



GUIDEBOOK

VERSION 1.0

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TABLE OF CONTENTS

SECTION 1. Advanced Fibers & Fabrics Definition.....	3
SECTION 2. Introduction and Background.....	3
2.1 AFFOA Mission	
2.2 Increasing Domestic Manufacturing Competitiveness	
2.3 Fabric Innovation Network	
SECTION 3. Project Call 2.0 Scope & Topics.....	4
3.1 Project Call 2.0 Scope	
3.2 MRL & TRL Definitions	
3.3 Project Call 2.0 Topics	
Project Call 2.1: Team System Demonstrator	
Project Call 2.2: Materials and Process Assessment	
Project Call 2.3: Textile Device Advancement	
Project Call 2.4: Textile Device Integration	
Project Call 2.5: Textile Technology Translation	
3.4 Project Deliverables	
SECTION 4. Proposal Submission Process.....	12
4.1 Project Call 2.0 Timeline	
4.2 Pre-Proposal and Full Proposal Format Guidelines	
4.3 Pre-Proposal Content	
4.4 Full Proposal Content	
SECTION 5. Administrative Topics.....	16
5.1 Confidential Information	
5.2 Intellectual Property	
5.3 Financial and Cost Share Requirements	
5.4 Work Requirements	
5.5 Membership Requirements	
SECTION 6. Proposal Evaluation Criteria.....	18
6.1 General Overview and Guidelines	
SECTION 7. Contact Information.....	19
SECTION 8. Reference Document Kits.....	19
APPENDIX.....	20
A. Cover Sheet Template (Pre-Proposal and Full Proposal)	
B. Instructions for Budget Template (Full Proposal Only)	
C. Proposal Evaluation Criteria	
D. AFFOA Headquarters & Fabric Discovery Centers	

SECTION 1. Advanced Fibers & Fabrics Definition

The convergence of device technology into fiber and textile production, enabling wireless connectivity and big data tools, will lead to fabrics that provide valuable services: fabrics that see, hear, sense, communicate, store and convert energy, regulate temperature, monitor health, and change color while delivering the conventional qualities of textiles to benefit the commercial consumer and warfighter. Advanced fabrics apply across a diverse set of applications and markets from materials to consumer electronics and from composites to apparel.

SECTION 2. Introduction and Background

2.1 AFFOA Mission

The mission of the Advanced Functional Fabrics of America (AFFOA) is to rekindle the domestic textiles industry by leading a nationwide enterprise for advanced fiber & fabric technology development and manufacturing, enabling revolutionary system capabilities for national security and commercial markets. To pursue this mission, AFFOA is addressing the spectrum of challenges associated with volume manufacturing of revolutionary fibers and textiles from design to end product prototypes through various efforts including project calls. The goal of these efforts is to facilitate the transition of revolutionary fibers and textiles from lab prototype demonstrations to pilot production (Manufacturing Readiness Level (MRL) of 4 to 7), delivering the functionality of sophisticated fiber devices into systems at scale.

Innovation at AFFOA starts with understanding the problem. We actively use our ecosystem and resources to identify domestic advanced fiber and fabric capabilities with use case opportunities for defense and commercial applications. Our focus is centered on transitioning technologies in the MRL 4 to 7 space. Through strategic facilitation and funding through projects, AFFOA helps transition technologies towards manufacturability and bridges the innovation valley of death.

2.2 Increasing Domestic Manufacturing Competitiveness

A core element in AFFOA's approach is to facilitate a domestic "Made in America" manufacturing capability in advanced fabrics based on US innovation. To that end, AFFOA is aggregating existing US university IP in the field of revolutionary fibers and textiles and directing the Institute's follow-on investment in IP that will be manufactured in the US. AFFOA's projects will address scaling challenges in order to make this IP more valuable and accessible to US manufacturers. Project teams that combine universities and manufacturing companies are encouraged.

2.3 Fabric Innovation Network

A key part of AFFOA's mission is to develop a robust ecosystem of advanced fiber and fabric thought leaders and problem solvers. Through this diverse group of members,

AFFOA's Fabric Innovation Network (FIN) brings together the elements necessary to accelerate the development and commercialization of advanced fiber and fabric products. Being a member of the FIN provides organizations with access to:

- An extensive ecosystem with prototyping, capability maturation, technology transition, product development and scaled manufacturing capabilities for advanced fiber and fabric products.
- Opportunities to advance textile innovation through joint proposals, project calls, and other-directed funding.
- Opportunities to network, connect, share and learn about emerging new technologies and cutting-edge capabilities at our in-person member events.
- Our Member Portal, which allows you to market your organization, learn about network capabilities, institute projects, open opportunities and connect with other members through advanced features.

SECTION 3. Project Call 2.0 Scope & Topics

3.1 Project Call 2.0 Scope

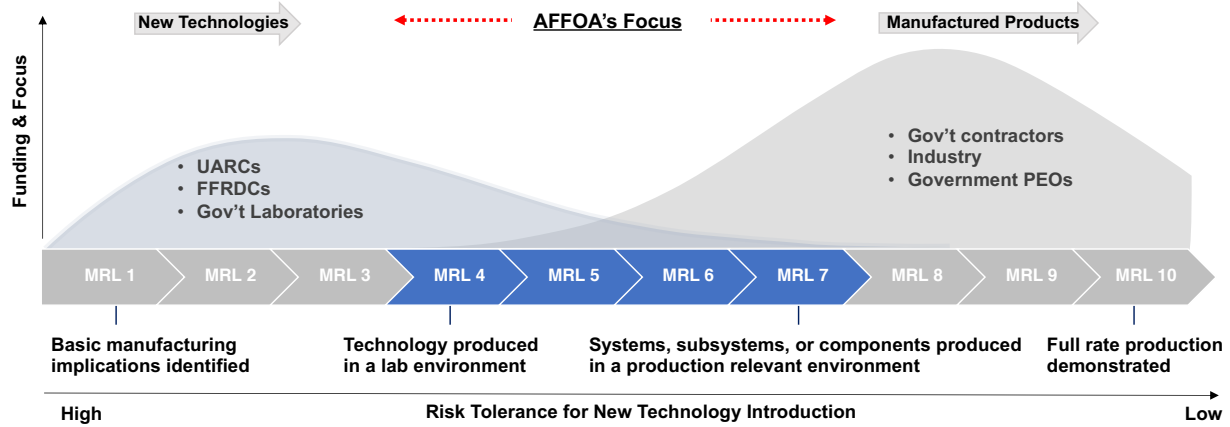
The scope of AFFOA Project Call 2.0 represents AFFOA's shifting strategy to include addressing manufacturing and foundational gaps that support the AFFOA ecosystem and goal of supporting the domestic textile industrial base. The four principal guidelines of Project Call 2.0 below reflect this strategy:

