



## **Program Manual**

*Residential Ground-Source Heat Pump Pilot Program*

### **Massachusetts Clean Energy Center & Massachusetts Department of Energy Resources**

Posting Date: May 12, 2014 (Updated 6-6-14)

Funding Available: Up to \$475,000

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## **1. Introduction and Overview**

The Massachusetts Clean Energy Center (MassCEC), with support from the Massachusetts Department of Energy Resources (DOER), is offering grants for the installation of ground-source heat pumps (“GSHP”) through this Residential GSHP-Source Heat Pump Pilot Program (“Residential GSHP Pilot” or the “Program”). Projects must meet the technology eligibility requirements and project requirements outlined in this Program Manual in order to qualify for a grant.

This Residential Ground-Source Heat Pump Pilot Program Manual (the “Program Manual”) describes the eligibility requirements, grant levels, and application process for Awards. The capitalized terms used in the Program Documents (Program Manual, Award Letter, Participant’s Agreement, Application, and Project Completion Form), including key definitions and definitions pertaining to eligible technologies, are listed in Section 5.7 and Section 5.8 of the Program Manual. All documents are available on the Residential GSHP Pilot webpage.

(Added 6-6-14) Please note the following modifications to this document since original posting date:

- Section 2.1: Project eligibility requirements were clarified to state that project economics and installed costs will be evaluated as part of the application evaluation process.
- Section 3.2: Clarification was provided to state that GSHP capacity sizing must correspond to the Manual J heat load calculation.
- Section 3.2, 3.3: Language was added that only projects with strict technical limitations may be sized less than the 80% minimum of building total heating load.
- Section 4.1: Heating and cooling capacity units were changed from tons to BTU/hr.

## 2. Eligibility

The following sections describe eligibility requirements for projects, equipment, and Primary Installers. The Application should be submitted by the Primary Installer with the assistance and approval of the System Owner. Both the Primary Installer and the System Owner are required to sign the Application.

### 2.1. Project Eligibility

To be eligible for a grant under this Residential GSHP Pilot, project sites must be single-family or multi-family (up to four units) residences located in the Commonwealth of Massachusetts. Both new construction and existing buildings are eligible. Residences must be conditioned through the winter. Awards through this Program are available to eligible residences located in all cities and towns of the Commonwealth of Massachusetts.

MassCEC reserves the right to reject applications based on excessive installed project costs or poor project economics.

### 2.2. Equipment Eligibility

Only projects installing ground-source heat pumps are eligible for grants through this program. Single-stage heat pumps and direct exchange (DX) systems are not eligible for grants under this program.

To qualify, the GSHP must meet the following requirements for energy efficiency ratio (EER) and coefficient of performance (COP) values as follows:

Product Type	EER	COP
<b>Water-to-Air</b>		
Closed Loop Water-to-Air	17.1	3.6
Open Loop Water-to-Air	21.1	4.1
<b>Water-to-Water</b>		
Closed Loop Water-to-Water	16.1	3.1
Open Loop Water-to-Water	20.1	3.5

Table 1: Minimum Equipment Performance Specifications

EER and COP must be calculated using the following equations:

$$\text{EER} = (\text{highest rated capacity EER} + \text{lowest rated capacity EER}) / 2$$

$$\text{COP} = (\text{highest rated capacity COP} + \text{lowest rated capacity COP}) / 2$$

### **2.3. Primary Installer Eligibility**

Primary Installers must demonstrate in the Application that they are accredited by the International Ground Source Heat Pump Association (IGSHPA). The Application must contain documentation which demonstrates that the Primary Installer is IGSHPA accredited.

If the Primary Installer has not received IGSHPA accreditation, the Primary Installer may still submit an Application but will be subject to MassCEC's Crawl-Before-You-Walk process. This process requires the Primary Installer to (1) submit references for three completed GSHP projects with the Application; and (2) if the Application is awarded by MassCEC, Primary Installer's first project must be inspected and approved by a MassCEC-designated inspector prior to submitting any further Applications for grants. Once a second installation has been inspected and approved under this policy, Primary Installer may then submit Applications for more than one Award at any given time. MassCEC and DOER reserve the right to disallow any Primary Installer who has not demonstrated their ability to complete two successful installations.

