



**2023 Focused Solicitation
Request for Proposals (RFP)
Issued: 5/5/2023**

White Paper Responses Due Date: 6/5/2023
Full Proposals Due Date: 8/18/2023

1. Mission/Objectives

The Nano-Bio Materials Consortium (NBMC) was established in 2013 to bring together experts in electronic technology research and development for human performance monitoring and augmentation. Through 38 projects, NBMC has made significant advances in human-performance monitoring with the help of over two dozen industry partners. The consortium's primary focus was initially on human-performance monitoring (generally). It has since shifted its attention to improving the functionality of components and systems that are integrated with human technology. The consortium is exploring novel approaches to enhance performance augmentation, decision-making capabilities, and accuracy. This is crucial to the Department of Defense's mobility resources, as Air Mobility Command is responsible for the strategic military medical evacuation of patients and the optimal performance of their pilots and medical professionals. Therefore, solutions for effective physiological monitoring that address Size, Weight, Power, and Cost (SWaP-C) are essential.

To achieve this goal, NBMC focuses on specific challenges and opportunities that are early in the Research and Development (R&D) process and raises the technology and manufacturing readiness levels (TRL/MRL) of nano and bio technologies by creating a community of experts who conduct strategic gap analysis and the placement of public and private sector funding. The consortium has built on its success since its inception under a cooperative agreement with the U.S. Air Force Research Lab (AFRL) awarded to SEMI. AFRL and SEMI have partnered to focus on key application areas for next-generation medical monitoring in the defense sector, with dual-use technology opportunities in electronic technologies for health and wellness.

Since its inception over two dozen organizations have participated in thirty-eight distinct projects aimed at developing low-cost, wearable sensors. These projects have yielded advances in materials science, microfluidics, electronics, power generation, and manufacturing processes. The resulting integrated sensing systems are wireless, flexible, and feature high-performance silicon devices designed to move with the wearer. Notable advancements include subsystems for ECG monitoring, functionalized biomarker sensors, and hydration sensing.

The program continues to its next phase with a focus on critical technologies, including the development of flexible high-performance circuits, computational capability, interconnect and data bus, multi-sensor integration, AI and machine learning, microfluidics, advanced materials, and nanostructures. It will also focus on developing biomarker detection and assessments with a focus on implantable sensors and interstitial fluid-based sensors, as well as bioelectrical, biochemical, and biomagnetic signature assessments such as brain-machine interface and textile integrations, and interventional technologies to address performance augmentation challenges, with a focus on chemical drug delivery and neuromodulation techniques. The program will emphasize the incorporation of lightweight and thin form factors, disposability, interoperability, innovative powering technologies, and ease of use for many of these technologies.

Topics in this 2023 Solicitation are:

1. Wearable/Bio-signal sensing for real-time cognitive, physical state monitoring, and augmentation

2. Wearable integrated sensing & edge computing
3. Human health protection/environmental monitoring & safety
4. Dermal, transdermal, and subcutaneous sensors
5. E-Textile/Textile based sensor for real-time monitoring

Concept demonstrations and/or prototypes must be part of the deliverables for consideration of an award. Human demonstrations are desired and partnership with end-user communities for independent testing and characterization is highly encouraged. End-users can be defined as defense customers, commercial market segment customers, or, in some cases, direct supply chain customers. If your proposal includes human subjects research (HSR) please provide concise answers to questions in section 7 (White paper instructions) and section 8 (Full proposal instructions).

Further detail about each topic is listed in section 5.

2. Proposal Process and Topics

The proposal process will start with a white paper submission. Members of the RFP Review Committee will review the white papers and recommend those for full proposal submission to the Governing Council. The point-of-contact for the submissions selected by the review committee for further consideration will be invited to submit a full proposal.

