BioMADE

Project Call 4.0

TECHNOLOGY & INNOVATION

EDUCATION & WORKFORCE DEVELOPMENT

4S (SAFETY, SECURITY, SUSTAINABILITY, SOCIAL RESPONSIBILTY)

Table of Contents

1. Introduction to BioMADE

BioMADE is a Manufacturing Innovation Institute (MII) sponsored by the U.S. Department of Defense (DoD) with a vision to build a sustainable, domestic, end-to-end bioindustrial manufacturing ecosystem. Our mission is to enable domestic bioindustrial manufacturing, develop technologies to enhance U.S. bioindustrial competitiveness, de-risk investment in relevant infrastructure, and expand the biomanufacturing workforce to realize the economic promise of industrial biotechnology.

BioMADE is building a robust bioindustrial manufacturing ecosystem and has a national network of over 240 members spanning industry, academia, and non-profit organizations. BioMADE's primary aim is to accelerate the commercialization of new bioindustrial manufacturing technologies by guiding them through the pilot-scale Biomanufacturing Readiness Levels (BioMRLs) 4-7 (Smanski et al 2022). The direct outcome of these efforts will be to develop and expand industrial and defense-related biomanufacturing in the United States. BioMADE will drive advances by leveraging DoD funds and in-kind support from member organizations to complete projects critical to domestic bioindustrial manufacturing.

BioMADE has three core programs areas: Technology and Innovation (Tech), Education and Workforce Development (EWD), and Safety, Security, Sustainability, and Social Responsibility (4S). These three programs work together to advance innovation in the bioindustrial manufacturing ecosystem. The Tech program focuses on reducing key scale up and production barriers. The EWD program works with BioMADE members to promote greater diversity, equity, and inclusion within biomanufacturing careers. The 4S Program focuses on advancing and integrating the pillars of safety, security, sustainability, and social responsibility throughout its work. Successful proposals will demonstrate commitment and strategy for achieving a combination of programmatic goals in their implementation plan.

2. Project Call Overview and Focus Areas

BioMADE is pleased to issue Project Call 4.0, *Accelerating Biomanufacturing Innovation: Advancing Solutions for Greener Chemistry, Low-Resource Environments, and Process Intensification.* This packet describes the purpose, process, and eligibility criteria for this funding opportunity.

Project Call 4.0 will follow a unique format, focusing on a set of cross-disciplinary solutions that advances biomanufacturing innovation as approved by BioMADE's Leadership Council. Focus areas are topic-specific and can advance bioindustrial manufacturing to support diverse applications, including alternative proteins, cultivated meat, feedstocks, additives, specialty chemicals, ingredients, and other product categories.

The focus areas are:

- **Accelerate the transition to greener chemistry**
- **Develop biomanufacturing solutions for low-resource environments**
- **Process integration and process intensification**

Successful proposals will describe in detail how the project aligns with the focus area(s). Projects must also align to a minimum of one BioMADE program area: Tech, EWD, and/or 4S. However, incorporating more than one program area into a project is highly encouraged and will be scored more favorably during the review process.

Depending on the program area(s) of the submission, proposals must align with either the BioMADE Technical Roadmap, EWD Blueprint, or an aspect of 4S social dimensions as described in Appendix B. Tech proposals must also fall within BioMRLs 4-7, described in Appendix A, with justification included that details the current BioMRL state and plan to advance BioMRL status for each bioproduct or process. For proposals in 4S and EWD, describe how the proposed work advances the workforce skills and competencies or social, ethical or security resources necessary to drive technology innovation through BioMRLs 4-7.

Details on the project call focus areas and instructions on how to submit a proposal can be found below.

Program Area Overviews

BioMADE has three core program areas - Technology and Innovation (Tech), Education and Workforce Development (EWD), and Safety, Security, Sustainability and Social Responsibility (4S) - that work together to advance innovation in the bioindustrial manufacturing ecosystem. Recognizing that successful industry building often requires collaboration across disciplines, Project Call 4.0 is designed to support holistic approaches integrating program areas. We envision multiple ways in which the three program areas productively overlap and intersect. For example, projects with emphases in sustainability, human safety, biosecurity, or environmental justice may be applicable to both Tech and 4S. Workforce projects addressing rural development, social inclusion, resources for underserved communities, or collaboration with local regulatory or policy institutions may cross 4S and EWD. Innovative modes of integration are welcome. Proposal submissions that address multiple program areas will be evaluated more favorably.

