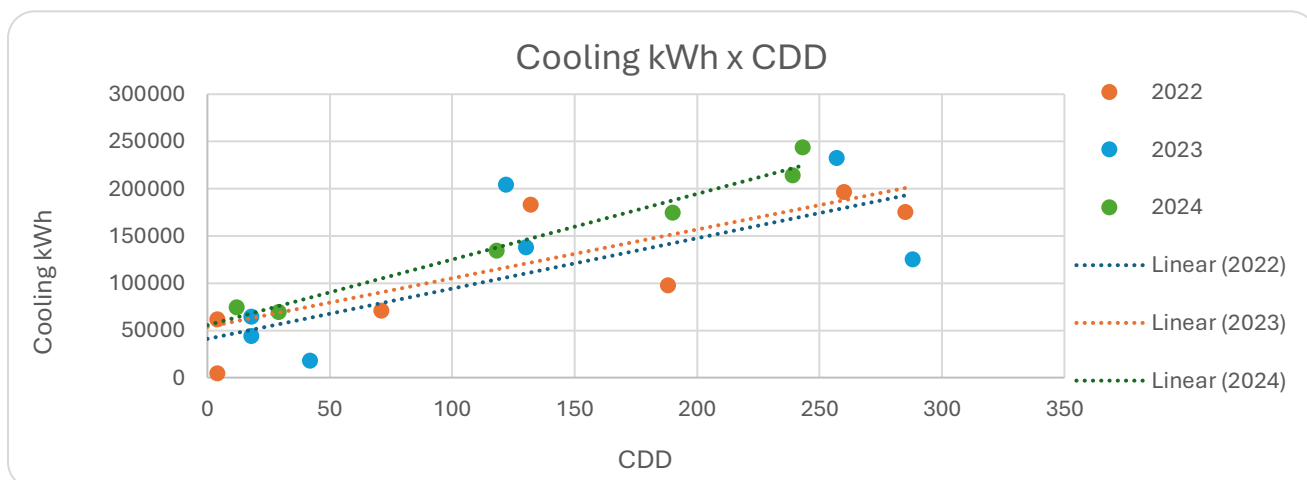


Figure 2. Relationship between cooling kWh and cooling degree days.

System Sizing

A load duration curve, which sorts daily loads from highest to lowest across the year, translates these loads into system-sizing options. The curve shows that a 500-ton hybrid system covers approximately 94% of the annual heating load and the full cooling load. A 1,000-ton system is required to cover 100% of the heating peak. This is why full heating coverage is disproportionately expensive: covering the last 6% of the load requires roughly doubling the system capacity. This trade-off is the central to determining the most cost-effective option.