In addition to inspection by building inspectors, all Primary Installers, pursuant to Section 3.5 of this Program Manual, will have their first two installations inspected by the DOER and MassCEC prior to payment of the grant.

### **2.4. Project Timeframe**

Projects awarded under this program must be completed in two stages:

1. Design
2. Construction

MassCEC requires the design stage to be completed prior to the commencement of construction. The Primary Installer must submit and have approved the Design Deliverable prior to moving on to the construction phase. Once the construction phase is complete, the Primary Installer must submit the Construction Deliverable. Once approved, MassCEC will issue a check for the Award amount. Please see Section 5.4 for more details on Design and Construction Deliverables.

MassCEC may require an inspection by a MassCEC authorized contractor prior to payment of the Award. This inspection may occur during the construction phase or after completion of the project.

All projects must be completed and all documentation submitted and approved by MassCEC within nine months of the Award Date. Grantees that do not meet this deadline will forfeit their Awards.

### 3. Project Requirements

To be eligible for an Award through the Residential GSHP Pilot, projects must meet the following requirements.

#### 3.1. Energy Audit Requirement

All facilities that will host a GSHP project with support from this program must have an energy efficiency audit completed within the past 24 months by the time of application. MassCEC and DOER highly recommend that priority recommendations from the audit are implemented. At the time of application, the Applicant Parties must provide a list of energy audit recommendations and outline what has been implemented. For qualifying locations, free residential energy audits can be scheduled through MassSave at [www.masssave.com](http://www.masssave.com). Existing energy audits that were conducted more than 24 months prior to application do not qualify.

Applications must demonstrate that an energy audit has been completed and that all reasonable recommendations from the energy audit have been implemented at the facility that hosts the project. Applications that have not demonstrated that sufficient energy efficiency measures have been implemented may be deemed ineligible for funding under this Program.

#### 3.2. Heat Load Calculation

All GSHP projects must submit a heat load calculation with the Application. Residential heat load calculations must be conducted using a Manual J calculation and submitted as part of the Application. In the application review process, assumptions will be scrutinized, including indoor temperature setpoints and weather data. Modelling must include indoor temperature setpoints of 68 to 72 degrees Fahrenheit and weather data taken from the ACCA Manual J Residential Load Calculation for Outdoor Design Conditions using 99% dry bulb for winter and 1% dry bulb for summer using the closest city. Please see [http://www.energystar.gov/ia/partners/bldrs\\_lenders\\_raters/downloads/Outdoor\\_Design\\_Conditions\\_508.pdf](http://www.energystar.gov/ia/partners/bldrs_lenders_raters/downloads/Outdoor_Design_Conditions_508.pdf). All GSHP systems must meet a minimum of 80% of the building total heating load. Projects with strict technical limitations that make meeting this requirement technically or economically infeasible may be considered for exceptions. **Please note:** GSHP capacity sizing must correspond to the Manual J heat load calculation.

Applications must also include results from modelled energy use, including GSHP performance metrics, electricity and heating fuel usage/savings, financial savings, etc. Please see Section 5 of the Application for more details.

#### 3.3. Installation Requirements

All GSHPs must be installed by a licensed contractor and/or plumber, installed in accordance with the National Electric Code and manufacturer's specifications, and must conform to all applicable municipal, state and federal codes, standards, regulation, and certifications, as well as program requirements. The

System Owner and Primary Installer must certify that the project has received approval from the local building inspection authority at the time of Project Completion.

All GSHP systems must meet a minimum of 80% of the building total heating load. An Air Conditioning, Heating and Refrigeration Institute (AHRI) certificate must be submitted to document that the system was properly matched. Projects with strict technical limitations that make meeting this requirement technically or economically infeasible may be considered for exceptions.

