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| **Applicant (proposed Prime Recipient): ThermoCapture LLC** |
| **Application Control Number: 0123-4567** |

*INSTRUCTIONS: The Principal Investigator (PI) of the proposed Prime Recipient is required to complete and submit this form with the Full Application. Additional instructions are provided below. A sample response to this form is available on ARPA-E eXCHANGE (*[*https://arpa-e-foa.energy.gov*](https://arpa-e-foa.energy.gov)*).*

Certification: I certify that the information contained in this disclosure form is accurate and complete. I understand that false statements or misrepresentations may result in civil and/or criminal penalties under 18 U.S.C. § 1001.

PI Name: Jane Doe, Ph.D.

Date: 02-13-12

PI Signature: [Insert below..]



1. **ADDITIONALITY AND RISKS:** Mandatory. 4 pages maximum. The PI must provide a narrative response to each question below. If the question is not applicable, please insert “N/A” in the space provided.
   1. **Describe the technical, market, and organizational risks associated with the proposed R&D project.**

ThermoCapture’s proposed technology will use supercritical fluids in a thermal energy storage device that can be integrated with utility-scale solar thermal and geothermal generating sources. A thermal energy storage of the proposed scale has never been developed by researchers in the field, making ThermoCapture’s proposed device advanced relative to the existing state of the art.

To date, ThermoCapture’s research has focused on identification and optimization of appropriate supercritical fluids that demonstrate ideal P-V-T characteristics for thermal energy storage. However, supercritical fluids have not been integrated into a scaled proof-of-concept system sufficient to demonstrate the full potential of supercritical thermal storage capacity for large-scale power systems. As a result private investors have deemed ThermoCapture’s technology premature for commercialization and risky from an investment standpoint (see Item (e) below). Intensive RD&D is required to overcome this perceived market barrier and situate the proposed technology for scaled manufacturing, market penetration, and commercial deployment. Securing public funding to support the proposed RD&D is critical to meeting these objectives.

* 1. **Describe why the proposed Prime Recipient and/or other members of the Project Team need ARPA-E funding for the proposed R&D project, relative to other funding sources.**

The proposed RD&D project seeks to prove the technical and commercial feasibility of using supercritical fluid in a proposed thermal energy storage system through proof-of-concept prototype testing. This work will lay the foundation for eventual commercial-scale demonstration activities. These are critical steps towards scale up, market penetration, and commercial deployment.

Given the technical risk of RD&D that remains for ThermoCapture’s proposed technology, at a proof-of-concept scale private investors are hesitating to provide further backing towards ThermoCapture. In particular, the risks associated with developing a compression technology matching the P-V-T characteristics identified in basic research of the supercritical fluid are high. In addition, as the P-V-T characteristics of the supercritical fluid have been investigated on a basic science basis, the proposed technology has advanced to a level of development beyond basic science (TRL 2), making funding from public sources such as the National Science Foundation inappropriate. Finally, due to the intensive involvement of the National Renewable Energy Laboratory (NREL) in the proposed project, funding under public programs such as the Small Business Innovation Research program is inappropriate.

Within the Department of Energy, ARPA-E is particularly well situated to fund a project of this nature. The project presents significant technical risk and demonstrates immense innovation potential, while other sources of funding are unavailable.

* 1. **Describe how, if the successful, the proposed R&D project may lead to increased employment and manufacturing in the United States.**

In its 3 years of operation, ThermoCapture has generated 21 high technology and 3 administrative jobs. Based on existing growth trajectory, ThermoCapture plans to develop new manufacturing facilities that will expand the company’s size to 110 personnel within 2-3 years. If successful in this project, ThermoCapture may accelerate this growth.

* 1. **If the proposed Prime Recipient is sponsored by private investors, identify the types of private investors that have supported your business and explain why this R&D project is not being supported by the private investors. In addition, describe technical outcomes of the proposed R&D project that could lead to additional private investment following a successful ARPA-E project.**

In April 2010, ThermoCapture raised $1,500,000 in Series A capital based on support from EnergyFund LLC, a venture capital fund. This funding was used to recruit a strong research team and support preliminary RD&D through computational modeling, and laboratory and bench-scale research. Since May 2011, ThermoCapture has sought Series B funding, but has not succeeded in securing additional venture backing.

