

Statement of Project Objectives
City of Ann Arbor
District Geothermal Design and Deployment to Equitably Decarbonize Low
Income Neighborhoods in Ann Arbor

A. Project Objectives Budget Period 1 - Planning and Design

The project team proposes undertaking seven (7) main tasks, all geared toward implementing a geothermal district heating and cooling systems that reduces thermal heating and cooling load by at least 75%, eliminates local energy burden, reduces greenhouse gas emissions by 40%, and establishes a framework for how to advance local, family-sustaining jobs in the climate field.

Project Objectives: The Project team has one goal and four shared objectives:

Goal: Design and implement a geothermal district heating and cooling system that reduces thermal heating and cooling load by 75% in the project area, significantly helping the Bryant neighborhood become the first decarbonized existing low-income neighborhood in North America while improving the quality of life and health outcomes of existing and future residents.

To meet this goal, by Fall 2024, the team will:

- **Objective 1:** design a district geothermal heating and cooling system that reduces thermal heating and cooling load by 75% and greenhouse gas emissions by 40%.
- **Objective 2:** design a district geothermal system that eliminates energy burden in a frontline, Justice40 neighborhood.
- **Objective 3:** create a strategy for scaling up good paying, family-sustaining jobs necessary to replicate this project in other areas of the City, region, and state.
- **Objective 4:** create a replicable model of both community engagement and geothermal design that can be scaled throughout the City and region.

B. Project Scope of Work Summary

Project Scope of Work Summary: The project team will undertake seven (7) main tasks:

1. Steering committee formalization.
2. Regular community-designed public engagement activities, including hiring two paid interns from the neighborhood fluent in Spanish or Arabic to facilitate engagement.
3. Conduct a detailed hourly load profile analysis for current and projected future natural gas and electricity usage for all sites considered for the geothermal district heating and cooling system. Use analysis to size, locate, and price the geothermal solution. Use the same data to quantify Green House Gas (GHG) reductions, energy savings, indoor air quality benefits, and low-cost energy efficiency improvements.

4. Co-create a workforce development plan with residents, labor representatives, and professional societies.
5. Develop draft socio-techno-economic model for potential geothermal system(s). Define the ownership structure for system(s) and lifetime operations and maintenance plans.
6. Finalize socio-techno-economic model and community-scale geothermal design.
7. Submit final deliverables and prepare down selection documentation.

At the end of Budget Period 1, the project team will have at least one, and potentially two viable community geothermal designs for reducing thermal heating and cooling load by 75%, greenhouse gas emissions by 40%, and eliminating energy burden in the project area, designs that have been created through robust community engagement and technical input. Geothermal potential will be validated, environmental and permitting needs identified, a robust socio-techno-economic model developed, and a local workforce development strategy created.

C. Tasks To Be Performed

Budget Period 1 Planning, Engagement, and Design

TASK 1.0: Steering Committee Formalization (M1)

Task Summary: Formalize project steering committee and commence regular project meetings. Executive committee composed of engagement, workforce, and analysis leads to meet weekly. Full steering committee to meet biweekly.

Milestone 1.1: Weekly project meetings.

Milestone 1.2: Detailed (living) workplan revisited and revised as needed.

TASK 2.0: Monthly Community-Designed Public Engagement Activities (M1-M12).

Task Summary: Creation of a public engagement strategy that includes the hosting of at least monthly community-designed public engagement activities to solicit feedback on needs and desires related to community heating and cooling. Includes hiring engagement leads from the neighborhood and administering design charettes with residents.

Subtask 2.1: Engagement Strategy refined based on public input (M1-M2).

Subtask Summary: Engagement strategy created outlining monthly events, modes, mediums, and messengers to equitably engage with residents.

Milestone 2.1.1: Engagement strategy created.

Subtask 2.2: Hire two community engagement interns with Spanish/Arabic language skills (M2)

Subtask Summary: Recruit, interview, and hire two neighborhood residents to assist with public

engagement. Recruit folk with diverse language skills to enable communication with all residents.

Milestone 2.2.1: Two community engagement specialists hired.

