



America's Flexible Hybrid Electronics Manufacturing Institute

PROJECT CALL 2.0

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1. FHE Definition

This section is provided as an introduction to potential members of NextFlex (“Institute” or “the Institute”) who may not be familiar with flexible hybrid electronics (FHE) and the scope of our efforts in the National Network for Manufacturing Innovation (NNMI). NextFlex describes FHE as the intersection of additive circuitry, passive devices, and sensor systems that may be manufactured using printing methods (sometimes referred to as printed electronics) and thin flexible silicon chips or multichip interposer structures into devices which can take advantage of the power of silicon and the economies and unique capabilities of printed circuitry to form a new class of devices for IoT, medical, robotics, and communication markets. While we primarily use the term flexible, we are interested in manufacturing methods that fall into the categories of flexible, stretchable, and conformable. In light of this, the Institute will focus its efforts on solutions in the space combining silicon and flexible, stretchable, or conformable systems with a significant component of additive processing as part of the design. Proposals and approaches that target pure “printed systems” and additive processing of organic transistors or other logic systems (metal oxide, carbon nanotubes) as their primary focus will most likely be considered at too low of a Technology Readiness Level (TRL) for Institute project calls as of 2016. Conversely, approaches that appear to be incremental advancements on currently mature manufacturing technologies will potentially be considered at too high a TRL/MRL level to be considered for Institute funding (such as a traditional printed flexible circuit board approach utilizing solely etched copper for conductors and COTS packaged die for the active components at the system level).

2. Introduction and Background:

NextFlex is an industry-led, dynamic, collaboration-based institute for advancing the manufacturing of flexible hybrid electronics. A primary Institute goal is to accelerate technology adoption into advanced products by developing and commercializing advanced manufacturing technologies through pre-competitive partnerships. One mechanism to do this is to provide cash awards to proposal teams undertaking development projects that are critical to FHE manufacturing. In these cases, the Institute may provide cash awards up to 50% of the development cost of the project through a structured selection process. Projects submitted to NextFlex for funding should consider the value to the Institute and the FHE industry, as well as the future goals of advancing the FHE ecosystem within the US, and clearly articulate those aspects to the Institute. In addition, all projects should define a commercialization or technology transition plan that demonstrates industry pull for the proposed manufacturing technology development.

Project Call 2.0 (PC 2.0) will address project focus areas as identified in the FHE Roadmap developed by the Technical Working Groups through partnership between industry, government, and university subject matter experts, and reviewed by the Technical and Governing Councils of the Institute. PC 2.0 will address one or more of three approaches: Manufacturing Thrust Area (MTA), Technology Platform Demonstrator (TPD), and Workforce Development (WFD). Project proposals are expected to be industry-driven problems and solutions with a transition concept to the US industrial manufacturing base. Project Call 2.0 is anticipated to fund up to approximately \$10,000,000 resulting in multiple awards in one or more topics (depending on the quantity and quality of proposal submissions received). Including cost-share, the total project value is expected to exceed \$20,000,000. The number of awards per topic will be based on the quality of the proposals and the funding requests of those proposals. A majority of the funding is expected to support projects from MTAs. In addition to WFD requirement as a part of the MTA and TPD project proposals, standalone WFD topics will also be considered in this project call, and we have separated the sections specific to standalone workforce development projects below where appropriate. The project call is open to all existing and potential partners.

Note that PC 2.0 includes an Air Force Research Laboratory topic. As noted in section 4.4, this topic has slightly different cost-share requirements and will be subject to a modified review process.

Given the clear focus on projects that have a near term commercial application, teams that are industry-led or have a strong industry partner as part of the commercialization plan are likely to be favorably considered by the evaluation process.

Prior to final granting of any awards, the recipients and their partners will be required to become members of the Institute and execute a development agreement. NextFlex anticipates announcing Project Call 3.0 in calendar year 2016 as well.

3. Flexible Hybrid Electronics (FHE) Roadmap 2.0

The Institute will leverage the electronics industry and the high performance printing industry, both well-established US industrial and academic areas of strength. A comprehensive roadmap was developed in collaboration with industrial partners, academics, and subject matter experts (SMEs) in different fields. The roadmap topics included different facets of application-specific devices/components for technology demonstration as well as various aspects covering design, materials, process, equipment, and test development that would enable realizing advanced manufacturing capabilities to meet the overall vision of the Institute and the FHE eco-system. The following topics were the focus of the Technical Working Groups that developed the roadmap.

- Manufacturing Thrust Area (MTA)
 - Device Integration and Packaging
 - Printed Flexible Components and Microfluidics
 - Materials
 - Modeling and Design
 - Standards, Tests and Reliability
- Technology Platform Demonstrators (TPD)
 - Human Monitoring Systems
 - Asset Monitoring Systems
 - Integrated Array Antennas
 - Soft Robotics
- Workforce Development

Since technology adoption through enabling manufacturing readiness is the primary mission of the institute, only proposals in the TRL 4 to 7 and MRL 4 to 7 range will be supported by for funding. Based on the gaps identified through the TWG roadmapping process, and reviewed by the Technical and Governing Councils, proposals in the following specific areas are prioritized and will be considered for potential funding in PC 2.0.