An appraisal of ThermoCapture’s intellectual property portfolio has characterized ThermoCapture’s technologies as “systematically unique” and “innovative.” However, the company has failed to secure next-round financing due to investor concern that its core thermal energy storage system is too premature for commercialization and would require a proof-of-concept scale demonstration.

A successful ARPA-E project could prove the technical and financial feasibility of utilizing supercritical fluids for thermal energy storage at the commercial scale and demonstrate the proposed technology’s flexible use with a variety of renewable energy applications. Funding from ARPA-E will thus assist ThermoCapture in bringing the proposed technology to a point of development at which investor confidence will increase.

* 1. **If the proposed Prime Recipient is not sponsored by private investors, describe why this R&D project has been unable to attract private financing. In addition, describe technical outcomes of the proposed R&D project that could lead to private investment following a successful ARPA-E project.**

N/A

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1. **POTENTIAL OVERLAP WITH OTHER APPLICATIONS:** Mandatory. No page limit. The PI must answer “Yes” or “No” to each question below. If the answer to either question is “Yes,” the PI must provide the requested information.
   1. **Has the proposed Prime Recipient, Subrecipient(s), PI, or any Co-PI(s) submitted this project to any Federal or non-Federal entity (including but not limited to industry, private investors, and foreign, state, or local governments)?**YES NO

If “Yes,” complete a separate table for each Federal and non-Federal entity. If additional tables are required, include the tables in an addendum to this form.

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| **Source of Funding #1:** |
| **Date of Submission:** |
| **Title of Submission:** |
| **Application Status:** |

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| **Source of Funding #2:** |
| **Date of Submission:** |
| **Title of Submission:** |
| **Application Status:** |

* 1. **Has the proposed Prime Recipient, Subrecipient(s), PI, or any Co-PI(s) submitted any application(s) for related work(i.e., work that relates directly or indirectly to the proposed R&D project) to any Federal or non-Federal entity (including but not limited to industry, private investors, and foreign, state, or local governments) within the last 24 months?**

YES NO

If “Yes,” complete a separate table for each Federal and non-Federal entity. If additional tables are required, include the tables in an addendum to this form.

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| **Source of Funding #1:** U.S. Department of Energy - Small Business Innovation Research Program |
| **Date of Submission:** 09/15/2012 |
| **Title of Submission:** Development of Supercritical Fluids for Thermal Energy Storage Devices |
| **Application Status:** Funded - Project Completed (see Section 3 below) |

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| **Source of Funding #2:** |
| **Date of Submission:** |
| **Title of Submission:** |
| **Application Status:** |

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| **Applicant: ThermoCapture LLC** |
| **Application Control Number: 0123-4567** |

1. **OTHER SOURCES OF FUNDING:** Mandatory. No page limit. The PI is required to disclose all Federal financial assistance received by the proposed Prime Recipient, Subrecipient(s), PI, and any Co-PI(s). In addition, the PI is required to disclose any funding from non-Federal entities for related work (i.e., work relating directly or indirectly to the proposed R&D project).
   1. The PI is required to disclose **all financial assistance from any Federal entity** that the **proposed Prime Recipient, Subrecipient(s), PI, or any Co-PI(s)** are **currently receiving or has received within the last 5 years**. Complete a separate table for each Federal entity. If additional tables are required, include the tables in an addendum to this form. If the PI and any Co-PI(s) have not received any such financial assistance, check the box marked “None” below.