- Key metrics will drive the success of advanced functional fabrics and need to include the ability to understand manufacturing performance (including cost, yield, quantity) in light of rapidly developing concepts in automation of smart textiles.
- Demonstration of integrated systems should be focused on applications identified in the topics that resolve critical user needs.
- Textile devices and components should be developed to support the evolving technology building blocks and made to be accessible to the US textile ecosystem.
- Evaluation of advanced functional fabric materials, processes, and products need to be assessed, critically, with respect to new testing standards. Likewise, design rules for the manufacturing of smart textiles need to be established and benchmarked.

The scope of each of the topics has been defined through input from the government and industry representatives. To further refine the scope, members of AFFOA's Fabric Innovation Network were surveyed to determine areas of highest interest.

3.2 MRL & TRL Definitions

AFFOA bridges the gap between early stages of innovation and commercialization by complementing R&D at universities and national labs while de-risking manufacturability of advanced system concepts through strategic partnerships with industry and DoD. As part of this, AFFOA's is focused on promoting manufacturing hardening and scale-up, developing supply chains, fostering partnerships across the FIN to accelerate product development, and making prototype and scale-up facilities available.



To meet these objectives, AFFOA’s technology focus is on MRL (and TRL) of 4 to 7. MRL and TRL assessment guidelines can be found on the Project Call 2.0 Member Portal Opportunity Posting for members and Project Call 2.0 section of AFFOA’s website.

A summary of the MRL and TRL definitions are provided:

MRL	Definition
1	Basic manufacturing implications identified
2	Manufacturing concepts identified
3	Manufacturing proof of concept developed
4	Capability to produce the technology in a laboratory environment
5	Capability to produce prototype components in a production relevant environment
6	Capability to produce a prototype system or subsystem in a production relevant environment
7	Capability to produce systems, subsystems, or components in a production representative environment
8	Pilot line capability demonstrated; Ready to begin low rate initial production
9	Low rate production demonstrated; Capability in place to begin Full Rate Production
10	Full rate production demonstrated and lean production practices in place

TRL	Definition
1	Basic principles observed and reported
2	Technology concept and/or application formulated
3	Analytical and experimental critical function or characteristic proof of concept
4	Component and/or breadboard validation in a laboratory environment
5	Component and/or breadboard validation in a relevant environment
6	System/subsystem model or prototype demonstration in a relevant environment
7	System prototype demonstration in an operational environment
8	Actual system completed and qualified through test and demonstration
9	Actual system proven through successful mission operations

3.3 Project Call 2.0 Topics

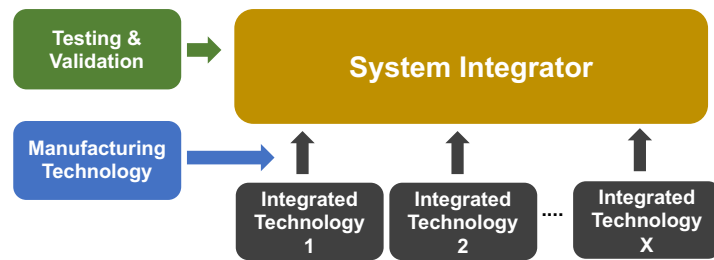
Five topics have been identified through engagement with government and industry entities, including members of AFFOA’s Fabric Innovation Network. Proposals are requested within the scope of each topic.

Topic 2.1: Team System Demonstrator

Full system integration that utilizes multiple technologies in the area of smart electronic textiles. Preferred current status of technologies is MRL & TRL ≥ 4 , although integrated technologies of TRL & MRL = 3 may be permitted with appropriate risk assessment mitigation strategies.

Four 'teaming' roles are expected in the effort:

- (1) Integrated Technology,
- (2) Manufacturing Technology,
- (3) Testing & Validation that work with (4) System Integrator to provide the demonstrated system. A team member's involvement in the project may encompass more than one role.



The scope of the topic includes:

- Sensing or feedback that supports physiological condition
- Responsive climate control in garment applications
- Sensing and/or therapy for wound management
- Energy transmission (near field) in garment applications

Funding expectation: One award up to \$750K.

In this topic, key challenges in system-level design of electronic textiles and smart systems that should be addressed, include:

- Power management analysis for extended lifetime for a consumer or application use case.
- Robustness of system in environments relevant to use case (thermal chemical, electrical shock), including system level testing and validation. Proposals should have a clear testing strategy.
- Manufacturing strategies that enable low-cost fabrication of units at scale.
- Development of product that has a clear market need. Proposals should have a clear market analysis and demonstrated voice of customer.

Scope of proposals that are not of interest:

- Excessive use of rigid electronic components that result in potential user discomfort.
- Technologies components or manufacturing that are below TRL/MRL 4 without a risk management strategy.

- Systems that are designed for only research and development support.

Topic 2.2: Materials and Process Assessment

Assessment of key design rule metrics and robustness of commercially available electronic materials for their use in electronic textiles. New strategies and validation for improving TRL and MRL of a materials and processes is anticipated. Processing investigations should evaluate the challenges to MRL in terms of throughput and costing.

The scope of the topic includes:

- conductive yarns utilized in yarn-to-fabric processing (including knitting, weaving, & braiding).