Technology and Innovation (Tech)

BioMADE is moving the bioindustrial manufacturing industry forward by funding innovative research, reducing barriers to scale-up and commercialization, and de-risking investment in relevant infrastructure. The Technology and Innovation program area strengthens capabilities at Biomanufacturing Readiness Levels (MRLs) 4-7 to accelerate data and design, downstream processing, testing and evaluation, biomanufacturing ecosystem resilience, and commercial readiness. Tech project proposals must be aligned to BioMADE's Technical Roadmap. The Roadmap includes an in-depth explanation of BioMADE's Technical Modules, a set of Representative Production Scenarios (RPS) for biomanufacturing, and a

prioritized list of technical needs by Innovation Area (IA) and Production Scenario. Technical subcommittees are responsible for reviewing and recommending updates to the Roadmap to the Technical Committee. The current version of the Technical Roadmap was ratified in February 2023 and is available to BioMADE members as a member benefit through the BioMADE Member Portal.

Education and Workforce Development (EWD)

BioMADE's EWD program engages in activities that support a prepared workforce for bioindustrial manufacturing and promote inclusive workspaces for an increasingly diverse workforce. EWD programming reaches students from middle school through college and emphasizes opportunities for groups currently underrepresented in bioindustrial manufacturing including veterans, women, persons with disabilities, and rural communities. Project proposals with EWD components must be aligned to BioMADE's EWD Blueprint. The current version of the Blueprint was ratified in February 2023 and is available to BioMADE members as a member benefit through the BioMADE Member Portal.

Safety, Security, Sustainability, Social Responsibility (4S)

BioMADE is committed to advancing the well-being of people, communities, and environments in all our work. The 4S program area aims to maximize positive impact and minimize risk related to Safety, Security, Sustainability, and Social Responsibility. Projects should address how they uphold related ethical principles and demonstrate how they advance one or more of these 4S components. This may include work or research that promotes the protection of workers, consumers, the public or environments from harm, manages potential threats of misuse, contributes to the long-term viability of our economy or environment, or improves societal welfare by creating positive outcomes for stakeholders, communities, or the public.

Focus Areas

The Project Call 4.0 focus areas are described below. Focus areas are topic-specific and can advance bioindustrial manufacturing to support diverse applications, including feedstocks, specialty chemicals, materials, food, and many other product categories.

Proposers will be requested to identify the focus area(s) relevant to their proposal during the submission process.

Focus Area 1: Accelerate the transition to greener chemistry

Technologies that expand access to green chemistries could improve the sustainability and safety of biomanufacturing processes. Biology-enabled greener chemistries can be applied across biomanufacturing product and process life cycles, including at design, production, utilization, and disposal stages. Example projects could focus on approaches to low-cost green precursor production, low-energy separations technologies, less hazardous process inputs, or ways to reduce toxic waste in biomanufacturing processes.

Focus Area 2: Develop biomanufacturing solutions for low-resource environments

Biomanufacturing could enable point-of-need production of key supplies in low-resource environments, including forward-deployments, space travel, disaster relief areas, or other remote settings. Technologies that enable biomanufacturing with limited access to water, power, feedstocks, or other resources will be critical to realizing those applications. Identifying and building access to new and diverse feedstocks could open new opportunities to advance biomanufacturing processes in constrained environments.

Focus Area 3: Process integration and process intensification

Process integration and process intensification can improve efficiency and lower capital and operational expenditures. Example projects could focus on ways to better integrate biomanufacturing processes with existing infrastructure, to design new equipment or facilities to maximize efficiency, or to optimize the conversion of renewable feedstocks.

Funded BioMADE Projects with Successful Cross-Program Collaboration

Social Dynamics Surrounding Bioindustrial Manufacturing and Products
University of Georgia, Tandem Repeat
Social Dynamics Surrounding Bioindustrial Manufacturing and Products is an example of a cross-disciplinary BioMADE project. This 4S led project was integrated with Tech. Tandem Repeat Technologies is developing prototype biobased masks based on their novel Squitex protein to be used as focal points in public perception studies led by social scientists at the University of Georgia. The actionable teaming of technology with social sciences will inform public engagement and messaging around biotechnology with broad relevance to the industry.

Development of Biosecurity Sequence Screening Training Course for Bioengineers
Signature Science, Rice University, Aclid
The project *Development of Biosecurity Sequence Screening Training Course for Bioengineers* integrated EWD and 4S in developing a biosecurity training course. Signature Science, Rice University, and Aclid teamed up to develop a Biosecurity Sequence Screening Training course which provides awareness, guidance, and hands-on training in the responsible use of advanced bioengineering capabilities. This course synergistically provides education and training to uphold 4S principles across the bioindustrial manufacturing ecosystem.

Stress Testing Supply Chains and their Ecosystems
Georgia Tech
Stress Testing Supply Chains and their Ecosystems, led by the Tech program area, also integrated 4S components. Led by the Georgia Institute of Technology, this project designed a simulation platform to stress test end-to-end bioindustrial manufacturing facilities and supply chains for levels of trust, security, agility, resiliency, and competitiveness. They also convened a workshop to assess what risks are important to BioMADE member companies and what performance metrics are of value in determining a firm's definition of robust resilience. The simulation platform quantitatively evaluated how a crisis affects supply chain performance, helping manufacturing firms, in collaboration with federal, state, and other levels of government, to build a trusted, secure, resilient, competitive, and sustainable bioindustrial manufacturing ecosystem for the nation. A second workshop will be convened on 8 November to present results of two case studies involving two BioMADE member companies.

