PROGRAM SOLICITATION OVERVIEW INFORMATION

- **Federal Agency Name** – Defense Advanced Research Projects Agency (DARPA), Defense Sciences Office (DSO)
- **Funding Opportunity Title** – Underexplored Systems for Utility-Scale Quantum Computing (US2QC)
- **Announcement Type** – Initial Announcement
- **Funding Opportunity Number** – DARPA-PS-22-04
- **Dates**
    - Posting Date: February 18, 2022
    - Registration Deadline for Office Hours: March 2, 2022
    - Office Hours: March 4, 2022
    - Proposer Questions Regarding Abstracts Due Date: March 14, 2022 at 5:00PM Eastern
    - Abstracts Due Date and Time: March 23, 2022 at 5:00PM Eastern
    - Abstract Responses: Not expected before April 11, 2022
    - Proposer Questions Regarding Oral Proposal Packages Due Date: May 10, 2022 at 5:00PM Eastern
    - Oral Proposal Package Due Date: May 19, 2022 at 5:00PM Eastern
    - Oral Presentation Date: Scheduled by Government request no earlier than the week of June 6, 2022

- The Defense Advanced Research Projects Agency (DARPA) is soliciting innovative approaches to address challenges related to quantum computing. The program Underexplored Systems for Utility-Scale Quantum Computing (US2QC) will explore innovative approaches to constructing a utility-scale fault-tolerant quantum computer. Proposed research should investigate approaches that enable revolutionary advances in design, engineering, testing, and evaluation of such systems. Specifically excluded is research that primarily results in evolutionary improvements to the existing state of practice.
- **Multiple awards are anticipated**.
- **Types of instruments that may be awarded** – Other Transaction (OT)
- **Attachments:**
    - Attachment A: Abstract Summary Slide Template (pptx)
    - Attachment B: Abstract Template (docx)
- **Agency Contact**

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PROGRAM SOLICITATION (PS)
Defense Advanced Research Projects Agency (DARPA)
Underexplored Systems for Utility-Scale Quantum Computing (US2QC)

1. PROGRAM INFORMATION

This program solicitation is organized as follows:

1.1. Background

It has been credibly hypothesized – but not proven – that quantum computers will have a transformative impact on a variety of scientific and technical disciplines. Two separate factors make the ultimate impact of quantum computing unclear. First, although a number of algorithms and applications for quantum computers have been suggested, in most cases a rigorous comparison to the best classical alternatives for real-world usage has not been completed. Second, it is unclear when or if a "utility-scale" quantum computer – one whose computational value exceeds its costs – can be built, particularly for applications that require fault-tolerance.

The complexity of a fault-tolerant utility-scale quantum computer could approach or exceed that of a classical supercomputer. A verification and validation effort which demonstrates that a utility-scale design is viable, that all the necessary components and sub-systems for the computer can be produced at the required specifications, and that all these components and sub-systems can be successfully integrated would likely be a difficult, multi-year process. Many scientists and engineers predict that a utility-scale quantum computer based on conventional designs is still decades away, making this type of verification and validation effort premature.

However, if an underexplored approach to quantum computing is discovered that enables utility-scale quantum computing much faster than anticipated, DARPA is interested in the immediate and timely verification and validation of the approach's viability – performed in parallel with on-going research and development efforts.

1.2. Program Goals

The primary goal of the US2QC program is to determine if an underexplored approach to quantum computing is capable of achieving utility-scale operation much faster than conventional predictions.

The US2QC program has a flexible acquisition strategy designed to fund efforts that are mutually beneficial for both the U.S. Government and for potential proposers who may already be expending significant resources to realize rapid progress in quantum computing systems. In particular, the US2QC program will add value to existing efforts by

a. providing sufficient funding to ensure that interaction with the U.S. Government either accelerates or does not reduce an organization's current rate of progress towards a utility-scale quantum computer;

b. providing unbiased verification and validation of an organization's path to a utility-scale quantum computer; and

c. effectively communicating the results of this verification and validation effort to other U.S. Government stakeholders.