Funding expectation: Two awards up to \$250K per award.

In this topic, key challenges in the materials and process assessment that should be addressed include:

- Correlation of materials to textile process effects based on a well-defined design of experiments.
- Establishment of design rules that demonstrate the limitations of pattern-ability or effects of fabric design on performance.
- The use or adaptation of testing standards (ASTM, AATCC, IEEE etc.) that are applicable to consumer and industrial applications including wash fastness, abrasion resistance, flexure, electromechanical cycling performance, air permeability, etc.
- Manufacturing feasibility that includes factors of materials cost for achieving performance, manufacturing throughput, and challenges that limit manufacturing efficiencies.

Topic 2.3: Textile Device Advancement

MRL advancement of electronic textile devices. MRL and TRL advancement should be demonstrated in this effort through a textile integration or demonstration that is validated and benchmarked to comparable processes. Preferred current status of proposed technologies is MRL & TRL ≥ 4 .

The scope of the topic includes:

- Touch-inspired force sensors
- Power sources (including flexible battery and supercapacitor)
- Antennas (data and power transmission at common IoT relevant bandwidths and range)

Funding expectation: Three awards at \$250K per award.

In this topic, key challenges in the device assessment that should be addressed include:

- The ability to conform to curve linear objects, such as the human body, in ways that meet textile performance standards (flex, stretch, roughness) while maintaining device performance needed for desired use case applications.
- Range of operation of the device with respect to key performance metrics related to quality, reliability, power.
- Correlation of materials to textile process that would influence the device performance based on a well-defined design of experiments.
- The use or adaptation of testing standards (ASTM, AATCC, IEEE, etc.) that applicable to consumer and industrial applications including wash fastness, abrasion resistance, flexure, electromechanical cycling performance, air permeability, etc.
- Manufacturing feasibility that includes factors of materials cost for achieving performance, manufacturing throughput, and challenges that limit manufacturing efficiencies.

Topic 2.4: Textile Device Integration

Advanced strategies for robust connectors and device placement that supports an increase in MRL for electronic textiles. MRL and TRL advancement should be demonstrated in this effort through a textile integration or demonstration that is validated and benchmarked to comparable processes. Preferred current status of proposed technologies is MRL & TRL ≥ 4 .

The scope of the topic includes:

- Connectorization strategies for robust electrical connection between soft textile interconnects (yarns, multifunctional fibers, printed electronics) and complimentary rigid or soft electronic materials
- Flexible, stretchable interconnects for power and data transmission
- Discrete component placement (including pick-and-place or surface mount technologies)

Funding expectation: Three awards up to \$250K per award.

In this topic, key challenges in the device assessment that should be addressed include:

- The ability to conform to curve linear objects, such as the human body, in ways that meet textile performance standards (flex, stretch, roughness) while maintaining device performance needed for desired use case applications.
- Range of operation of the device with respect to key performance metrics related to quality, reliability, power.
- Correlation of materials to textile process that would influence the device performance based on a well-defined design of experiments.
- The use or adaptation of testing standards (ASTM, AATCC, IEEE, etc.) that are applicable to consumer and industrial applications including wash fastness, abrasion resistance, flexure, electromechanical cycling performance, air permeability, etc.
- Manufacturing feasibility analysis that includes factors of materials cost for achieving performance, manufacturing throughput, and challenges that limit manufacturing efficiencies.

Topic 2.5: Textile Technology Translation

MRL and/or TRL advancement of a textile-based technology innovation for start-ups. Preferred current status of proposed technologies is MRL & TRL ≥ 3 with customer discovery completed and evidence of technology traction.

The scope of the topic includes:

This topic is open to the area of advanced textile materials, devices, or manufacturing that supports the dual-purpose vision of commercial and military applications.

Additional Requirements for funding:

- Eligible offerors should be a startup company.
- Prior demonstration of product or technology that is at least TRL 2-3.
- Customer discovery should be completed.
- Prior evidence of technology traction should be demonstrated.
- Finalists selected for Full Proposal Pre-proposal down selection are expected to present in a National Security Innovation Network (NSIN) STARTS: Military Textiles Workshop & Virtual Pitch Event in late July as part of the full proposal evaluation. STARTS event information will be provided to finalists upon selection.

Funding expectation: Up to three awards with a total topic budget of \$450K.

3.4 Project Deliverables

Reporting. Each funded project is expected to provide a confidential quarterly report and presentation update to the AFFOA leadership team. Further, a non-confidential 1-page report and summary slide deck of key results will be published quarterly on the AFFOA member portal. A template for these reports and technology summary presentations will be provided to the awarded teams.

A final report is also expected at the end of the project period of performance. A template for these reports and technology summary presentations will be provided to the awarded teams.

Prototype Demonstration. During Q4 of the project period of performance, each awardee is expected to present their technology in person at an AFFOA member event. This event will serve as a showcase for the results of Project Call 2.0 and aims to establish connections between AFFOA members. The demonstrations are expected to be non-confidential in nature. The date of the member event will be announced at a later date.

Further requirements for each project include:

- Functional Prototype Reporting and Demonstration
 - Confidential quarterly reporting and presentation updates to the AFFOA leadership team.
 - Non-confidential 1-page report and summary slide deck of key results published quarterly on the AFFOA member portal.
 - Final report at the end of the project period of performance.
 - Non-confidential presentation and demonstration of technology at an AFFOA member event to be held toward the end of the period of performance. Demonstration quantities are required as follows:

PC 2.1 Team System Demonstrator	PC 2.2 Materials and Process Assessment	PC 2.3 Textile Device Advancement	PC 2.4 Textile Device Integration	PC 2.5 Textile Technology Translation
Performance report & x5 replications	Performance report	Performance report & x5 replications	Performance report & x5 replications	Performance report & x3 replications

- Evidence for TRL or MRL advancement through project and comparison to key benchmarking.
- Testing and validation of technology in a relevant use-case using existing or adapted standards (ASTM, AATCC, IEEE, etc.). New use case specific testing and validation techniques are permitted with documentation.
- Cost of manufacturing and bill of materials for (10K, 1M units) and/or scaled throughput of process (10K, 1 M units and/or 0.1, 1 m/min).
- Technology risk assessment for TRL and/or MRL advancement with roadmap for needed technology development.
- US Patent Filing (if necessary).

