

POSITIVE ENERGY INC.

Independent Electric Power Systems

Project Report

Solar Electric Thermal Hydronic (SETH) Product Development Project

University of California (Los Alamos National Laboratory)
Subcontract Number 04397-001-99-35

Bristol L. Stickney and Allan Sindelar
September 30, 1999

ABSTRACT AND SUMMARY

Positive Energy, Inc. received a second Technology Maturation and Commercialization Project Subcontract during the 1999 round of awards. This Subcontract is for the purpose of further aiding Positive Energy, Inc. in preparing its Solar Electric Thermal Hydronic ("SETH") control and distribution package for market introduction. All items of this subcontracted project have been successfully completed.

This Project Report contains a summary of the progress made during the SETH Development Project ("the Project") over the duration of the 1999 Subcontract. It includes a description of the effort performed and the results obtained in the pursuit of intellectual property protection and development of product documentation for the end users. This report also summarizes additional efforts taken by and for the SETH project outside of the Subcontract. It presents a chronology of activities over the duration of the Subcontract, and includes a few selected sample copies of documents offered as evidence of our success.

STATEMENTS OF OBJECTIVES AND RESULTS OBTAINED

Part 1: Background

In the Positive Energy, Inc. Technical Proposal, dated April 23, 1999, we sought TCO funding to assist us in achieving the following four objectives:

1. Legal support to secure patent and trademark protection on our product.
2. Continued technical refinement in several areas.
3. Professional development of Design, Installation, and User's manuals for use with our product.
4. Completion of a market assessment for our product.

Objectives 1. and 3. were substantially funded by the Subcontract, and the effort performed and results obtained from completing these two Objectives are described in the next parts of this section.

Part 2: Intellectual Property Legal Support (Objective One)

Our section of our Proposal that addressed intellectual property legal support read as follows:

We are purposefully avoiding general distribution of the SETH package or the details of its design until we can protect it. Should another manufacturer of hydronic heating equipment recognize the value of our design, and develop and market a similar product, we could not defend our original work. We wish to work with an attorney specializing in the area of intellectual property. This legal work will address two specific topics:

1. To file one or more patents on our design;
2. To establish trade name protection for the SETH name, or a different name if appropriate;

We intend to pursue a utility patent on the SETH design, including as many design options as possible.

We would expect initially to apply for a provisional patent, to allow us to begin marketing SETH packages as soon as possible.

Patent Protection

Our efforts to obtain patent protection for SETH took the greatest effort. As part of the preparatory research for our Proposal, we contacted three recommended patent attorneys in Albuquerque to receive information about the patent procedure and the typical costs involved. When the Subcontract was

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awarded, we were ready to move forward with our selected patent attorney, Dennis F. Armijo, who provided competent and professional service to us.

We first completed a patentability search to ascertain that our design was indeed unique and patentable. We then crafted a utility patent application that is as broad in scope as possible. We faced a stringent time constraint for submittal of our patent application, as our first recorded sale of a SETH unit was on September 6, 1998, and we are allowed one year from first sale to file.

We submitted our patent application on August 26, 1999. Our application was carefully written to protect the SETH design approach at its most fundamental level. In our application, we have described two preferred embodiments and twenty claims. We have completed filing of a nonprovisional patent application, and we now can (and should) legitimately use the term "Patent Pending" on all of our SETH products and product literature.

Trade Name Protection

Although we both remain quite enamored of the SETH name, our informal research has determined that we should select another trade name for our product that is stronger and more descriptive. We have not yet selected a name to replace SETH, although we have developed a list of likely candidates.

We have submitted an application to the office of the New Mexico Secretary of State for Trademark protection in New Mexico. This will protect the SETH name from exploitation by others in our home state. (With one exception, all of our production SETH units have been installed in New Mexico.) When we have chosen the replacement name to be used for SETH Stout and Light, we will file for federal Trademark registration through our attorney, Dennis Armijo.

Part 3: Support Documentation (Objective 3):

In our Proposal, Objective 3 identifies the need for "Professional development of Design, Installation, and User's manuals for use with our product". We proposed to hire a technical writer to work directly with us to complete these manuals and prepare them for printing.