All projects must comply with the Commonwealth of Massachusetts Department of Environmental Protection (MassDEP), Bureau of Resource Protection, Drinking Water Program, Guidelines For Ground Source Heat Pump Wells, and Underground Injection Control Program (January 2012) <http://www.mass.gov/dep/water/laws/gshpguid.pdf>. In addition, all open-loop GSHP wells shall be installed in conformance with MassDEP's *Private Well Guidelines* (as amended) or MassDEP's *Guidelines and Policies for Public Water Systems* (as amended), whichever is applicable. All GSHP wells shall be installed in conformance with 313 CMR 3.00: *Registration of Well Drillers and Filing of Well Completion Reports*.

All motors installed for a GSHP project must be energy-efficient motors, also called premium or high-efficiency motors. Motors qualify as "energy-efficient" if they meet or exceed the efficiency levels listed in the National Electric Manufacturers Association's (NEMA's) MG1-1993 publication.

All systems must meet the following testing and rating for performance standards. Primary Installers/dealers must demonstrate that the proposed system meets one of the following Standards:

- **ANSI/AHRI/ASHRAE/ISO Standard 13256-1** for water-to-air models (open and closed loop systems).
- **ANSI/AHRI/ASHRAE/ISO Standard 13256-2** water-to-water models (open and closed loop systems).

### 3.4. Performance Monitoring

One of the goals of this pilot program is to monitor and collect data on GSHP projects and back-up heating systems (i.e. existing boilers, furnaces, etc.) in order to verify performance. Some projects funded under this program will be required to have performance monitoring equipment installed to measure and record the electricity use and net thermal output of the system for two years. Monitoring equipment will be paid for and installed directly by contractors to MassCEC and/or DOER with no direct cost to the System Owner. Data will be collected and analyzed for program evaluation purposes and will not impact the Award received by the Grantee.

Monitored projects must be capable of remotely transmitting data to an online database. All monitored projects require internet connectivity capable of transmitting data wirelessly to an online database. Performance monitoring data will be collected for a period of 24 months after installation.



To be eligible for an Award under this Program, the System Owner must agree to allow metering and monitoring to be conducted on their GSHP project and back-up heating system for up to 24 months after installation, if requested. The System Owner will be required to submit utility and fossil fuel bills for two years prior to installation (for existing buildings) and for the duration of the performance monitoring. Also, any additional specifications, such as specific heat of the refrigerant, must be submitted for assessment upon request.

### **3.5. Inspection**

In addition to inspection by building inspectors, the DOER and MassCEC will inspect the first two installations completed by each Primary Installer prior to payment of the Award. For projects being installed by IGSHPA accredited Primary Installers, these inspections are required prior to payment of the Award but do not have to be completed prior to applying for additional grants. For Primary Installers going through MassCEC's Crawl-Before-You-Walk Process, each inspection must be completed to MassCEC's and DOER's satisfaction prior to applying for any additional grants. DOER and MassCEC reserve the right to inspect additional installations before final payment of the Award. If moderate or significant installation issues are identified during the inspection, MassCEC may withhold Award payment until these issues are sufficiently addressed and meet MassCEC standards.

## 4. Award Structure

The following section describes the grants available through this program and requirements associated with each grant. Grants are available for the installation of the project. Design and engineering grants are not available.

### 4.1. Program Awards

GSHP projects are eligible for a grant of **\$2,000 per 12,000 BTU/hr (heating) capacity for up to 60,000 BTU/hr**. Higher capacity systems may apply for funding under this program, though they will only receive a grant for the first 60,000 BTU/hr.

Grants are only paid to reimburse for costs incurred and may not be applied to work conducted prior to the Award Date, as stated on the Award Letter. Grants can be paid to the System Owner or Primary Installer, provided that the System Owner provides permission for this in the Application.

MassCEC will not provide funding that would, in MassCEC's sole determination, exceed total project costs. Total project costs shall include all costs presented in the Application, less all other available incentives, including any state or federal grants, subsidies, and tax incentives, discounted to present value where necessary. MassCEC will evaluate these situations on a case-by-case basis, and shall reserve the right to reduce any Award projected to exceed total project costs by an amount sufficient to prevent the excess.