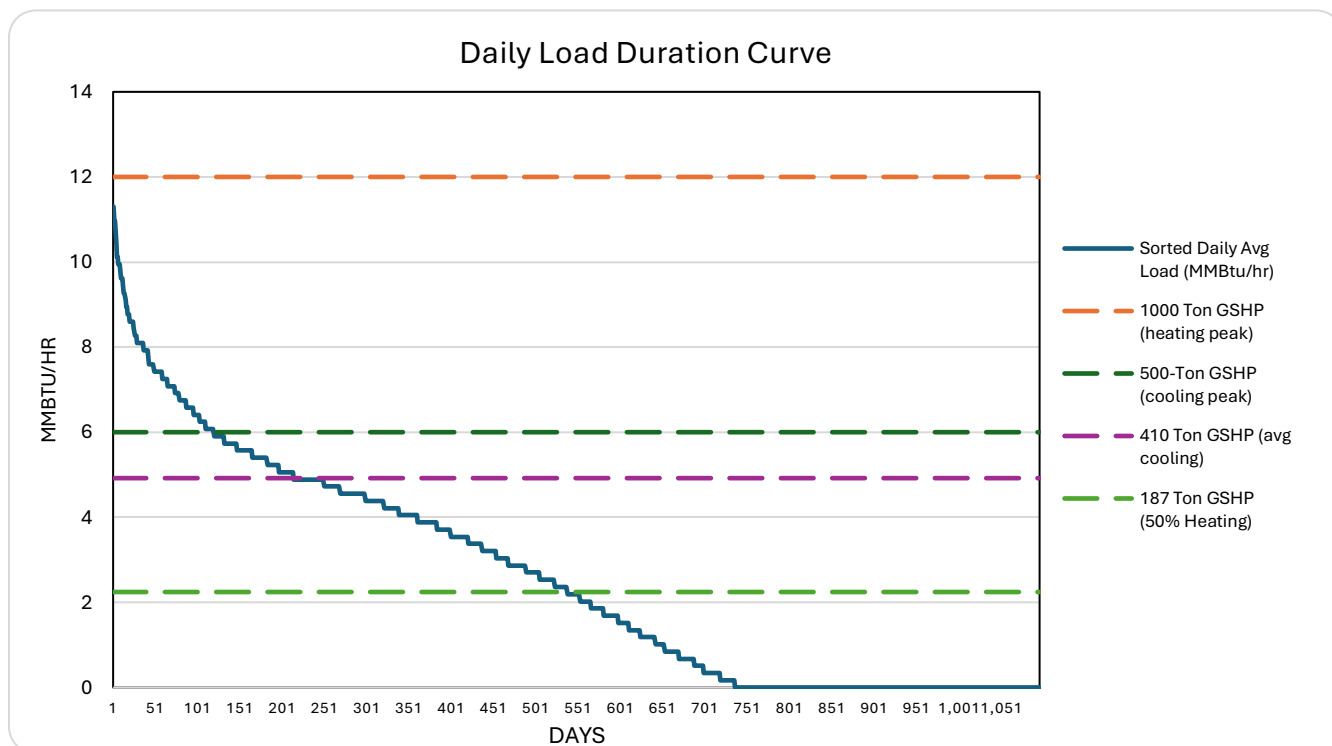


Figure 3. Estimated daily load duration curve for CRC's 2022-2024 natural gas usage. The area under each horizontal line represents the percentage of annual heating load covered by a system.

Lifecycle Cost Assessment

An excel-based screening model was developed to conduct a financial analysis and lifecycle cost assessment using a 30-year net present value (NPV) lifecycle cost framework. All costs, including capital, energy and maintenance, are discounted to present value so the three options can be compared on the same basis. This was the primary analysis. The same energy escalation, demand and emissions assumptions and parameters were applied to both sides. Parameters were modeled with a low, base and hi case. Low represents a case that is unfavorable to the feasibility of a geothermal and hi represents a case that is favorable to geothermal. The results presented are established from the base case.

Existing equipment was cost estimated using RSMeans data and internal capital funding requests. The deep well aquifer geothermal used to model and cost estimate these scenarios is Darcy technology. Based on a performance estimate provided by Glacier group, three wells would provide enough capacity to serve the campus' full cooling load and were used for the hybrid scenario. Four wells would serve the campus' full heating and cooling load and were used to model the full system costs.

Scenarios Modeled

- **BAU (Business as Usual):** A like-for-like replacement of the gas boilers and chiller system as they reach end of life. This scenario installs new gas boilers and a new chiller system, including replacement of the three natural gas boilers, two chillers, cooling tower and steam infrastructure.
- **Hybrid Cooling-Led GSHP (recommended):** A ground-source heat pump of approximately 500 tons, sized to meet the full cooling load and 94% of the heating load. A small gas boiler is retained to cover the peak heating load on the coldest days.
- **Full Heating GSHP:** A system of approximately 1,000 tons, sized to meet 100% of the heating peak. This scenario eliminates gas heating entirely.

Table 3. 30-year Lifecycle Cost Results (NPV, Base Case)

	BAU	Hybrid Cooling	Full Heating GSHP
<i>Gross Capital Cost</i>	\$10,338,000	\$13,978,400	\$17,219,300
<i>ITC Value</i>	\$0	\$3,993,720	\$5,165,790
<i>Capital Cost (net ITC)</i>	\$10,338,000	\$9,984,680	\$12,053,510
<i>Year-1 Operating Cost</i>	\$328,264	\$261,148	\$249,587
<i>30-yr Lifecycle Operating Cost</i>	\$8,649,272	\$7,113,447	\$6,864,245
<i>30-yr Lifecycle Cost (NPV)</i>	\$19,333,243	\$17,536,270	\$19,391,009