We originally envisioned developing three distinct manuals:

- The Design Manual would be a planning guide for incorporating the SETH approach into new construction. It would also serve as ordering guide for purchase of a SETH package for a specific application. Topics would include heating zone placement and hydronic loop design, selection of SETH packages (*Stout* or *Light*), guidelines for boiler compatibility, pump selection, and special applications, including retrofit installations.
- The Installation Manual would accompany the delivered hardware package. It would address specifics of the actual installation, including plumbing and wiring diagrams, system startup, and troubleshooting.
- The User's Manual would accompany the installation manual, but it would be written for the homeowner's use. It would offer non-technical explanations of the SETH system, maintenance procedures, and troubleshooting guidelines. It will also contain warranty and service information.

During the course of our work on this part of the Subcontract, we hired a technical writer (Octavio Ramos, a skilled technical writer who was suggested to us by the Technology Commercialization Office). He first made a thorough review of the earlier drafts and the three objectives stated above. He recommended that we organize the information in a substantially different way:

- The most basic user information would be summarized in marketing brochures that explain what SETH is and does, to guide the buyer's choice of the proper model.
- The Installation Manual would contain related design and application information, as well as thorough and specific instructions that would be relevant to most common installations. This manual would be appropriate for the majority of common installations, with enough reference material to allow proper installation, startup, operation and troubleshooting for both the installer and the owner.
- As SETH may be modified in many possible variations to control custom heating systems, each variation would be written up in an instructional supplement called a "Procedure". These special Procedures would be included with the standard Installation Manual as needed for custom applications.

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Using a standard format, each would contain specific design guidelines, and would include operating and installation instructions necessary for that specific variation. New Procedures could be written whenever a new custom design variation is encountered.

We decided to follow the recommendations of our technical writer. As a result, he first developed a set of three standard templates upon which to structure our manuals. The three include one template for a series of tri-fold brochures, another for the Installation Manual, and another for the Special Procedures series. The template method will allow any competent writer to work in a standard format, with text and graphics, using a computer word processing program. The templates include a numbering system that keeps track of updates and revisions as they occur.

Two draft tri-fold brochures have been completed, one that explains what SETH is and one that explains what SETH does. The first working version of the Installation Manual is complete. Because it includes more content than originally envisioned, it is now about twice as long as originally estimated, filling out nearly 50 pages. The working draft of the first Special Procedure has also been completed.

We expect to continue writing Special Procedures regularly, as new applications for SETH are implemented. We also expect to be able to update the brochures and manuals easily, using the electronic templates, whenever new graphics, photographs, name changes, or corrections are called for in the future.

NOTES ON ADDITIONAL AREAS OF DEVELOPMENT

We have also made substantial progress on some of the Objectives included in our 1999 Proposal. Areas but not funded by this Subcontract.

Continued Technical Refinement

In our 1999 proposal, we identified four specific design refinements as desirable options. During the Subcontract term, a number of SETH heating system installations have been under construction. Three of the four refinements were incorporated into SETH heating systems installed in this region:

- Some hydronic systems employ an external "primary" boiler pump in combination with secondary zone pumps. A minor modification to the SETH package would cover this contingency. We installed (but have not yet begun operation) of two hydronic systems that employ this design option.
- Design enhancements may be incorporated into the SETH package to allow a domestic hot water priority option. This would allow a boiler to also provide domestic hot water in a "sidearm" tank configuration, a popular option in upscale homes. One of the two systems mentioned above also includes this option.
- A similar design option would allow active solar heating collectors to be incorporated into either a SETH *Stout* or *Light* package. A solar heat priority circuit option would allow the boiler to shut down whenever sufficient solar heat is available for space heating or domestic hot water. Three SETH installations, including both of the above systems, include this option as well.

These SETH systems are in new houses, and will serve as showcase examples. We will develop these modifications into a series of options that will allow the SETH control system easy compatibility with the greatest number of heating system configurations. Custom features requested by the owners of these systems will be written up as Procedures once they are completed and commissioned. Photos of these systems will be updated in the brochures and manuals as they become available.