If you have inquiries regarding these projects, please reach out to proposals@biomade.org.

3. Guidelines for Successful Proposals

The intent of this Project Call is to solicit proposals that directly address the focus areas detailed above in a cross-program approach. Therefore, projects addressing any of the three focal areas are within scope of this Project Call and will be weighted equally. Compliant project proposals will identify the focus area(s) being addressed and how successful completion of the project will benefit the BioMADE community.

Successful projects will include clearly defined tasks and deliverables within BioMRLs 4-7 (Smanski et al 2022). It may be acceptable for a project to contain some tasks that contribute fundamental knowledge or specialized measurement or modeling capabilities, but the overall project must focus on advancing an intermediate BioMRL process to a higher level of manufacturing readiness.

A. Eligibility and Membership Requirements

The proposal eligibility requirements are detailed below. Failure to comply with these requirements may result in disqualification of the proposal. Contact BioMADE staff at proposals@biomade.org with questions. Membership inquiries should be directed to membership@biomade.org.

To request an exception to any of the requirements, please complete and submit this form to proposals@biomade.org at least five (5) business days prior to the proposal submission deadline. Exception requests will be reviewed and approval or denial of any such requests is at BioMADE's discretion.

- The lead submitting organization must be a member, with a signed membership agreement, at the time of white paper submission.
- The lead and all partner organizations must be members, with signed membership agreements and membership dues paid in full, at the time of full proposal submission.
- The lead organization is responsible for ensuring the membership compliance of their project partners.
- If the organization signs their initial membership agreement **less than** 15 days prior to proposal submission, the organization has 15 days to pay dues for a proposal to be considered.
- If an organization's membership lapses following proposal submission or during subaward negotiation, dues must be paid within 15 days of notice or prior to subaward execution (if applicable) – whichever comes first.
- All project participants must agree to remain members in good standing through the life of the project.
- White papers must meet the minimum requirements of this project call to be considered eligible for full proposal consideration.
- Submitted proposals must be responsive to focus area(s) of the Project Call and align to the BioMADE Technical Roadmap, Education & Workforce Development Blueprint, and/or 4S Definitions (Appendix B)

- All submitted materials must be completed in full on the provided forms and/or templates; including, but not limited to, the Budget Template, Subrecipient Profile Questionnaire, Current and Pending Support, Statement of Work (SOW), Project Timeline, and Technical Narrative.
- Proposals must be submitted via BioMADE's Proposal Submission Platform on the Member Portal
- BioMADE Members in the Training Tier are not eligible to lead a Tech project and/or contribute to technology development efforts. Training tier members may participate in a Tech project by contributing in EWD-related capacities.

Find more details about eligibility in the FAQ section.

B. Funding Levels

BioMADE desires to fund collaborative projects that bring together team members from multiple organizations to address the project call focus areas. Total project costs including funded and cost-share contributions are generally between $250,000 and $2,000,000; however, variations outside of that range will be considered with justification. BioMADE generally funds projects with a period of performance of 18-24 months. Longer project periods will only be considered with sufficient justification. Budget requests and timelines should match the scope of the proposed project and have a clear justification based on the impact of the proposed work. White papers must meet the minimum requirements of this call to be eligible for full proposal consideration. BioMADE reserves the right to make one, multiple, or no awards for this solicitation. BioMADE cannot fund every proposal. BioMADE reserves the right to review unfunded proposals and reevaluate funding decisions, should availability of funds or research priorities change.

C. Cost Share Requirements

BioMADE funded projects must include a minimum of 1:1 cost share from awarded teams. Cost Share of greater than 1:1 is strongly encouraged and will be judged favorably in review. Cost sharing includes cash and third-party in-kind contributions such as equipment use, facilities, and labor. State and Local funds, as well as private industry funding, can be used as cost share; however, federal funds or funds used for cost share for any other effort may not. Cost share can be divided between partnering entities at their discretion. More detailed cost share guidelines are attached in Appendix C.

D. Indirect Cost Rates

Organizations with a federally negotiated Indirect Cost (IDC) rate must use this rate in their proposed budgets. BioMADE encourages organizations without a current federally negotiated IDC to negotiate an IDC rate directly with BioMADE. If approved, this rate is applicable to BioMADE projects for a period of two years. IDC rate negotiations must be complete at the time of full proposal submission. If an organization does not have a negotiated rate, a 10% de minimis rate is allowable. (Please note: If a federal rate is negotiated after a rate is approved by BioMADE, the federally negotiated rate will be used for all future BioMADE projects). Queries regarding IDC negotiations should be directed to finrequest@biomade.org.

