



**KNOX  
HERITAGE**

*Preserve. Restore. Transform.*

**Request for Proposals for:  
Knox Heritage Vintage Home Renovation  
1011 Victorian Way Knoxville, TN 37916**

**Solar Hot Water System**

**Issue Date: February 23, 2010**

**Proposals Due: 5:00 PM EST, Friday, March 12, 2010**

**Owner:**

**Knox Heritage, PO Box 1242, Knoxville, TN 37901**

PROPOSAL FORM

Address Submissions To:  
Ms. Kim Trent  
Knox Heritage Inc.  
PO Box 1242  
Knoxville, Tennessee 37901

Time and Date for Receiving Proposals:  
5:00 PM EST (Local Time) – Friday, March 12, 2010

Dear Ms. Trent,

The undersigned, having carefully familiarized himself (or themselves) with the existing conditions at the site and with the Construction Documents, hereby propose to furnish all labor, materials and equipment and perform all work to design and install a (choose one) a solar PV or a solar hot water system in a 2100 sf residence in accordance with the enclosed specifications for the sum of:

BASE PROPOSAL:

\_\_\_\_\_ Dollars  
(\$ \_\_\_\_\_ )  
Time of Completion \_\_\_\_\_ Days

STIPULATIONS:

In submitting the Proposal, the undersigned agrees:

1. Proposals will not be withdrawn within the period of 30 calendar days following the opening thereof.
2. If notified of the acceptance of this proposal, to execute a contract for the work and deliver to the Owner that performance and payment bond specified within the 10 calendar days after such notification.
3. That the right is reserved by the Owner to reject any or all bids and to waive any informalities in proposals received.
4. That the Owner shall have the right to award the contract based upon a number of factors, not solely on the sum of the base proposal.
5. No contract is given or implied regarding the project until funding is appropriated and the Owner has offered a written contract to the contractor and both parties have fully executed the contract. No offer has been made to the contractor until the aforementioned items have transpired.
6. The Proposing entity agrees that the Proposal Documents have been thoroughly reviewed prior to submitting a proposal and the discrepancies, conflicts, errors, and/or omissions within the documents have been brought to the attention of the Owner, Owner’s Agents, Architect and/or Architect’s Consultants and have been resolved prior to submission of bids.
7. Proposals will be opened privately by the Owner; submitting entities will be notified within 72 hours if results.

PREREQUITES FOR ISSUING A CONTRACT TO THE SUCCESSFUL PROPOSING ENTITY:

This Contract will not be issued until the Contractor has delivered to the Owner, satisfactory proof of carriage of all insurance required herein, and a complete list of all subcontractors and major material suppliers. Execution of contract is dependent on appropriate federal and local government approval of a subgrant from the Knoxville Solar America Cities Program to Knox Heritage and DOE approval of a Knoxville Solar America Cities subcontract with Knox Heritage.

RECEIPT OF DRAWINGS:

Receipt is acknowledged of the Drawings and addenda, listed under "Addenda Receipt"

NAME \_\_\_\_\_ FIRM \_\_\_\_\_

INCORPORATION \_\_\_\_\_ STATE OF \_\_\_\_\_

BY \_\_\_\_\_

TITLE \_\_\_\_\_

DATE \_\_\_\_\_,

OFFICIAL ADDRESS AND TELEPHONE:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Telephone: \_\_\_\_\_

Note: If by a corporation, this proposal must have the signature required by its bylaws.

ADDENDA RECEIPT: (List addenda and supplementary drawings and the date received).

Title

Date Received

END OF PROPOSAL FORM

PROPOSAL FORM

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**KNOX HERITAGE HOUSE  
REQUEST FOR PROPOSALS  
TECHNICAL AND GENERAL REQUIREMENTS: Solar Hot Water Installation  
February 23, 2010 Specification**

**I. OVERVIEW OF INTENT**

Knox Heritage plans to install both solar hot water and solar PV technology on a residential home of historic significance. The intent of the project is to showcase low-profile or roof-integrated solar power installations that do not destroy or detract from the historic character or integrity of the home. The installations will be one component of a larger gut-rehabilitation of the home to LEED certification standards, a project which has already received national attention and is expected to become a national model for energy efficient rehabilitation and remodeling of historic homes. As such, the solar design and installation process should be innovative and replicable, and should adhere to all historic rehabilitation regulations and solar installation best-practices. Specific historic building regulations pertaining to solar installations are under development with the Historic Zoning Commission. Drafted proposed regulations will be shared at the mandatory pre-proposal meeting on February 23<sup>rd</sup> and are available in Attachment A: Draft Historic Guidelines for Solar.

