2017 Focused Solicitation

Request for Proposals (RFP)

Issued: April 7, 2017

Full Proposal Responses Only - Due Date: Wednesday, May 17, 2017, 5:00 PM PST

FlexTech Mission/Objectives

FlexTech is an industry-led, public/private partnership providing a common platform for flexible hybrid electronics (FHE) manufacturers/developers and their supplier base to develop the next generation of manufacturing equipment, materials and components. FlexTech’s mission is to develop and organize the U.S. manufacturing expertise to expand the infrastructure required to support world-class manufacturing capability for FHE. FlexTech will oversee and administer funds provided by the U.S. Government through the Army Research Laboratory (ARL) for this purpose.

The focus in this 2017 RFP is flexible power solutions, flexible hybrid electronic components, and printed electronics.

Proposal Process and Topics

The purpose of this focused solicitation is to fund one or more recipients or teams to deliver or develop key components and enabling solutions for a Functional Electronic Print (FEP) device. Consistent with the process and conditions set forth within, FlexTech anticipates multiple awards from the 2017 RFP.

FlexTech’s process for this RFP is full proposals only.

Members of the FlexTech Technical Council will review the full proposals and, following completion of the evaluation and prioritization of the complete proposals and consistent with the available budget, recommend one or more to the FlexTech Governing Council for approval of funding. In soliciting these proposals, FlexTech plans to grant and administer funding which, in most cases, should be matched (e.g. 50%) with funds in the form of cash and in-kind contributions provided by the grant recipients to cover the total project cost. If all other response criteria are equal, preference will be given to proposals with a higher percentage of cost share. It should be noted that, historically, cost share for the ARL/FlexTech development program has averaged over 60% industry funding. Project Teams of skilled technical resources from FlexTech member companies will be identified to provide project oversight and direction. These Project Teams will be comprised of 2 to 4 experts from the consortium companies and members from the successful individual supplier or supplier team.

In responding to this solicitation, partnering among industrial companies or industrial company/R&D organization/university teams is appropriate and encouraged in developing comprehensive and integrated solutions. Individual company responses are appropriate where company size, breadth and expertise are sufficient to cover effectively all areas (e.g., technical resources, financial stability, and market presence) critical to the successful completion of the proposal.
FlexTech will support technical approaches that are revolutionary, thus having a more significant element of risk, as well as approaches that are evolutionary improvements upon existing capability, which tend to be less risky and involve shorter development and delivery intervals. Research and development efforts funded by FlexTech are in the TRL 3-6 and MRL 1-3 readiness levels and should show readiness level advancement as a result of the project achievements. TRL and MRL self-assessments can be instrumental in developing useful risk analyses and are required elements in submitted proposals. Various resources can be found on the internet. Two such resources are as follows:

www.dodmrl.com/MRL_Deskbook_V2.4%20August_2015.pdf

With respect to confidentiality, it is recognized that it may be desirable to include information that is considered confidential and proprietary by the submitter in order to fully and effectively convey the technical merits of the proposal. While a best effort will be made to restrict the proposal information to those with a need to know expressly for purposes of the review, it is recommended that the inclusion of proprietary information be limited to the minimum necessary to convey the highlights of the technical approach.

With respect to intellectual property developed under a FlexTech contract, the following policy has been established to encourage suppliers to cooperate with FlexTech and ARL in the accomplishment of their objectives:

“Legal title to any technology developed under a FlexTech funded research and development contract will be the property of the development partner.”

Development agreements generally will be awarded as fixed payment based on actual project costs, not-to exceed contracts, with payments to be made on achievement of milestones, as presented in the proposal. If your company has a U.S. government approved rate structure, use it. If not, the normal commercial cost accounting system used for internal R&D projects can be proposed. The methods used to value “cost sharing” cost must be the same as those used to value the full project costs. All suppliers are expected to have a government approved or industry standard accounting system by which actual project costs are tracked and reported. This is a requirement to ensure that cost share obligations are met.