To date, SEMI has enabled funded R&D projects to be conducted by industry and academic teams with technical guidance and oversight from the subject matter experts within the government. Through the recently announced AFRL-Industry co-development program, NBMC has created an opportunity for industry to partner with subject matter experts within AFRL to address key capability or technology gaps for their development strategy. Industrial investigators interested in the program should indicate that interest in their whitepaper submissions. If the whitepaper proposal is selected and AFRL elects to co-develop, an AFRL research partner will contact the whitepaper principal investigator to work together to submit full proposals to the consortium and compete for an award. The funding to enable AFRL to support these industry-led proposals will not reduce the funding opportunity eligible to the industry.

Some of the AFRL capabilities and competencies that can be leveraged with this program include, but are not limited to, advanced materials (2D materials, liquid electronics, carbon nanomaterials, high temperature lithium ion chemistries), advanced processing & integration methods (additive manufacturing, photonic processing, ultrathin fabrication, e-beam atomic printing), human biomarker discovery and biosensor development (biomarker characterization in different biofluids, multianalyte sensor platforms for continuous biosignature monitoring, biorecognition element selection and optimization for integration in different sensor platforms), and biomaterials and synthetic biology (programmable, self-assembled optical and composite materials, energetic and catalytic materials, high throughput screening, functionalization and characterization of materials).

SEMI will support technical approaches that are novel, or game-changing thus having a more significant element of risk, as well as approaches that represent evolutionary improvements upon existing capability, which tend to be less risky and involve shorter development and delivery intervals. It is recognized that it may be desirable to include information that is considered confidential and proprietary by the submitter to fully and effectively convey the technical merits of the proposal. While a best effort will be made to restrict the proposal information to those with a need to know expressly for purposes of the review, it is recommended that the inclusion of proprietary information be limited to the minimum necessary to convey the highlights of the technical approach.

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

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

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

A work breakdown structure should be the basis of project schedules, milestone definitions, and cost estimates. A spreadsheet showing these calculations should accompany each full proposal. The same spreadsheet should also show the specifics of how you will contribute your matching share of the total costs of the development contract. A template will be provided. Cost-sharing expectations have been established in the master agreement between SEMI and AFRL, and a minimum 50/50 cost-sharing ratio between government and industry is targeted.

3. Research and Development Award Budget

Anticipation for this 2023 RFP solicitation is a cash budget range of \$500k - \$1M with an additional matching (or greater) cost share from the award recipient(s). Submissions may be from single institutions, or a project team comprised of various companies and/or universities. Submissions from multi-institutional teams will be preferred.

4. TRL and MRL Entry and Exit Levels

The maturity of the proposed research effort should be assessed by a TRL or MRL definition. We seek innovations in the TRL3 through TRL6 showing clear technology maturation over the duration of the project. TRL/MRL levels are determined through the project team self-assessment as well as AFRL, or other designated end user assessment. Proposers should consider the definitions of TRL and MRL and reference specific elements within the TRL category that will enable the maturation of the technology. The primary focus of the RFP review team will be on the justification and maturation of TRL, however, reference to MRL awareness should be included.

The definition of the TRL and MRL levels are described below:

TECHNOLOGY READINESS LEVEL DEFINITIONS

TRL 4. Component and/or breadboard **validation** in laboratory environment

- Basic technological components are integrated to establish that they will work together
- Relatively “low fidelity” compared with the eventual system
- Examples include integration of “ad hoc” hardware in the laboratory

TRL 5. Component and/or breadboard **validation** in relevant environment

- Fidelity of breadboard technology increases significantly
- Basic technological components are integrated with reasonably realistic supporting elements so they can be tested in a simulated environment
- Examples include “high-fidelity” laboratory integration of components

TRL 6. System/subsystem model or prototype **demonstration** in a relevant environment

- Representative model or prototype system, well beyond TRL 5, tested in a relevant environment
- Represents a major step up in a technology’s demonstrated readiness
- Examples include testing a prototype in a high-fidelity laboratory environment or in a simulated operational environment

MANUFACTURING READINESS LEVEL DEFINITIONS

MRL 4. Capability to produce the technology in a laboratory environment

- Required investments, such as manufacturing technology development identified.
- Processes to ensure manufacturability, producibility, and quality are in place to produce demos.
- Manufacturing risks identified for prototype build.
- Manufacturing cost drivers identified.
- Producibility assessments of design concepts have been completed.
- Key Performance Parameters (KPP) identified.
- Special needs identified for tooling, facilities, material handling, and skills.