4. Project Call Topics

Project Scale and Duration: In PC1.0 funding levels for individual projects ranged for requests as low as \$25,000 to upwards of \$1,000,000. Funding levels are not predetermined, however given the varied nature of the topics in PC 2.0, it is anticipated that we will see a diversity of project scales including perhaps several smaller projects (e.g., ~\$200,000 federal funding request) and some larger projects (e.g., ~\$1,000,000 federal funding request). Standalone WFD proposals, owing to their unique application,

have been reviewed in the past for as small as \$25,000-50,000. Projects of a larger scale may be divided into multiple phases, provided that each phase warrants funding on its own merit and has valuable deliverables at the conclusion of each stage as well as a clear, large picture roadmap inclusive of the total funding estimated to deliver the final capability. The duration of proposed Institute projects is typically 12 to 18 months. Projects should not exceed 24 months for any single phase and aggressive timelines are certainly encouraged.

4.1 Manufacturing Thrust Area (MTA): The objectives of this topic area focus on developing and qualifying manufacturing processes, methods or tools identified as FHE needs via the roadmapping process and discussions with TWG leads and member companies. The processes and the tools developed will have a considerable impact on the manufacture of low-cost reliable systems for a wide range of military and civilian applications. The specific areas will be outlined below and cover areas as diverse as software design tools and datasets to physical production machinery on which production processes may be defined and products may be prototyped.

It is expected that any topic area which calls for development of equipment will produce at least one piece of equipment in an operational state that will be placed at the NextFlex hub facility in San Jose, California, or in some cases a NextFlex node, or both as appropriate. All NextFlex members will have access to the tool for development of prototypes and manufacturing processes. Any equipment should be provided with the appropriate documentation for the installation, setup and operation of the equipment, and the team lead will be expected to assist in the installation and setup of such a tool as well as provide training to Institute personnel and member companies on its use as required.

In the case of projects focused on process development, it is expected that those process developments will be documented in a level of sufficient detail that it is reliably replicable and that it may be included in manufacturing guidelines for relevant processes in the future.

Any development of software tools should include licenses or provisions to allow NextFlex member companies and Institute personnel to access and use the tools for development purposes and it is expected that 3rd party licensing needs or maintenance costs required to operate the tools will be considered by the proposal team and addressed as part of the proposal.

The use for development purposes of equipment or tools developed with institute funding will be made available to institute members free of charge. In cases where use of the tool or equipment requires the host of that equipment to provide operators or technicians as requested by the member company, a reasonable labor charge may be accordingly assessed to the user to offset any costs incurred.

PC Topic 2.1: Ultra-Thin Die Assembly for FHE Systems: This will include preparation of the silicon die for FHE interconnection, die placement from a dicing tape or tape reel, and interconnection methods after placement. The processes should be compatible with placement on broad spectrum of FHE substrates. The scope covers die thickness in the range of 15 - 75 μm thickness X/Y dimensions in the range of 0.5 – 5 mm per side and a placement accuracy of 10 μm in X/Y with a rotational accuracy of 0.25° for positioning. Proposals focused on either sheet to sheet process or roll-to-roll (R2R) process will both be considered. If the proposal targets a sheet-to-sheet approach, the system should lend itself to future modifications that would allow R2R automation.

PC Topic 2.2: Multi-Process Integration Tool with Real Time Metrology: The project focus will be to develop a pilot-scale, sheet-based tool which incorporates direct write interconnects and

the capability to connect to surface mounted silicon die, passive components, as well as multi-layer geometries. The tool should integrate deposition of encapsulation materials or other dielectric materials and subsequent curing of these materials all on a single platform. The equipment should include non-contact registration technology and the integration of in situ process monitoring to enable open-loop control of process steps in real time. Projects should scope greatest FHE need area and monitor (a) deposition processes to correlate key process parameters (e.g., print speed, gas flow rates, material flow rates, ink flow rate, stand-off distance), (b) in-situ deposition behavior (e.g., over-pumping, overspray, etc.), and (c) resulting materials or device properties (e.g., line breaks, performance parameters, dimensional variations) and resolve features of 25 micron or less. The system would ideally be able to handle both flexible and stretchable substrates and be designed with the future integration of FHE pick-and-place tools in mind. Although aspects of this multi-process tool (e.g., some direct-write techniques) may not be transferrable to R2R manufacturing, most processes and tools should be compatible with future R2R integration.