### 4.2. Funding Caps

Individual Primary Installers are limited to participating in projects that have, in aggregate, received no more than \$70,000 in Awards through this Program. Individual project System Owners may be awarded no more than \$30,000 in total Awards through this Program. MassCEC and DOER, at their sole discretion, will determine the applicability of the cap to a Primary Installer or site owner in the event that the cap is reached. MassCEC and DOER may, at their sole discretion, remove the Primary Installer or System Owner cap.

## 5. Application Process

The Residential GSHP Pilot is accepting applications on a first-come, first-served basis. Applications should be completed by the Primary Installer with support of the System Owner. Both the Primary Installer and the System Owner (together the “Applicant Parties”) are required to review and sign the Application. The Primary Installer is responsible for the ultimate submission of the Application.

### 5.1. Application Deadline and Timeframe

Applications will be accepted on a rolling basis through **3:00 pm, October 31, 2014**, or until program funds allocated to this Program are exhausted, whichever occurs first. MassCEC and DOER anticipate providing an initial response to Applicants within three to five weeks of receipt of a complete Application. MassCEC and DOER will accept questions regarding the Program at any time. MassCEC and DOER will review applications on a rolling basis. MassCEC and DOER staff may contact the Applicant Parties to request supplemental information prior to formal review, and/or request an interview with qualified Applicant Parties.

MassCEC reserves the right to extend or terminate this Program.

### 5.2. Application Submission

Applications should be submitted via email to the High Efficiency Heat Pump mailbox at [hehp@masscec.com](mailto:hehp@masscec.com). Please submit the Application and supporting materials as a single pdf file by email with “GSHP Application: *Project Name*” stated in the subject line.

The Application must contain the following supporting materials:

- Signed Application Document and Participation Agreement
- Energy Audit
- Heat Load Calculation
- Site Description/Site Plan
- Feasibility Study (if available)
- Grantee W-9 (to be completed and submitted directly to [finance@masscec.com](mailto:finance@masscec.com))

### 5.3. Application Evaluation Criteria and Awarding

Applications will be evaluated to ensure that they are expected to meet the Eligibility and Project Requirements stated in this Program Manual. MassCEC and DOER reserve the right to accept, reject, or place applications on hold based on completeness, qualitative criteria, and available funding; to make no Awards; to award less than the Applicant requests; and/or to award less than the maximum amount of funds potentially available through this Program.

Potential Applicant Parties are advised to visit the Residential GSHP Pilot website periodically for formal updates to the Program Manual.

If the Application meets all requirements of this Program and funding remains available, MassCEC will issue an Award Letter to the System Owner which will provide details on the Award amount, deadlines, and Project Completion submission requirements.

#### **5.4. Project Completion and Payment**

**Projects may begin only after the awarded System Owner receives the Award Letter.**

Prior to Award payment, the Primary Installer will be required to submit to MassCEC for review and approval the following two deliverables:

##### **Design Deliverable**

MassCEC will provide an outline defining Design Deliverable requirements. This deliverable consists of but is not limited to the following:

- Project Completion Form (except construction deliverable section)
- Final project site plan and layout
- Loop or well design overview, layout, and specifications including geology summary and test bore results (if available)
- Specifications on GSHP equipment
- Heat distribution system layout drawing, including zones

Grantee must submit the Design Deliverable for approval prior to beginning construction. MassCEC will review the Design Deliverable and provide any comments to be addressed in the design. Once complete, MassCEC will approve the Design Deliverable, notify the Grantee, and project construction may commence.

##### **Construction Deliverable**

Once the project construction is completed, the Primary Installer for the project must submit Project Completion documentation to MassCEC, which includes:

- Project Completion Form
- Project invoices
- Documentation of installed equipment model (such as a paid invoice identifying model)
- AHRI certificate documenting that the system was properly matched
- Certification that the project passed local building inspection
- Two clear project photographs:
  - One of the GSHP unit (outside)
  - One of the indoor air-handling system (vent or split air-handling unit)

Once all complete documentation is received and satisfactory, MassCEC will consider that Project Completion has been met and issue payment to the Grantee within four weeks.

## 5.5. Award Taxability

Grant Awards may be considered taxable income to the parties in this agreement by the U.S. Internal Revenue Service and the Massachusetts Department of Revenue. All parties are strongly encouraged to consult with a tax professional to determine the federal and/or state tax implications of receipt of the Award. Please note: a grant tax liability may exist whether the payment is made directly to one of the parties or on its behalf.