MRL 5. Capability to produce prototype components in a production-relevant environment

- Manufacturing strategy refined and integrated with Risk Management Plan.
- Identification of enabling/critical technologies and components is complete.
- Prototype materials, tooling, and test equipment demonstrated on components in a production-relevant environment.
- Manufacturing technology development efforts initiated or ongoing.
- Producibility assessments of key technologies and components ongoing
- Cost model based upon detailed end-to-end value stream map

MRL 6. Capability to produce a prototype system or subsystem in a production-relevant environment

- Initial manufacturing approach developed.
- Most manufacturing processes have been defined and characterized, but there are still significant engineering/design changes
- Preliminary design of critical components completed
- Producibility assessments of key technologies completed
- Prototype materials, tooling, and test equipment, as well as personnel skills have been demonstrated on subsystems/ systems in a production-relevant environment
- Detailed cost analysis includes design trades. Cost targets allocated.
- Producibility considerations shape system development plans.

TRL/MRL CLARIFYING DEFINITIONS

BREADBOARD: Integrated components that provide a representation of a system/subsystem and which can be used to determine concept feasibility and to develop technical data. Typically configured for laboratory use to demonstrate the technical principles of immediate interest. May resemble final system/subsystem in function only.

HIGH FIDELITY: Addresses form, fit and function. High fidelity laboratory environment would involve testing with equipment that can simulate and validate all system specifications within a laboratory setting.

LOW FIDELITY: A representative of the component or system that has limited ability to provide anything but first order information about the end product. Low fidelity assessments are used to provide trend analysis.

MODEL: A reduced scale, functional form of a system, near or at operational specification. Models will be sufficiently hardened to allow demonstration of the technical and operational capabilities required of the final system.

OPERATIONAL ENVIRONMENT: Environment that addresses all of the operational requirements and specifications required of the final system to include platform/packaging.

PROTOTYPE: The first early representation of the system which offers the expected functionality and performance expected of the final implementation. Prototypes will be sufficiently hardened to allow demonstration of the technical and operational capabilities required of the final system.

RELEVANT ENVIRONMENT: Testing environment that simulates the key aspects of the operational environment.

SIMULATED OPERATIONAL ENVIRONMENT: Environment that can simulate all of the operational requirements and specifications required of the final system or a simulated environment that allows for testing of a virtual prototype to determine whether it meets the operational requirements and specifications of the final system.

PRODUCTION RELEVANT ENVIRONMENT: An environment normally found during MRL 5 and 6 that contains key elements of production realism not normally found in the laboratory environment (e.g., uses production personnel, materials or equipment or tooling, or process steps, or work instructions, stated cycle time, etc.). May occur in a laboratory or model shop if key elements or production realism are added.

Additional Information on the Technology and Manufacturing Readiness Assessment process can be found at:

TRL Assessment: <http://www.acq.osd.mil/chieftechнологist/publications/docs/TRA2011.pdf>

MRL Assessment: <http://dodmrl.com>

5. Focused Solicitation

There are five focused solicitation topics:

Topic A: Wearables/ bio-signal sensing for real-time cognitive, physical state monitoring, and augmentation

The purpose of this focused solicitation is to fund a recipient, a single team, or multiple recipients and teams to conduct an R&D effort by combining expertise in various fields, such as bioengineering, electronics, data science, AI/ML and textile design develop, demonstrate a TRL3-TRL6 wearable integrated system that relies on bio-signals to detect and augment/optimize physical human health, to enhance mission effectiveness and prevent safety mishaps. The physiological status, mental capacity, and operational effectiveness of a warfighter, pilot, driver, or any other working personnel in high-risk environments should be assessed and integrated with responsive augmentation (i.e., closed-loop) to avoid a mission-ending traumatic response. Systems should be on- or near-body, and capable of reliably sensing, wirelessly communicating, and monitoring subjects' cognitive and physical status in real time. The system should be low-power, environmentally friendly (to ensure its sustainability), and safe to wear for extended durations. If regulatory action and/or IRB approval is required for the demonstration of the solution, the strategy should be clearly articulated.