PC Topic 2.3: Printing On Complex Surfaces: Development of Direct-Write tool/processes for non-planar surfaces, e.g., printing antennas or interconnects for 3D circuits on doubly-curved or irregular surfaces. The project shall include both the translation of G Code tool paths from 3D CAD files and the actual print tool capable of uniformly depositing functional materials on surfaces with greater than +/- 30-degree biaxial curvature at a uniform and normal stand-off distance. The deliverables would include software packages, pilot-scale printing equipment, and an FHE demonstrator that illustrates the capability. The FHE demonstrator shall be characterized for geometric distortion relative to the intended pattern geometry and may not exceed 10% in any dimension.

PC Topic 2.4: FHE Process Design Kit (PDK) (Phase 1): This project will focus on adapting basic design and modeling tools (not statistical) for use with printed components, interconnects, thinned chips, and passives components. The PDK should facilitate 3D design layout inclusive of circuit patterns, interposers, FHE specific components, and standard SMT components. This initial phase would have an emphasis on geometry and 3D layout capability, as well as shortening the file type chain between design tool and production processes. Resulting work should be compatible with mainstream EDA and FEA tools (SPICE, Cadence, Mentor, Dassault, ANSYS, etc.).

PC Topic 2.5: Mechanical Test Methods: Responses to this topic should develop and/or demonstrate static and dynamic mechanical test methods for FHE materials and devices. Building on existing mechanical test methods and protocols, testing should minimally include stretching, bending, and folding. These test methods and protocols should enable the characterization of a broad spectrum of FHE materials and devices, including substrates, printed and non-printed components, and interconnects. Test methods should reflect the significant variability in use cases that could range from days to years of use and from minimal mechanical deformation to thousands of fold or flex cycles. In addition, the test methods should be compatible with testing devices under bias or electrically active conditions. In development and/or demonstration of the mechanical test methods, the project is anticipated to generate materials, performance, and reliability data that will inform FHE design and manufacturing processes.

4.2 Technology Platform Demonstrations (TPDs): The flexible hybrid electronics TPDs are used to highlight technology capabilities based on FHE manufacturing processes. The technology platform projects are not intended to solve specific technical challenges nor result in product development, but

rather are an opportunity to showcase FHE capability and manufacturing technologies broadly with the intention of encouraging designers and OEMs to incorporate these technologies into their future products. In addition to highlighting technology capability, TPDs will also facilitate the identification of critical and pervasive manufacturing gaps to productize the demonstrated technology. The proposals should fall within TRL 4 to TRL 7 range with the ability to transition through MRL 4 through MRL 7. TPD projects should produce at minimum two functional prototypes and deliver them to the Institute in San Jose, California, for incorporation into product display areas for the purpose of illustrating the capabilities of FHE technology. The following TPDs have been identified as focus areas for PC 2.0:

PC Topic 2.6: Flex-Hybrid Array Antenna: Demonstrate fabrication of array antenna (including electronic components) that is flexible either in deployment or in both deployment and operation. Applications could include wearable electronics, FHE appliques for vehicles, and deployable antennas for aircraft or satellites. Proposer should provide baseline performance for the state of the art flexible and/or rigid antenna arrays. The goal is to advance flex-hybrid antenna array technology, which must match current performance criteria and integrate all the essential flex-hybrid components such as design (multi-physics based flex-hybrid electronics/electromagnetics), manufacturing, materials, and characterization.

PC Topic 2.7: Asset Monitoring for Time Critical Inventory: Demonstrate fabrication of small, low-profile device (including power and communication capabilities) that can track and report the state (minimal temperature) of perishable or otherwise sensitive inventory for two (2) weeks. Approach must be compatible with low costs at high volumes and connect wirelessly to communicate the data for IoT concepts. The objective here is to use known sensor technologies to develop a robust and widely applicable data link and power management support that can be incorporated into other asset monitoring or human monitoring TPD applications in the future. Communication distance should target two (2) meters or more (i.e., prefer non-NFC approaches).

4.3 Workforce Development (WFD): The overall goal for WFD in this project call is to assist in the creation of workforce development programs that help overcome the employment gaps within a regional FHE ecosystem, primarily at the technician and technologist level. Successful proposals will demonstrate capacity and partnerships capable of rapidly deploying new and innovative models for local work-based learning programs, such as internships, learn-and-earn, and apprenticeship programs among a combination of industry, academic, and local government partners. The best programs will be ones with industry, academic, and government partnerships, where quantity, content, and timing are aligned and are based on the particular balance of supply and demand within the respective region.

PC Topic 2.WFD: Stand Alone Work Force Development (2.9): This topic seeks proposals that generate sustainable workforce development initiatives that create and deliver trained people capable of filling workforce gaps within companies in local and regional FHE ecosystems. This project call topic focus is specifically at the technician and technologist level and includes both current and anticipated demand over time.

4.4 Agency Driven Projects: In addition to the Institute topics specified in Sections 4.1-4.3, government agencies may elect to execute agency-funded projects related to FHE technology through NextFlex. These projects enable government agencies to leverage the NextFlex ecosystem toward addressing agency-specific requirements. Rather than originating through the roadmap process, these projects instead are defined by the funding agencies, who maintain ultimate authority in proposal selection.