In order to determine that a Utility-Scale Quantum Computing Concept can be constructed as designed and operated as intended, it will be necessary to rigorously verify and validate any proposed path to Utility-Scale. For this reason, the US2QC program will focus on verifying and validating Utility-Scale Quantum Computer Concepts, and will not focus on tracking incremental improvements to existing Quantum Computers.

Because of these requirements, every successful US2QC performer effort will progress through two critical stages:

1) Describe a **Utility-Scale Quantum Computer Concept** that has a plausible path to realization in the near term
2) Work with the Government to **Verify and Validate** that their Utility-Scale Quantum Computer Concept can be constructed as designed and operated as intended

After a proposal is selected for OT award negotiation (see Section 5 and sections referenced therein), DARPA is open to wide-ranging negotiations to find a mutual value proposition. The US2QC program is not a competition between performers; DARPA is interested in pursuing all viable approaches for which there is available funding.

1.2.1. Definition of Utility-Scale Quantum Computer

DARPA qualitatively defines a Utility-Scale Quantum Computer as a system whose computational value exceeds its costs. Individual proposers should clearly describe the proposed scale, quality, and configuration of their Utility-Scale Quantum Computer Concept. In addition, they should argue why the computational value of this system is likely to exceed its costs.

Quantifying the utility of large quantum computers is the subject of significant ongoing research and development, and the utility of many proposed large quantum computing systems is unknown. Proposers are not required to prove the utility of their Utility-Scale Quantum Computer Concept. Similarly, proposers are not required to produce a detailed cost estimate for a Utility-Scale Quantum Computer as part of their proposal, since establishing the difficulty and cost of constructing a Utility-Scale Quantum Computer is a goal of the US2QC program itself. However, proposals should include an estimate of system construction and/or operating cost, if these are available.

Performers, in collaboration with the Government, are expected to update their definition of "Utility-Scale" throughout the program as ongoing Government and private sector research and development clarifies both the utility and the cost of fault-tolerant quantum computers.

1.2.2. Approach to Verification and Validation

The US2QC program will take a staged approach to verification and validation of underexplored quantum computing approaches, with certain activities gated on successful completion of earlier milestones. However, in general, US2QC will pursue verification and validation activities that fall into three broad categories of evaluation in parallel:

System Design Verification and Validation. The US2QC program is focused on evaluating the viability of approaches to utility-scale quantum computing, rather than incremental improvement of existing noisy intermediate-scale quantum systems. As a result, in the initial phase of US2QC, performers will present a design concept that describes their planned Utility-Scale Quantum Computer. This design concept will be used to guide a more rigorous design process focused on all of the sub-systems that – once constructed and tested – will show that the Utility-Scale Quantum Computer Concept can be constructed as designed and operated as intended. Throughout the program, the Utility-Scale Quantum Computer Concept design will continually

evolve and improve.

Component and Sub-System Verification and Validation. One characteristic of a successful design study is the creation of detailed minimum specifications for required components and sub-systems. These requirements should guide both research and development and verification and validation of all components and sub-systems. This will allow components to be developed at the specifications required to complete the proposed Utility-Scale Quantum Computer, not just an incrementally improved quantum computer. In addition, it will allow sub-systems to be built and tested in a way that shows that construction at Utility-Scale can be successful. A completely successful US2QC effort will rigorously verify and validate component specifications and sub-system performance, and demonstrate that the Utility-Scale Quantum Computer Concept can be constructed as designed and operated as intended.

Parallel U.S. Government (USG) Research & Development (R&D). DARPA plans to engage U.S. Government stakeholders in the ongoing US2QC program. In particular, performers may have the opportunity to interact with a team pursuing U.S. Government-targeted applications exploration. These parallel USG R&D efforts may consider the extent to which performer Utility-Scale Quantum Computing Concepts are or are not useful for the applications being explored. This Program Solicitation is not soliciting proposals to perform the USG R&D effort.