Completion of a Market Assessment for our Product

The Technology Commercialization Office independently commissioned Argus Insights, a market research firm, to perform a Market Assessment for SETH. The researchers interviewed us several times over the course of their research. We provided them with names of component manufacturers, distributors, dealers, and professionals in relevant industries, in addition to their own researched sources.

Their excellent research concluded that the market size for the SETH product for off-grid applications ranged between 1,350 and 3,600 units, and they projected annual growth rates of 20% for the

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Photovoltaic industry, and 25-30% for the hydronic industry. They gave no estimate of market size for the grid-connected backup heating market.

Their estimate for the off-grid market pleased but did not surprise us. This estimate reinforces our confidence that SETH is a unique, effective product, intended to fill a specific market niche for which it is ideally suited. This niche is invisible to the casual eye; Argus Insights was able to substantiate a market of this size through diligent investigation.

The lack of a market size estimate for the other projected market, backup heat for grid-connected applications, is not surprising as little if any market now exists for an as-yet unknown product. SETH has no direct competition. Sales to this market depend on effective advertising and promotion of a genuinely new product and concept. Only a focused effort will determine the size of this untested market.

Independent Marketing Efforts

Shortly after submittal of the provisional patent application (which finally allowed us to openly display our product) Allan Sindelar attended the Southwest Renewable Energy Fair, a major regional solar industry conference in Flagstaff, Arizona. He showed a complete SETH *Light* package to several major national distributors who were displaying at the fair. All indicated serious interest in our product, and all requested sales brochures and pricing information as soon as it was available. The reactions were consistently favorable. In fact, the CEO of one major distributor of renewable energy equipment (David Katz of Alternative Energy Engineering, Inc.) purchased the same SETH *Light* package to use in his own home.

Home Power Magazine also inspected the SETH unit at the Fair. The publishers have offered one year of display advertising for SETH, with layout and graphic design services, at no charge, in order to help introduce SETH to the renewable energy market. In addition, they wish to purchase a unit for their own facility, to use for comparison testing of solar thermal systems for publication in the magazine.

On the same weekend, Bristol Stickney attended the annual conference of the New Mexico Solar Energy Association at Ghost Ranch, New Mexico. He announced our development of the product and the patent pending status. He talked individually to conference attendees who expressed an interest in the details of the product. He also submitted an announcement to be included in the conference proceedings, with mention of TCO support and a web page address to contact us for more information.

CHRONOLOGY OF SETH DEVELOPMENT DURING PERIOD OF SUBCONTRACT

The following project development record is listed in chronological order, as recorded by members of the development team. The first chronology relates to development of our patent and trademark. The second chronology addresses efforts made concerning development of the manuals. The third chronology concerns matters related to the Market Assessment done for SETH at the request of the TCO.

Development of Patent and Trademark:

- 6/11/1999 Initial meeting with Patent Attorney at his office in Albuquerque to plan the actual procedure for preparing a patent application. Arranged to do nearly all document preparations of text and drawings by collaboration by e-mail over the Internet.
- 6/14/1999 Received "Terms of Representation" letter from patent attorney. Wrote up first draft of patent disclosure statement for the patent attorney.
- 6/15/1999 Wrote up final draft of patent disclosure statement for the patent attorney after his review.
- 6/29/1999 Received positive Patentability Search results from the patent attorney, with instructions to write up our perceived differences between existing related patents and our claims. This was done in the following days. Several additional internet searches for further similar patents accomplished using different key words.
- 7/7/1999 Discussed Patentability Search results with the patent attorney.
- 7/12/1999 Met with Ron Brookman, TCO contract consultant, to review the contract goals.