SECTION 4. Proposal submission Process

4.1 Project Call 2.0 Timeline

Project Call 2.0 will utilize a two-step proposal process. First, offerors are expected to submit a Pre-Proposal for initial down selection. Down selected offers will then be invited to submit a Full Proposal and terms and conditions for Full Proposals will be supplied by AFFOA.

Through evaluation of the Pre-Proposals, AFFOA will work with the Offeror to promote teaming to meet the desired outcomes of Topics 2.1-2.5. Full proposal submissions will undergo an evaluation by an assigned AFFOA technical advisory committee following the rubric provided in Appendix C.

To ensure that proposal teams have an opportunity to receive feedback from AFFOA on their project concepts, teaming, and other relevant criteria, proposers are strongly encouraged to contact AFFOA to schedule a conference call with Institute representatives. These calls are a valuable opportunity for all proposers. Please use the directions provided in Section 7 for contacting AFFOA with questions and to request a consultation.

Key steps and target dates are outlined in the table below:

May 17 th : 12:00 – 12:45 PM EST	Member Topic Selection Webinar
May 17 th – May 20 th	Member Voting Period
May 21 st : 12:00 – 1:00 PM EST	Member Webinar & Topic Announcement
May 25 th	General Solicitation Announcement
June 1 st : 12:00 PM – 1:00 PM EST	General Solicitation Webinar
June 13 th	Pre-Proposal Deadline
June 21-25 th	AFFOA Down Selection & Teaming
July 9 th	Full Proposal Deadline
July 30 th	Notification of Awards

4.2 Pre-Proposal and Full Proposal Format Guidelines

To maintain consistency through submission, review, and approval processes, please follow these guidelines:

Submission. Each Offeror shall submit compiled document (PDF preferred) of their proposal.

Pre-proposals should be submitted via email: proposals@affoa.org by 5:00 PM PST on June 13th, 2021.

Full proposals should be submitted via email: proposals@affoa.org by 5:00 PM PST on July 22nd, 2021.

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 by 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, tables, graphs, images, and pictures. Pages shall be single-spaced, 8.5 by 11 inches, with at least one-inch margins on all four sides of each page.

Page Limit. The main body is limited to 3 pages for the Pre-Proposal and 15 pages for the Full Proposal. In the Full Proposal, the page limit includes all required sections of the proposal except as indicated in *Full Proposal Content*. Pages that exceed these guidelines may not be reviewed. Proposal cost calculations should be in the Excel format provided; the spreadsheet should be included as a separate file along with the submission.

Page Numbering. Number pages sequentially within each major section of the proposal (frontmatter, proposal content, appendices).

Summary PowerPoint Slide. Each team is required to provide a single PowerPoint slide for their proposal which outlines proposed budget, funding, duration, objective, and deliverables, to be used while reviewing the projects for selection. This slide is required for the Pre-Proposal and Full Proposal. Graphics or other relevant and impactful material is often helpful in this regard. A template for this slide may be downloaded from the Project Call 2.0 Member Portal Opportunity Posting for members and Project Call 2.0 section of AFFOA’s website.

4.3 Pre-Proposal Content

The Pre-Proposal content guidelines are provided in this section. Please follow instructions listed in *Pre-Proposal and Full Proposal Format Guidelines* for format and other requirements. Use the standardized cover page format (Appendix A). A table of contents is not required. Any text beyond the three-page limit will not be evaluated. The cover page is excluded from page count.

Proposal Table of Contents

Frontmatter - Not included in the page count	
Page 1	Cover Page (see Appendix A)

Pages 1-3: Proposal Content – There is a 3-page maximum for the proposal, excluding Cover Page and PowerPoint Slide Project Description; the page count in each section below is for guidance. Any text beyond the 3-page limit will not be evaluated.

Pre-Proposal Content – 3-Page Maximum; The cover page is excluded from page count.	
Pages 1-3	Include the following items in the pre-proposal: Succinct summary of the project goals; Current MRL and/or TRL status of technology; Benchmark summary, including IP positioning of team and plan for adding capabilities to the Manufacturing USA ecosystem; brief work plan addressing key challenges of the proposed project; Team member/company bios; Budget summary that includes budgeting to each team member (subcontracts included) and acknowledgement of a minimum of a 1:1 cost share requirement.

4.4 Full Proposal Content

The Full Proposal table of contents and content guidelines are provided in this section. Please follow instructions listed in *Pre-Proposal and Full Proposal Format Guidelines* for format and other requirements. Use the standardized cover page format (Appendix A). The table of contents for the proposal is outlined below. If required, additional tables may be included, but may not be used to artificially exceed the proposal page length. Please ensure that all table or figure references include a clear numbering system and are cross-referenced in the proposal text. Please ensure that proposals clearly identify the current capability and the quantitative target specifications that will determine success of the project.

It is imperative that proposals define milestones that are tangible, measurable, and demonstrable. The specifications of each milestone achievement should be clearly defined based on the goal of improving MRL and/or TRL. Examples of tangible milestones may include physical samples, written reports containing collected data, or live demonstrations of functionality.

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.

Proposal Table of Contents

Frontmatter - Not included in the page count	
Page 1	Cover Page (see Appendix A)
Page 2	Table of Contents
Page 3-4	Executive Summary: A succinct summary of no more than 2 pages clearly articulating the big picture problem being addressed, proposal objectives, relevance to AFFOA, approach to address all critical technical and non-technical aspects, expected outcome and overall cost/cost share information.

Pages 1-15: Proposal Content – There is a 15-page maximum for the proposal, excluding appendices and PowerPoint Slide Project Description; the page count in each section is for guidance. Total number of pages is more important than the page count in each section.

