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Request for Proposals
GeoMicroDistrict Feasibility Study

1.Introduction

HEET is a Massachusetts grassroots nonprofit that works to reduce greenhouse gas emissions and to develop local renewable energy sources. We achieve impact through research, education, and by building the coalition of stakeholders and experts necessary to take action.

HEET solicits proposals[1] on a study of the feasibility of designing, developing, implementing, and scaling up a neighborhood-level district heating system in the Greater Boston area. The district heating system will be a geothermal energy powered low-temperature[2] hot-water system.

The proposed plan is:

- Stage 1: Start with a micro-district of just one street segment that employs a neighborhood-shared hot water supply and return loop under the street (GeoMicroDistrict). Water is heated at a small pump station by a ground-source heat pump pulling thermal energy off geothermal boreholes. Natural gas is no longer supplied to the buildings on the street, but if necessary, can provide emergency back-up heat at the pump station for the hot water supply loop.

[1] In conjunction with the Gas Leaks Allies, a coalition of 20 nonprofits, researchers and academics working to reduce emissions.
[2] 80 to 120 degrees fahrenheit

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- Stage 2: If the first GeoMicroDistrict shows potential, the next step is to replicate the design in neighboring streets. This will allow for micro-districts to then be interconnected, building a community-scale district energy system. The connected micro-districts will increase resilience and allow for centralized efficiency gains through tactics like waste heat recovery. Both the initial micro-district and interconnected district would be installed, owned, maintained and operated by the local gas distribution companies, allowing them to transition their infrastructure to a sustainable renewable model, moving forward with the state into a clean economy.

2. Background

This study is inspired by the ongoing replacement of 27% of the aging natural gas pipes under Massachusetts' streets. At current utility-reported prices, the remaining two decades of pipe replacement will cost ratepayers over $9 billion statewide.

Aging natural gas pipes

Since:

- These gas pipes are amortized over 40 yrs and are expected to last 60 years,
- The future is uncertain for gas in a state with a mandate to reduce greenhouse gas emissions 80% by 2050

this feasibility study is attended to address the risks of stranded assets and protect against the harmful outcomes of utility collapse.

The GeoMicroDistrict design concept explores the potential of replacing some portion of these aging pipes with district heating pipes instead. District heating created through gradually connecting micro-districts into larger areas, could gradually grow a new business model for the gas utilities to sell clean renewable thermal BTUs instead of selling therms of natural gas.

This utility-scale approach to renewable thermal, where heat and hot water is provided by the local utility instead of through individual household investment in renewable technology, addresses inequity of access to a clean energy future, making transition accessible to all instead of just those with discretionary income.

HEET has explored and found great interest in this concept with Massachusetts' major gas utilities, city and state level government agencies, and other key stakeholders. Since the Merrimack Valley gas system collapse in September, the drive to develop non-gas alternatives has increased for all stakeholders.

This solicitation is intended as the first step in the potential development of one such alternative system. It seeks to analyze the technical and economic viability of this approach and its potential to drive utility-scale transition to a renewable energy future.

We appreciate greatly the expertise of the many individuals who have helped shape this proposal. The following key advisors and stakeholders are a partial list of those committed to the ongoing development of this concept.

Key Advisors & Stakeholders:

Economics

- Liz Stanton, Director and Senior Economist, Applied Economics Clinic
- Ron Gerwatowski, Energy Policy Advisor

Technical

- Ryan Dougherty, COO, Geothermal Exchange Organization
- Drew Michanowicz, C-CHANGE, Harvard University

Regulatory

- David Ismay, Senior Staff Attorney, Conservation Law Foundation

Utility Perspective

- Steve Bryant, President, Columbia Gas

The work of the feasibility study is intended to do more than just answer the specific economic, technical and engineering questions listed below. The process itself will help the many stakeholders share knowledge with each other, working together to reach consensus on the project while building confidence in the answer.

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3. Project Goals and Scope of Service

HEET is seeking the services of a consulting firm with appropriate engineering and utility industry expertise to perform a feasibility study of the GeoMicroDistrict renewable thermal concept as described above.