E. Intellectual Property (IP) Policy

Terms for IP generated under this solicitation must be clearly articulated as part of the full proposal submission and proposers are encouraged to include such terms in the white paper proposal submission. BioMADE's IP policy, the Intellectual Property Management Plan (IPMP), describes how background IP related to a funded project and new IP generated on an institute project (foreground IP) will be handled. Projects funded through this Project Call must adhere to the IP sharing requirements provided in the IPMP. Further details on BioMADE's IP policy are found in our Membership Agreement documents, or on the BioMADE Member Portal.

F. Field of Use

A defined Field of Use for any IP generated under this project must be clearly articulated as part of the full proposal submission and is encouraged to be included in the white paper proposal submission. As described in Section 4.1.3 of the BioMADE Intellectual Property Management Plan (IPMP), "At the time of an Institute Project proposal, the Participants will define the Field of the Institute Project. Participants will retain commercial Foreground Intellectual Property (FIP) rights within the Field as defined in Section 4.2, and in defining the Field are expected to advance the overall biomanufacturing enterprise while providing specific commercial incentives to Members or teams of Members. The breadth of the Field is expected to be carefully defined and may be considered as part of the review criteria for funding. BioMADE will review the proposed Field and, if necessary, negotiate the Field as part of BioMADE subaward agreements for funded projects." As per the IPMP, a field can be described as "the technical, scientific, product-related, or market application of the Institute Project, which will be defined by Institute Project Participants when they develop and submit an Institute Project proposal to BioMADE." Please refer to BioMADE's IPMP accessible in the BioMADE Member Portal.

G. Compliance Requirements

To receive funding, project participants must have a Unique Entity Identifier (UEI). Members can register for free at SAM.gov.

H. Cross-Institute Collaboration

BioMADE is one of 17 Manufacturing Innovation Institutes (MIIs) that span across several manufacturing sectors. Proposals that address intersectional areas between BioMADE and another MII should be highlighted in the full proposal. In such cases, leveraging funding from both Institutes is allowable and encouraged, but cost share requirements and the requirements of collaborating institutions must still be met. For cross-institute collaborations, the proposed work needs to specify distinct projects and clear Statements of Work (assigned to each collaborator) to ensure proper use of federal funding and to prevent redundancies for time and effort reporting. The budget justification must document funds from all sources and how these funds will support distinct lines of work. We strongly encourage members with cross-institute proposals to contact a BioMADE program manager for review and approval prior to submission to ensure that the project meets compliance and guidelines.

I. Team Composition

BioMADE is focused on growing domestic manufacturing capabilities, including industry capacity, workforce development, and socially relevant considerations. Project Call 4 is specifically designed to promote projects that combine two or more of these programmatic aspects. Depending on the project focus proposal teams are strongly encouraged to include at least one industry organization, and appropriate academic, government or non-profit partners. International organizations may be eligible to participate, however any team seeking to spend funds outside the U.S. or planning to incorporate foreign organizations as team members are required to discuss the plan and justification with a BioMADE Program Manager prior to submitting a full proposal, as foreign participation requires DoD approval. Details on what additional information will need to be included in the full proposal will be provided at that point.

Letters of Commitment from project partners and Letters of Support from contractors/vendors are required at full proposal stage and are encouraged at white paper stage. These letters indicate the signatory's intent to commit resources to the funded project as specified in the letter, should the proposal be funded. They can also include the partner's rationale for supporting the project and point to the strengths of the organization that could be of value in implementing or sustaining the project.

4. Proposal Submission Process and Timeline

BioMADE will use a two-step solicitation process: a white paper submission followed by invitations to full proposals. Submission of a white paper or full proposal does not guarantee project funding. Additionally, proposers should ensure submitted materials are complete and include all requested materials according to instructions to avoid disqualification. Make note of all deadlines, as late submissions will not be accepted. Before submitting a white paper to this call, BioMADE encourages project teams to reach out to a BioMADE Program Manager to discuss project viability and alignment to the mission of the project call. Reach out to proposals@biomade.org with a brief description of your project to schedule a meeting.

A. Timeline

Key dates for proposal submission and decisions for Project Call 4.0 are as follows:

- **November 8, 2023:** Project Call 4.0 is released
- **November 16, 2023 at 9:00 am PT/12:00 pm ET:** Proposer's Day Webinar (open to the public)
- **November 16, 2023 at 12:00 pm PT/3:00 pm ET:** Project Teaming Webinar (BioMADE Members only)
- **December 20, 2023:** White Papers due by 5:00 pm PT
- **Week of January 22, 2024:** Notification of advancement or declination
- **February 28, 2024:** Full proposals due by 5:00 pm PT
- **Week of March 25, 2024:** Notification of funding decision
- **June 2024:** Anticipated project start date

B. Submission of Materials

White papers should be submitted electronically via BioMADE's new Proposal Submission Platform. Instructions and templates for submission are provided on the Project Call 4.0 page on BioMADE's website, found here, as well as BioMADE's Member Portal. If a proposal addresses more than one program area across Tech, EWD, or 4S, a single primary program area must be selected out of the three at the time of submission. Late submissions will not be considered. Project leads are responsible for collecting details on the budget and cost-share for all proposed team members. If invited to submit a full proposal, submission materials and instructions will be provided at that time. Please contact proposals@biomade.org should any issues with document submission arise.