Full Proposal Content – 15 Page Maximum for Sections 1-7; Sections 8-9 are Excluded from Page Count Suggested Length Section and Contents	
1.5 pages	1. Background and Need 1.1. Identify the Advanced Functional Fabric Opportunity and Proposed Solution 1.2. Describe Background, Current State-Of-The-Art, and Alignment to AFFOA’s mission of “Increasing Domestic Manufacturing Competitiveness” 1.3. Addressed Roadmap Gap (or manufacturing gap not previously identified) and Problem Definition
~4 pages	2. Technical Objectives, Scope, and Approach 2.1. Technical Objectives 2.2. Technical Scope and Approach 2.3. Innovative Claims 2.4. Performance and Reliability Metrics/Standards 2.5. Key Target Specifications
~5 pages	3. Work Plan 3.1. Project Schedule 3.2. Detailed Description of Milestones, Tasks, and Deliverables 3.3. Project Risk Assessment and Mitigation Plan 3.4. Project Management Approach, Roles, and Relationship of Key Personnel
~2 pages	4. Technology Assessment 4.1. TRL/MRL Assessment (current state of the technology, expected level to be achieved, and explanation of how the proposed work will advance the TRL/MRL) 4.2. Manufacturing Partners and Approach (if relevant to topic) 4.3. Tool Accessibility to AFFOA Members and Broader Ecosystem (for manufacturing/test tools and standards and software tools only) 4.4. IP: Existing Portfolio and Future Strategy (if relevant to topic) and plan for IP availability to Manufacturing USA Ecosystem
~1 page	5. Budget Justification and Cost Share 5.1. Breakdown of costs (labor, materials, travel, etc.) by project team member. Sources of funding including AFFOA funds, participant cost share, 3rd party cost share, and any other sources. This section provides budgetary information for the technical reviewers; Appendix B includes detailed costing. 5.2. Value and Quality of Cost Share

~1.5 pages	6. Capability to Meet Technical and Business Goals 6.1. Key Personnel Experience and Qualifications 6.2. Prior Work Toward This Specific Effort 6.3. Relevant Facilities and Equipment Infrastructure (pertinent to the proposal)
As Needed; Excluded from Page Count	7. Appendix 7.1. Bio-sketches 7.2. Facilities and Infrastructure Detail Relevant to the Proposal 7.3. Technical References and List of Patents 7.4. Letters of Support and Letters of Intent from key collaborators. 7.5. Budget Workbook per Attached Workbook Template (Required). Include labor (by staff position), materials, and overhead, including overhead rates, each divided by source of funds. Must use the AFFOA Cost Calculations spreadsheet for required format. Attach tabs to the spreadsheet with detail behind the summary figures.
Excluded from Page Count	8. Single Page PPT Slide Project Description (template provided)

SECTION 5. Administrative Topics

5.1 Confidential information

AFFOA understands that it may be desirable to include information that is considered confidential and proprietary by the Offeror to fully and effectively convey the technical merits of the proposal. All submitted proposals are distributed for the purpose of review to a select group of evaluators. Besides AFFOA staff, the majority of AFFOA’s evaluation team are AFFOA members, who will be bound to customary confidentiality provisions (no less than reasonable care standard). Representatives of the U.S. Government may also serve as proposal evaluators. AFFOA reserves the right to engage other persons or entities as part of the proposal review & evaluation process (e.g., third-party SMEs), in which case AFFOA will require such evaluator to enter into a special purpose non-disclosure agreement. Please keep the foregoing in mind when determining the information to provide in your proposal. If, understanding this, you include any information that you deem “proprietary”, it is recommended that the included confidential or proprietary information be clearly marked and be limited to the minimum necessary to convey the highlights of the technical approach. Additionally, Offerors should refrain from including Export Controlled or trade secret information in their submissions. If an Offeror believes that the inclusion of Export Controlled, or trade secret information is required to fully respond to the technical topic or to fully convey the merits of their proposal, they should submit this as a request by question via the ‘Questions and Consultation Requests’ form on the Project Call 2.0 Member Portal Opportunity Posting for members and Project Call 2.0 section of AFFOA’s website. Please submit these questions no later than the online cover sheet submission deadline.

5.2 Intellectual Property

AFFOA recognizes that companies protect intellectual property (“IP”) through various mechanisms, including patents and trade secrets. Offerors shall retain their rights to background IP, however, proposals are expected to address and detail each Offeror’s (or joint Offeror’s) willingness to share background IP or make background IP available to third parties upon reasonable terms. Protection of background IP and know-how does not exclude an Offeror organization from participating in a project.

Foreground IP shall be retained by the Inventor however, foreground IP shall be subject to the PC 2.0 IP Terms and Conditions which shall include government purpose rights. An element of the proposal evaluation rubric will include a willingness to make foreground IP (and background IP to extent necessary) available to AFFOA's Membership either in the form of a license to practice or in product form, under commercially reasonable terms.

Offerors are expected to negotiate and agree on joint IP ownership terms between the partnering parties ahead of full proposal submission. AFFOA's encourages teaming amongst AFFOA Members.

The Project Call 2.0 IP Terms and Conditions shall also specify that the Offeror agree to a “Made in America” commitment. Data reporting shall also be required as part of the reporting process.

For proposals of equal merit in all other evaluation criteria, awards will be made to teams most willing to collaborate and share information to improve overall domestic manufacturing practices.

5.3 Financial and Cost Share Requirements

Development agreements will be generally awarded as cost reimbursement, not-to-exceed contracts, with payments to be made on progress as presented in the proposal. If the Offeror’s organization 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. AFFOA plans to provide and administer funding that must be matched (1:1 minimum) with funds in the form of cash and in-kind contributions provided by the 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.

5.4 Work Requirements

Proposal teams shall include at least one corporate/industrial organization and should be industry led. Non-profit institutions and universities are encouraged to apply for funding but must partner with a for-profit company and demonstrate scale up of their technology in a manufacturing facility in Year 1.