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- 7/13/1999 Ran several patent searches on the Internet and wrote reviews of our findings for use by the patent attorney.
- 7/14/1999 Received letter from patent attorney advising that we could proceed with a patent application with further instructions.
- 7/21/1999 Received instructions by e-mail on how to prepare the information needed to assemble a patent application. This would include descriptions of prior art, specific descriptions and drawings.
- 7/29/1999 Finished a preliminary package of descriptions and drawings that describe the "preferred embodiment" (a.k.a. SETH Stout control package) to be sent to the patent attorney by e-mail.
- 7/30/1999 Wrote reviews of the final few patents we could find with similar "prior art" for the patent attorney.
- 8/2/1999 Finished a preliminary package of descriptions and drawings that describe the "second embodiment" (a.k.a. SETH Light control package) to be sent to the patent attorney by e-mail. Began preparing a list of possible "Claims" and "Objectives" of the invention for inclusion in the patent application.
- 8/3/1999 Finished a preliminary package of descriptions and drawings that describe an "alternative embodiment" (a.k.a. the Seth 12 volt DC control package), to be sent to the patent attorney by e-mail.
- 8/9/1999 Meeting at Positive Energy to organize and review ongoing contract work.
- 8/12/1999 Finish a major revision of the text and drawings, edited for technical accuracy to suit the requirements of the patent application, as instructed and reviewed by the patent attorney.
- 8/14/1999 Meeting at Positive Energy to discuss and organize ongoing work on the product and the contract.
- 8/17/1999 Edit and revise six drawings to incorporate details and features required by the patent office. E-mail copies to the attorney's office and send originals by mail.
- 8/18/1999 Review the final edits of the text of the patent application. Discuss the list of claims and their wording with the patent attorney by phone.
- 8/23/1999 Review and edit the wording of the final list of patent claims.
- 8/25/1999 Review final wording of patent application and accept it with only minor typo corrections.
- 8/26/1999 Meet at attorney's office in Albuquerque to sign and send off patent application.
- 9/7/1999 Meet with Ron Brookman at Positive Energy's office. Presented him with the finished patent application and the working copies of the brochures and manuals. Meet also with Robert Kline, an advisor from the Board of Directors of the Santa Fe Business Incubator, who discussed marketing and other issues pertinent to our product. Spoke with Positive Energy's Certified Public Accountant regarding incorporation strategies for a distinct and separate SETH business entity.
- 9/21/1999 Meeting at Positive Energy about SETH project and conference debriefings.
- 9/29/1999 Prepared New Mexico State Trademark Application for SETH trade name, filed with Secretary of State

Development of Manuals:

- 6/26/1999 Meeting with technical writer in White Rock to present and discuss unformatted draft material to be used in brochures and manuals as well as procedures for collaboration and editing by E-mail.
- 7/17/1999 Met with technical writer in White Rock for review of outlines, formats and contents developed so far by E-mail following our last meeting.
- 7/19/1999 Wrote new text sections of the Installation Manual and created a computer file of photo images of the product and components using a video camera. Continued through 7/20/99.
- 8/4/1999 Met with technical writer in White Rock to view sample formats and discuss content and graphics.
- 8/15/1999 The first formatted working draft of the Installation Procedure of the Combicor Solar Hydronic Heating System is produced by the technical writer. This will serve as a template for the many "Procedures" that will be written to cover all the different ways a SETH control system can be applied to various hydronic heating system configurations. The collection of "Procedures"

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along with the Installation Manual and other reference materials supplied by the manufacturers of key components will make up the sum total of the "Design Manual". This modular approach was recommended by the technical writer to allow easy additions, deletions and revisions to a design manual as components and applications are changed and refined in future installations.

- 8/18/99 Receive e-mail copies of the latest versions of the User Manuals from the technical writer.
- 9/1/1999 Sent first of several customer testimonials to the technical writer to be included in the marketing brochures that are under development.
- 9/13/1999 Send digital photographs taken from several recent visits to new field installations to the technical writer for use in the brochures and manuals.
- 9/15/1999 Began a list of names to possibly replace "SETH" as our product brand name. Review and edit the text and format of the brochures and manuals. Make corrections and add graphics.
- 9/16/1999 Write additional text of procedures with more graphics and specifications for the manuals. E-mail all edits and additions to the technical writer for formatting the next day.
- 9/25/1999 Meeting in White Rock with the technical writer to see the layout of the brochures and manuals.
- 9/27/1999 Downloaded the electronic templates for the brochures and manuals, by e-mail from the technical writer. These templates will allow easy editing and updating when new applications, improved procedures, new components or better graphics become available.