PC Topic 2.8: Failure Modes in Wearable Performance Monitors. Substantial research and development has occurred for non-invasive health and performance monitors, incorporating sensors to track basic biometric data (heart rate, ECG, etc.), as well as hydration, and ultimately biomarkers indicative of psychological and cognitive states. With increasing complexity in these systems and a need for low-cost, reliable, and robust fabrication, a comprehensive understanding of potential failure modes is required to assure the systems can perform reliably and are suitable for operating in a wide variety of environmental conditions. The objectives of this topic are to develop and demonstrate a detailed understanding of the physics of failure that occurs in current state-of-the-art wearable devices. Development and demonstration of means to fully characterize failure modes in such devices shall also be addressed. Respondents may also address how this information and understanding will provide a foundation for the development and demonstration of advanced manufacturing techniques to improve reliability.

Responses to this project call shall develop testing and evaluation protocols suitable for the identification of mechanical and operational failure modes, including root-cause failure assessment, in wearable performance devices. Dynamic testing is expected, including during device operation. The responses to this project call shall include development of models and predictive tools in anticipated operational environments, working toward the ability to demonstrate life prediction for wearable performance monitors.

The government sponsor, AFRL, will provide up to five distinct wearable monitors, including one commercial off-the-shelf monitor and four developmental prototype systems. Respondents may also incorporate assessments of other devices, either commercially available or under development. The government sponsor for this topic will also provide a summary of anticipated operational requirements (typical for military environments). These devices will serve as the basis for identifying failure mechanisms as well as validating test methods and protocols. To the extent reasonable, the respondent should consider leverage of existing standards and protocols in test development and operational environment simulations. The respondent shall address correlation between standards/simulations and actual environmental conditions.

Ultimately, the data, test protocols, and models that result from this project will contribute to the foundation for fabricating operationally robust devices, reliability testing, validation and verification specifications and standards development within the industrial base. It is anticipated that results from projects supported under this project call will directly support the NextFlex Standards, Testing, and Reliability Technical Working Group activities.

Note: As an agency-funded topic, PC Topic 2.8 will fund one or more proposals up to 24 months in length. The total amount of funding available is \$1.25M. 1:1 cost-share is strongly preferred but is not required for this agency-driven project. Although proposals will be independently evaluated by SMEs, ultimate decision authority will belong to the AFRL program manager. Evaluation criteria in Sections 7.1-7.3 will be applied to pre-proposals and proposals submitted for this topic.

5. Proposal Submission Process

5.1 Proposal Format Guidelines

In order to maintain consistency from submission through review and approval process, please follow the guidelines provided below:

Email. The proposer shall submit one (1) word processed electronic copy of its response to this project call.

Figures, graphs, images, and pictures. Figures and tables must be numbered and referenced in the text by that number. They should be of a size that is easily readable and may be in landscape orientation. They must fit on an 8.5 x 11 inch paper size.

Font. Proposals are to be prepared with easy to read font, such as Times New Roman or Arial (10 point minimum), single-spaced. Smaller font may be used in figures and tables, but must be legible.

Page Layout. The proposal document must be in portrait orientation except for figures, graphs, images, and pictures. Pages shall be single-spaced, 8.5 by 11 inches, with at least one-inch margins on both sides, top, and bottom.

Page Limit. Page limit for the proposal shall be:

The main body is limited to 6 pages for the pre-proposal and 25 pages for the full proposal. The page limit includes table of contents (if included) and the required sections within the proposal. The page limit does not include the cover page and relevant appendices. Pages that exceed these guidelines may not be reviewed.

The proposal cost calculations should be in the Excel format provided. In addition to the pdf version of the spreadsheet attached to the word processed document, the spreadsheet should be included as a separate file along with the submission.

Page Numbering. Number pages sequentially within each section of the proposal showing proposal section and page number.

5.2 Project Call 2.0 Timeline:

The project selection process will occur in two steps. The first step is that a “pre-proposal” will be evaluated for important early feedback from the evaluation team and to minimize the investment of time and energy into out-of-scope proposals. The second stage is that certain pre-proposal will be invited to submit a full proposal. For planning purpose, the key steps involved and the target date for each step are outlined in the table below for your reference.

Project Call Announcement & Posting	5/5/2016
Project Call 2.0 Webinar	5/11/2016
Pre-Proposal Online Cover Sheet Due	5/30/2016
Pre-Proposal Submission Deadline	6/6/2016
Invitation for Full Proposal Submission	6/15/2016
Full Proposal Online Cover Sheet Due	7/18/2016
Full-Proposal Submission Deadline	7/25/2016
Anticipated Technical Council Review	8/10/2016
Anticipated Governing Council Review	8/16/2016

5.3 Pre-proposal Guidelines

The pre-proposal table of contents and guidelines are provided in this section. Please follow instructions in Sec. 5.1 for format and other requirements. In order to keep the main body of the proposal succinct and consistent, please provide supporting tables as appendices. Use the standardized cover page format (Appendix A). The table of content for the pre-proposal is outlined below. If required, additional tables

may be included. Please ensure that any table or figure references includes a clear numbering system.
Please ensure that your proposal clearly identifies the current capability and the quantitative target specifications that will determine success of the project.