The company or composite team of companies/government labs/universities must have a significant presence in the US in the form of R&D activities and manufacturing. 100% of the work activity (funds) must be spent within the United States operations.

Project Call 2.0 Awardees shall use their best efforts to perform the required work specified under the applicable SOW, within the obligated amount and the total estimated cost set forth in the applicable SOW. Project Call 2.0 Awardees shall abide by all the terms and conditions agreed to in the subsequent Contract.

5.5 Membership requirements

Non-AFFOA members may provide proposals in response to Project Call 2.0. However, in order to qualify for funding awards, companies, organizations, and their partners that are selected for an award and who are not already a member of the Institute, must subsequently join AFFOA. Project Leads/Primes are responsible for communicating this requirement to their respective partners and coordinate their membership process with AFFOA. Potential members are encouraged to check out go.affoa.org and/or reach out to info@affoa.org to learn more about how to join.

SECTION 6. Proposal Evaluation Criteria

6.1 General Overview and Guidelines

AFFOA Project Call 2.0 is a two-stage proposal process, aimed at providing evaluation at Pre-Proposal and Full Proposal stages. AFFOA will evaluate, down select and engage proposers after the Pre-Proposal. Based on the number of Pre-Proposal submissions, it may not be possible to provide pointed feedback to all proposers.

Of those down selected to submit a Full Proposal, members of an AFFOA technical advisory council (“TAC”), comprised of subject matter experts from industry, government, and academic institutions will evaluate and prioritize all proposals and provide feedback. They may make recommendations for proposal modifications to some teams as appropriate.

Partnering among industrial organization or industrial company/R&D organization/university/government teams is very strongly encouraged for PC 2.0. Individual company responses may be appropriate where company size, breadth, and expertise are sufficient to effectively cover all areas (e.g., technical resources, financial stability, and market presence) critical to the successful delivery of the demonstrator, prototypes, processes, or material proposed. Engagement with industry organization will strengthen the value of the submission.

Consultation with AFFOA: The purpose of discussing proposals with AFFOA prior to official submission of the Pre-Proposal or Full Proposal is to receive feedback on all aspects of the proposal, including technical approach, partnering, connection to previous AFFOA projects, etc. This consultation is meant to strengthen the competitiveness of the proposal. It is the responsibility of each proposing team to decide how to incorporate or not incorporate the feedback. This consultation does not factor into the proposal evaluation.

Proposal Evaluation: During the final selection process of the proposals, communication between the proposers and AFFOA may be initiated over the terms, conditions, specifications, deliverables, schedule, budget, IP, 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, and prioritized; and they will be considered in voting by the TAC. The TAC may seek additional modifications before making recommendations to the AFFOA leadership. Upon approval by AFFOA leadership, the proposal shall advance to executing Partnership and Development Agreements prior to awarding any funds and, if not already a member of AFFOA, execute a Membership Agreement as well.

Proposals are evaluated based on the criteria as outlined in the table provided in the Appendix C.

Utilizing AFFOA Headquarters (“HQ”) and/or the FDCs is not a specific evaluation criterion. Any proposal team intending to utilize the AFFOA HQ and/or the FDCs in their project should engage these facilities about this well ahead of proposal submission (as they would any other partner) by using the contact information provided in the Appendix D.

SECTION 7. Contact Information

Proposers are encouraged to arrange a consultation with AFFOA in preparation of the Pre-Proposal and, if selected, the Full Proposal. Due to the number of expected consultations, AFFOA will be limiting the meeting time to 20 min. AFFOA respectfully request that a list of questions and no more than a 1-page summary of the project is provided in arranging the consultation. All communication documentation sent in the summary should be labeled as ‘non-confidential’. *Please use the form on the Project Call 2.0 Member Portal Opportunity Posting for members and Project Call 2.0 section of AFFOA’s website for questions and consultation requests.*

SECTION 8. Reference Document Kits

All the following reference documents are in the Project Call Reference Documents section of the Project Call 2.0 Member Portal Opportunity Posting for members and Project Call 2.0 section of AFFOA’s website.

1. Project Call 2.0 Guidebook
2. Webinar Slide Decks and Video Recordings
3. MRL & TRL Assessment Documentation
4. Coversheet, PPT Slide Submission, and Full Proposal Budget Templates
5. Online Form for Questions and Consultation Requests
6. Common Q&A Document (updated as necessary)

For additional information on membership please visit go.affoa.org and/or contact info@affoa.org.

APPENDIX

A. Cover Sheet Template

Project Title:

Response to Topic 2.X <please label 2.1, 2.2, 2.3, 2.4 or 2.5>

Date of Submission: <XX/YY/2021>

Project Leader

Name and Title	
Organization	
Address	
Phone Number	
Email Address	

Lead Organization DUNS Number:

Lead Organization AFFOA Member status:

External Collaborators <copy and paste for each lead collaborator>

Name and Title	
Organization	
Email Address	
AFFOA Member Status of Organization	

Proposed Project MRL/TRL Summary

MRL @ Project Start		MRL @ Project End	
TRL @ Project Start		TRL @ Project End	

Budget Summary

Estimated Total Project Costs:	
Estimate Cost Share (identify breakdown of in-kind, labor, material, etc.)	
Estimate Cost Requested from AFFOA	
Project Duration (Months)	

B. Instructions for Budget Template (Full Proposal Only)

A budget template can be found on the Project Call 2.0 Member Portal Opportunity Posting for members and Project Call 2.0 section of AFFOA's website. There are specific requirements for planning and tracking proposal and project spending when receiving federal funding for Institute projects. To support those requirements, please lay out the project financials in the provided format. While budget details will be entered 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 percent and amount of funding requested from AFFOA
- 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, you must provide spending by quarter for the 12-month period of performance for which the project operates and a breakdown by lead and partners. The spreadsheet includes columns for 4 budget quarters.

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 Full Proposal is to ensure that the review process can adequately identify all details of the proposal. Proposals that advance to funded projects will be subject to further documentation and record retention requirements which will be provided in detail 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 there are any additional questions on how to prepare the cost calculations workbook, proposers may contact proposals@affoa.org for further clarification.