Market Assessment

- 7/12/1999 Met with market research team member in Santa Fe to familiarize him with the product.
- 8/24/1999 Received a list of questions from the market assessment team. Worked out the answers in a phone call with Allan Sindelar.
- 8/26/1999 Telephone discussion with market assessment researcher covering most aspects of SETH markets.
- 8/30/1999 Market assessment completed by market team, received their report a few days later.

TESTIMONIALS

As part of our marketing plan, we have been soliciting and recording the testimonials of users of SETH and "pre-SETH" heating control packages, for use in our design manual and product literature. A sampling of the responses we have received include:

"It's the most comfortable heat we have ever felt. (Even with the large) size of our home...29 foot ceiling...and open floor plan, on the coldest day (of the year) the house is as warm as we want it to be. Extremely comfortable heat. Positive Energy has bent over backwards to help with any questions...we have had. We feel confident that we have had the best!"

Rusty and Ricki Read, remote home owners and cattle ranchers, Maes, NM.

"I was amazed how quickly the system came on line...It only took 3 or 4 days to bring the house with brick floors up, and it kept it there all winter. I'm delighted with it. It uses almost no electricity."

Scott Massey, remote home owner, Cochiti, New Mexico

"I used to run my [backup] generator three or four times a week during the winter months, sometimes twice a day. I retrofit my boiler in late fall of 1997, and I didn't use my generator once that winter. I feel extremely fortunate to have the boiler retrofit so it cut down on personal energy, to run the generator, maintain it, keep gas in it...I feel much more positive in my whole life. It has saved me financially, energy-wise, and [with] increased peace of mind. I would highly recommend it to anyone."

Jim McGrath, remote home owner, La Cienegulla, New Mexico

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FILING RECEIPT



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APPLICATION NUMBER	FILING DATE	GRP ART UNIT	FIL FEE REC'D	ATTORNEY DOCKET NO.	DRWGS	TOT CL	IND CL
	08/26/99	2838	\$380.00	2140-99	6	20	2

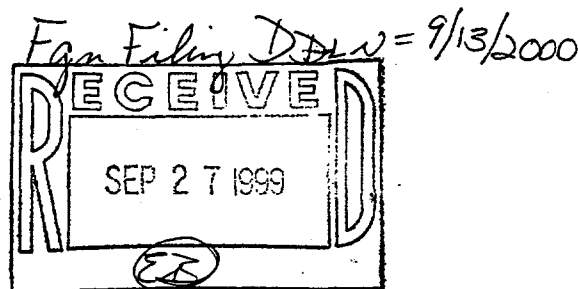
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Receipt is acknowledged of this nonprovisional Patent Application. It will be considered in its order and you will be notified as to the results of the examination. Be sure to provide the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION when inquiring about this application. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please write to the Office of Initial Patent Examination's Customer Service Center. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts of Application" ("Missing Parts Notice") in this application, please submit any corrections to this Filing Receipt with your reply to the "Missing Parts Notice." When the PTO processes the reply to the "Missing Parts Notice," the PTO will generate another Filing Receipt incorporating the requested corrections (if appropriate).

Applicant(s) BRISTOL L. STICKNEY, TESUQUE, NM; ALLAN L. SINDELAR,
SANTA FE, NM.

IF REQUIRED, FOREIGN FILING LICENSE GRANTED 09/13/99 ** SMALL ENTITY **
TITLE
DIRECT CURRENT ELECTRICAL CONTROLS FOR HEATING SYSTEMS

PRELIMINARY CLASS: 363



DATA ENTRY BY: JONES, ANN

TEAM: 06 DATE: 09/13/99

(See reverse for new important information)

APPLICATION FOR
REGISTRATION OF TRADEMARK/SERVICE MARK
STATE OF NEW MEXICO

COPY

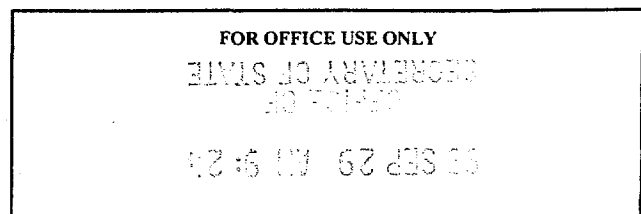
Complete **all** items on the application. The application must be typed or printed in black ink and signed by an individual applicant, general partner, or officer of a corporation or an association. Enclose three different specimens of the mark and \$25.00 for each class code (see number 11 below) plus an application fee of \$25.00.