1.3. Program Strategy

1.3.1. Program Execution Overview

The US2QC program assumes that any successful effort to develop a Utility-Scale Quantum Computer will need to pursue many of the same broad research and development goals: 1) Defining the Utility-Scale Concept, 2) Designing a prototype and deriving the requirements for components and sub-systems from that prototype design, 3) Demonstrating those components and sub-systems at the required specifications and under the appropriate conditions, and 4) Building and testing a prototype. It is likely that if any proposers are on the path to realizing a Utility-Scale Quantum Computer, they are already pursuing these activities.

The US2QC program assumes that each proposed approach will have a very different research and development path through these common steps. With that in mind, US2QC intends to be very flexible at the proposal, negotiation, and execution stages of the program to accommodate an optimal path to a Utility-Scale Quantum Computer. Specifically, only the initial Phase 0 will be pursued by all performers. Once under contract, performers may negotiate additional phases as appropriate with the Government. The number and duration of these additional phases will be performer-specific. This solicitation does not set any requirements for the number or duration of these additional phases.

For clarity, Figure 1 illustrates how one example program structure could extend from Phase 0 into at least two additional phases. This is intended only as an example, and the actual structure of all phases beyond Phase 0 will be negotiated with individual performers.

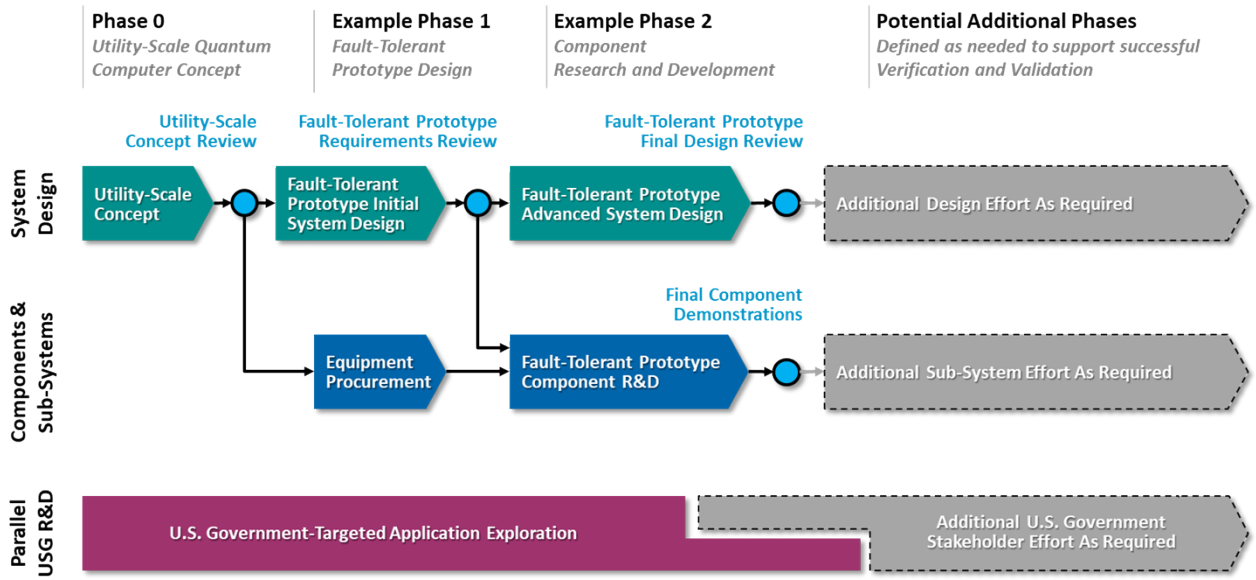

Figure 1 – Example Program Structure for a US2QC Effort. Phase boundaries show points at which the DARPA verification and validation effort changes scope. Both Phase 0 (required) and Phases 1 and 2 (provided as examples only) are summarized later in this Section. Cyan circles show example milestones (see Section 1.4). Arrows show dependencies. Rows show broad categories of evaluation (see Section 1.2.2).

Note that proposers who are already implementing an aggressive plan to build a Utility-Scale Quantum Computer will already be pursuing some example late-phase activities in parallel with a US2QC Phase 0. This is expected. This example structure represents a phased approach to the DARPA verification and validation effort and is not meant to constrain an organization's existing research and development plan. Organizations that have already funded some or all of these efforts will have a faster path to program completion.

