

Promethean Clay: DARPA-PS-26-16

Question and Answer Document

1. **Who do I contact if I have questions about the Promethean Clay program?**
 - a. Please send questions to the Promethean Clay email address (Promethean_Clay@darpa.mil).
2. **Will the slides that the Program Manager presented at Proposers Day be available upon request?**
 - a. A recording of the presentations at Proposer Day is now publicly available at the following link. <https://www.darpa.mil/research/programs/promethean-clay>. This video includes the combined Program Manager presentation and slides.
3. **Are you able to discuss or review technical concepts and applications of interest to Promethean Clay?**
 - a. We cannot engage in discussions or review any documents related to technical concepts or applications of interest with potential performers per DARPA guidance. As noted in the Program Solicitation and attachments, potential applications should enable innovation in military or commercial systems relevant to the DARPA mission. We encourage all applicants to review the Program Solicitation in detail and reach out to promethean_clay@darpa.mil with any questions unmet in this FAQ document.
4. **Is there an opportunity for an FFRDC or UARC to support this program?**
 - a. FFRDCs and UARCs are currently permitted to propose to the program either as a prime or subcontractor. Specific details and associated processes related to participation of FFRDCs and UARCs is provided in the Program Solicitation in "Section IV Special Considerations."
5. **The Program Solicitation describes eliminating the need for rigidity imposed by current energy storage systems. What does rigidity mean in this case?**
 - a. Rigidity is imposed in energy storage devices by materials, such as casing, which apply pressure across components. Eliminating rigidity in a system where all components are mechanically and electrochemically co-designed, as described in the Program Solicitation, would result in a device that can meet program requirements and metrics with no applied external stack pressure.
6. **Are malleable, deformable, or flexible batteries of interest to the program?**
 - a. Yes, these solutions are of interest to the program if they meet the required program metrics. However, the Program Solicitation does not require the energy

storage device to be malleable, deformable, or flexible. Performers are asked to describe how their solution will bring new capabilities in an application, and leveraging properties such as malleability, deformability, or flexibility is one of many ways to approach this.

7. Are energy storage solutions other than electrical energy storage devices acceptable for this program?

- a. No, this program focuses on electrical energy and any electrical energy storage device that meets the metrics and requirements detailed in the Program Solicitation are of interest to Promethean Clay.

8. Is the deliverable in Phase 2 the energy storage device or an energy storage device integrated into a separate functional device?

- a. The deliverables throughout the program are only those of the energy storage device.

9. Are pouch cells or coin cells an acceptable option for Promethean Clay?

- a. Pouch cells and coin cells represent the approaches used today that Promethean Clay is working to overcome and therefore are not of interest to this program. Additionally, as stated in the Program Solicitation, co-design of all components *including* inactive materials is the technical challenge for this program and this is not commensurate with how conventional packaging methods are applied.

10. Does the energy storage device delivered in this program need to be at the pack level or individual cell level?

- a. The key requirement is that the delivered unit, whether a single cell or a combination of cells, must meet all program metrics as a self-contained device.

11. Is there a minimum or maximum size requirement of the energy storage device?

- a. There are no size requirements for energy storage devices in this program as long as it meets all of the metrics described in the Program Solicitation.

12. The current requirements of C/3 – 1C rates will scale with the overall energy density of the device. Are there specific minimum rates (power or current) for the final device?

- a. The required power density is defined by the required energy density of 150 Wh/kg and the required charge/discharge interval of 1-3 hours, both of which are

specified in the Program Solicitation. There are no requirements for current in the Program Solicitation.

13. Are the energy density metrics, charge-discharge rates, and cycle count required at specific temperatures?

- a. The prescribed energy density metrics, charge-discharge rates, and cycle count for each phase are intended for testing at ambient temperature. The operating temperature range described in each phase is defined as the temperature range in which the energy storage device maintains $\geq 80\%$ of its initial capacity. This can be demonstrated through a single cycle at a rate between C/3 and 1C.

14. Is the >2V requirement for a single full cell or is it permissible to achieve this by connecting multiple cells in series?

- a. It is permissible to achieve the >2V requirement specified in the Program Solicitation by connecting multiple cells in series under the circumstance that the proposer justifies that losses due to series connections will not compromise the device from meeting program requirements. The resulting device must be capable of meeting all other program metrics as outlined in the Program Solicitation.