Engineering Feasibility

- What low-temperature hot-water system technologies are currently operating in locations throughout the country and internationally?
- Provide several case studies of related existing systems to demonstrate both best practices and lesson learned in terms of implementation.
- Which ones may work best in Massachusetts in terms of climate, geology and cost?
- What are potentially optimal combinations, with specification, of mechanical equipment needed?
    - Installation Equipment: Drill rig, drill bits, etc.
    - Utility mechanicals: distribution piping, micro pump station, back-up gas boiler

    - Consumer mechanicals: heat exchangers & interface with existing heat & hot water equipment
    - Other non-gas appliances needed to replace the gas appliances (stove, dryer, etc.)
- What are the optimal physical parameters of location selection?
    - Please consider such parameters as geology, energy-use and population intensity, local zoning and regulation, local moratoriums on new gas services, as well as other pertinent factors.
    - Note: The intent of the initial pilot is to demonstrate this model in a residential area with existing housing stock, with demonstration in more commercial, higher energy use regions in phase II. Please identify optimal physical parameters constrained to residential for Phase I and considering municipal wide locations for Phase II.
- Is a water-source heat pump system (either in a closed or open loop, using the sea or a nearby lake or river) viable?
    - If so, what are the tradeoffs between ground-source and water-source systems?
- What are the design, efficiency, and cost impacts of a system that allows for cooling capability in addition to heating and hot water, likely through shifting the heat exchange work to the household mechanicals or potentially running a seperate ground loop.
- Please identify potential efficiency gain strategies through bringing this model to scale (for example: waste-heat recovery, co-generation, and sewer-heat recovery)
- What are potential limits statewide for this GeoMicroDistrict model?
- What is the greenhouse gas reduction of moving from gas to a geothermal system? Calculate this reduction for both current emissions per kilowatt hour, as well as for our state's mandated emissions goal of 80% by 2050.

Economic Feasibility

- Provide several case studies of related existing systems to demonstrate both best practices and lesson learned in terms of return on investment.
- What are the known costs of designing, installing, insuring and maintaining both the initial street-segment pilot and a community wide implementation of the GeoMicroDistrict system?
- What are key points of comparison between this proposal and replacing the gas mains for the current gas energy delivery system. In this comparison, please include system maintenance, fuel price volatility and liability insurance.
- Compare the costs and benefits to the utility and to consumers of designing the GeoMicroDistrict with cooling capacity for the summer?
- What is the potential market opportunity for Massachusetts given the engineering feasibility assessment?
- Detail factors necessary to determine return on investment for the gas company.

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- Detail factors necessary to determine the short term and long term impact on the consumer's energy bills, HVAC repair and replacement costs, and insurance costs for the building.
- What are the potential population level health and safety impacts of shifting from gas to GeoMicroDistrict?

Note: Given the climate emergency, and that we humans are very late in changing our actions, we wish to spread good ideas and iterate as quickly as possible. Thus, this request for proposals is considered to be a collaborative process with all content licensed for open sharing and adapting under Creative Commons CC BY-AS 4.0.

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4. Budget

The budget for this project is currently $50,000. The advising stakeholders above, in addition to other in-kind help, can supply expertise to facilitate and enhance the study.

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5. Schedule

- RFP published: Nov. 21, 2018
- Webinar on RFP with questions and answers: Dec. 4, 2018, 12 pm
- Proposals due: Jan. 4, 2019
- RFP awarded: Jan. 18, 2019
- Draft of complete feasibility study due: April 26, 2019
- Completed feasibility study due: May 17, 2019

Submit questions at any time to contacts listed below.

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6. Elements of Proposal

- A description of the firm that includes a general overview, names and credentials of the team. Include:
  - Relevant projects the team/firm has worked on in the past.
  - Relevant projects where the team/firm has had achieved consensus from diverse stakeholders.
  - Three references.
- A description of the scope and timeline for the work.
- Summarize criteria and process to be used in locating and designing GeoMicroDistrict systems.
- Summarize factors to be included in the economic analysis.

- Describe approach to stakeholder engagement and concept iteration.
- Additionally, please identify missing elements in our scope document.
- Budget should address the described scope completely for the lowest possible price. If this budget exceeds the proposed budget, please identify your recommended subset of deliverables to fit our proposed budget.

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7. Evaluation Process & Criteria

The proposals will be evaluated by a team composed of five reviewers, three of which are members of the HEET team.

Each proposal will be scored based upon:

1. The overall design and scope of the proposed feasibility study.
2. The technical capability and related experience of the proposed study team.
3. Past projects of the team demonstrating a proven track record of success, especially in pulling together a wide group of diverse stakeholders to deliver a project on time.
4. Knowledge and experience with relevant engineering challenges, including geothermal design, heat exchange optimization, and district energy load design.
5. Knowledge and experience with the gas utility industry and its financial structure.
6. Overall budget.

Note: Massachusetts firms encouraged to apply.

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