Subtask 2.3: Host two community-led design charettes. (M2-M4)

Subtask Summary: Host two community-led design charettes to understand community centered opportunities and constraints. Use public charettes to collaboratively determine metrics of success to use in evaluating project pathways and impacts.

Milestone 2.3.1: At least 40 unique individuals given input into project, including feedback on potential design(s)

Milestone 2.3.2: Resident-centered metrics of project success created.

Subtask 2.4: Ongoing community engagement (M3-M11)

Subtask Summary: Conduct additional activities as outlined in engagement strategy, including working with residents to determine future energy opportunities and hosting at least monthly events.

TASK 3.0: Conduct Detailed Assessment of Existing Infrastructure and Energy Load Profile Analysis for all Sites in Target Geography. Use Analysis to Size, Locate, and Price Geothermal Solution(s) and Use Data to Quantify GHG Reductions, Energy Savings, Indoor Air Quality Benefits, and Efficiency Improvement Opportunities. (M1-M9)

Task Summary: Conduct all technical design, engineering, and economic analysis necessary to validate feasibility of proposed designs and generate district geothermal models for the community's consideration. Ensure results quantify greenhouse gas reduction potential, energy savings, air quality benefits, and potential energy efficiency improvement opportunities.

Subtask 3.1: Meet with existing Bryant Decarbonization project team (M1)

Subtask Summary: Meet with Bryant Decarbonization project team to gather existing energy usage information available for the neighborhood via a separate, ongoing project.

Subtask 3.2: Compile detailed information on demographics, power infrastructure type and quality, rate and tariff structures, and projected future energy investments. (M1-M3)

Subtask Summary: Compile requisite non-energy usage information needed to build model.

Subtask 3.3: Inventory existing HVAC systems for homes and commercial buildings. (M2-M4)

Subtask Summary: Compile detailed information on HVAC systems for at least 25% of units to be included in district geothermal design.

Subtask 3.4: Build existing energy usage and greenhouse gas emissions model. (M3-M4)

Subtask Summary: Integrate data from previous tasks into an energy usage and greenhouse gas emissions model for the geographical area to be served by proposed geothermal system.

Milestone 3.4.1: Creation of existing energy usage and greenhouse gas emissions model.

Subtask 3.5: Assess energy, cost, and GHG reduction associated with efficiency improvements and a switch to geothermal. (M4-M5)

Subtask Summary: Estimate the energy, cost, and reduction associated with a switch to geothermal within the target geography.

Subtask 3.6: Assess impact of integrating renewable energy and other beneficial solutions into work to understand cost and carbon reduction potential (M4-M5)

Subtask Summary: Integrate information on energy saving opportunities, beneficial electrification, and renewable energy potential compiled from a separate project in Bryant to estimate the potential energy efficiency savings of a transition to geothermal PLUS deep energy efficiency improvements, electrification, and onsite solar deployment.

Milestone 3.6.1: Updated energy usage and greenhouse gas emissions model.

Milestone 3.6.2: Upload energy usage and greenhouse gas emissions model in a XLS file, inclusive of HVAC system details, energy usage, energy efficiency and onsite solar potential, into the U.S. DOE Geothermal Data Repository.

Subtask 3.7: Two geothermal design charettes with experts and workforce leaders. (M5-M6)

Subtask Summary: Organize and host two geothermal design charettes with geothermal designers and installers.

Milestone 3.7.1: At least 20 technical experts attend charettes.

Subtask 3.8: Create design for community-scale geothermal heating and cooling system (M5-M6)

Subtask Summary: Create draft design for community-scale geothermal heating and cooling system based on all tasks completed to-date.

Milestone 3.8.1: Complete draft design(s) for two viable community-scale geothermal systems.

Subtask 3.9: Test ground suitability, size geothermal field, and assess supplemental equipment options. Preliminarily assess cost of viable options. (M6-M8)

Subtask Summary: Test ground suitability, size geothermal field, and assess supplemental equipment options for proposed systems. Preliminarily assess cost of viable options.

Milestone 3.9.1: Ground test of geothermal viability, engineering study completed, and preliminary cost estimate generated.

TASK 4.0: Create Workforce Development Plan with Labor, Professional Societies, and Academia (M3-M8)

Task Summary: Create workforce development plan and secure commitment to implementation.