Table 4. 30-year Lifecycle Cost Comparison to BAU (NPV, Base Case)

	Hybrid Cooling	Full Heating GSHP
<i>NPV savings vs. BAU</i>	\$1,796,973	-\$57,766 (premium)
<i>Year-1 operating savings vs. BAU</i>	\$67,116	\$78,677
<i>Lifecycle operating savings vs BAU</i>	\$1,535,825	\$1,785,027

System Recommendation

The Hybrid Cooling-Led scenario is the only option that beats BAU on 30-year lifecycle cost. It saves approximately \$1.8 million. Three factors drive this result. First, the 30% ITC is worth nearly \$4M, which brings the Hybrid net capital cost slightly below that of BAU. As such, the Hybrid costs less than BAU once the credit is received. Second, ground source heat pumps are estimated to save around 40% in maintenance costs. These savings combined with reduced natural gas expenditures; the hybrid system would likely result in \$50,000 to \$70,000 in annual operating savings that compound over the analysis period. Third, at year 30, BAU faces another full boiler and chiller replacement. The GSHP borefield has a lifespan of 50 or more years, so it does not require this replacement. Only minimal equipment, such as the heat pumps, would need replacement.

The Full Heating scenario, on the other hand, essentially ties BAU. The difference is roughly \$58K, which is nominal at this high level of analysis. The additional well and heat pump equipment add roughly \$3M in net capital to cover only the last 6% of the heating load. This is why the Hybrid is recommended over Full Heating, even though Full Heating eliminates slightly more emissions.

A 60-year view was also modeled. It is not the primary analysis. Over 60 years, the GSHP advantage roughly doubles, because BAU incurs a second full replacement cycle that the geothermal borefield avoids. The 30-year figures remain the central basis for the recommendation.

Emissions and Climate Impact

Beyond cost, the recommended system advances the County's climate commitments. The Climate Action 2050 Plan already commits the CRC to electrifying the boiler plant by 2030 and to significantly reducing campus natural gas use by 2035. A hybrid geothermal system is a direct way to meet those commitments, and it does so at a point when the equipment is being replaced anyway.

Table 5. Hybrid System Emission Impact

	Result
<i>Annual CO₂ emissions (Hybrid)</i>	706 t/yr, vs. 1,513 t/yr for BAU
<i>Lifetime CO₂ avoided (30 yr, grid-decarb adjusted)</i>	32,985 t
<i>Cost per ton CO₂ avoided</i>	-\$54 /t (net saving, not net cost)

The negative cost per ton is notable. The Hybrid system avoids emissions while saving money, while most emission reduction measures come at a premium. Over 30 years, the avoided emissions total roughly

32,985 metric tons of CO₂. To put that in perspective, it is equivalent to driving the perimeter of Wisconsin more than 53,000 times.

Additional Benefits

- **One system for heating and cooling.** A single integrated system replaces the separate boiler and chiller plants.
- **Protection from natural gas price volatility.** Shifting loads from gas to electricity reduces the campus's exposure to commodity price swings.
- **More resources for residents and programming.** The Hybrid avoids full system replacement at year 30, reduces the rising O&M spent running aging equipment, and eliminates the need for 24/7 boiler operator staffing. Each of these frees up operating budget.
- **Potential education opportunity.** Maplewood Middle School in Menasha, WI operates a geothermal system and uses it as a visual learning tool rather than only a mechanical system. It presents an educational opportunity relevant to the CRC's rehabilitation mission.
- **Safer to operate.** Eliminating high-pressure steam and on-site combustion removes the hazards that come with them, resulting in a cleaner and healthier environment for residents and staff

Recommendation

The screening analysis finds that a Hybrid Cooling-Led ground-source heat pump is the recommended path and likely the most cost effective. It is the only scenario that beats like-for-like replacement on 30-year lifecycle cost, saving approximately \$1.8 million. At the same time, it covers the full cooling load and 94% of the heating load. Annually, it cuts campus emissions by roughly 13% and natural gas usage by 41%.

Recommended action: the County should commission a full engineering feasibility study to confirm these screening-level findings and advance the project toward design. This is a strong recommendation to advance the project by having a deeper study produce a clear project design, scope and cost estimate.