Phase 0: Utility-Scale Quantum Computer Concept. The foundation for all US2QC efforts is a plausible concept for a Utility-Scale Quantum Computer. As a result, in Phase 0, all performers are required to quantitatively describe a complete concept, including all components and sub-systems, projected performance capabilities against a variety of metrics, and anticipated technical risks and mitigation strategies. This concept is not expected to enable construction of a Utility-Scale Quantum Computer; however, it is expected to be sufficient to create a component and sub-system research and development plan. The concept design is expected to change significantly over the course of the US2QC Program. However, in order to graduate from Phase 0, the concept is required to have significant technical detail (see Section 1.5.1), and be able to guide the design of a Fault-Tolerant Prototype.

Example Phase 1: Fault-Tolerant Prototype Design. In this example, performers that continue into Phase 1 will design a Fault-Tolerant Prototype, that shows that the Utility-Scale Quantum Computer can be constructed as designed and operated as intended. In addition, they will identify all required components and sub-systems and establish their minimum performance requirements.

Example Phase 2: Component Research and Development. It is expected that building a successful Utility-Scale Quantum Computer will require development of components and sub-

systems with performance specifications that exceed existing state of the art. Performers that continue into this example Phase 2 will work with the Government team to verify and validate that all required components and sub-systems can achieve the target specifications derived in the example Phase 1 described above. In addition, the measured component and sub-system performance specifications must be incorporated into a final design for a Fault-Tolerant Prototype.

1.3.2. Government Test and Evaluation Overview

A central goal of the US2QC program is the verification and validation of performer progress towards a Utility-Scale Quantum Computer – without imposing any delay to pre-existing research and development efforts. The Government test and evaluation team will be comprised of U.S. Government employees and support contractors.[1] DARPA is not soliciting Government test and evaluation support in this PS. This verification and validation process is expected to be:

Collaborative. Members of the Government test and evaluation team are expected to embed at performer sites in order to participate in real-time development of the target technologies and to accelerate performer progress toward Government-desired capabilities. The Government test and evaluation team will model, simulate, and test multiple performer-proposed solutions to hard problems as early as possible, rather than waiting for performer research and development efforts to settle on a single preferred solution. This will allow the Government test and evaluation team to more thoroughly understand the design choices that are being made, and to effectively argue at internal Government meetings that those choices are, in fact, sound.

Independent. The Government test and evaluation team must be able to independently verify and validate performer claims. For designs, this will require access to performer software for simulating classical and quantum architectures, for example. For components and sub-systems, this may require separate equipment at the performer site for verification and validation. Alternately, for some critical sub-systems, both the performers and the Government could agree to construction and/or delivery of the sub-system under test to a Government site. A final decision about whether to construct and/or deliver specific systems to either the performer site or the Government site will be made during negotiations for the appropriate phase.

Rigorous. The Government test and evaluation team is not expected to simply ingest performer claims, but be able to independently reproduce and rigorously defend those claims to U.S. Government stakeholders.

Valuable to Performers. Performers are expected to benefit from these activities in several ways. In the long-term, the verification and validation process will create a Government team capable of rigorously and independently defending a performer's approach to U.S. Government stakeholders. In the near-term, US2QC will provide external, unbiased, and independent verification and validation of a performer's approach. Finally, US2QC will provide financial support to performers to ensure that interaction with the Government accelerates – or at a minimum does not slow down – their current path to a Utility-Scale Quantum Computer.

[1] For the purposes of this solicitation, "support contractors" are defined as being under contract to DARPA to perform specific support functions to include the following: administrative, program management, financial, security, facilities, information technology, subject matter expertise, and verification and validation. Support contractors support DARPA personnel and programs, including R&D programs, but they are not eligible to compete as performers on this program or on related programs.

1.3.3. Acquisition Process Overview

This solicitation describes the acquisition steps leading to US2QC awards, including multiple opportunities for direct interaction with the Program Manager throughout. It is noted whether each step is required or optional. The dates for each of the steps are listed on Page 1 of this solicitation.