As a result, MassCEC will need to receive a completed W-9 Form from each Grantee (System Owner) at the time of application. W-9 forms should be sent directly to [Finance@MassCEC.com](mailto:Finance@MassCEC.com). MassCEC will send out a Form 1099 to each Grantee that receives an Award through this Program.

## 5.6. Contact Information

For questions on the Residential GSHP Program, please email the High Efficiency Heat Pump mailbox at [hehp@masscec.com](mailto:hehp@masscec.com) or call 617-315-9379.

## 5.7. Program Definitions

**Applicant:** The Applicant is the Primary Installer who prepares and submits the Application on behalf of the System Owner. The Primary Installer is responsible to work with the System Owner to prepare and submit the Application.

**Applicant Parties:** The Primary Installer and the System Owner, who together are responsible for providing the content of and signing the Application.

**Application:** Application submitted on behalf of System Owner by Primary Installer for an Award.

**Award:** Grant funding awarded to a System Owner under the Residential GSHP Pilot based on a submitted Application that has been approved by MassCEC.

**Award Date:** The Award Date is the date that the Award first becomes active. The Award Date is provided in the Award Letter.

**Award Letter:** The Award Letter is a document provided by MassCEC to the System Owner notifying them that the Award has been made for the Application to the Residential GSHP Pilot. The Award Letter specified the Award Date, Award amount, and other information pertinent to the Award.

**Grantee:** The System Owner who will receive the Award.

**Payee:** The Payee is the designee to receive the grant for a project that has achieved Project Completion. A System Owner may choose to have its Award paid directly to the Primary Installer. Payment is made for the work performed on the project and does not convey ownership rights to the installed system.

**Primary Installer:** The Primary Installer is the primary entity responsible for the project installation. The Primary Installer is directly responsible for turnkey project management and installation work, although aspects of the installation work may be sub-contracted.

**Program Documents:** The Program Documents consists of the Program Manual, Application, Participation Agreement, Award Letter, and Project Completion Form.

**Project Completion:** Project Completion is defined as meeting the requirements as specified in Section 5.4.

**System Owner:** An individual who applies to MassCEC for a Residential GSHP Pilot grant. The System Owner is the owner of the project that is supported by the Residential GSHP Pilot grant.

## 5.8. Technical Definitions

**Closed Loop:** A ground heat exchange method in which the heat transfer fluid is permanently contained in a closed piping system. Also called a ground-loop system.

**Coefficient of Performance (COP):** The coefficient of performance of a heat pump is a ratio of heating or cooling provided to electrical energy consumed. Higher COPs equate to lower operating costs. While the COP is partly a measure of the efficiency of a heat pump, it is also a measure of the conditions under which it is operating.

**Energy Efficiency Ratio (EER):** A measure of efficiency in the cooling mode that represents the ratio of total cooling capacity to electrical energy input. For the purpose of this specification, EER will be calculated for closed loop and open loop systems in accordance with ISO 13256-1 or 13256-2 as stated in Section 2.2.

**Ground-Source Heat Pump (GSHP):** A ground-source heat pump uses the thermal energy of the ground or groundwater to provide residential space conditioning and/or domestic water heating. A geothermal heat pump model normally consists of one or more factory-made assemblies that include indoor conditioning and/or domestic water heat exchanger(s), compressors, and a ground-side heat exchanger. A GSHP model may provide space heating, space cooling, domestic water heating, or a combination of these functions and may also include the functions of liquid circulation, thermal storage, air circulation, air cleaning, dehumidifying or humidifying. A GSHP system generally consists of one or more geothermal heat pump models, the ground heat exchanger(s), the air and/or hydronic space conditioning distribution system(s), temperature controls, and thermal storage tanks.

**Multi-Stage:** GSHPs that are designed to operate at more than one stage or capacity through the use of technologies such as multiple stage compressors, dual compressors, variable speed compressors, etc. Multi-stage models are more efficient while running at lower capacities, but have the capability to supply more heating or cooling using higher capacities when required.

