Statement of Project Objectives

Northwestern Michigan College
Northwestern Michigan College Campus Geothermal Project

A. Project Objectives

The overall goal of this project is to replace Northwestern Michigan College's ("the College" or "NMC") aging and inefficient steam boiler system, which serves six central buildings on our main campus, with a sustainable ground-source geothermal exchange system in effort to reduce the College's carbon footprint (by offsetting fossil fuels with renewable energy) and demonstrate community and regional leadership in energy sustainability practices.

Project objectives by budget period are as follows:

- Budget Period 1 Objective: Procure engineering design services, develop preliminary design, conduct proposed wellfield testing, data submission, finalize system design, and procure construction manager
- Budget Period 2 Objective: Begin installation of geothermal vertical closed-loop wellfield
- Budget Period 3 Objective: Complete installation of wellfield, site restoration, and case study

B. Technical Scope Summary

The scope of work under this grant is limited to system design, installation of the borefield and vault, and other modifications to the extent funding remains. Note: Other infrastructure upgrades are required to fully implement the system, but excluded from the scope of this grant such as installation of new temperature controls, conversion of our mechanical room, electrical upgrades, piping, and equipment upgrades in each of the six buildings served by the system.

Budget Period 1 Scope of Work: The College will procure third-party design engineering services to develop the design of the geothermal exchange system based on feasibility testing. Once testing is completed, the College will submit test data to GDR. After design is finalized, the College will request proposals for construction management services, review bids, and award the project during this budget period.

Budget Period 2 Scope of Work: Installation of the geothermal borefield will commence during this period. This includes the installation of approximately 300 wells, 300-500 feet deep, in a vertical closed loop system. The ideal proposed location is beneath a central parking lot (Cedar Lot) on campus.

Budget Period 3 Scope of Work: Installation of the geothermal borefield and vault will be completed during this period, along with restoration of Cedar Lot and the development and promotion of a written case study.

C. Tasks To Be Performed

Budget Period 1

Task 1.0: Procure engineering design services.
Task Summary: Under this task, the College will draft and issue a request for proposal for design engineering services. Following a 3 or 4 week bid period, the College will analyze bids, and select a design firm subject to board approval.
Milestone 1.1 Draft a request for proposal for engineering design services
Milestone 1.2 Solicit and analyze bids, make selection, and prepare a recommendation for the Board of Trustees
Milestone 1.3 Gain Board of Trustees approval
Milestone 1.4 Execute design contract

Task 2.0: Complete preliminary design and perform feasibility testing
Task Summary: The College will rely on an engineering design firm to complete a preliminary design of the proposed geothermal system and any ground or system testing required to ensure feasibility.
Milestone 2.1 Preliminary testing and system design completed by third-party
Milestone 2.2 Hire well driller to determine thermal properties of wellfield location
Milestone 2.3 Drill a vertical test well in the proposed area to determine thermal conductivity, thermal diffusivity, and undisturbed temperature of the ground in accordance with ASHRAE and/or IGSHPA standards. These thermal properties will serve as inputs for determining the required wellfield loop length.
Milestone 2.4 Test well report including the data referenced in the previous milestone is organized and uploaded/submitted to Geothermal Data Repository (GDR) by third-party and/or NMC.

Task 3.0: Refine and finalize design based on wellfield test data
Task Summary: Finalize the design of the geothermal system.
Milestone 3.1 Using the wellfield test data, engineering consultants conduct design modeling to refine expectations on long-term energy performance.
Milestone 3.2 Final design completed by third-party

Budget Period 1 Go/No-Go Decision Point: DOE and NMC approval of design

Task 4.0: Prepare project bid documents

Task 4.0 Summary: In conjunction with engineering design firm, prepare bid documents for the project seeking the services of a construction manager.
Milestone 4.1 Bid documents prepared

Task 5.0: Procure construction management services
Task 5.0 Summary: In conjunction with engineering firm, procure a contractor or construction manager to deliver the project.
Milestone 5.1 Solicit and analyze bids, make selection, and prepare a recommendation prepared for Board of Trustees
Milestone 5.2 Gain Board of Trustees approval
Milestone 5.3 Execute contract

Budget Period 2 Go/No-Go Decision Point: Completion of 40% of bore-field wells.

Budget Period 2

Task 6.0: Demolition of Cedar Lot and borefield site preparation
Task 6.0 Summary: This task captures the demolition and site preparation for the wellfield with approximately 300 wells that will serve the geothermal exchange system.
Milestone 6.1 Demolition of parking lot
Milestone 6.2 Site prepared and ready for installation of wells

Task 7.0: Installation of borefield and vault
Task 7.0 Summary: Install approximately 300 wells in a closed vertical loop system. The wells will be approximately 300-500 feet deep. This task also includes installation of the underground valve vault required for the system.
Milestone 7.1 Installation of approximately 300 wells
Milestone 7.2 Installation of underground valve vault

Budget Period 3

Task 8.0: Restoration of Cedar Lot
Task 8.0 Summary: Restore the parking lot over the borefield
Milestone 8.1 Parking lot restored

Task 9.0: Case Study
Task 9.0 Summary: Develop and promote a written case study to share insights and lessons learned.