Pre-proposal table of contents for projects

- Cover Sheet
- 1. Executive Summary
 - a. What problem are you trying to solve?
 - b. How and why will this project make a difference in FHE?
- 2. Project Category and Relevance to FHE
- 3. Background and Technical Objectives with Supporting Data/diagram
- 4. Key Specifications
- 5. Competitive alternatives, industry needs, differentiation, and commercialization approach
- 6. MRL/TRL Description and Transition
- 7. Technical Approach and Deliverables
- 8. Workforce Development
- 9. Risk & Mitigation Analysis
- 10. Overall Project Schedule
- 11. Overall Project Cost Including Cost Share (Detailed cost calculations not required)
- 12. Single Page PPT slide “Project Description (Format Provided) [to be used in the review process]

Pre-proposal table of contents for standalone WFD projects

- Cover Sheet
- 1. Executive Summary
 - a. What problem are you trying to solve?
 - b. How and why will this project make a difference in FHE?
- 2. Project Category and Relevance to FHE
- 3. Background
- 4. Targeted Career Pathway(s)
- 5. Description of Work and Education-based Components
- 6. Emerging Technical Skills Integration.
- 7. Program Scope and Duration
- 8. Overall Project Schedule
- 9. Overall Project Cost Including Cost Share (Detailed cost calculations not required)
- 10. Outline of the commercial partners who would make use of these resources to engage in FHE manufacturing in the United States.

Pre-proposals will be accepted electronically up to **5:00 PM PACIFIC TIME** on the due date, **June 6, 2016**, as shown in Sec. 5.2.

Please note that this is not a typical government grant or contract opportunity. We are open to and encourage clarifying questions, guidance, and dialogue during the process of the proposal preparation.

The completed pre-proposal should be submitted to proposal@nextflex.us.

5.4 Full Proposal Guidelines

A full proposal is an expanded version of the pre-proposal with detailed explanation and supporting documents. While the funding requested in the full proposal can be less than what was requested in the pre-proposal, it cannot increase by more than 10 percent of that requested in the pre-proposal and any

increase should be supported by explanation. The main body of the full proposal should be limited to 25 pages (excluding cover page and Appendices). Please follow the instructions in Sec. 5.1 for format and other requirements where you may find the requested table-of-contents and guidelines for each section. Please keep the main body of the proposal succinct and clear in each section to improve the quality of the review process. You may provide supporting Tables/Data in the appendices. Please ensure that any table or figure references includes a clear numbering system. **Please ensure that your proposal clearly identifies the current capability and the quantitative target specifications that will determine success of the project.**

Content: The proposal shall comply with the following content and structure. Importantly, the budget sheets must be filled out completely and consistent with format provided.

Page 1: Cover Page (See Appendix A).

Page 2: Table of Contents

Page 3: Executive Summary: A succinct summary of no more than two (2) pages clearly articulating the big picture problem being addressed, proposal objectives, relevance to FHE, approach to address all critical technical and non-technical aspects, and the expected outcome at the end of the duration of the proposal.

Pages 4-25: Proposal Content

1. Project Proposal

- 1.1. Problem definition
- 1.2. Background & prior work, current status, and results (if any). Please be as concise as possible.
- 1.3. Market needs and competitive landscape
 - 1.3.1. Existing product portfolio
 - 1.3.2. Technology/product value proposition and business justification
 - 1.3.3. Primary markets served and major customers
- 1.4. Objectives
- 1.5. Project category
- 1.6. TRL/MRL levels – at the start and end of the project and how the project will advance to the expected level.

2. Statement of Work

- 2.1. Project scope
- 2.2. Technical approach, rationale and innovative claims (with supporting data and diagrams)
- 2.3. Detailed description of milestones, tasks, and deliverables
- 2.4. Performance target metrics and/or specifications
- 2.5. Project risk assessment
 - 2.5.1. Analysis of risk and mitigation strategy
- 2.6. Milestones, deliverables, reports, process definition, test results, reviews, etc.
- 2.7. Project schedule
- 2.8. Project management approach
 - 2.8.1. Roles and relationships of key personnel

3. Commercialization Strategy for Target Markets

- 3.1. Manufacturing strategy and approach
- 3.2. Cost of ownership benefits of proposed technology in absolute terms or relative to the cost of the typical current process