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| **If NONE, check here** |

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| **Federal Entity #1:** U.S. Department of Energy |
| **Federal Program Manager Name and Title:** Tommy Johnson |
| **Federal Program Manager Telephone:** (202) 555-5555 |
| **Federal Program Manager Email Address:** Tommy. Johnson@hq.doe.gov |
| **Federal Program Manager Postal Address:**  U.S. Department of Energy  1000 Independence Ave., SW  Washington, DC 20585 |
| **Title of Project:** Development of Supercritical Fluids for Thermal Energy Storage Devices |
| **Federal Funding:** $150,000 (Phase I SBIR) |
| **Non-Federal Funding:** $0 |
| **Start and End Dates:** 10/15/2012 – 04/15/2013 |
| **Abstract for Project:** This project focsed on the development of a supercritical fluid to accommodate heat-based, grid-scale energy storage. Various supercritical fluid mediums were examined in order to determine which allowed for the highest capacity of energy storage within traditional metrics. |

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| **Federal Entity #2:** |
| **Federal Program Manager Name and Title:** |
| **Federal Program Manager Telephone:** |
| **Federal Program Manager Email Address:** |
| **Federal Program Manager Postal Address:** |
| **Title of Project:** |
| **Federal Funding:** |
| **Non-Federal Funding:** |
| **Start and End Dates:** |
| **Abstract for Project:** |

* 1. The PI is required to disclose **any funding from any non-Federal entity** for **related work (i.e., work that is related directly or indirectly to the proposed R&D project)** that the **proposed Prime Recipient, Subrecipient(s), PI, or any Co-PI(s)** are **currently receiving or has received within the last 5 years**. Please complete a separate table below for each source of funding. If additional tables are required, include the tables in an addendum to this form. If the PI and Co-PI(s) have not received any such funding, check the box marked “None” below.

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| **If NONE, check here** |

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| **Non-Federal Entity #1:** EnergyFund LLC |
| **Point of Contact Name and Title:** John Smith, President and CEO |
| **Point of Contact Telephone:** 650-555-5555 |
| **Point of Contact Email Address:** JSmith@genericemailaddress.com |
| **Point of Contact Postal Address:**  EnergyFund LLC  123 Venture Way  Suite 430  Palo Alto, CA 94301 |
| **Title of Project:** Optimization of Supercritical Fluids for Thermal Energy Storage Devices |
| **Funding Amount:** $1,500,000 |
| **Start and End Dates:** 04/2010 - ongoing |
| **Abstract for Project:** ThermoCapture raised $1,500,000 in internal Series A capital. The uses of funds were explicitly defined in the investment agreement as “general working capital” under the direction and approval of EnergyFund’s Board of Directors. This funding was used to recruit a strong research team and support preliminary applied RD&D through computational modeling, and laboratory and bench-scale research, to optimize supercritical fluids for use in an integrated proof-of-concept-scale thermal storage system. |

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| **Non-Federal Entity #2:** |
| **Point of Contact Name and Title:** |
| **Point of Contact Telephone:** |
| **Point of Contact Email Address:** |
| **Point of Contact Postal Address:** |
| **Title of Project:** |
| **Funding Amount:** |
| **Start and End Dates:** |
| **Abstract for Project:** |

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| **Applicant: ThermoCapture LLC** |
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1. **LETTERS OF CORROBORATION:** Mandatory. No page limit.
   1. **The PI is required to provide any letter(s) or other communications (e.g., emails) from private investors explaining why they decided not to fund the proposed R&D project or related work** (i.e., work that is related directly or indirectly to the proposed R&D project).Append copies of the letters or other communications to this form.
   2. **If the PI has not received any such letters or other communications, the PI must document any interaction(s) with private investors.** Complete a separate table for each source of funding.If additional tables are required, include the tables in an addendum to this form.

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| **Source of Funding #1:** EnergyFund LLC |
| **Point of Contact(s):** John Smith, President and CEO |
| **Dates of Interaction(s):** May 17, 2011 |
| **Reason(s) Given for Not Funding the Proposed R&D Project:** Investor concern regarding technological maturity relative to commercialization horizon |

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| **Source of Funding #2:** NextGen Tech LLC |
| **Point of Contact(s):** Lawrence Johnson, President |
| **Dates of Interaction(s):** October 3, 2011 |
| **Reason(s) Given for Not Funding the Proposed R&D Project:** Investor concern regarding technological maturity relative to commercialization horizon |