C. Proposal Evaluation Criteria

AFFOA PC 2.0 Proposal Review Rubric for AFFOA technical advisory committee and AFFOA Leadership

Reviewer Name	
Reviewer Organization	
Criteria	Score*
(1) Impact. Does the problem statement present a relevant and innovative solution to AFFOA’s mission? This includes a thorough understanding of the technology State of the Art	
(2) Technical Scope. Does the technical scope of the proposed work meet the scope of the topic addressed? Are key MRL and TRL challenges identified with respect to the technology landscape? Are appropriate metrics/standards identified to evaluate and resolve progress these technical challenges?	
(3) Plan of Work. Does the Plan of Work of the proposed work meet the scope of the topic addressed? Is a 12 month timeline provided with appropriate milestones and metrics for project success? Does the risk management and mitigation plan allow for project success?	
(4) MRL/TRL Assessment. Is the TRL and/or MRL of the current project accurately defined? Is the MRL/TRL advancement proposed suitable toward advancing commercialization of the technology?	
(5) Budget Justification and Cost Share. Is the budget appropriate to meet the project deliverables? Does the cost-share provide quality and value to the proposal?	
(6) Team Capability. Does the project team have suitable expertise and resources to meet the project deliverables in the 12-month performance period?	
(7) IP Position. Does the team specify the ability to incorporate technology into the US manufacturing ecosystem in the USA via IP licensing, product and component offering in the market, etc.?	
Reviewer Comments:	

*Scores are provided on a scale of 1 to 5, with 5 being the highest score. A score of 5 exceeds the expectations of the listed criteria.

9.5 AFFOA Headquarters (HQ) and Fabric Discovery Centers (FDCs)

AFFOA HQ FDC



AFFOA's HQ FDC is an end-to-end advanced fibers and fabrics prototyping facility with state-of-the-art prototyping and manufacturing equipment. Our facility is ITAR compliant, enabling us to support a range of defense & commercial needs.

Facilities & Equipment: HQ FDC is 12,000 square feet and houses a variety of equipment, including:

- *Fiber Development & Manufacturing:* 5 fiber draw towers, machine shop for polymer processing, hot press with vacuum capability, chemical lab for active material preparation, including a fume hood and a glove box, thermal deposition system for low temperature material deposition, and a clean room
- *Knitting & Weaving:* Stoll ADF X Shima Seiki Mini Whole Garment, Santoni Circular Knitter, TC2 Jacquard, Studio Dobbie AVL Loom, CCI Weaving Machine, Agteks Twister
- *System Assembly:* Bernina sewing machine with embroidery module, laser cutter, 3D printers, JUKI industrial sewing machines, Pegasus Sergers
- *Testing:* spectrophotometer, spectrometer, bend testing, tensile testing, wash testing, microscopy – optical microscopy, SEM, Keyence 3D microscope, electrical assembly, electrical characterization, fabric-embedded software

Capabilities: AFFOA's in-house capabilities include end-to-end advanced fiber design and product prototyping. Our five main categories of capabilities include:

- *Design & Modeling of Integrated Textile Systems:* Modeling advanced fiber and fabric properties and design for systems analysis driven product prototyping.
- *Fiber & Yarn Devices:* Creating advanced multi-material monofilaments with embedded semiconductors through our proprietary thermal draw process (polymer and glass fiber capabilities).
- *Systems Integration:* Integrating electronic components at any stage of the prototype process. Validating product design through iterative testing and rapid feedback.
- *Textile & System Assembly:* Designing & developing end products or textiles with integrated advanced fibers or components through knitting, weaving, embroidery, and traditional cut and sew.
- *Testing:* Characterizing fibers and fabrics through, electronic, optical, and mechanical testing, ensuring reliability and manufacturability of prototypes.
- *Prototyping:* AFFOA can rapidly prototype in-house for a variety of fiber and fabric demonstrators and support small batch manufacturing.

How to Engage:

Website: <http://go.affoa.org/startup-fabric-discovery-center/>

Email: info@affoa.org

Defense FDC



The Defense Fabric Discovery Center (DFDC) is a state-of-the-art prototyping facility at MIT Lincoln Laboratory capable of classified analysis and processing, including polymer and silica preform fabrication, fiber draw, weaving, knitting, and sewing / fabric integration.

The DFDC is also an informal innovation ecosystem formed in partnership with AFFOA, MIT Lincoln Laboratory, the Commonwealth of Massachusetts, and DEVCOM, which enables technical solutions to national security problems, from technology to systems.

The DFDC is currently working on programs on a technology roadmap that range from low-speed electronics in individual fibers and special material properties in textiles to high-speed electronics and optical data transfer, to wearable soldier systems.

Facilities & Equipment: The DFDC is located at MIT Lincoln Laboratory in Lexington, Massachusetts. This location houses CAD software used to model the fiber preform that contains the microelectronics, draw towers that pull and spool fiber, full garment knitting machines that weave the fiber into fabric, and system integration technology that produces a finished product.

Capabilities: The center is equipped to design and produce fabrics with embedded microelectronics, which enables these fabrics to change color, store energy, emit and detect sound, light, temperature, and pressure, monitor health, and facilitate communication. The ability to complete all the prototyping steps under one roof expedites the process of supplying finished products to the Department of Defense for operational use.

How to Engage:

Website: <https://www.ll.mit.edu/about/facilities/defense-fabric-discovery-center>

Email: dfdc@ll.mit.edu

Pennsylvania FDC



About the Pennsylvania Fabric Discovery Center at Drexel University (PA FDC)

The PA FDC at the Center for Functional Fabrics (CFF) is an end-to-end manufacturing platform dedicated to advancing the design and manufacturing of integrated textile systems that will transform the way we work, live and interact with the world. Our vision is to foster the creation of a new US industry where transdisciplinary teams tackle innovation barriers in advanced manufacturing of textile devices, enabling the next generation of meaningful products.