For the full proposal, a work breakdown structure in a statement of work (SOW) will be required to define project schedule, milestone and deliverable definitions, and cost estimates. Project cost reimbursement will be paid per a calendar or milestone schedule and based on milestone achievement and related actual cost of development subject to cost-share agreement. A financial spreadsheet will be provided to both estimate project costs as well as track and report actual development costs and cost share contributions per milestone achievements. Cost sharing expectations have been established in the master agreement between FlexTech and ARL, and a minimum 50/50 cost sharing ratio between government and industry is encouraged.

**Focused Solicitation to Support Functional Electronic Print Development**

The Functional Electronic Print device is defined as a class of products including paper-like products (e.g., leaflets, pamphlets, signs, posters, booklets, and the like) with embedded functional electronic capabilities. Preferred electronic element or component thickness is less than 0.10 mm for a total device thickness of 0.254 mm or less with a bend radius capability of 0.25 inches. Prototype dimensions include:

**Leaflet:** 3” x 6” (Minimum Size)
The functional electronic capabilities can include audio recording and playback, FM radio signal reception, and wireless communication. The goal is to have integrated electronics within the paper-thin substrate that can perform reliably after graphic printing using commercially available printing equipment. The leaflet is designed to be lightweight and will be subject to environmental conditions with normal seasonal temperature variations, humidity, and manual handling. The leaflet must be water resistant and reliably deliver printed and audio messages as well as other functionality being developed (audio recording and playback, FM receive, video message, wireless transmission, etc.).

The 2017 FlexTech RFP builds on the FEP leaflet’s development progress. Specifically, FlexTech is seeking proposals on these topics:

1. **Printed electronics – a benchmark study : No cost share required for this topic**

   This effort is meant to focus on the technical state of the art of printed electronics for flexible, unbreakable, thin electronic systems and what that technology may look like in 3-5 years. Presently, even simple analog circuits require SMT (surface mount technology) components to achieve the performance tolerance required. Integration of sensors, sensor systems, signal processing, perhaps data analytics, wireless communication systems, memory, flexible batteries and other power system components, as well as other human interface capabilities like flexible displays is needed. This benchmark study should include an analysis of the state of the art of printed and flexible capabilities of the following technologies:
   
   i. Flexible batteries
   ii. Photovoltaic and other energy harvesting devices for recharge-ability
   iii. Passive components
   iv. High performance circuits
   v. Semiconductor integration such as MCUs, ADCs, OpAmps, Audio chips, wireless transmit and receive ICs, human-machine interface switches
   vi. Speakers and audio circuits
   vii. Test technology and approaches
   viii. Graphics printing with electronic embedded devices
   ix. Antenna
   x. Sensors of all types

   A technical study (as opposed to a market business forecast) will be requested to baseline the state of the art from a processing and performance perspective of each FHE functional block, who are the players, how will the technology progress (in 3, 5, 10 years), and what is the MRL (manufacturing readiness level) expected on this timeline. This study should include up to date market reports as on set/source of benchmark data.

2. **Hybrid integration: 50% cost share target, $500,000 cash budget award estimate**

   This proposal topic will explore latest innovations and development plans for integrating SMT passives and semiconductor devices into FHE systems. Surface mount components are commonly used, certainly in rigid PCB systems, but also in systems using flexible PCBs. To move the technology to the
next level of thin and flexible, hybrid integration challenges need to be met. Proposals within this
category will address these challenges. Examples may be unique methods to process ultra-thin die and
assemble into flexible PCBs, low temp die assembly process development and characterization (like
ACF), and printed passive device development within the 3 or 4 layers typical of a FHE substrate
construct. In addition, proposals will be sought for methods to integrate high performance circuits such
as wireless communications modules within the Ag printed PET, PI or PEN PCB environment.
Innovative development to incorporate logic functions, memory, and complete high performance circuits
within flexible electronic systems should be demonstrated within the project scope and delivered.
Optimally, integration of the hybrid approach will be demonstrated at the system level.