Topic A: Technology requirements:

The technologies that enable those solutions will address some or all of the following features:

Form Factor:

- Near- or on-body, minimally invasive, reliable, low power consumption

Sensing Technology:

- Examples include biometrics Electromyography (EMG), Electrooculography (EOG), and Electroencephalography (EEG) to measure muscle tension, eye movements (ocular motion/blink rate), and brain activity to correlate, quantify and assess human performance under stressful conditions such as fatigue and cognitive workload. This topic also includes the assessment of subject status due to the effects of conditions such as PTSD, TBI, blast exposure, CBRN exposure, muscle atrophy, as well as risk tolerance in real-time
- A continuous biomolecular sensing system that utilizes a robust biological recognition element (BRE) by binding to physical and mental stress/fatigue biomarkers, such as cortisol, GABA, creatine kinase, or other biochemical markers
- Identification of additional bio-signals, such as ultrasonic waves.
- An integrated system (Hardware and software) that can accurately and reproducibly create transcranial current stimulation, noninvasive vagal nerve stimulation, or other low-current electrical stimulation, for maintaining alertness and improving cognitive function in high-risk environments
- Closed-loop platforms, such as chemical drug or neuromodulation stimulation delivery based on the subject's status assessment to improve the treatment process
- Improved algorithms for both subject's cognitive state monitoring (continuous, on-demand) and decision-making/actionable outcome

Communication

- Wireless connectivity in an integrated system for transferring data
- Improved data transmission with considerations for data privacy and security

Topic B: Wearable integrated sensing & edge computing

The purpose of this focused solicitation is to fund a recipient, a single team, or multiple recipients and teams to conduct an R&D effort to develop a TRL3 to TRL6 subsystem with a balance of enabling components and/or an integrated sensing with on-module data storage (i.e., data cache)

and edge computing capabilities (including AI/ML) for analyzing and interpreting sensor signals collected in austere environments (such as outer space, high or very low temperature). The system shall address the likely scenario of limited/intermittently available communications while ensuring physical and network data security per government and commercial cybersecurity standards. Robust, low-mass, and low-profile power supplies should be used to reduce power consumption, reduce lifecycle cost, improve wearability, and maintain longer usage. It is expected that such foundational development will include designing, fabricating, and testing the integrated sensing and computing system.

Topic B: Technology requirements:

The technologies that enable the above solutions will address some or all of the following features:

- On-chip edge computing hardware should involve the use of integrated Field Programmable Gate Array (FPGA) or neuromorphic computation hardware, which can perform signal interpretation and data processing in real-time
- Use of multiple sensors and machine learning algorithms to improve the accuracy and reliability of the system
- Sensor data variabilities, such as sensor manufacturing variability or noise from data collection should be considered
- Physical security of the chip in applications that involve sensitive information (Anti-tamper and anti-counterfeit technologies)
- Data privacy and security for real-time transmission in applications that involve the transmission of sensitive information
- Low power consumption: Architecture of the sensor, edge computation, data transfer (compression or abstraction), and communication to the cloud should be designed in a way to manage power consumption
- Development of novel materials and designs that are less susceptible to radiation-induced damage and can withstand a harsh environment

Topic C: Human health protection/environmental monitoring & safety

The purpose of this focused solicitation is to fund a recipient, a single team, or multiple recipients and teams to conduct an R&D effort to develop and demonstrate devices and/or integrated environmental sensor systems that can be used in various applications, such as in on-human wearables, ground-based fixed-point detectors, and/or mounted on an unmanned aerial vehicle (UAV) to monitor and prevent human and environmental health and hazards—such as gas plumes, toxic chemical vapors, CBRN agent exposure, water hazards (wastewater, underwater), and structural building (building, utility poles, large areas). Sensor systems should be able to multiplex detect, characterize, sustain power, and be able to wirelessly, securely communicate, and monitor the environment in real-time and provide accurate and reliable information to decision-makers to mitigate the risks. Environmental sensor systems should be lightweight, compact, have integrated power management with built-in redundancy, and be environmentally friendly. The integrated sensor should be easy to use, maintain, and operate and provide timely alerts and notifications to users in case of potential hazards.