4. Detailed Project Cost and Cost Share by Task or by Quarter (MUST use the format provided in the template)

- 4.1. Labor (by staff position), materials, overhead, including overhead rates. Each divided by source or funds. Must use the [NextFlex_PC2.0_Cost_Calculations.xlsx](#) spreadsheet for required format. Attach tabs to the spreadsheet with detail behind the summary figures.
- 5. **Capability to Meet Technical and Business Goals**
 - 5.1. Management team & key personnel experience and qualifications
 - 5.1.1. Project staff size and make up by function
 - 5.1.2. Relevant information of team/partner organizations
 - 5.2. Facilities and equipment
 - 5.3. Three-year financial performance track (not applicable to established corporations/academic institutions)
 - 5.4. IP strategy, key previous innovative developments and intellectual property (patents) held related to the proposal topic (attach a list of relevant patents in the appendix)
- 6. **Workforce Development, Education, and Training Component of the Proposal** (should you choose to include this, encouraged but not required for MTA and TPD submissions)
- 7. **Contact Information** for Technical Lead, Alternative Technical Representative, and Contract Representative (can be the same as in the cover sheet)
- 8. **Appendix** (as needed - NOT INCLUDED IN PAGE TOTAL)
 - 8.1. Relevant referenced tables, pictures, and other information
 - 8.2. Technical references & list of patents
 - 8.3. Letters of support
 - 8.4. Single page PPT slide Project Description, NextFlex_PC2.0_Project_Description (Format Provided)

For Standalone WFD Full Proposals

- 1. **Project Proposal**
 - 1.1. Problem definition
 - 1.2. Background and prior work, current status, and results
 - 1.3. Description and analysis of the talent landscape in the region
 - 1.4. Measurable objectives
- 2. **Statement of Work**
 - 2.1. Project/program scope
 - 2.2. Targeted career pathway(s):
 - 2.2.1. Outline of the commercial partners who would make use of these resources to engage in FHE manufacturing in the United States.
 - 2.3. Description of work and education-based components
 - 2.4. Emerging technical skills integration
 - 2.5. Detailed description of milestones, tasks, and deliverables
 - 2.6. Performance target metrics
 - 2.7. Project/program risk assessment
 - 2.7.1. Analysis of the risk and mitigation strategy
 - 2.8. Project/program schedule
 - 2.9. Project management approach
 - 2.9.1. Roles and relationships of key personnel
- 3. **Detailed Project Cost and Cost Share by Quarter**
 - 3.1. Labor (by staff position), materials, overhead, include overhead rates. Each divided by source or funds. Must use the [NextFlex_PC2.0_Cost_Calculations.xlsx](#) spreadsheet for required format. Attached tabs to the spreadsheet with detail behind the summary figures.
- 4. **Capability to Meet Stated Goals**

- 4.1. Management team and key personnel experience and qualifications
 - 4.1.1. Project/program staff size and make up by function
 - 4.1.2. Relevant information of team/partner organizations
- 4.2. Facilities and equipment
- 4.3. Intellectual property, curriculum, or other areas along these lines specifically used with this project/program
5. **Contact Information** for overall project/program lead, industry and academic leads, and contract representative
6. **Appendix**
 - 6.1. Relevant referenced tables, pictures, other information
 - 6.2. Letters of support
 - 6.3. Single page PPT slide description of the project/program

Full proposals will only be accepted electronically up to **5:00 PM PACIFIC TIME** on the due date, **July 25, 2016**, as shown in the table in Section 5.2. Please submit your questions and completed full proposal via email to proposal@nextflex.us.

6. Administrative Topics

6.1. Confidential Information

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 clearly marked and be limited to the minimum necessary to convey the highlights of the technical approach.

6.2. Financial and Cost Share Requirements

Development agreements generally will be awarded as fixed payment, not-to-exceed contracts, with payments to be made on achievement of milestones as presented in the proposal. If your company has a US government-approved rate structure, please use it. The methods used to value "cost sharing" 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 an absolute requirement to be sure that cost share obligations are met. Overall guidance on the working principles and requirements of cost-share (in-kind cost share, and cash and cash equivalent cost share), including various regulations governing federally funded programs are given in a separate document (NextFlex_PC2.0_Cost_Share_Definitions_and_Guidance.pdf).

6.3. Work Requirements

In order to submit a response to Project Call 2.0 and subsequently to be considered for an award, the following requirements must be met:

- Proposal teams should include at least one corporate/industrial organization and are encouraged to be industrially led when appropriate.
- The company or composite team of companies/government labs/academics must have a significant presence in the US in the form of R&D activities and/or manufacturing. 100% of the work activity (funds) must be spent within the United States operations.

- The company or companies must be committed to delivering the developed products and provision to the US flexible hybrid electronics and systems manufacturing 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 the latter case, a pathway to commercialization must be envisioned and described.
- Equipment development projects should include the production of at least one machine to be operational and available to NextFlex members at the HUB or relevant NODE or both as appropriate.
- Process development projects should include sufficient documentation that the method is replicable at the HUB, NODE, or member company's facility or all of the above as appropriate.
- Test methods, materials data or design tools should be foundational and available for incorporation into tools for the advancement of FHE and not limit collaboration.
- The total project funds must be matched at a minimum of 1:1 (with the exception agency sponsored PC Topic 2.8). Teams may determine how to divide that requirement among their members. The cost share is defined in the Membership Participation Agreement to include matching share of the development cost in cash and in-kind contributions, e.g., labor and materials, of at least 50%. The funding requested in the full proposal can decrease but cannot increase by more than 10% of that requested in the pre-proposal.