15. What is considered an active and inactive component of an energy storage device in this program?

- a. In Promethean Clay, we are defining active materials to be the electrodes that store and deliver energy, the separator, and the electrolyte. We recognize that electrodes (e.g. battery cathodes) are typically comprised of an electrochemical active material, polymer binder, and conductive additive. In this case, we are considering the electrode material with all constituents as the active component. All other components are considered inactive (e.g. current collector, casing, tabs, etc.).

16. Does the limiting oxygen index (LOI) testing include active and inactive constituents of electrode materials, e.g. binders and conductive additives?

- a. The LOI testing is to be performed at the component level in Phase 1 of the program as noted in the Program Solicitation. An electrode component used in the device that contains binders and conductive additives would involve LOI testing of the electrochemical active material with those same binders and conductive additives.

17. Is the LOI requirement for ignition or continued combustion?

- a. LOI is defined as the minimum concentration of oxygen to ensure a self-sustained flame. Therefore, the LOI requirement pertains to continued combustion for the purposes of safety tests.

18. Does the LOI testing need to be performed at different states of charge?

- a. In Phase 1 of the program the LOI will evaluate individual components and not the full device, and therefore tests will not require evaluation at different states of charge. However, in Phases 2 and 3, LOI tests will be performed on fully packaged devices and therefore will require testing at different states-of-charge relevant to evaluating safety of the device.

19. Can I still be successful in submitting a strong proposal if my team does not have the capability to test and evaluate LOI?

- a. Yes, you can still be successful in submitting a strong proposal if your team does not have the capability to perform LOI testing. If you do not have that capability we will work with our government IV&V team to assist you in performing these tests.

20. If a combination of components has an LOI >26% but the individual components do not, will the final system be acceptable?

- a. The final system will not be acceptable if the individual components (electrode, separator/electrolyte, current collectors, packaging) do not possess a LOI of >26%. As noted in the Program Solicitation, the LOI of individual components > 26% is a requirement of Phase 1 in the program.

21. Can we alter material choice of the components in the energy storage device after Phase 1?

- a. As noted in the Program Solicitation, new components may be utilized in the energy storage device after Phase 1, but they must undergo individual LOI testing at the component level and exhibit >26% for allowable use in the energy storage device. In such a case, the LOI testing results are required to be provided as a deliverable at the next milestone after the components are modified.

22. Are there additional safety tests that need to be performed on the energy storage device?

- a. Performer teams only need to do LOI testing as stated in Program Solicitation. However, deliverables will be subjected to additional testing by the government IV&V team.

23. The solicitation states, “DARPA anticipates that the Promethean Clay program may also produce unclassified fundamental research, including experimental results, modeling, and scientific insights that advance understanding of materials, physical mechanisms, and design concepts underlying the technical challenges of the program.” The cover page of the abstract template asks proposers to “acknowledge that the program is non-fundamental research...” Could DARPA provide examples of what would constitute publishable fundamental research on the effort?

- a. Fundamental research generally includes studies directed toward understanding the mechanisms, properties, modeling approaches, and scientific principles underlying materials and design concepts, where the intent is to publish and broadly disseminate the results. However, the designation of work as fundamental research is determined based on the nature of the specific effort and whether it is subject to publication or access restrictions. Work that incorporates information identified as Controlled Unclassified Information (CUI), as described in Attachment K (Promethean Clay CUI Guide), or that is otherwise subject to dissemination controls, would not qualify as fundamental research to the extent of those restrictions. Each proposed effort will be evaluated in its entirety to determine the appropriate research classification.

24. The abstract instructions require acknowledging that the research is non-fundamental. Is there any provision or specific track for university proposers to conduct a portion of the effort as fundamental research, or is the entire program classified as applied research (6.2)?

- a. As specified in the Program Solicitation, university proposers may participate in non-fundamental research if they are or become CUI compliant before the start of Phase 1. If university proposers cannot or do not wish to become CUI compliant, they can still participate as a subcontractor on a team to carry out fundamental research portions of the proposed work. Per the Program Solicitation, all prime research efforts will be classified as non-fundamental research and any team member conducting only fundamental research needs to be listed in the abstract and proposal.

25. If we submit as the lead institution, I understand from the solicitation that our effort will not be designated as fundamental research. Will we be able to publish results that come from the fundamental research portion of the project?

- a. As noted in the Program Solicitation, this observation is correct. Information deemed CUI, as described by the Promethean Clay CUI Guide (Attachment K) will

not be publishable. Other findings from the effort can be published with approval from DARPA regardless of whether the effort is deemed non-fundamental.