3. **Power initiative: 50% cost share target, $500,000 cash budget award estimate**

FlexTech has several funded efforts in the flexible battery category. Proposals in this topic area will
expand that scope to a holistic approach to power in flexible systems and have the opportunity to
 collaborate with our present battery principal investigators and teams. Power system elements such as
energy harvesters (photovoltaics, RF scavenging, kinetic generation, thermoelectric, bio-potential, etc),
ultra-low energy ICs, and super-capacitors will be of interest. There is particular interest in small area,
higher efficiency, energy transducers using breakthrough discoveries in materials such as graphene.
Priority will be given to integrated solutions addressing low power components, energy harvesting, as
well as judicious employment of battery and capacitor power sources, and clever duty cycling and
wake-up protocols. Also proposals addressing simulation tools, power design/strategy, and
optimization capabilities will be considered. Present system voltage is 3.5 to 6.0 V and average current
is 80 to 100 mA. Peak current of 180 mA for hundreds of milliseconds need be considered.
Performance specifications require 100 audio recording plays at 180 seconds/play. System-level
prototype demonstration will be required for both software and hardware R&D proposals.

4. **Audio circuit design and optimization for FHE: 50% cost share target, $350,000 cash budget
award estimate**

Given a performance specification and system constraints, proposals in the topic area will define
development plans to design and build audio circuits in FHE systems and optimize performance from
both an audio fidelity as well as power consumption perspective. Proposals on FHE-compatible audio
transducers such as surface mount or printed speakers and/or microphones will also be considered.
Peak operating voltage (Vpp) should be less than 30 V. And magnets are not acceptable. Thickness
targets are less than 0.100mm. Sound magnitude target is 80dB at 2 ft and frequency range of 100Hz
to 18kHz. Advanced audio ASIC or MCU-based designs and development with integrated audio
amplifier are also candidate topics. Digital audio file upload is preferred with message lengths of 180
seconds each. Audio message playback is on demand with present sampling rates of 44kHz or 128
Kbps. There will be an opportunity to partner with FlexTech members and system integration
specialists and priority will be given to those proposals that demonstrate their innovation at the system
level.

**Requirements for a Full Proposal**
In order to submit a response to this FlexTech RFP and subsequently to be considered for an award, several requirements must be met as explained below.

- To receive an award from FlexTech the company or composite team of companies must be a US company or have a significant presence in the United States in the form of R&D activities and/or manufacturing. At least 50% of the work activity (funds) must be spent within the U.S. operations. The primary company leading the proposal must be a U.S.-owned company. Further, for the period of award performance plus the 3 years following, the primary company plus all IP resulting from said award must remain under control of a U.S.-owned or majority controlled company. In certain cases, where it can be demonstrated that the development is both critical to U.S. manufacturing capability and unique, this “preference for U.S. operations” requirement can be waived with ARL approval. Any responding company requiring such a waiver must make this known in the pre-proposal document.

- The company or companies must be committed to volume manufacturing of the developed products and provision to the U.S. FHE industry on a right-of-first acceptance basis. Applied research conducted by universities will be considered and does not need to meet this requirement. However, in this latter case a pathway to commercialization must be envisioned and described.

- The company or companies, including universities, should provide a matching share of the development cost in cash and in-kind contributions (e.g., labor and materials).

- Companies and organizations which are selected for an award, including all partners and/or subcontractors, must subsequently join SEMI/FlexTech at the appropriate membership level.

**Wire and Credit Card Instructions for Membership Dues:**
Contact Andy Knopes at aknopes@semi.org

**By Check:**
Payable to SEMI and mailed to:
FlexTech
c/o SEMI
673 So. Milpitas Blvd.
Milpitas, CA 95035

**Full Proposal Instructions**

The format below will help FlexTech evaluate your proposal and ensure that the major topic areas are covered. A full proposal is typically 15-25 pages; however there is no page limit. If providing support letters, limit these to five (5) letters only.