6.4. Membership Requirement

In order to qualify for funding awards, companies, organizations, and their partners which are selected for an award and who are not already a member of the Institute, must subsequently join NextFlex at the appropriate membership level (not Observer Level). Only the suppliers from whom standard parts, components, or materials are acquired based on a part number from their catalog are exempted from this requirement. It is the responsibility of the project lead(s) to communicate this requirement to their respective partners, and coordinate their membership process with NextFlex. Here is the URL for potential members: <http://www.nextflex.us/membership/>.

7. Proposal Evaluation Criteria

7.1 General: The members of the NextFlex Technical Council comprised of SMEs from industry, government, and academic institutions will evaluate and prioritize the proposals and provide feedback to the winning teams. They may make recommendations for proposal modifications to some teams as appropriate. In soliciting these proposals, NextFlex plans to grant and administer funding that must be matched (1:1 minimum) with funds in the form of cash and in-kind contributions provided by the grant recipients to cover the total project cost. It is not a requirement that each team member demonstrates a cost share at a minimum of 1:1, however the entire project must be cost shared at least 1:1 and ratios greater than 1:1 are highly encouraged. It is anticipated that equipment or tool development projects may have a higher ratio of cost share as compared to TPD topics, with precedent for ratios as high as 3:1.

Project Teams with skilled technical expertise from NextFlex member organizations will be identified to provide project oversight and direction. These Project Teams typically will be comprised of two to four experts from NextFlex companies, government laboratories, and other members.

In responding to this solicitation, partnering among industrial companies or industrial company/R&D organization/university/government teams is encouraged. Individual company responses may be 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 delivery of the product demonstrator or material proposed. Such an engagement with industry partner(s) will strengthen the value of the submission.

Pre-proposal Evaluation: The purpose of this evaluation is to rank all competitive submissions with respect to overall proposal quality as relevant to the project call topics, value proposition, overall approach and relevance to FHE, cost share, workforce development, and the strength of committed industry partnership and the team. The proposals will be reviewed by a team of SMEs, ranked, and only those down selected will be advanced to submitting a full proposal. The number of proposals advanced will be governed by the allotted budget for and goals of the project call.

Full Proposal Evaluation: During the final selection process of full proposals, communication between the proposers and NextFlex 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 awards to proposals submitted in response to this project call is contingent upon the continued availability of US government funding)

The scores and comments from different reviewers on all proposals will be compiled, ranked, voted, and prioritized by the Technical Council. They may seek additional modifications before making the recommendations to the Governing Council. Upon approval by the Governing Council, the proposal shall advance to executing Partnership and Development Agreements prior to awarding any funds.

The proposal components are evaluated based on the criteria as outlined:

7.2 Fundamental Criteria: The selection of projects for funding awards will be based on a review process by subject matter experts in a variety of fields that are applicable to the topics under review. All projects, irrespective of category, will be evaluated on the following fundamental criteria.

- **Cost**
- **Cost share** – what percentage of the total expense of the project is NextFlex being asked to support?
- **Cost realism** – the analysis of the cost of the effort must be credible and based on data and prior related experience.
- **Relevance to FHE ecosystem** – the project must be clearly relevant to needs for product or manufacturing methods within the FHE ecosystem.
- **Key deliverables** – a clear, well laid out and measureable set of deliverables that the Institute and its membership can expect upon completion.
- **Experience of the team** – a clear description of the experience of the team and a proven track record that supports their ability to deliver upon the proposed objectives.
- **Probability of success** – the assessment by the reviewer the combination of project feasibility, scope, team experience, and timeline will yield a successful result for the project. Key components of this are as outlined below.
 - The project and schedules are well defined
 - The risk analysis is sound
 - The development is cost effective
- **The most important evaluation criteria for a winning proposal is:**
 - **A clear, detailed description of what problem you are trying to solve and why it is critical to the FHE community, i.e., the potential impact on the FHE community.**
 - **Quantify how will the successful completion of this project be a game changer for FHE.**

In addition to these fundamental evaluation criteria, which we anticipate from all proposals submitted, the following selection criteria will be applied to each of the three category areas as listed below:

7.3 Manufacturing Thrust Areas (MTA)

- Feasibility and originality of the manufacturing approach
- Path and challenges to integrate this process/equipment into manufacturing or a clear technology transition plan (including identification of transition partners if applicable)
- The level of quantitative improvement that the project will deliver when comparing the detailed specifications that the project will deliver as compared the current state of the art (which should be summarized in the proposal).
- Soundness and completeness of MRL/TRL assessment (and the appropriateness of the MRL level which is targeted between 4 and 7 for Institute focus areas)