Topic C: Technology requirements:

The technologies that enable the above solutions will address some or all of the following features:

Form Factor:

- Wearables, or ground-based, vehicle-mounted, lightweight, low-power, ease of use

Sensing Technology:

- Sense a wide range of chemical and biological agents in various environments with the capability to detect and identify hazards in real time and provide accurate and reliable information to decision-makers to mitigate the risks.
- Emerging techniques for multiplex detection and characterization, such as nano or metamaterials
- Smart sensory system with the capability of UAVs swarm pattern, search pattern, detect hazard source, track dispersion, and, ideally, neutralize atmospheric bioaerosol via UAVs with advanced algorithm and signal processing, incorporated with gas plume dispersion models, and with targeting tracking locating capabilities (GPS or LEO (Low Earth Orbit) satellite image)
- Detection system with signal-to-noise ratio at low levels, such as %, ppm, or ppb for high detection resolution
- Detection system with electromagnetic interference (EMI) shielding to minimize interference and signal noise.

Communication

- Wireless and secure data transmission

Topic D: Dermal, transdermal, and subcutaneous sensors

The purpose of this focused solicitation is to fund a recipient, a single team, or multiple recipients and teams to conduct an R&D effort to develop and demonstrate components and/or integrated transdermal/subcutaneous sensor systems capable of multiplexed detection and assessment of biomarkers to improve performance and tailor and/or provide integrated treatment for warfighters. The detection and evaluation system should be minimally invasive, low-power, and capable of wireless communication and real-time monitoring of the subject's medical status. To reduce irritation, inflammation, scar tissue, and foreign body response, minimally invasive biosensors should be biocompatible and non-surgically removable or resorbable. To reduce the environmental impact and cost, biodegradable or recyclable materials should be used, especially if the biosensor is disposable.

This development should consider critical factors such as low power consumption and overall system compatibility.

Topic D: Technology requirements:

The technologies that enable the above solutions will address some or all of the following features:

Form Factor:

- Biocompatible implantable or ingestible sensors
- Transdermal sensors, such as microneedles and hydrogel, to collect, analyze, and determine the presence and concentration of biomarkers in interstitial fluid (ISF)
- Enhance the functionality of adhesive patches by using advanced materials and integrating microfluidics to collect various types of biological samples

Sensing Technology:

- Sensing methods such as physicochemical, electrochemical, optical, or piezoelectric
- Integrated closed-loop drug delivery capability based on subject status assessment (data analysis, dose levels)
- Integrate transdermal sensing technology with different types of sensors, such as electrochemical or optical sensors, to detect and assess biomarkers
- Identification of additional biomarkers in biofluid, with minimally invasive technology

Communication:

- A sensory system that can be calibrated before and during operation with minimal effect from the surrounding environment while also maintaining sensor stability over time

- Bluetooth, NFC, and optical (NIR) connectivity are desirable options for communication.
- Improved data transmission rates including reduced latency, or reduced data size with considerations for data privacy and security

Topic E: E-textile/ textile-based sensors for real-time monitoring

The purpose of this focused solicitation is to fund a recipient, a single team, or multiple recipients and teams to conduct an R&D effort to develop and demonstrate a combined electronics and sensors with textiles. Design wearable sensor devices that are comfortable and unobtrusive and can take many forms, including but not limited to, everyday wearable clothing items, including but not limited to shirts, socks, compression sleeves, and gloves. The e-textile wearables should be embedded with sensors having various sensing capabilities, such as motion sensors, for example, that can track various physiological parameters in real-time and optimize the health of warfighter, pilots, or any working personnel in high safety risk environments and prevent safety mishaps. E-textile-based sensor systems should be capable of long-term wear and environmentally friendly.