The intent of this request for proposals is to identify a firm that can design and fully install a solar hot water system that achieves the goals of the project. The following specifications are issued to provide general guidance regarding historic appropriateness and installation. Interested firms should read the following specifications carefully to ensure they are aware of contract expectations and prepared to turn in all necessary information. The term “Contractor” refers to those submitting a proposal. The term “Owner” refers to Knox Heritage. A total of \$30,000 is available for the combined labor and installation of a solar PV and solar hot water system.

Any and all expenses incurred by the proposing entity(ies) resulting from the preparation of proposals/submissions shall be borne by the proposing entities.

**II. TIMELINE**

This timetable is for the information of submitting entities. These dates are subject to change, but **in no event shall the deadline for submission of the proposals be changed except by written modification from Knox Heritage.**

Availability of RFP.....	February 23 <sup>rd</sup> , 2010
Mandatory Pre-Proposal Meeting*.....	February 23 <sup>rd</sup> , 2010
Deadline to submit questions (in writing) to Knox Heritage**.....	March 5 <sup>th</sup> , 2010
Proposals due.....	5:00 PM, March 12 <sup>th</sup> , 2010
Selection Process.....	March 15 <sup>th</sup> -26 <sup>th</sup> , 2010
Anticipated Contract Start Date.....	April 12 <sup>th</sup> , 2010

The selected contractor will work with Knox Heritage to integrate the installation schedule for the SHW system with the overall home rehabilitation schedule. Design of system should commence as soon as possible upon execution of contract; term of contract for installation shall be 21 days from issuance of notice to proceed by Knox Heritage assuming no extreme weather or other approved reasons for delay. It is anticipated that the selected firm will have three weeks to complete design of the system. Award of contract is dependent on appropriate federal and local government approval of a subgrant from the Knoxville Solar America Cities Program to Knox Heritage and DOE approval of a Knoxville Solar America Cities subcontract with Knox Heritage. Actual installation will require federal NEPA approval prior to starting construction.

*\* The mandatory pre-proposal meeting will be held February 23<sup>rd</sup>, 2010 at 2:00 PM (EST) at the offices of Knox Heritage, The Carriage House at Greystone, 1300 N. Broadway Knoxville, TN 37917*

*\*\*Questions should be submitted via email to kimtrent@knoxheritage.org. Answers to all questions shall be issued in writing to all interested firms and by addendum, so that all firms have equal information when preparing their proposals.*

### **III. Specifications**

These specifications cover the procurement of equipment, hardware, documentation, labor and supervision required for the installation of Solar Hot Water (SHW) system on the roof of the Knox Heritage house. Construction will occur during the major building renovation expected to begin Spring 2010.

#### *A. General Information*

1. More information about the roof structure/dimensions of the home and shading is provided in Attachment B: Solar PV/Thermal Specification Data and Drawings Package.
2. The system shall be provided on a "turn-key" basis to the Owner. Proposals shall provide energy production estimates with documentation supporting the calculations.
3. Design Load: The current structure is to be renovated for residential use. In anticipation of a 4-5 person household, a daily hot water usage of at least 75 gallons per day should be considered for purposes of overall system design.
4. The system shall be a drain-back or pressurize glycol system that meets a freeze tolerance of -20°F, mounted flush with the roof, as shown in the attached drawings.
5. The system shall be properly designed for the installation at the chosen site. The area is subject to long-term high humidity and temperature conditions. The system shall be designed to handle expected ambient temperatures that range from 5°F to 93°F (temperatures provided by ASHRAE). Supplied equipment must be rated and warranted to withstand and operate under these conditions.

6. The SHW system will be interconnected to the Owner's household hot water supply lines. The design and specification of the SHW collectors, piping system, collector configuration, storage tank, transport subsystem, control and instrumentation subsystem and electrical work are described in the following sections.
7. Owner will incorporate required manufacturer's and vendor's drawings into its as-built drawings for its own records. Therefore, all drawings created for the project shall be provided within three (3) weeks after the award. Drawings will be submitted in an electronic format that may be imported into AutoCAD drafting software. Proper credit of the source of these drawings will be noted on the Owner's drawings.
8. Contractor shall be responsible for educating, coordinating, and satisfying all questions from the Owner before, during, and after installation.
9. Proposals must list all major system components required to complete system installations.
10. Contractors should be aware of all the documentation and procedural issues required prior to submitting proposals. These are listed below.
11. The successful Contractor shall work under any state licenses as required by the local authority having jurisdiction.
12. The successful Contractor should provide documentation of experience in the installation of similarly-sized systems.
13. Firms may include any value-added services in their proposals and cost estimates, as long as they are not bound to the mandatory portions of this specification.
14. Selected contractor shall provide training for Knox Heritage/Homeowner to properly use and maintain SHW system.
15. System should be optimized for easy use and maintenance by the homeowner.
16. Please note that additional requirements regarding indemnification and contract termination may be issued by addendum.