26. Am I able to lead a proposal as a PI from an academic institution?

- a. If your institution is able to comply with CUI requirements as detailed in the Program Solicitation and attached CUI guide, you can lead a proposal. If your institution does not possess CUI compliance there will be a phase 0 security setup period to obtain CUI compliance as described in the Program Solicitation. If your institution does not obtain CUI compliance, another institution must serve as the prime and your institution may only work on elements of the project deemed as non-CUI.

27. Will a project need a phase 0 if a sub-contractor requires a phase 0?

- a. Only if the sub-contractor is handling CUI information.

28. If SPRS is less than 88, do we need to participate in Phase 0?

- a. As noted in the Program Solicitation, the SPRS must be above 88. This can be done by participating in the Phase 0 preparation period or through another way.

29. Would Phase 0 funding be available also for project-level expenses to obtain CUI compliance?

- a. Funding will be available to cover required expenses to obtain CUI compliance.

30. Is CUI compliance for the prime required at institutional or project level?

- a. CUI safeguarding requirements apply to the information systems and environments in which CUI is stored, processed, or transmitted under the agreement. Compliance may therefore be implemented at the project level, provided the required controls are in place for the systems supporting that effort. Institution-wide implementation is not required unless otherwise specified in the solicitation, award terms, or applicable DoD assessment requirements.

31. Will we be receiving CUI technology from DARPA in the course of the project?

- a. DARPA will not provide CUI technology for this project.

32. Can the program accommodate transition from academic lab to start up at the Phase 2 stage.

- a. Yes, DARPA can accommodate this.

- 33. Will foreign nationals be able to participate in the project, as long as this information is disclosed to DARPA?**
- a. Yes, any foreign nationals participating in this project will need to undergo background investigation and security approval by DARPA before the start of the program.
- 34. If I submit an abstract as a prime with a team for the March 25 deadline, am I required to maintain that team through the submission of a full proposal, or can I change my team between the abstract and proposal phases?**
- a. Yes, the team members can be modified between the abstract and proposal submission dates. However, the prime institution and PI cannot change during this time.
- 35. Can one company or member of a team participate in multiple submissions (as a sub or prime)?**
- a. A prime can participate in multiple submissions (as a sub or prime) as long as they justify that there is no overlap between contributions and there are no conflicts of interest. A sub-contractor may participate in multiple submissions as long as they justify that there is no overlap between contributions and there are no conflicts of interest.
- 36. Is there a limit to the number of members of any one team that submits proposals to Promethean Clay?**
- a. The program solicitation does not place limits on the number of members in any one given team. The number of members should reflect distinct capabilities needed in the proposed solution to meet program goals and milestones as described in the Program Solicitation.
- 37. Is there an upper limit to the budget or a suggested budget for this program?**
- a. The Program Solicitation does not indicate any limits or suggestions for budgets. For this program, the budget will be evaluated based on cost realism of the proposed effort.
- 38. Can you clarify how the teams are required to increase energy density from 150 Wh/kg to 195 Wh/kg between Phase 2 and Phase 3 of the program, but why packaging requirements only move from 20% packaging in Phase 2 to 15% packaging to Phase 3?**
- a. As noted in the Program Solicitation the 150 Wh/kg energy density metric is commensurate with that of fully packaged commercial Li-ion batteries today that

possess ~45% of inactive mass (current collectors, casing, etc.). By reducing this to <15% inactive mass, realization of 195 Wh/kg needs to be accomplished without changing the materials storing energy. The Phase 2 and Phase 3 packaging goals reflect improvements in device fabrication as the program continues.

39. Are liquid-electrolyte batteries, solid-state batteries, fuel cells, supercapacitors, hydrogen absorption/desorption systems acceptable to this program?

- a. Any solutions that meet the metrics described in the Program Solicitation are of interest to the program.

40. Are alkali metal batteries a viable platform for Promethean Clay?

- a. Layers of pure alkali metals commonly used as battery electrodes (e.g. Li, Na, K metal batteries) are highly reactive and combustible, therefore energy storage devices that produce these at any state-of-charge will not meet the safety metrics associated with this program (LOI > 26% for all components). However, approaches that utilize alkali metals in a non-flammable component with LOI > 26% are permissible as this meets the program metrics.

41. If a proposed design offers compelling performance in critical metrics for specific platforms but does not fully meet every energy density target in the solicitation, will the proposal still be considered? Are the energy density thresholds absolute "go/no-go" criteria for phase advancement?