Topic E: Technology requirements:

The technologies that enable the above solutions will address some or all of the following features:

Form Factor:

- comfortable, flexible, and durable textile-integrated sensing devices
- electrode patches, for long-term comfortable use and accounting for sweat and perspiration

E-textile sensing technology:

- Textile integrated sensing capable of physiological monitoring that requires small signal detection (deep tissue or from the face), and motion artifacts (particularly for monitoring/assessing “deep tissues/organs)
- Improvement of dry electrode technology to detect small signals for cognitive and complex physiological monitoring (capable of reducing interference from environmental sources such as electronic devices or radio waves and improving signal-to-noise)
- Sensing capability integrated with interpretation and prioritization of translatable actions in a closed-loop format

Sustainability:

- E-textile wearable device that harvests power from the body
- Semi-reusable devices having hybrid use of the electronics unit such as disposable patch-based sensors/electrodes
- washable, textile-based sensors/electrodes that reduce waste and are environmentally friendly
- reusable or modular integrated patches to help towards sustainable manufacturing pathways, mitigate the current challenges and shortage of supply chain

Communication:

- Wireless connectivity in an integrated system for transferring data
- Improved data transmission with considerations for data privacy and security

6. Requirements for Receiving an Award

To submit a response to this RFP and subsequently be considered for an award, several requirements must be met as detailed below.

- To receive an award the company or composite team of companies must have a significant presence in the United States in the form of R&D activities and/or manufacturing. At least 50% of the work activity (funds) must be spent within the U.S. operations. The primary company leading the proposal must be a U.S.-owned company. Further, for the period of award performance plus the 3 years following, the primary company plus all IP resulting from the said award must remain under the control of a U.S.-owned or majority-controlled company. In certain cases, where it can be demonstrated that the development is both critical to U.S. manufacturing capability and unique, this “preference for U.S. operations” requirement can be waived with AFRL approval. Any responding company requiring such a waiver must make this known in the white paper.
- The company or companies must be committed to volume manufacturing of the developed products and provision to the U.S. medical electronics industry on a right-of-first acceptance basis. Applied research conducted by universities will be considered and does not need to meet this requirement. However, in this latter case, a pathway to commercialization and/or licensing must be envisioned and described.
- The company or companies, including universities, must provide a matching share of the development cost in cash and in-kind contributions (e.g., labor and materials) - 50% minimum.
- Companies and organizations which are selected for an award, including all partners and/or subcontractors, must subsequently join SEMI at the appropriate membership level. Membership information is available at <https://www.semi.org/en/connect/semi-membership-levels>
- Companies and organizations which are selected for an award, including all partners and/or subcontractors, must agree to terms and conditions set forth in the SEMI Development Agreement before receiving any portion of the award.

7. White Paper Instructions

White paper submissions are limited to 4 pages (including any cover pages, tables of contents, figures, etc.) or less and contain a description of the proposed idea, high-level budget, timeline, and background/experience of the R&D team. In addition, the submission should clearly outline the problem being addressed and how the proposed idea would solve the challenge. The current state-of-the-art and the advancement the proposed idea has over that state-of-the-art, how the new technology differentiates from the state-of-the-art benchmark (define the reference) and its relevance to advancing or demonstrating the role that nano-bio materials have on human-monitoring should be discussed. In addition, the value to the smart medical electronics ecosystem and the potential path to commercialization should also be outlined. White paper submissions do not have to adhere to a specific format (other than maximum page length), but it may be useful to review the full proposal instructions in section 8 for suggested content. White paper submissions must include Primary Administrative Contact (telephone and email), Entity Name, and Project Title.