**Open Loop:** A ground heat exchange method in which the heat transfer fluid is part of a larger environment. The most common open loop systems use ground water, reclaimed water, or surface water as the heat transfer medium. Also called a ground-water system.

**Single-Stage:** Geothermal heat pumps that are designed to operate at one stage and one capacity.

**Water-to-Air:** A GSHP model that provides space conditioning primarily by the use of an indoor air heat exchange coil. Water-to-air models may also provide domestic water heating and hydronic space heating by using desuperheater and/or demand water heating functions.

**Water-to-Water:** A GSHP model that provides space conditioning and/or domestic water heating by the use of indoor refrigerant-to-water heat exchanger(s). Water-to-water models may provide domestic water heating by using desuperheater and/or demand water heating functions.

(Definitions courtesy of EPA's Energy Star Program)

## **6. GENERAL CONDITIONS**

MassCEC reserves the right to reject any applications or projects.

### **6.1. Notice of Public Disclosure**

#### **6.1.1. General Statement**

As a public entity, MassCEC is subject to Massachusetts' Public Records Law, codified at Chapter 66 of the Massachusetts General Laws. Grantee acknowledges and agrees that all Program Documents will be public records subject to disclosure. Thus, MassCEC urges Applicant Parties to carefully consider what documents, materials, data and other information is submitted to MassCEC in connection with an Application.

Notwithstanding the foregoing, should Applicant determine it necessary to submit to MassCEC materials that may be exempt from public disclosure under the statutory exemption set forth at Massachusetts General Laws Chapter 23J, Section 2(k), specifically, documents, materials, data or other information that (a) consist of trade secrets; (b) consist of commercial or financial information regarding the operation of any business conducted by Applicant Parties; or c) regarding Applicant Party's competitive position in a particular field of endeavor; then Applicant Party may assert a claim of confidentiality for such documents, materials, data or other information by clearly identifying the documents, materials, data or other information for which it wishes to receive confidential treatment and by attaching the confidentiality cover letter shown in Attachment A of the Application.

MassCEC recommends Applicant Party consult with legal counsel prior to submitting any such documents, materials, data or other information. Applicant Party acknowledges and agrees that MassCEC, in its sole discretion, shall determine whether any particular document, material, data or other information is exempt from or subject to public disclosure.

#### **6.1.2. Procedures for Handling Documents Classified as "Sensitive Information"**

An Applicant Party may assert a claim of confidentiality for part or all of the information submitted to MassCEC by following the instructions on the Notice of Confidentiality Cover Letter, which can be requested from MassCEC.

### **6.2. Contractual Requirements**

The Participation Agreement defines the legal terms that will govern the Award and sets forth the respective roles and responsibilities of the parties specifically as they relate to the project that is the subject of the Award. The Participation Agreement is designed to be executed upon submitting an application. This contract language is non-negotiable. Upon MassCEC authorization to proceed with an Award, MassCEC will issue an Award Letter.

No grant funds may be used to reimburse costs incurred prior to the Award Letter being issued.

### **6.3. Waiver Authority**

MassCEC reserves the right, at its sole discretion, to waive minor irregularities in submittal requirements, to request modifications of the Application, to accept or reject any or all Applications received, and/or to cancel all or part of this Program at any time prior to Awards.

### **6.4. Disclaimer**

This Program Manual does not commit MassCEC to award any funds, pay any costs incurred in preparing an Application, or procure or contract for services or supplies. MassCEC reserves the right to accept or reject any or all Applications received, negotiate with all qualified Applicant Parties, cancel or modify the Program Manual in part or in its entirety, or change the Application guidelines, when it is in its best interests.

### **6.5. Changes/Amendments to the Program Manual**

The requirements listed herein are subject to change without notice to potential Applicant Parties. This Program Manual has been distributed electronically using MassCEC's website. It is the responsibility of Applicant Parties to check MassCEC's website for any addenda or modifications to the Program Manual to which they intend to respond. MassCEC, the Commonwealth of Massachusetts, and its subdivisions accept no liability and will provide no accommodation to Applicants who submit an Application based on an out-of date Program Manual and/or related document.