**Content:** The proposal shall comply with the following content and structure.

**Page 1: Cover Page**

Date
Project Title

Company Name
Address
Project Leader Contact Information (telephone and email)
Project Team (Prime & Subs)
Project Duration

Total Project Cost
Cost Share
FlexTech Funds Requested

Page 2: Table of Contents

Page 3: Executive Summary, containing a short description of the project objective and industry or supply chain impact

Pages 4-20: Proposal Content

1. Project Proposal
   1.1. Problem definition
   1.2. Project scope and objectives
   1.3. Technical approach, rationale and innovative claims with supporting data and diagrams
   1.4. Performance target metrics and/or specifications
   1.5. Prior work, current status, and results (if any)

2. Statement of Work
   2.1. Project management approach
      2.1.1. Roles and relationships of key personnel
   2.2. Project schedule
   2.3. Detailed task description
   2.4. Milestones, deliverables, reports, process definition, test results, reviews etc.

3. Detailed Project Cost and Cost Share by Task or by Quarter
   3.1. Labor, materials, overhead, and capital

4. Project Risk Assessment
   4.1. TRL/MRL self-assessment
   4.2. Table: Analysis of Risk and Mitigation Strategy

<table>
<thead>
<tr>
<th>Risk</th>
<th>Consequence</th>
<th>Mitigation Strategy</th>
<th>Impact (L,M,H)</th>
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5. Market Needs and Competitive Landscape
   5.1. Business justification
      5.1.1. Existing product portfolio
      5.1.2. Primary markets served and major customers
   5.2. Commercialization strategy for target markets
   5.3. Cost of ownership benefits of proposed technology in absolute terms or relative to the cost of the typical current process

6. Company Background and Capability to Meet Technical and Business Targets
   6.1. Team & key personnel
      6.1.1. Management and technical personnel experience and qualifications
   6.2. Facilities and equipment
   6.3. Relevant company information
      6.3.1. Three year financial performance track
      6.3.2. Staff size and make-up by function
6.3.3. IP strategy, key previous innovative developments and intellectual property (patents) held related to the proposal topic

7. Contact Information for Technical Lead, Alternative Technical Representative, and Contract Representative

8. Appendix (if needed - NOT INCLUDED IN PAGE TOTAL)
   8.1. Technical References
   8.2. Letters of Support

Full Proposals will only be accepted electronically up to 5:00 PM PT on the due date, Wednesday, May 17, 2017. Please submit your questions and completed proposal to RFP2017@semi.org

Proposal Evaluation

Full proposals will be evaluated by the FlexTech Technical Council.

During the final selection process of full proposals, some communication or negotiation between the potential supplier and representatives of FlexTech may be initiated over the terms, conditions, specifications, deliverables, schedule or other relevant factors contained in the proposal in advance of awarding of a contract. Granting of any awards to proposals submitted in response to this RFP is contingent upon the continued availability of funding from the U.S. Government.

2017 RFP Schedule

The tentative schedule of activities for the FlexTech 2017 RFP is as follows:

April 7, 2017  RFP Issued
May 17, 2017  Full Proposals Due to FlexTech by 5 pm PT
May 22-26, 2017  Review and Final Selection by FlexTech Technical Council
June 5-9, 2017  Presentation of proposals to the FlexTech Governing Council by Technical Council members for consideration and approval. Notification of results to successful proposers will follow shortly thereafter.

RFP Schedule subject to change based on availability of review personnel, commitment of federal funds, and other factors.

Current Members of the FlexTech Technical Council

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<thead>
<tr>
<th>Applied Materials</th>
<th>NextFlex</th>
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<td>Binghamton University – CAMM</td>
<td>Cambridge Display Technology</td>
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<td>DuPont Teijin Films</td>
<td>E Ink</td>
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<td>Qualcomm</td>
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<td>ThinFilm (Member, not TC)</td>
<td>US Army Research Laboratory</td>
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<td>SmartKem</td>
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Contact Information

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