Milestone 9.1 The College will, with assistance from our third-party engineers, develop a written case study covering design considerations, geological properties, wellfield capacity, expected energy savings and carbon impact, and lessons learned. The College will post this study on its sustainability website [https://www.nmc.edu/sustainability] and share it with the Department of Energy/GDR, peer institutions, regional media outlets, and sustainability forums such as Michigan Sustainable Business Forum (MISBF) to help promote geothermal for other businesses or entities considering a central campus geothermal system in a heating-dominated climate.

END OF PROJECT GOAL: By the end of this project, the College will have fully designed and implemented some of the most critical elements of the distributed geothermal system.

D. Project Management and Reporting

Reports and other deliverables will be provided in accordance with the Federal Assistance Reporting Checklist following the instructions included therein.

Additional deliverables as indicated in the task/subtask descriptions include the following: None

Milestone Summary Table

Recipient Name:	Northwestern Michigan College
Project Title:	Northwestern Michigan College Campus Geothermal Project

Task Number	Task or Subtask (if applicable) Title	Milestone Type (Milestone, Go/No-Go Decision Point, End of Project Goal)	Milestone Number* (Go/No-Go Decision Point Number)	Milestone Description (Go/No-Go Decision Criteria)	Milestone Verification Process (What, How, Who, Where)	Anticipated Date (Months from Start of the Project)	Anticipated Quarter (Quarters from Start of the Project)
1.0	**Procure Engineering Design Services**						
1.0	Prepare RFP	Milestone	1.1	Draft a request for proposal for engineering design services	Completed RFP	2	1
1.0	Bidding	Milestone	1.2	Solicit and analyze bids, make selection, and prepare a	Memo of recommendation prepared for Board approval	4	2

				recommendation for the Board of Trustees			
1.0	Board approval	Milestone	1.3	Gain Board of Trustees approval	Approval of firm by Board of Trustees	4	2
1.0	Board approval	Milestone	1.4	Execute design contract	Executed contract	4	2
2.0	**Complete preliminary design and perform feasibility testing**						
2.0	Preliminary Design	Milestone	2.1	Preliminary testing and design completed by third party	Preliminary testing and design completed	6	3
2.0	Hire Well Driller	Milestone	2.2	Hire Well Driller	Well driller under contract	7	3
2.0	Wellfield Testing	Milestone	2.3	Feasibility testing completed by third party	Vertical test well drilling completed and testing data gathered by engineering consultants.	7	3
2.0	Test Data Submission to GDR	Milestone	2.4	Test well report submitted to GDR	Data is posted to GDR, either by NMC or directly by engineering consultants.	7	3
3.0	**Refine and finalize design**						
3.0	Modeling based on test data	Milestone	3.1	Engineers conduct modeling to determine final design considerations	Modeling completed and provided to NMC in a report	8	3
3.0	Finalize design	Milestone	3.2	Final design completed by third party	Final design is completed	9	3
		Go/No-Go Decision Point	Go/No-Go # 1	DOE and NMC approval of design	DOE and NMC approval of design	9	3
4.0	**Prepare project bid documents**						
4.0	Project Bid documents	Milestone	4.1	Prepare bid documents	Bid documents prepared	10	4
5.0	**Procure construction management services**						
5.0	Bidding	Milestone	5.1	Solicit and analyze bids, make selection, and	Recommendation memo to Board of Trustees	12	4

				prepare a recommendation for Board of Trustees			
5.0	Board approval	Milestone	5.2	Gain Board of Trustees approval	Board approval	12	4
5.0	Board approval	Milestone	5.3	Execute contract	Execute contract	13	4
6.0	**Demolition of Cedar Lot and borefield site preparation**						
6.0	Cedar Lot demolition	Milestone	6.1	Demolition of Cedar lot	Recommendation memo to Board of Trustees	18	6
6.0	Site preparation	Milestone	6.2	Site prepared for installation of wells	Site prepared and readied for installation of wells	18	6
		Go/No-Go Decision Point	Go/No-Go # 2	Completion of 40% of wells for bore-field	NMC to submit record of completion of wells to DOE	21	7
7.0	**Installation of Borefield and Vault**						
7.0	Borefield installation	Milestone	7.1	Installation of wells	Installation of approximately 300 wells comprising the borefield	24	8
7.0	Valve vault installation	Milestone	7.2	Installation of underground valve vault	Installation of underground valve vault	24	8
8.0	**Restoration of Cedar Lot**						
8.0	Restoration of Cedar Lot	Milestone	8.1	Parking lot restored	Parking lot restored	26	9
9.0	**Case Study**						
9.0	Case Study	Milestone	9.1	Written Case Study	Written case study posted on the College's website and distributed to DoE, media, peer institutions, and other sustainability forums.	28	10