#### *B. SHW Collector Specifications*

1. The base bid should include pricing for glazed flat plate solar collectors.
2. The collectors shall be SRCC OG-100 rated. While use of a SRCC OG-300 certified system is preferred, it is not a mandatory requirement for purposes of bidding.
3. Each collector unit shall be warranted by the manufacturer for at least 10 years from the date of system acceptance.

#### *C. Piping System Specifications*

1. Provide a piping system complete with pipe, pipe fittings, valves, strainers, expansion loops, pipe hangers, inserts, supports, anchors, guides, sleeves, and accessories with this specification and the drawings. Pipe shall be designed to observe limits on flow velocity, pressure drop, and gauge pressure associated with the pipe type and characteristics.

2. Provide, install and test the piping. Provide piping flow rates below 5 feet per second. Piping shall be Type L or Type M copper tubing, ASTM B-88, with 95-5 tin-antimony soldered joints. If cold water piping supplying the SWH system is of another type, such as PVC, it shall be replaced within 10 feet of the SWH system with copper to avoid bulging and rupture due to proximity to the higher temperatures of the solar system.
3. Pipe Insulation: Furnish interior pipe insulation and coverings such as Armaflex, Insul-Tube, Rubatex, or approved equivalent. Provide outside array piping insulation with a capability of withstanding 250 degrees F, except that piping insulation within 1.5 feet of collector connections shall be capable of withstanding 400 degrees F. Protect outside piping insulation from water damage and ultraviolet degradation with a suitable outer coating manufactured for this purpose (aluminum, sunlight resistant PVC or approved equal).
4. Pipe Hangers and Supports: Support and hang piping so that the weight of the piping is not supported by drywall, siding, or other building members not designed to bear load. Support piping so that thermal expansion and contraction of pipe lengths is accommodated.
5. Valves: Provide valves compatible with the piping. Ball valves shall be used for shutoff, with full port, bronze body, bronze ball and teflon seat. Bronze hose-end gate valves shall be used for draining low points of piping.

#### *D. Collector Configuration*

1. Net Absorber Area and Collector Layout: Collectors should be sized for the available space as outlined in the attached drawings. Bids may also present optional installations at alternate locations on the structure based on optimizing solar resources.
2. Supports for Solar Collectors: Provide support structure for the collector array of aluminum, stainless steel, or other corrosion-resistant approved material. Collectors are to be mounted parallel to the pitched roof. Provide a support structure that will withstand the static weight of filled collectors and piping, wind, seismic, and other anticipated loads without damage. Provide a support structure that allows access to all equipment for maintenance, repair, and replacement. Neoprene or EPDM washers shall separate all dissimilar metals. Depending on system type, supports for solar array could terminate in ballast blocks to avoid roof penetrations.

#### *E. Hot Water Storage and Backup Tank*

1. Provide a cylindrical thermal energy storage solar preheat tank suitable for potable surface with a storage capacity between 1.25 and 1.75 gallons per square foot of collector area. The tank is to be insulated with a loss coefficient of not more than  $0.5 \text{ W/m}^2 \text{ } ^\circ\text{C}$ . Provide a tank rated at 100 lb/in<sup>2</sup> at 190 degrees Fahrenheit. The system is to have a back-up heating source capable of supporting the full heating requirements of the system (as outlined in Sect A.2) in the event that that collector panels are unable

to provide sufficient heating (i.e. extended periods of cloud cover, limited sunlight exposure in winter). Note that the selected installation company will be required to coordinate early and very carefully with the home rehab's General Contractor on this project so as to avoid confusion and purchase/installation of unnecessary water tanks.