C. Proposal Formatting Requirements

White paper materials should be submitted electronically as a .docx file. Pages should be formatted with 1" margins on each side, single spaced, with 11-point minimum Arial font. Smaller font size can be used in figures and figure legends. White Papers have a 5-page maximum. Supporting materials such as Letters of Support and Letters of Commitment are not included in the page count.

5. Proposal Evaluation Criteria

White Papers

White papers (pre-proposals) will be evaluated on several criteria areas including but not limited to adherence to the project call focus areas, eligibility requirements, the BioMADE mission, and budget and cost share requirements. Detailed scoring criteria is provided below. White papers that are deemed competitive for funding will be invited to submit a full proposal. Invitation to submit a full proposal is dependent on the debrief with the BioMADE Program Manager. Prior to full proposal submission, a BioMADE Program Manager will be made available for up to an hour to meet with the proposers and other key personnel to discuss the approach for the full proposal. An invitation to submit a full proposal does not guarantee funding.

Full Proposals

Full proposals are evaluated by a panel of reviewers and will receive section scores and overall scores based on the criteria listed in the table on the following page. Each proposal will be read and evaluated by multiple reviewers and all reviewers on the panel will discuss each proposal prior to ranking for funding decisions. BioMADE Program Managers will use the proposal ranking to guide funding of projects, but they have the flexibility to recommend projects based on innovation area to maintain a suitable balance of projects in each of BioMADE's program areas.

Confidentiality in Proposal Review

To protect confidential, proprietary, and strategic information of our member organizations, we will have an internal review process for submitted project proposals. All reviewers will be BioMADE staff or government personnel who will protect the confidentiality of proposal content. Proposal information will be restricted to those individuals with a need to know during the review; however, proprietary information should be clearly marked and be limited to the minimum amount necessary to convey the highlights of the technical approach.

Documents submitted in response to this Project Call shall be labeled as "BioMADE and U.S. Government Only; Not for Public or General Member Distribution". This label is already in the provided template. Prior to the proposal decision and announcement to sub-awardees, the identity of the submitters and the content of the proposals will be limited to BioMADE staff and proposal reviewers within the U.S. Government. See more in the Proposal Evaluation section below.

Scoring Criteria

The following scoring criteria will be used to evaluate submissions. Relative weights of scoring sections are noted in the table below.

Proposal Scoring Rubric	
Section (weight)	**Criteria**
Fit to BioMADE Mission and Project Call Focus Areas (20)	• Proposed solution addresses one or more of the three identified Focus Areas (above). • Projects involving technical processes/technologies are clearly and demonstrably in BioMRL 4-7 (Appendix A). • Project is aligned to either Tech Roadmap, EWD Blueprint, and/or 4S definitions (Appendix B).
Personnel, Facilities, Infrastructure, and Teamwork (15)	• Team includes a diverse and relevant set of subject matter expertise with at least one industry partner. • Project will clearly synergize to achieve goals that no single member could on their own. • Personnel expertise and physical infrastructure selected are appropriate to accomplish project goals. • Effective strategy to ensure productive teamwork and collaboration across partnering organizations is provided.
Project Approach (15)	• Project approach is sound and likely to yield highly applicable and informative results. • Project approach incorporates the appropriate tools, technologies, and methods. • Clear objectives are stated for programmatic components of the proposal (4S, EWD, and/or Tech). • Aspects of DEIA (Diversity, Equity, Inclusion, and Accessibility) are incorporated to enhance project outcomes. • For manufacturing projects, a process block flow chart is included in the proposal.
Project Schedule and Milestones (15)	• Schedule and milestones are appropriately scoped to the available time and funds. • Periodic milestones are included that demonstrate progress toward project objectives and deliverables. • Milestones, objectives and deliverables are SMART (Specific, Measurable, Achievable, Relevant, Timely) such that progress on project can be objectively measured. • Timeline demonstrates how integrated programmatic components build on one another.
Impact, Product Deliverables, & Ecosystem Benefit (15)	• Clear articulation of what the impact, final outcomes, and ecosystem benefit will be upon successful completion of the project. • Deliverables are SMART (Specific, Measurable, Achievable, Relevant, Timely). • Dissemination audience and strategy is clearly defined.