Program Manager Office Hours. (Optional for proposers.) The Program Manager will hold virtual "office hours" where they will briefly describe the program and its goals and solicit questions from the audience in real time. Office hours will be a three-hour open session held on the date shown in the Overview on Page 1 of this PS. Where possible, the Government will provide answers in real time, and a comprehensive list of questions and answers will be provided afterward via the public Frequently Asked Questions document. Participation in office hours is optional and is not a requirement for proposers seeking to submit an Abstract. Additional details about the Office Hours will be provided in Special Notice DARPA-SN-22-30 separate from this PS.

Abstracts. (Required. Result if selected: Invitation to submit an Oral Proposal Package.) Through this solicitation, the Government requests performers to submit an Abstract. Required Abstract content is described in Section 4.2. The Government will review all submitted Abstracts for technical comprehension and ability, evaluating Abstracts against the criteria stated in Section 4.3. After the Government's review, selected performers will be invited to submit an Oral Proposal Package for their approach to the Government Evaluation Team. Note that proposers must submit an abstract in response to this solicitation to be eligible to participate in the next acquisition step – Oral Proposal Package – or to be considered for award.

Oral Proposal Package. (Required. Result if selected: Invitation to negotiate an OT award.) Upon the Government's request, proposers will have the opportunity to submit an Oral Proposal Package. Section 4.4 outlines the required Oral Proposal Package content. The Government will review all Oral Proposal Packages as described in Section 5.1, and selected proposers will be invited to enter negotiations for an OT award. Oral Proposal Packages will not be made public or provided to other proposers. The Oral Proposal Package must be submitted by May 19, 2022 at 5PM Eastern, and Oral Presentation dates will be scheduled no earlier than June 6, 2022. DARPA will provide a list of questions one week in advance of the scheduled Oral Presentation to give proposers an opportunity to consider their response in advance. Additional instructions (to include presentation date/time) will be provided with the official invitation to submit an Oral Proposal Package.

OT Award Negotiation. DARPA will review Oral Proposal Packages to determine which proposed solutions sufficiently meet the evaluation criteria stated in Section 5.1. After the Oral Presentations, the Government will select proposers to enter negotiations for an OT for Prototype award under 10 U.S.C. § 4003 (formerly 10 U.S.C. § 2371b). The negotiation phase will include both technical and contractual negotiations to determine the effort that provides the most advantageous solutions for both DARPA and individual proposer teams.

DARPA intends to use a phased acquisition approach for the US2QC program. Oral Proposal Packages should encompass a full proposal for a Base Phase 0 effort, and a summary of the proposer's current plan – apart from the US2QC program – to build a Utility-Scale Quantum Computer.

Prior to the completion of any phase of the US2QC program, DARPA intends to enter negotiations for the next phase of effort, as appropriate. These negotiations are intended to begin with sufficient lead time to minimize or avoid any work stoppage.

1.4. Program Structure

Section 1.4.1 describes common attributes expected to be shared by all phases. Phase 0 is described in detail in Section 1.4.2, while Sections 1.4.3 and 1.4.4 illustrate Example Phases 1 and 2, respectively.

1.4.1. Attributes Common to All Phases

Asynchronous Schedule. Performers are expected to pursue significantly different technical approaches to address the US2QC program goals. As a result, the period of performance for each phase is not expected to be the same for all performers.

Performer-Defined Milestones. In the detailed description of Phase 0 provided below, only a single required milestone is provided to support the primary goal of that phase. Proposers are expected to define and pursue additional milestones that support their individual research and development plan. Similarly, the Example Phases 1 and 2 provide a minimal set of required milestones as an example, and performers are expected to work with the Government team to define additional appropriate milestones during negotiations for any later phases of effort.

Supportive of Government Test and Evaluation Effort. US2QC anticipates providing support for performer personnel to aggressively engage with Government test and evaluation teams; this support should not slow down a performer's existing rate of progress towards a Utility-Scale Quantum Computer and should instead provide the opportunity for collaboration with the Government test and evaluation team to modestly accelerate the current rate of progress. In addition, for phases beyond the initial Phase 0, the Government intends to consider performer-proposed procurement milestones for equipment that is required for the Government test and evaluation team to independently verify and validate the critical components and sub-systems of a performer's approach.