Facilities & Equipment: The CFF and the PA FDC is a 10,000-square-foot facility at Schuylkill Yards in University City, Philadelphia, PA. The PA FDC is an end-to-end rapid prototyping facility for advanced manufacturing of functional fabrics.

The CFF at PA FDC utilizes a wide range of state-of-the-art industrial textile fabrication equipment for research and development of functional fabrics including:

- *Fiber Development & Yarn Assembly:* Agteks yarn covering and twisting machines, Simet twisting machine, bobbin winding machine, custom-built modular twisting set-up, New England Butt Company braiding machines, nanomaterial electrospinning machine
- *Knitting & Weaving:* 7 Shima Seiki flat weft knitting machines, a Lonati circular weft knitting machine (shoe upper machine), a Santoni circular weft knitting machine, a Comez warp knitting machine, a CCI weaving machine
- *System Assembly:* JUKI industrial sewing machines, 3D body scanner, ultrasonic welding/sewing machine, hot air seam sealing machine, embroidery machine, advanced flat overlock sewing machine, precision washer and dryer, steam iron station, ultrasonic bath with temperature control
- *Testing & Characterization:* stereoscopic microscope, electronic twist tester, yarn count tester, yarn wrap reel, tensile testing, seam testing station, abrasion and pilling tester

Capabilities: The PA FDC utilizes their equipment to push the current boundaries of functional fabrics, smart garments, novel materials and wearable technology. PA FDC resources are used by faculty, staff and students at Drexel University to develop textile devices from concept to prototype as well as multidisciplinary research, enabling quick knowledge transfer between disciplines.

- *Prototyping/Translation to scalable manufacturing:* The PA FDC has experience modifying full scale manufacturing equipment and developing small scale equipment to translate novel materials into prototypes relevant to industry and research application.

- *Yarn Level Prototyping:* The PA FDC has the knowledge and equipment to develop prototypes and solutions at the yarn level. Manufacturing and research scale equipment is used to modify existing yarns and create composites through twisting, covering and sizing processes.
- *Knit & Woven Textile Fabrication:* Flat and circular weft, warp and sample weaving machines are used at the PA FDC. Each of these knitting machines are commonly used in full scale textile manufacturing. The PA FDC team has created modifications and interventions to quickly scale ideas from research and development level prototypes to production level proof of concepts.
- *Testing:* The PA FDC has a variety of equipment for both traditional and non-traditional textile testing and characterization including stereoscopic optical microscopy, abrasion and pilling, water resistance, yarn twist, burst strength, flexural strength and tensile testing. Electrical properties such as linear resistance can also be measured to characterize yarns for use in e-textiles.
- *Systems Integration:* The PA FDC is experienced in developing embedded hardware and software for textile devices and in finding solutions to interface textiles to electronics hardware. This includes embedded sensing, signal processing and driver development for textile-based sensors.
- *Education and Workforce Development:* In alignment with Drexel University's broader strategic strengths in experiential learning and applied research, the PA FDC incorporates a hands-on undergraduate cooperative educational role and extensive transdisciplinary graduate research in its projects.

How to Engage:

Website: <https://drexel.edu/functional-fabrics/initiatives/pennsylvania-fabric-discovery-center/>

Email: [Patrick Doran](mailto:Patrick.Doran@drexel.edu); pwd37@drexel.edu

UMass Lowell FDC



About UMass Lowell Fabric Discovery Center: UMass Lowell Fabric Discovery Center (FDC) is the first and only site in the nation that brings together opportunities from three Manufacturing USA Innovation Institutes (AFFOA, Nextflex and ARM) under one high-tech regional ecosystem to transform new ideas into valuable solutions and drive research and prototyping (product and process development) for automated manufacture and commercialization of advanced functional fabrics & flexible hybrid electronics, and robotics. The Center helps also help in creating the next generation of workforce and advanced manufacturing for advanced textiles, wearable electronics, & medical textiles and will impact the regional and national economy as well as national security.

Facilities and Equipment: The UMass Lowell Fabric Discovery Center is a 28,000-square foot research facility, located at 110 Canal Street in Lowell, MA. This interdisciplinary center focuses on the development, testing, and manufacturing of “smart” materials. The Fabric Discovery Center offers leading edge equipment for the development of new advanced textiles, fiber-based materials, and integrated electronics. This pilot production and testing facility serves the needs of both academic and industry researchers to rapidly transform product concepts into functional prototypes. The facility houses a variety of equipment, including:

- *Fiber and Yarn Processing:* Wire Coating Line, Xplore Microcompounder, Agteks Twister, Wardwell Maypole Braider
- *Knitting & Weaving:* Stoll Knitting Machine, TC2 Jacquard Loom
- *Integration & Post-Processing:* HMI Screen Printer, Roll to Roll Coating Line, Heat Transfer Press
- *Functional Apparel, Fashion Makerspace:* Gerber Cutter, Digitizer & Plotter, Industrial sewing machines
- *Testing:* KLA Nano-single fiber tester, Instron Tensile Tester, Thermal Mechanical Analyzer, Air Permeability Tester, Thermetrics Guarded Hot Plate, ESPEC Temp/Humidity chamber, Martindale Abrasion Tester, Vertical Flame Tester, MOCON WVTR tester, Olympus microscope
- *PPE Testing:* Automated Filter Tester, Hydrostatic Head Tester, Mask Synthetic Blood Penetration Tester

Capabilities: UMass Lowell FDC serves the needs of both academic and industry researchers to rapidly transform product concepts into functional prototypes. Capabilities include:

- Polymer compounding and Fiber extrusion
- Textile assembly (e.g., knitting, weaving, braiding) and textile finishing (e.g., coating, digital printing, bonding/seaming, sewing) equipment

- Additive manufacturing and roll-to-roll processing (for creation of flexible electronics, conformal sensors, energy harvesting devices, wearable electronics)
- Testing for mechanical and thermal properties, flammability, permeability, and abrasion.

How to Engage:

Website: <https://www.uml.edu/Research/fdc/>

Email: LowellFDC@uml.edu