	• Results will be of high impact to the entire field, regardless of what they are (i.e., even negative results would be impactful because of the design of the projects). • Where relevant - any Intellectual Property (IP) that will be generated and made available from completion of the project is clearly articulated with a defined field of use. Note: While IP sharing is not a formal requirement of this funding opportunity, projects that elect to share IP or articulate a compelling benefit to the biomanufacturing community that will result from their work will be scored favorably.
Cross-Program Integration Across Tech, EWD, & 4S Programs (10)	• Clear and meaningful collaboration across multiple program areas of Tech, EWD, & 4S. • Integration of multiple program areas increases significance of potential project impact to the community. • Cross-program integration is substantial and fundamental to project objectives.
Budget and Cost-Share (10)	• Budget is appropriate and well-aligned with tasks and deliverables. • Cost share meets or exceeds minimum 1:1 requirement. • Cost share sources are specific and comprise an integral component of the project. • Budget justification provides sufficient detail for reviewers to clearly understand the budgetary request.
Total (100)	

6. Reporting and Invoicing Requirements After Award

Project leads are expected to have regularly scheduled calls with their BioMADE Program Manager, as well as submit written monthly reports using provided templates. Due dates for monthly reporting will be established prior to award of funds, and continued project funding is contingent on meeting reporting requirements.

Required Deliverable: Project teams, in collaboration with their BioMADE Program Manager, will provide a description and timeline of how/when project products, deliverables, and learnings will be made available and communicated to the BioMADE member community through forums such as presentations, webinars, trainings, courses, workshops, newsletter stories, and/or others as agreed upon. This communication plan must be delivered no later than in the last 3 months of the project period of performance. Modification of Statements of Work after onset of project funding require review and written approval from the Program Manager.

Invoices for cost-reimbursable awards will be due on the 20th of the following month. Invoices must include detailed expenditures broken into budget categories for both the federally funded and cost shared portions of expenses for that month. If cost share detail is not included, invoice payment may be delayed.

7. Contact Information

Project Call, Proposal, Eligibility Inquiries: proposals@biomade.org

Membership Inquiries: membership@biomade.org

Indirect Cost Rate Proposal Inquiries: finrequest@biomade.org

Appendix A: Bioindustrial Manufacturing Readiness Levels

The BioMADE Technical Working Group recently published a formal description of the Bioindustrial Manufacturing Readiness Levels (BioMRLs). Projects will focus on BioMRLs 4-7, which correlate with advancing a pilot-scale manufacturing process through at-scale, production-representative environments. Early R&D efforts (BioMRLs 1-3) focused on metabolic pathway engineering and improvements are not likely to be mature enough to fit into BioMADE's scope. Exceptions may include strain engineering efforts that are specifically tailored to address known issues with Scale-up Production (SUP) or Downstream Processing (DSP).

As part of the proposal, an estimation is required of the project's current and ending BioMRL. A formal manufacturing readiness assessment is not required at this stage, but evidence to support the estimated BioMRL classification is an important part of successful proposals. We encourage proposers to allocate project funds or cost share to perform a rigorous BioMRL assessment of their process as part of the funded research effort. More information on how to perform these assessments can be found at biomrl.org. A description of the BioMRLs relevant to BioMADE projects follows:

BioMRL3: *Proof-of-concept.* Components of the biomanufacturing process have been proven in a laboratory environment. This includes genetic engineering efforts needed to create strains capable of producing the desired products in titers that support the transition to pilot-scale production (typically in excess of 1 g/L). Methods for the purification and analysis of the product of interest are also required but can rely on lab-scale equipment that is not suitable for larger-scale DSP.

BioMRL4: *Independent validation and verification of proof-of-concept.* The proof-of-concept system has been demonstrated in a strain suitable for commercial-scale manufacturing and has been independently reproduced/validated/verified. Additionally, an initial assessment of the manufacturability is complete, including technoeconomic analysis (TEA) and life-cycle analysis (LCA). This assessment should include plans for the scale-up production (SUP) and DSP needed to produce sufficient quantities to allow testing and evaluation by downstream stakeholders. These plans incorporate production-relevant environments. Product quality risk and mitigation plans are documented.

BioMRL5: *Demonstration of prototype unit operations in a production relevant environment.* Identification of enabling/critical unit operations is complete. Prototype materials, tooling and test equipment, as well as personnel skills, have been demonstrated empirically for unit operations in a production relevant environment. Scale-up production and downstream processing has been performed at suitable scales to deliver sufficient quantities of end-product to downstream stakeholders for testing and evaluation. The TEA has been refined to assess projected manufacturing cost. A risk management plan to mitigate technical and economic risks is integrated with the manufacturing strategy.

BioMRL6: *Demonstration of a prototype system or subsystem in a production relevant environment.* Manufacturing processes have been selected for the end-to-end manufacturing pipeline, even if engineering and/or design variables still need to be optimized. Prototype manufacturing processes and technologies, materials, tooling and test equipment, as well as personnel skills, have been demonstrated on systems and/or subsystems in a production relevant environment. The TEA is refined based on system performance and is expanded to include inventory control, production scheduling, plant maintenance and production quality attributes (PQAs). Long-lead and key supply chain elements have been identified and supply chain risk mitigation strategies exist.