7.4 Technology Platform Demonstrator (TPD)

- Quantified technology/product impact, with assumptions listed and justified
- Detailed description of this technology or product that differentiates it from what is currently achieved
- Describe how this broadly impacts advancement across FHE Technologies
- Clear TPD technology transition plan, including commercialization partners as applicable
- Detailed and quantitative performance specification improvement as well as the use of appropriate test and evaluation methods
- Soundness and completeness of MRL/TRL Assessment (and the appropriateness of the MRL level which is targeted between 4 and 7 for Institute focus areas)

7.5 Workforce Development (WFD)

- Describe the relevance to the FHE ecosystem and how these efforts will produce the talent qualified to add value to companies engaged in FHE manufacturing activities
- Quantify the cost per person through the program
- Describe the objective completion rate of those who start the program
- Describe the methods to engage partners and expand the partnership over time
- Describe the targeted populations and discuss diversity goals to include veterans, women, and underrepresented populations
- Describe how the program will endure beyond the funding period
- Describe how participants are set up to successfully grow further within the industry over time

8. Contact Information

Communication and questions during the proposal period and submission of proposals should be directed by email to proposal@nextflex.us.

9. Reference Documents Kit

All of the following seven (7) reference documents are in the project call section of the NextFlex website at www.nextflex.us/project-call/:

- a. Project Call 2.0
- b. MRL/TRL Definitions
- c. Cost Calculations Excel workbook
- d. Cost Share Definitions and Guidance
- e. Membership/Partnership: www.nextflex.us/membership/
- f. Project Description – single-page PPT slide
- g. Online Cover Sheet: nextflex.formstack.com/forms/pc_cover. Due 1 week in advance (pre-proposals cover - May 30, 2016; full proposals cover - July 18, 2016).

10. Glossary of Terms

Glossary of Terms		
No	Acronym/Term	Definition
1	FHE	Flexible Hybrid Electronics
2	GC	Governing Council
3	MRL	Manufacturing Readiness Level
4	MTA	Manufacturing Thrust Areas
5	PC	Project Call
6	SME	Subject Matter Expert
7	TC	Technical Council: (comprising of SMEs and Tier 1 and Tier 2 members from industries and academia)
8	TPD	Technology Platform Demonstrator
9	TRL	Technology Readiness Level
10	TWG	Technical Working Group
11	WFD	Workforce Development

Revision Tracking Table

PC 2.0 Revisions	Date	Revised by	Comments
Original	05/05/2016	n/a	Baseline
A	05/09/2016	DN	Project topic number assigned to WFD topic in Section 4.3

Appendix A: Coversheet Template

NextFlex PC 2.0: Provide Project Title	
Date of Submission	
Proposal Stage (Pre- or Full-Proposal)	
Project Leader	
Organization, Department & Address	
Phone Number	
Email Address	
Non-Industry Partnering Organization(s)	Provide details
Industry Partnering Organization(s)	Provide details
Supplier/Subcontract Organization (s)	
Project Topic Category	
MRL Level - Start/Finish	Include both
TRL Level - Start/Finish	Include both
NextFlex Membership Status & Level	
Total Project Cost:	\$
Cost Share (in-kind, labor, material, etc.)	\$
Cost Request from NextFlex	\$
Project Duration	months

Appendix B: Instructions for Filling Out Proposal Cost Calculations Excel Workbook

As a result of the federal funding channel for Institute projects, there are some specific requirements for planning and tracking proposal spending. While the details of those budgets will be input into the Excel tables provided, the following should serve to clarify what needs to be documented and how:

Overall the following areas are important for the Institute to understand:

- Total Project Cost
- Total Cost Share, Including % and Amount of Funding Requested from NextFlex
- Type of Costs
- In Kind Contributions and Types Thereof
- Hours and Rates for Labor
- Any Equipment Purchases Planned
- Materials Purchases
- Travel Expenses

In addition to detail on the above, the Institute will need to understand spending by each calendar year the project operates in and a breakdown by lead and partners.

Therefore, the following explanation may be helpful.

Please add columns to the tab entitled "Project Detail" for additional columns needed for "Funds Year 20xx" and "NextFlex Funds Year 20xx".

Please add additional "Project Detail" and "Cost Detail" tabs for each partner on the project, and please make sure to maintain one "Project Detail Total" and "Cost Detail Total" tab which summarizes the partner breakdown.

The primary objective of this supporting workbook for the project proposal is to ensure that the review process can adequately identify the details of the proposal. Proposals which advance to funded projects will be subject to further documentation and record retention requirements which will be detailed to the project lead at that point in time.

If the lead or any partners of the proposal team have audited indirect rates for labor, please use those.

If you have any additional questions on how to prepare the cost calculations workbook, you may contact proposal@nextflex.us for further clarification.