Subtask 4.1: Co-host two municipal-labor-professional society-academic roundtables. (M3-M4)

Subtask Summary: Organize and co-host two roundtables to explore existing capacity, needs, and opportunities related to creating the skilled workforce needed to support large-scale geothermal deployment as well as implement other decarbonization initiatives.

Milestone 4.1.1: At least 30 representatives from labor, trades, professional societies, or academia attend roundtables.

Subtask 4.2: Develop and secure commitment to workforce development strategy including in community training plan for future O&M tasks. (M4-M6)

Subtask Summary: Develop workforce development training plan and secure commitment to implementing, or at least fundraising to implement, the plan.

Milestone 4.2.1: Workforce development strategy created and agreed to by project partners.

Subtask 4.3: Engage with trade programs at Ann Arbor and Ypsilanti public schools to host a student-focused forum on opportunities in the clean energy industry. (M7-M8)

Subtask Summary: Host a forum with young adults to educate them about opportunities in the clean jobs industry and answer their questions.

Milestone 4.3.1: At least 10 high schoolers join forum on job opportunities.

TASK 5.0: Develop Draft Socio-Techno-Economic Model of a Fully Decarbonized Project Region (M4-M7)

Task Summary: Creation of a socio-techno-economic model of the proposed community geothermal systems and their benefits and the integration of additional energy waste reduction, beneficial electrification, and on-site solar generation into the model.

Subtask 5.1: Use results from Task 3 and integrate with data from residential energy assessments. (M4-M5)

Subtask Summary: Integrate results from Task 3 with data from residential energy assessments being conducted by a parallel project to understand future energy waste reduction, electrification, solar, and storage opportunities for the Bryant neighborhood.

Subtask 5.2: Evaluate the status of existing natural gas infrastructure and its ability to be repurposed for geothermal. (M5-M6)

Subtask Summary: Conduct a rapid assessment of the type and quality of natural gas infrastructure in the project geography and assess its ability to be used in geothermal designs.

Subtask 5.3: Build draft socio-techno-economic model of future energy demand. (M4-M7)

Subtask Summary: Build draft socio-techno-economic model of future energy demand if the entire project area was efficient, electric, and powered with renewables. Integrate future energy demand findings into model created in Task 3 to have a current and future energy model.

Milestone 5.3.1: Updated socio-techno-economic model that includes current and future energy demand.

Milestone 5.3.2: Upload draft socio-techno-economic model of current and future energy demand for the Bryant neighborhood, in XLS file format, to the U.S. DOE Geothermal Data Repository.

Subtask 5.4: Compare model results against existing grid capacity. (M4-M7)

Subtask Summary: Compare model results against existing grid capacity, integrating the impact of expanded onsite renewable energy potential to lessen demand on the grid.

Milestone 5.4.1: Grid and solar capacity assessment.

TASK 6.0: Finalize Socio-Techno-Economic Model and Community-Scale Geothermal Design. (M7-M11)

Task Summary: Finalize the model and community-scale geothermal designs. Identify the top design(s) that are supported by residents and technical and economically feasible.

Subtask 6.1: Integrate other funding sources into financial model. (M7-M8)

Subtask Summary: Assess impact of the Inflation Reduction Act, a potential Community Climate Action Millage, and utility rebates on proposed model. Integrate findings into draft socio-technoeconomic model to fully understand the economic implications of the proposed designs.

Milestone 6.1.1: Updated socio-techno-economic model to include outside funding sources.

Subtask 6.2: Share draft community-scale geothermal design(s) with residents. (M8-M9)

Subtask Summary: Share draft community-scale geothermal heating and cooling system design(s) with residents, including developing a replica of the proposed system. Alter designs, as needed, based on feedback.

Milestone 6.2.1: Final designs and model of potential system(s) shared at public meeting.

Subtask 6.3: Determine environmental and permitting requirements. (M8-M9)

Subtask Summary: Identify all assessments and permits needed to move design(s) forward.

Subtask 6.4: Finalize design, including technical design and cost analysis for system. (M9-M11)

Subtask Summary: Create final design and cost analysis for proposed system(s).