Goals, Required Milestones, and Graduation Criteria. Phases are intended to verify and validate a specific aspect of a performer's proposed path to utility-scale quantum computing. A required milestone is listed when, regardless of technical approach, that milestone is necessary (for Phase 0) or anticipated to be necessary (for Example Phases) to complete either the graduation criteria or the primary goal of a phase.

1.4.2. Phase 0 – Utility-Scale Quantum Computer Concept

Primary Goal

Allow the Government to evaluate the baseline concept for a Utility-Scale Quantum Computer.

Graduation Criterion

- Successful completion of a Utility-Scale Quantum Computer Concept Design Review (see Section 1.5)

Required Milestone (Proposers should provide a schedule for this and other milestones based on their chosen technology solution)

- Utility-Scale Quantum Computer Concept Design Review

1.4.3. Example Phase 1 Approach – Fault-Tolerant Prototype Design

For phases beyond Phase 0, DARPA anticipates that performer-specific approaches may require performer-specific verification and validation to accurately assess the proposed systems. The following is one example of the minimum requirements for a Phase 1 effort.

Primary Goal

Complete the baseline design for a Fault-Tolerant Prototype and ensure that its key system performance metrics have been completely and properly identified, leading to initial specification targets for all of its components and sub-systems.

Graduation Criteria

- Successful completion of a Fault-Tolerant Prototype System Requirements Review

Anticipated Minimum Required Milestone (Proposers should provide a schedule for this and other milestones based on their chosen technology solution)

- Fault-Tolerant Prototype System Requirements Review

1.4.4. Example Phase 2 Approach – Components and Sub-systems

For phases beyond Phase 0, DARPA anticipates that performer-specific approaches may require performer-specific verification and validation to accurately assess the proposed systems. The following is one example of the minimum requirements for a Phase 2 effort.

Primary Goal

Complete a final design for the Fault-Tolerant Prototype and demonstrate that all components and sub-systems meet required specifications.

Graduation Criteria

- Successful completion of Fault-Tolerant Prototype Final Design Review
- Successful demonstration of Components that meet the specifications defined in the Fault-Tolerant Prototype Final Design Review

Anticipated Minimum Required Milestones (Proposers should provide a schedule for this and other milestones based on their chosen technology solution)

- Fault-Tolerant Prototype System Intermediate Design Review
- Utility-Scale Quantum Computer Concept Design Review Update
- Fault-Tolerant Prototype System Final Design Review

1.5. Deliverables

For each design review milestone listed in Section 1.4, the descriptions that follow provide a *Purpose* for the design review and an *Example Structure* for the design review. The *Purpose* is the Government's qualitative description of the goals of the design review, and is meant to be general enough to apply to any proposed definition of a Utility-Scale Quantum Computer. The *Example Structure* is not required, but is provided to help inform the level of rigor that the Government expects to be necessary to achieve the design review *Purpose*. See Figure 1 for a graphical depiction of how several of these milestones would fit into an example US2QC effort.

1.5.1. **Utility-Scale Quantum Computer Concept Design Review**

Purpose

- Allow the performer to present their system conceptual baseline, review the results of any trade studies, and review the initial system-level specifications.
- Confirm the feasibility of the performer's Utility-Scale Quantum Computer concept.
- Confirm the design concept is consistent with US2QC goals.

Example Structure

- Delivery of a Utility-Scale Quantum Computer complete system description, which should provide at a minimum:
    - A description of the performer's definition of "utility-scale"
    - A high-level but complete description of the system components and sub-systems
    - A description of the approach to performing logical operations, including initial estimates for the utilization of system resources to execute utility-scale algorithms
    - The notional form of the Fault-Tolerant Prototype unit
    - An initial supply chain analysis
    - Projected performance capabilities against the following metrics:

Metric Description
Area/Volume of individual system components as well as the fully constructed total system
Wall power requirement (for all sub-systems)
Classical computing power required in steady state (in GFlops)
Cooling power at specified temperatures, in specified volumes
Required configuration and connectivity within and between quantum and classical sub-systems
Input/Output requirements for key sub-systems
Space versus time tradeoffs between system size, gate depth, logical qubit number, etc.
Expected calibration time

Expected purchase price

Table 1 – Table of system-level metrics to project performance against.