1. Name of applicant: Positive Energy, Inc.
2. Business Address: 3900 Paseo del Sol #201, Santa Fe NM 87505
3. If applicant is a corporation or limited liability company, enter state of incorporation: New Mexico
4. If applicant is a partnership, enter the state in which partnership is organized and the full and complete names of the general partners: _____
5. Name of trademark/service mark being registered: SETH
6. State the manner in which the mark will be used on or in connection with goods or services (i.e. on foods, on labels or tags, on displays, on signs or letterheads, in advertising materials, on business cards, etc.): Product labels, advertising and marketing literature, signs.
7. Describe in exact detail the mark to be registered: The word SETH, as acronym for Solar Electric Thermal Hydronic. No logo or design
8. Identify the place(s) of distribution of products in New Mexico or physical location where services are being rendered and available to be rendered in New Mexico (Not a P.O. Box): Throughout the United States and New Mexico
9. Month, day, year of first use of trademark/service mark anywhere: September 6, 1998
MUST BE IN USE PRIOR TO REGISTRATION
10. Month, day, year of first use of trademark/service mark in New Mexico: September 6, 1998
MUST BE IN USE PRIOR TO REGISTRATION
11. Class code(s) in which above particular goods or services fall: 11
SEE REVERSE SIDE
12. Describe the kind(s) of goods or services in each class which the trademark/service mark is used to identify:
A packaged system of electrical controls and pumping componentry for the control of hydronic heating equipment.
13. Contact person and mailing address, if different from above: _____

I hereby swear or affirm under penalty of perjury that the information provided is true, correct and complete and further that, I, or the person or entity I represent, own and use in the State of New Mexico the trademark/service mark identified above and to the best of my knowledge no other person has registered, either federally or in this state, or has the right to use the mark either in its identical form or in near resemblance thereto as to be likely, when applied to the goods or services of the other person, to cause confusion, mistake, or to deceive.

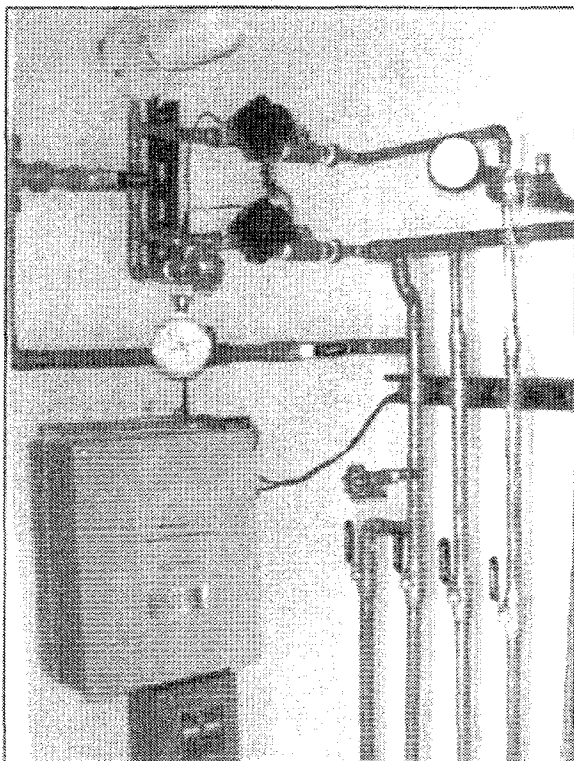
By: [Signature] President 9/29/99
Applicant Signature Title Date
By: Allan Sindelar (505) 424-1112
Please Print Applicant's Full Name Phone Number

Submit application, specimens and fees to:
Office of the Secretary of State
State Capitol, Room 420
Santa Fe, New Mexico 87503





Positive Energy, Inc.



SETH

Solar Electric Thermal
Hydronic

Installation Manual

PEP-SETH-001-R.00

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