Milestone 6.4.1: At least one viable community geothermal design that reduces thermal heating and cooling load by 75%, greenhouse gas emissions by 40%, and eliminates energy burden for Bryant residents.

Milestone 6.4.2: Upload final socio-techno-economic model of current and future energy demand for the Bryant neighborhood, in XLS file format, to the U.S. DOE Geothermal Data Repository.

Subtask 6.5: Develop maintenance plan for system. (M10-M11)

Subtask Summary: Create maintenance plan for proposed system.

Milestone 6.5.1: Maintenance plan created for proposed system.

Subtask 6.6: Develop a cost-of-service model for designed system. (M10-M11)

Subtask Summary: Develop a cost-of-service model for proposed system that outlines ownership, energy rates, and an all-in development cost.

Milestone 6.6.1: Cost of service model created.

Subtask 6.7: Develop a case study outlining process. (M11)

Subtask Summary: Creation of a case study outlining process completed as part of project.

Milestone 6.7.1: Case study document process and outlines created.

TASK 7.0: Submit final deliverables and prepare down selection documentation (M11+)

Task Summary: Prepare and submit all final deliverables and create application for Phase Two grant.

Milestone 7.1: Grant deliverables submitted.

End Of Budget Period 1 Goal

At the end of Budget Period 1, the project team will have at least one, and potentially two viable community geothermal designs for reducing thermal heating and cooling load by 75%, greenhouse gas emissions by 40%, and eliminating energy burden in the project area, designs that have been created through robust community engagement and technical input. Geothermal potential will be validated, environmental and permitting needs identified, a robust socio-techno-economic model developed, and a local workforce development strategy created.

Down-Select:

EERE intends to conduct a competitive project review (down-selection process) upon the completion of an initial 12 months of work (Budget Period 1). Recipients will present their

projects to EERE individually (not to other recipients). Subject matter experts from academia, national laboratories, and industry may be used as reviewers, subject to conflict of interest and non-disclosure considerations. Projects will be evaluated based on the following criteria:

The degree to which the Budget Period 1 deliverables show progress towards meeting the following FOA Specific Goals, as indicated in Section I.A.ii:

- 1) Deploy new or retrofitted geothermal, or geothermal-hybrid, district heating and cooling systems in U.S. districts, neighborhoods, and communities
- 2) Identify solutions for environmental justice conditions, such as cumulative environmental pollution and other hazards; underserved and disadvantaged communities; and community members who have historically experienced vulnerability due to climate change impacts
- 3) Assist U.S. communities to develop career and technical education and workforce transition initiatives to design, install, inspect, operate, and maintain new energy systems such as geothermal heating and cooling
- 4) Develop U.S. case studies about projects, including technical and economic data, to illustrate how projects can be replicated by communities throughout the United States
- 5) Publish data and information about U.S. geothermal district heating and cooling system deployment to demonstrate the success of such systems in a range of environments and geographies

Sixty days (60) before the completion of Budget Period 1, the Recipient will submit the following documents to the DOE Technical Project Officer.

Down-select application including:

- Report summarizing all work complete in Budget Period 1
- Proposed scope of deployment objectives
 - Revised Budget Justification, adding additional Budget Period (s)
 - Revised SOPO, adding additional Budget Period (s)
 - NEPA questionnaire
 - SF-424

These documents are used by the DOE Project Review Committee to conduct a project review against the criteria listed previously. The Recipient will give a presentation to the DOE Project Review Committee via webinar. The documents and reports will be available for internal use only by the review committee; however, any data delivered should be marked as specified in the terms and conditions of the award.

D. Project Management and Reporting

The City of Ann Arbor will serve as project lead and oversee coordination with all project team members, including day to day administration (Tasks 1 and 7), including monitoring progress toward work plan deliverables, organizing biweekly Committee meetings, and ensuring fidelity to project outcomes. Project-related decision making will be heavily guided by the residents of Bryant with final design authority coming from the City of Ann Arbor.