#### *F. Transport Subsystem*

1. Heat Exchanger: Provide a minimum design pressure rating of 100 psi. Construction of heat exchanger should be of 316 stainless steel, titanium, copper-nickel, or brass. Furnish heat exchanger with a capability of withstanding temperatures of at least 240 degrees F. Tube-in-tube copper side-arm heat exchangers are acceptable for appropriate system types.
2. Pumps: Provide electrically-driven, single-stage, centrifugal type circulating pumps such as those manufactured by Grundfos, Hartel, March, Taco or approved equivalent. Support pumps on a concrete foundation or mounting intended for the purpose, or by the piping on which installed if appropriate to the size. The pump shaft shall be of corrosion resistant alloy steel with a mechanical seal. Provide stainless steel impellers and casings of bronze. Control motors with switches that can be activated by either the differential temperature controller or by manual override (Hand-Off-Automatic). Pumps shall be installed with isolation valves so the pump can be serviced without draining the system.
3. Heat Transfer Fluid: Heat transfer fluid shall be compatible with all materials in the system. The nature and amount of heat transfer fluid will depend on the type of system proposed and the freeze conditions encountered at the site. Any anti-freeze, conditioners or corrosion inhibitors added to the heat transfer fluid must be non-toxic and intended for use in potable water systems.

#### *G. Control and Instrumentation Subsystem*

1. Differential Temperature Control Equipment: If the system design includes controls, furnish the differential temperature control equipment as a system from a single manufacturer. Furnish a solid-state electronic type controller complete with an integral transformer to supply low voltage. Controller accuracy shall be plus or minus 1 degree F. Supply controllers that are compatible with the thermistor temperature sensors. Provide differential controls with direct digital temperature readings of all temperatures sensed. Supply controls with a visual indicator when pumps are energized. Provide a controller that will identify open and short circuits on both the solar collector temperature sensor circuit and the storage tank sensor circuit.
2. Thermistor Temperature Sensors (if utilized): Provide temperature sensors that are compatible with the differential temperature controller, with an accuracy of plus or minus 1 percent at 77 degrees F. Supply sensors that have passed an accelerated life test conducted by subjecting thermistor assemblies to a constant temperature of 400 degrees F or

greater for a period of 1000 hours minimum with an accuracy of within plus or minus 1 percent as stated above. Furnish hermetically sealed type thermistors. Provide immersion wells or watertight threaded fittings for temperature sensors. Temperature sensors shall be mechanically attached to the surface they are measuring and wire to the sensor must be mechanically attached and protected along its length.

3. Tempering Valve: All systems installed under this procurement action MUST have a tempering or mixing valve to limit the temperature of the hot water supplied to the plumbing fixtures. The tempering valve is to be located downstream of the electric water heater and is to be set to a temperature suitable for the application.
4. System should have basic data reporting abilities so that BTU energy output of the system can be monitored for technical and educational purposes.

#### *H. Electrical Work*

1. If pumps are required in the system design, provide electric motor-driven equipment complete with motor, motor starters, and controls. Provide electrical equipment and wiring in accordance with NFPA 70. Furnish motor starters complete with thermal overload protection and other appurtenances necessary for the motor control specified. Provide each motor of sufficient size to drive the equipment at the specified capacity without exceeding the nameplate rating of the motor.

#### *I. SHW Collector Mechanical Design*

1. The Contractor shall provide the mechanical hardware for mounting the SHW collectors. The Contractor shall provide all other hardware required for assembling the collectors and structurally attaching them to the roof supports.
2. The collectors, hardware and attachments shall be designed to withstand the required wind loads and comply with all existing local and national codes. Verifying documentation shall be provided to the Owner.
3. Collector mounting hardware supplied by the bidder should be compatible with the site considerations and environment. Special attention should be paid to minimizing the risk from exposed fasteners, sharp edges, and potential damage to the modules or support structure. Corrosion resistance and durability of the mechanical hardware should be emphasized – the use of stainless steel fasteners and an aluminum support structure is preferred. Galvanic corrosion should be avoided.
4. Aesthetics of the overall installation are extremely important to the Owner. To create a uniform appearance, spacing between individual collectors should be kept to a minimum. As much as possible, all mechanical hardware, piping and other equipment should be concealed. Preference will be given to bids that seek to address the sensitive aesthetic requirements of this heritage restoration project through designs that are unobtrusive to a street level observer.