- a. If the proposed energy storage device cannot meet the energy density targets described in the Program Solicitation the proposal will not be considered. If the proposed energy storage device does not meet the energy density requirement in Phase 1 (150 Wh/kg, 300 Wh/L) it will not advance through Phase 1 and/or into Phase 2.

42. For mission-critical systems requiring rapid energy delivery, power density is a vital parameter where conventional Li-ion systems are limited. While not explicitly listed in the metrics table, is it appropriate to present power density as an additional performance metric? Would advantages in power density be viewed favorably regarding DARPA mission relevance?

- a. All solutions of energy storage systems that can meet program metrics are of interest to this program. As described in the Program Solicitation, performers are required to describe how their specific solution would enable new capabilities in an application framework.

43. Is the inactive mass metric a strict requirement for all architectures?

- a. The inactive mass metrics throughout each phase of the program are a strict requirement and solutions that do not meet the metrics described in the Program Solicitation will not be considered.
- 44. Given performances validated at the system level, is it acceptable for full systems containing pressurization components with active mass <15%.**
- a. This program requires solutions that are free from materials or components that apply stack pressure on the device. Solutions that require any applied stack pressure by casing or other components will not be considered.
- 45. May solutions focus on novel integration solutions in ways that do not consider inactive mass?**
- a. All solutions must be evaluated on the basis of all active and inactive mass in the device and must meet the metrics described in the Program Solicitation.
- 46. The solicitation defines Phase 3 as focusing on "application feasibility and realization." Is the expectation a fully integrated end-use prototype, or is a standalone device meeting Phase 3 metrics—supported by a credible integration roadmap—sufficient for successful completion?**
- a. A standalone energy storage device that meets the phase 3 metrics and is supported by a credible integration roadmap is sufficient for successful program completion.
- 47. Is Technology Readiness Level relevant to the proposal?**
- a. No, proposals must just describe a technology that meets the program goals and metrics described in the Program Solicitation.
- 48. What applications are of interest for this program?**
- a. As stated in the Program Solicitation, we require proposers to provide insight into how their solution can enable new capabilities for specific applications relevant to military or commercial systems.
- 49. Are primary or reserve batteries of interest for Promethean Clay?**
- a. As noted in the Program Solicitation, all energy storage solutions must be rechargeable.
- 50. Are load bearing energy storage devices of interest?**

- a. Load-bearing energy storage devices are of interest to the program as long as the proposed energy storage device meets all of the requirements and metrics described in the Program Solicitation.

51. May energy storage and power generation be combined in a proposed solution?

- a. No matter what is being integrated with the energy storage device, the full device that includes all active and inactive mass must meet all of the required metrics described in the Program Solicitation.

52. Do energy storage devices in this program need to be reusable?

- a. Rechargeability is a requirement of the program, but there is no requirement or metrics for the device to be reusable beyond its defined cycle life or recyclable by design.

53. Is it acceptable to make different designs or devices to meet the high and low temperature requirements?

- a. The proposed energy storage solution needs to fully address the program metrics, including the full range of operation temperatures, in a single device/design.

54. Can charging be accomplished mechanically?

- a. Yes, we are open to novel ways to charge the device in non-electrical ways.

55. Will the cost of the proposed energy storage solution be evaluated?

- a. Cost, scalability, and manufacturability are important to the program as described in the Program Solicitation. However, there is no cost metric associated with proposed solutions.

56. Is the OT for prototype agreement considered OT authority.

- a. Yes, as stated in the Program Solicitation performers are under the authority of 10 USC §142 which allows the award for transaction of prototype.

57. Do proposers need to establish or identify potential U.S. sourcing of materials for the proposal? What if the material is new and there is no commercial vendor for it?

- a. Proposers are required to identify potential U.S. sources for materials used in the program. However, clarity about raw materials sourcing beyond this is welcomed. In the case of a novel material that is synthesized in a laboratory setting and cannot be acquired commercially, proposers should identify raw materials sourcing as an alternative.

58. Do all proposers need to be present for proposal presentations beyond the abstract phase?

- a. The PI is required to be present in the presentation, but the PI may have subcontractors present during the proposal and Q&A session.

59. Will DARPA assist with teaming and/or is there a teaming list available for proposers?

- a. DARPA will not assist proposers with teaming. However, a list of attendees participating in the Promethean Clay Proposers Day will be provided upon request by emailing Promethean_Clay@darpa.mil. Requests must be received by 5:00 pm E.T. on March 10, 2026, as stated in the DARPA-SN-26-30.