There are critical reasons that support pushing this project forward now. 1) Existing equipment is reaching end of life. Both the boiler and chiller are already scheduled for replacement within 3 to 5 years. The decision is therefore which technology to install, not whether to spend the money. 2) The federal tax credit is available now. To receive the maximum benefit, construction must commence before January 1, 2032. 3) It advances County climate goals. The project directly supports the 2030 and 2050 commitments, and it does so at a point when the equipment is being replaced anyway. 4) It aligns with the existing CRC master plan. The master plan supports anticipatory planning instead of reactive to avoid like-for-like replacement, directing staff to consider alternative systems. A geothermal system would also advance the goal to transition away from steam.

Considerations for the Feasibility Study

This screening study is intended to scope the next phase. The items below identify where a full engineering feasibility study should focus. They fall into three groups: savings this screening flagged but could not confirm, design questions the study would resolve, and technical work the study would perform. They are offered as direct input to the RFP scope.

Cost Saving Measures to Confirm

- **Reuse of the existing chilled water coils, approximately \$500K in potential savings.** The South Building's AHU coils may be reusable with the GSHP, which would avoid their replacement cost. This requires field verification of the coil condition and compatibility.
- **Repurposing the existing 1,800-ft well, approximately \$1M in potential savings.** If the 1948 well can serve as a production or injection borehole for an aquifer-based system, it could substantially reduce drilling cost. The well should be tested to confirm performance as well as further study the potential impacts to the fish hatchery and if use of the well would significantly alter the water temperature.
- **Additional cost-saving measures.** These can include an aquifer (Darcy) well plus traditional geothermal configuration or on-site solar PV as a complement to the geothermal system.

Design Questions to Resolve

- **The viability of a phased approach within the ITC window.** The study would determine whether the project can be phased (ex. building-by-building) while still commencing construction before the 2032 deadline.
- **Whether the Full Heating premium is worth it.** More granular design and precise cost estimate can allow decision-makers to more carefully weigh whether the full geothermal system is worth the added cost

Technical Verification to Perform

- **Domestic Hot Water capacity.** An examination of the campus' full systems and loads should be conducted as this screening focused on heating and cooling. There is also significant hot water demand on campus that a ground-source heat pump system could meet.
- **Sub-metering to confirm the North and South load split.** The split is currently assumed to be proportional to floor area, at roughly 69% North and 31% South. Metered data would confirm the building-by-building loads.
- **Confirmation of the cooling load.** The cooling regression carries only medium confidence, with an R^2 of approximately 0.64. Sub-hourly load data would tighten the 490 to 530-ton estimate that drives the system sizing.
- **A performance check.** This would confirm the ground-loop performance assumptions, which currently rely on the consultant's estimate and the 1948 geologic logs.

Appendix – Supporting Information

Key Modeling Assumptions

Assumption	Basis
Boiler	80% efficiency
Heat Pump	3.5 COP -> 350% efficiency; one unit of electricity creates 3.5 units of heat
GSHP Annual Maintenance	40% savings used in place of maintenance estimate (highly likely conservative due to aging steam infrastructure & 24/7 labor requirements; savings in model do not include labor costs)
Debt Service	GSHP is modeled with taxable bonds (5.5% interest) due to potential issues with using tax credits on tax-exempt bonds. Existing equipment is financed with tax-exempt bonds (4.5%)
Federal Incentive (ITC)	30% tax credit used in financial calculations. Although there is a possibility of receiving a bonus adder of 10% if domestic content requirements are met. This would bring the total tax rebate to 40%.
Existing Equipment Costs	Set to base case in financial model, which is likely a conservative estimate of replacement costs. Cost estimation was based on existing chiller replacement capital request and RMSmeans data.
Geothermal System Costs	Cost estimates were based on quotes from a Glacier group consultant.
Soft Costs	County soft cost multipliers were added to cost estimate of each system. 44% was used based on ranges observed in county cost estimation documents. Could be conservative but impacts all three projects equally.
Heating and Cooling Loads	Estimated from energy data; medium confidence in cooling load due to lack of submetering

Potential Geothermal Sites – CRC Map