#### **IV. INFORMATION TO BE SUPPLIED WITH PROPOSALS**

- A. Proposals must include (at a minimum) the following information to be considered responsive:
1. The total price for the design and installation of a qualifying solar hot water system.
  2. General design concept for the SHW system outlining/showing:
    - a. Proposed technology to be used;
    - b. Size of system;
    - c. Proposed location on roof;
    - d. Visual impact of all system components from street-level view
  3. Information (descriptions and any appropriate graphics) showing details of collectors/array mechanical support.
  4. Parts lists and cut sheets for the major components (collectors, pump, water storage tank(s), mounting system).
  5. Anticipated construction schedule outlining the expected or required lead-time in delivery of equipment, and the projected completion date.
  6. A price list for all replacement components, including individual collectors, pumps and tank(s) shall be included. These prices are to remain in effect for one year after the date of acceptance.
  7. Description of test plan for final system acceptance (as outlined in Sect 6.4 below)
  8. Warranty information on individual components.
  9. Description of your organization's qualifications with regard to conducting similar projects by providing the following:
    - a. Names, contact information, and résumés of the top management team of your organization and (more importantly) the résumés of the persons who will actually be doing the work if your firm is selected.
    - b. Proof of NABCEP- Solar Thermal Installer certification, where relevant.
    - c. Names of any subcontractors (including key personnel and résumés) and their scope of services;
    - d. Proposed responsibilities of each team member;
    - e. Any other information necessary to explain your qualifications and/or demonstrated competence.
  10. Proof State of Tennessee-issued General Contractors and City of Knoxville-issued Plumbing license, with license numbers, type of license, and expiration date.
  11. Proof of Certificate of insurance (More information on Knox Heritage's insurance requirements for contractors will be posted by addendum).
- B. Proposed design concepts will be considered as part of the proposal review process. The drawings and other technical information will be checked for completeness, accuracy, and aesthetic compatibility of the structure. Firms

whose proposals include insufficient design information may be requested for additional supporting material or have their bid dismissed outright.

C. Please submit four copies of the full proposal for review by committee.

## **V. EVALUATION CRITERIA**

The criteria listed below will be used to evaluate written submissions. The scoring weight is listed for each criterion. These criteria will be applied and interpreted solely at the discretion of the proposal evaluation committee established by Knox Heritage, and their decision(s) shall be final. Proposals should include all necessary information pertinent to these evaluation criteria. Additional information required for proper assessment of proposals may be requested at the discretion of Knox Heritage. Evaluation criteria and points are as follows:

- A. System Design and Innovation (30 points)
  - i. Aesthetic qualities of design concept, technologies, and the overall expected installation.
  - ii. Compliance with the intent of Historic Zoning regulations.
  - iii. Ease of system maintenance.
  - iv. Ability of design to be replicated on other historic properties.
- B. Cost Effectiveness (30 points)
  - i. Expected cost per BTU expected capacity.
  - ii. Warranty of system components and installation.
  - iii. Supplier stability
- C. Firm Qualification (30 points)
  - i. Demonstrated competence of critical personnel involved with the project.
  - ii. Experience of the firm in managing similar projects and fulfilling project requirements.
- D. Total Cost of Project (10 points)
  - i. Includes Design, Equipment, Construction, and all other expenses related to the project.
  - ii. Proposals totaling over \$30,000 will not be accepted.

## **VI. INFORMATION TO BE PROVIDED BY CONTRACT AWARDEE BEFORE PROJECT COMPLETION**

- A. The Contractor is responsible for providing two complete hard copies of all installation, operations and maintenance manuals, plus two copies on data CDs.
- B. As-built diagrams indicating overall layout of entire system, including SHW collectors, and location of BOS .
- C. A site survey of the intended collector locations should be completed before the installation begins.
- D. An acceptance test must be performed on the system once the installation is complete. At a minimum this includes:
  - 1. Hydrostatic Test: Hydrostatically test system. Isolate valving and instrumentation not suitable for the intended pressure test

2. Operational Test: Operationally test each system with sufficient solar insolation to cause activation of the system during daylight hours. As required by system design, demonstrate the system controller will start the pumps after being warmed by the sun, and that it will properly shut down during cloudy weather or in the evening over a minimum of three complete cycles. It is permissible to manipulate the temperature of the storage tank by the introduction of cold water.
  3. Temperature Sensor Diagnostics: As required by system design, demonstrate the controller will correctly identify open and short circuits on both the solar collector temperature sensor circuit and the storage tank sensor circuit. These tests will be conducted in accordance with the test plan submitted as part of the original bid package. Results of all acceptance tests shall be submitted in a written record.
- E. A copy of the permit obtained from the appropriate legal authority for system installation.
  - F. A copy of the **minimum one-year** system warranty including parts and labor as well as individual subsystem component warranties.
  - G. Collector array structural design information sealed by a professional engineer is required.

## **VII. BONDS**

The Contractor will be required to provide a Performance and Payment Bond in the full amount of this contract.

### **SUMMARY:**

In your bid response, please provide line item costs for:

1. SHW Collectors + BOS materials
2. SHW Labor
3. Bond

Thank you for considering our project.

### **Attachments:**

A: Draft Historic Guidelines for Solar

B: Solar PV/Thermal Specification Data and Drawings Package