BioMRL7: *Demonstration of systems or subsystems in a production representative environment.* Detailed system design is complete. Manufacturing processes and procedures have been demonstrated in a production representative environment. Sufficient quantities of product have been made to test packaging and distribution systems. Unit cost reduction strategies, such as Statistical Process Controls (SPCs), are underway in a production representative environment. Quality assurance of supply chains is in place, and procurement schedules for long-lead elements are established. The manufacturing process is sufficient to support low-level commercial manufacturing.

Appendix B: Safety, Security, Sustainability, and Social Responsibility (4S)

A commitment to incorporating safety, security, sustainability, and social responsibility (4S) is part of the fabric of BioMADE. Consequently, proposals for BioMADE projects addressing 4S competencies should demonstrate how they will further this mission, by improving safety and security of biomanufacturing processes and technologies and/or by commitments to sustainability and societal issues in ways beyond revenue or capital growth.

To provide further guidance to BioMADE members as they integrate these 4S components into their work, we have developed the following definitions:

Component	Definition	Application Examples
Safety	Practices, controls, and measures taken to protect people and the environment from harm from biomanufacturing development processes and/or physical products or byproducts. Includes safety of the workplace, consumers, and the general public.	Identify ways in which your project will help improve compliance with existing professional norms and regulations (e.g., including training in safety protocols) and/or will identify areas in need of additional or different guidance.
Security	Measures taken across biomanufacturing sectors including food and agriculture, materials, and energy, to manage potential threats and loss due to theft, misuse, diversion, unauthorized possession of property (including intellectual property) or intentional release of biological risk and/or technology.	Please describe how your proposed work: 1. Proactively addresses potential biological or economic security risk, and 2. Impacts the industry or national security in biotechnology.
Sustainability	Measures taken to maintain or improve the long-term sustainability of the environment and economy due to advancing biomanufacturing processes. These include consideration of the impacts of products and processes on the environment, supply chain, as well as local public / consumer acceptance and practices.	Please describe how your proposed work will meet or exceed emerging norms and standards for environmental protection, reduction of greenhouse gases, or development of business models that are adapted to long-term economic accessibility and stability for a wide range of users.

Social Responsibility	A principle that acknowledges the impacts of biomanufacturing on stakeholders with respect to associated benefits, risks, and consequences throughout its value chain. This implies taking actions that optimize positive social outcomes through adherence to ethical standards, including seeking ways to make products and processes that improve societal welfare. Special attention to this commitment includes equitable distribution of benefits and risks and a responsiveness to society's needs and values.	Please describe your plans for social responsibility as it relates to the execution of your project. Examples may include community engagement, whether as education or consultation; or for workforce development that addresses the need for diversity and inclusion; or for creative initiatives to bring open dialogue, perspectives and appreciation of biomanufacturing and economic possibilities to the general public.

Appendix C: Cost Share Guidelines

Cost share is an important part of BioMADE, which is funded through a Cooperative Agreement with the United States Department of Defense that requires cost share. **Project awardees receiving funds from BioMADE are sub-recipients under the Cooperative Agreement and thus have a cost share requirement**. This Appendix offers guidance for cost share required by BioMADE funded project awards. Guidance for cost share required as part of BioMADE's annual membership dues may be found on the BioMADE website.

The minimum cost share for BioMADE Institute-funded projects is 1:1. The cost share ratio must be maintained throughout the life of each Institute-funded project. For example: a subawardee receiving $250,000 in Institute-funded project funds is required to contribute a minimum of $250,000 in cost share but would be more favorably reviewed with a higher cost share contribution of $350,000 for a total project amount of $600,000. The cost share can be divided between partnering entities at their discretion but must adhere to Federal guidelines.

Project cost share is a contribution made towards the subawardee's project that is in addition to the amount funded by BioMADE. Allowable cost share items include costs such as salaries and equipment, that directly benefit the project. Cost share is used for expenses eligible to be charged to the project but that are instead charged to the sub-recipient. Costs that are not allowable to be charged to BioMADE are not allowable for cost sharing. As with costs directly charged to BioMADE, allowable cost share expenses must be reasonable, allocable, and consistent with the terms of the award. Examples of unallowable cost sharing can include items such as alcoholic beverages and facility construction costs.

Eligible cost share must meet all the following criteria: verifiable from subawardee records; not from federal funding sources or included as contribution to any other federally-assisted program(s); necessary and reasonable for proper and efficient accomplishment of the project or program objectives; allowable as a direct cost under applicable federal cost principles; and falls within defined cost principles as defined in 2 CFR 200.306 , and provisions of Chapter I, Subchapter C of Title 32, CFR, "DoD Grant Agreement Regulations" other than part 33.