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:

1. Subtask 2.1: *Community engagement strategy*
2. Subtask 4.2: *Workforce development strategy*
3. Subtask 6.1: *Socio-Techno-Economic Model for Bryant neighborhood*
4. Subtask 6.4: *Final geothermal design*
5. Subtask 6.5: *Maintenance plan for final geothermal design*
6. Subtask 6.6: *Cost-of-service model for final geothermal design* 7. Subtask 6.7: *Case study on project*

Milestone Summary Table							
Recipient Name:		City of Ann Arbor					
Project Title:		District Geothermal Design and Deployment to Equitably Decarbonize Low Income Neighborhoods in Ann Arbor					
Task Number	Task or Subtask (if applicable) Title	Milestone Type (Milestone or Go/No-Go Decision Point)	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		Milestone	1.1	Biweekly steering committee meetings	Virtual meetings and meeting notes	1	1
1.0		Milestone	1.2	Detailed work plan	Detailed written work plan	2	1
2.0	2.1	Milestone	2.1.1	Engagement strategy created	Submission of draft engagement strategy to DOE	2	1
2.0	2.2	Milestone	2.2.1	Two community engagement individuals hired	Resumes of individuals shared with DOE	2	1
2.0	2.3	Milestone	2.3.1	40 unique Bryant residents given input into project	Workshop attendee list and meeting results shared with DOE	4	2
2.0	2.3	Milestone	2.3.2	Resident-centered metrics of success created	Workshop summary report with metrics of success highlighted shared with DOE	4	2
3.0	3.4	Milestone	3.4.1	Existing energy usage and GHG model	Draft model shared with project partners	4	2
3.0	3.6	Milestone	3.6.1	Updated model that includes efficiency, electrification, and solar potential	Updated model shared with project partners	5	2

3.0	3.6	Milestone	3.6.2	Submission of energy usage and GHG emission model to GDR	Submission of data to the DOE GDR		
3.0	3.7	Milestone	3.7.1	At least 20 experts attend design charettes	Workshop attendee list and workshop report shared with DOE	6	2
3.0	3.8	Milestone	3.8.1	Draft design(s) for community scale geothermal system created	Draft designs shared with project partners	6	2
3.0	3.9	Milestone	3.9.1	Ground test of proposed designs	Results from ground tests shared with project partners and public	8	3
4.0	4.1	Milestone	4.1.1	At least 30 representatives attend workforce roundtables	Roundtable attendee list and notes shared with DOE	4	2
4.0	4.2	Milestone	4.2.1	Workforce development strategy created	Workforce development strategy shared with DOE	6	2
4.0	4.3	Milestone	4.3.1	At least ten high school students attend job forum	Forum attendee list and meeting notes shared with DOE	8	3
5.0	5.3	Milestone	5.3.1	Updated socio-techno-economic model to include projected future energy demand	Draft model shared with project partners and DOE	6	2
5.0	5.3	Milestone	5.3.2	Submission of draft socio-techno-economic energy demand model to GDR	Submission of data to the DOE GDR	6	2
5.0	5.4	Milestone	5.4.1	Grid and solar capacity assessment	Assessment shared with project partners and integrated into project modeling	6	2

6.0	6.1	Milestone	6.1.1	Updated socio-techno-economic model that includes current and projected future energy usage and the economic benefits of IRA, utility rebates, and local programs	Updated model shared with DOE	9	3
6.0	6.2	Milestone	6.2.1	Final draft designs and model of potential geothermal system developed	Model shared with public and US DOE	9	3
6.0	6.4	Milestone	6.4.1	Final geothermal system designs and agreed to by public	Final design shared with DOE	12	4
6.0	6.4	Milestone	6.4.2	Submission of final socio-techno-economic energy demand model to GDR	Submission of data to the DOE GDR	12	4
6.0	6.5	Milestone	6.5.1	Maintenance plan for proposed system	Maintenance plan shared with DOE	12	4
6.0	6.6	Milestone	6.6.1	Cost-of-service model created for proposed geothermal system	Model shared with DOE	12	4
6.0	6.7	Milestone	6.7.1	Case study highlighting project process created	Case study shared with DOE	12	4
7.0		Milestone	7.1	Submit final deliverables and prepare down selection documentation	Submit final deliverables to DOE. DOE verification of application submission	12	4