If your proposal includes human subjects research (HSR) please provide concise answers to the following questions:

1. Will the proposed HSR require direct funding from this project or will it be funded separately and only the results of the HSR will be shared and used in the study
2. If the HSR effort is planning on using direct funds from the proposed effort, please clarify whether the purpose of the HSR is for technology demonstration, or do you plan to address additional scientific/clinical questions.
3. If the HSR effort is planning on using direct funds from the proposed effort, please describe your approach to obtaining regulatory approvals
 - a. Please provide details about the institutional review board (IRB) that you will use
 - b. Please clarify whether the proposal team has been involved in similar/related HSR efforts previously. If the answer to this question is yes, what was the IRB determination, minimal risk or greater than minimal risk?
 - c. Please provide information about the total number of subjects that you plan to involve in the study
 - d. If the proposed research involves the use of non-commercial new devices, please provide a brief clarification on whether additional regulatory approvals (such as FDA/IRB exemptions for research use only) will be required
 - e. Please provide a high-level estimate on the timeline required for obtaining regulatory approvals

Any HSR performed under the NBMC program will require additional local IRB (or IRB exemption) approval to be further approved by AFRL HRPO. If the white paper is selected for subsequent consideration, the approach and expected timelines for obtaining both IRB and HRPO approvals should be included in the full proposal.

White papers will only be accepted electronically up to 5:00 PM PT on the due date of June 5, 2023. Please submit your completed proposal via email to nbmcrfp@semi.org

8. Full Proposal Instructions

The format below will help us evaluate your proposal and ensure that the major topic areas are covered. Full proposal submissions are limited to 20 pages maximum.

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

Page 1: Cover Page

Date
Project Title

Company Name
Address
EIN
UEI
CAGE

Primary Administrative Contact (telephone and email)
Project Leader Contact Information (telephone and email)
Project Team (Prime & Subs)
Project Duration

Total Project Cost
Cost Share
Federal Funds Requested

Page 2: Table of Contents

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

Pages 4-20: Proposal Content

1. Project Proposal
 - 1.1. Problem definition
 - 1.2. Project scope and objectives
 - 1.3. Technical approach, rationale and innovative claims with supporting data and diagrams
 - 1.4. Performance target metrics and/or specifications
 - 1.5. Prior work and current status and uniqueness compared to
2. Statement of Work
 - 2.1. Project management approach
 - 2.1.1. Roles and relationships of key personnel and institutions
 - 2.1.2. Lead institution and subcontract partners
 - 2.2. Project schedule
 - 2.3. Detailed task description
 - 2.4. Milestones, deliverables including demonstration prototypes, reports, process definition, test results, reviews etc.
3. Detailed Project Cost and Cost Share by Task or by Quarter (a template will be provided by SEMI)
 - 3.1. Labor, materials, overhead, and capital
4. Project Risk Assessment
 - 4.1. Table: Analysis of Risk and Mitigation Strategy (list risk assessment tools/processes used if any)

Risk	Consequence	Mitigation Strategy	Impact (L, M, H)
5. Market Analysis and Competitive Landscape
 - 5.1. Competitive benchmark – what solutions are available today and how does your innovation differentiate?
 - 5.2. Market drivers
 - 5.2.1. Existing product portfolio and/or future product concepts
 - 5.2.2. Primary markets served and market drivers (i.e., wireless, mobile, performance specs, etc.)
 - 5.3. Commercialization path/strategy
6. Company Background and Capability to Meet Technical and Business Targets
 - 6.1. Team & key personnel
 - 6.1.1. Management and technical personnel experience and qualifications
 - 6.1.2. Roles and responsibilities of key personnel
 - 6.1.3. Clearly indicated lead institution and subcontract partners
 - 6.1.4. Contact information for technical lead and contract representative
 - 6.1.5. Details on team diversity and information on institutions' Diversity, Equity and Inclusion policies
 - 6.2. Facilities and equipment
 - 6.3. Relevant company information
 - 6.3.1. Three-year revenue and/or investment round (omit for University)