A detailed budget of how the funds will be distributed across various cost categories should be provided to allow BioMADE to review/approve any associated costs being used as cost share. The subawardee is responsible for providing the total amount and/or source of cost share accepted by the sponsor. Should the actual value, source, or type of cost share change, contact BioMADE immediately.

Cash and Cash Equivalent Cost Share

Any contribution of funds, services or materials for which the subawardee is required to pay cash, and which would normally be authorized for reimbursement as a direct or indirect charge to the sub-award is allowed as cost share. Examples include paying labor (including benefits and direct overhead associated with that labor), acquiring materials and authorized travel. Equipment purchases over $5,000 require

approval by BioMADE. To the extent feasible, volunteer services shall be supported by the same methods used to support the allocability of regular personnel costs. Overhead and General and Administrative costs for project participants are also sources of cost share. Only the additional resources or monies spent that are provided to carry out the current project can be counted. Independent Research and Development (IR&D) funds may also be used as cost share when provided in direct support of BioMADE. Cash contributions cannot include profit or fee.

In-Kind Cost Share

In-kind cost share may include labor, authorized travel, materials, and equipment. In-Kind cost share is defined as the reasonable value of such cost items, loaned/provided equipment, materials or other property used in the performance of BioMADE and the resulting Institute-funded project statement of work. In-kind contributions are sometimes hard to value (such as space or use of equipment and intellectual property). The in-kind value of equipment (including software) cannot exceed its fair market value and must be prorated according to the share of its total use dedicated to carrying out the project. Outreach activities and tech transfer activities can be considered allowable cost share if they are necessary and reasonable for the proper and efficient accomplishment of project or program objectives (i.e., contained in a Statement of Work). The in-kind value of space (including land or buildings) cannot exceed its fair rental value and must be prorated according to the share of its total use dedicated to carrying out the project. Intellectual Property value should primarily be determined commensurate to its fair market value.

Cost Share Reporting and Documentation

Documentation for all cost share expenditures must be included on each monthly subawardee invoice and provided to BioMADE quarterly/annually and at the conclusion of the project to ensure that the commitment has been fulfilled. Supporting documentation of all costs and cost share incurred must be maintained by the subawardee and provided to BioMADE. Supporting documentation must be available for audit by Government or BioMADE. An audit of cost share may be initiated at any time by BioMADE or the federal funding agency.

Compliance

Subawardees that do not comply with cost share requirements may be subject to payment garnishment commensurate with their cost share deficit. For instance, if a subawardee's cost share requirement is 1:1 and their current invoice reflects a cumulative total of $10,000 federal funds incurred, their cumulative cost share contribution must meet or exceed $10,000. Cost share contributions in excess of the ratio required by the member's subaward are not grounds for additional payment using federal funds. Members will only be reimbursed for actual costs incurred, provided the subaward's funded amount has not been exceeded and cost share requirements have been met.

Subaward Modifications

When a modification to a subaward incorporates additional scope or provides additional Government funds, the status of cost share will be evaluated to ensure that the project cost share ratio contained in the sub-award remains appropriate. If the amount of Government funds deviates from the original total, either by adding or de-obligating Government funds, the cost share dollar amount must be adjusted by sub-award modification to ensure the original cost share ratio is maintained.

Types of In-Kind Cost Share

Labor	Services furnished by professional and technical personnel, consultants or other skilled and unskilled labor that are not charged directly to a BioMADE project or other Government program. The service is an integral and necessary part of an approved project, or to BioMADE. Labor rates for services shall be consistent with those paid for similar work in the labor market in which the sub-recipient competes for the kinds of services involved. Paid fringe benefits that are reasonable, allowable and allocable may be included in the valuation.
Travel	Travel taken and donated in support of an approved BioMADE project, program, or meeting may be included as cost share, provided that all costs are reasonable, allowable, and allocable under the sub-recipient's applicable cost guidelines and not charged directly to a BioMADE project or other Government program.
Materials	Donated supplies or materials may include laboratory supplies or workshop and classroom supplies, provided that all costs are reasonable, allowable, and allocable under the sub-recipient's applicable cost guidelines and not charged directly to a BioMADE project or other Government program.
Equipment	For support activities that require the use of equipment, buildings or land, normally only depreciation or use charges for equipment and buildings may be made. However, the full value of equipment or other capital assets and fair rental charges for land may be allowed, provided that the charges are approved and an integral and necessary part of an approved project or the BioMADE program, provided that the equipment is not charged directly to a BioMADE project or other Government program. The value of donated equipment shall not exceed the fair market value of equipment of the same age and condition at the time of donation.
Indirect Costs	Unrecovered indirect costs may be included as cost share, provided that the costs are consistent with the sub-recipient's approved negotiated indirect cost rate, or other allowable rate such as the de minimis rate (10%), and evidence of such is provided.