- 6.3.2. Staff size and make-up by function relevant to this project and in addition to key personnel
- 6.3.3. IP strategy or business strategy for innovations resultant of this effort such as licensing strategy, new product introduction, M&A, etc.
- 6.3.4. Present patents held related to the proposal topic
- 6.3.5. Is the Company Foreign or Domestically owned
- 6.3.6. How long has it been in business?
- 6.3.7. Prior experience with similar subawards?
- 6.3.8. Purchasing policy?
- 6.3.9. Evidence of effective financial controls within the subrecipient's system

7. Appendix: (NOT INCLUDED IN PAGE TOTAL)

- 7.1. Technical References
- 7.2. Letters of Support
- 7.3. If your project includes human testing, please include the information in section 7 (Whitepaper instruction)

Full Proposals will only be accepted electronically up to 5:00 PM PDT on the due date of August 18, 2023, please submit your completed proposal via email to nbmcrfp@semi.org

9. Proposal Evaluation

Full proposals will be evaluated by the review committee based on a set of criteria that include budget, collaboration value, dual-use (commercial and military/aerospace) applicability, relevance to the ecosystem, relevance to advancing or demonstrating the role of nano-bio materials on human-monitoring, augmentation and biosensing technology advancement, schedule & milestones, deliverables, overall proposal quality, and team diversity. White paper and full proposal content requirements are listed in sections 7 and 8. Typical, programs run from 12-18 months and include a clear set of deliverables, quarterly project reviews, a demonstration component/system, and a final report.

Upon receipt, submissions will be forwarded to the RFP Review Committee. During the final selection process of full proposals, some communication or negotiation between the potential supplier and representatives of AFRL and/or SEMI may be initiated over the terms, conditions, specifications, deliverables, schedule, or other relevant factors contained in the proposal in advance of awarding of a contract. Granting of any awards to submissions in response to this RFP are contingent upon the continued availability of funding from the U.S. Government.

Regarding team diversity, SEMI supports efforts to build diverse and inclusive project teams and workforces because we believe these teams foster greater productivity and innovation in the microelectronics industry. Diverse project teams, including women and other under-represented groups, can bring a more diverse problem-solving set of lived experiences. Therefore, we encourage proposers to create diverse and inclusive teams which recognize, appreciate, and use the talents and skills of employees of all backgrounds.

SEMI plans to grant and administer funding which should be matched (50% of total project cost requested) with funds in the form of cash and in-kind contributions provided by the grant recipients to cover the total project cost. If all other criteria are equal, preference will be given to full proposals with a higher percentage of cost share. It should be noted that historically, cost share for funded development programs has averaged greater than 60% industry funding. Technical leaders from member companies and government will be identified to provide project oversight and direction. These Project Teams typically

will be comprised of 2 to 4 experts from the consortium members as well as members from the successful individual supplier or supplier team.

In responding to this solicitation, partnering among industrial companies or industrial company/ R&D organization/university teams is highly encouraged. Individual responses will be considered if appropriate size, breadth, and expertise are sufficient to effectively cover all areas (e.g., technical resources, financial stability, and market presence) critical to the successful completion of the proposal.

10. RFP Schedule

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

May 5, 2023	RFP Issued
May 17, 2023	Webinar – “Ask me Anything”
June 5, 2023	White Paper Due
June 30, 2023	Notification of White Paper Acceptance and Full Proposal Request
August 18, 2023	Full Proposals Due
September 22, 2023	Notification of Award (each full proposal point of contact will be notified)

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

11. Resources

Additional information can be found at <http://nbmc.org>

Additional information and guidance on prospective proposal partners may be available and should be requested at nbmcrfp@semi.org. Please include a brief description of your institution’s competencies/contribution and highlight the type of institution/partner that would increase the quality, maturity, or commercial viability of your ideas.

A webinar will be held on May 17, 2013, to review white paper requirements and answer any questions from the public. A recording of the webinar will be available at <http://nbmc.org>.

12. Contact Information

Communication and questions during the proposal period should be directed to nbmcrfp@semi.org.