- Delivery of a baseline Utility-Scale Quantum Computer Components and Sub-systems Research and Development Plan, which should provide at a minimum:
    - A description of the system baseline technologies, to include projected specification requirements for key components and sub-systems
    - A baseline research and development plan for non-commercial-off-the-shelf (non-COTS) components and sub-systems (to include baseline proposed plan for Government test and evaluation)
    - Current state of the art for required components and sub-systems, to include all candidate components for development in later phases, e.g., Phase 2, (if not COTS)
- Delivery of a Utility-Scale Quantum Computer software and drawings package, which should provide at a minimum:
    - Modeling and simulation plan for identifying/optimizing system performance targets
    - The full system drawing package

1.5.2. **Fault-Tolerant Prototype System Requirements Review**

Purpose

- Confirm that key Fault-Tolerant Prototype system performance metrics have been completely and properly identified and that a mutual understanding between the Government and performer exists
- Confirm that all components and sub-systems of the Fault-Tolerant Prototype have initial specification targets derived from the key system performance metrics
- Confirm the Fault-Tolerant Prototype system concept is consistent with the US2QC goals of verifying and validating progress toward a Utility-Scale Quantum Computer

Example Structure

- Delivery of a Fault-Tolerant Prototype Complete System Description, which should provide at a minimum:
    - A description of the Fault-Tolerant Prototype system's relevance to the Utility-Scale Quantum Computer baseline design concept
        - Specific identification of elements of the Fault-Tolerant Prototype that will not conform to the Utility-Scale Quantum Computer requirements. In each such case, performers should show how Utility-Scale-Quantum-Computer-level metrics will be revealed through alternate demonstrations and analysis (an example might include error syndrome decode times)
    - A description of the system components and sub-systems

    - The initial approach to performing logical operations and validating key system performance metrics, including specific comparison to the approach to perform utility-scale algorithms on the Utility-Scale Quantum Computer
    - An initial supply chain analysis for the Fault-Tolerant Prototype system
    - Projected performance capabilities
- Delivery of a Components and Sub-systems Research and Development Plan, which should provide at a minimum:
    - Specific and quantifiable metrics for all of the key components and sub-systems that will need to be developed in order to realize a Fault-Tolerant Prototype System
        - Current state of the art for these components and sub-systems should be included
    - An initial schedule showing the cycles and timeframe for progress for each component and sub-system
    - An initial test plan to verify the component and sub-system specifications (to include proposed plan for independent Government test and evaluation)
    - Modeling and simulation plan for identifying/optimizing system performance targets (to include proposed plan for independent Government test and evaluation)
    - Component and sub-system development risks and risk mitigation strategies
- Delivery of a Fault-Tolerant Prototype software and drawings package, which should provide at a minimum:
    - Current software for analyzing system trades and component requirements within Fault-Tolerant Prototype design manifold
    - The full system drawing package

1.5.3. **Fault-Tolerant Prototype System Intermediate Design Review**

Purpose

- Provide an update of the Fault-Tolerant Prototype system baseline since the Fault-Tolerant Prototype Requirements Review
- Review the key Fault-Tolerant Prototype system performance metrics
- Update the specification targets for the components and sub-systems of the Fault-Tolerant Prototype
    - Specifically identify any targets that have been exceeded during component research and development and focus on changes to the specifications identified at the Fault-Tolerant Prototype Requirements Review
- Provide a schedule and risk update

Example Structure

- Delivery of an updated Fault Tolerant Prototype Complete System Description
- Delivery of an updated Components and Sub-systems Research and Development Plan

- Delivery of an updated Fault-Tolerant Prototype software and drawings package, which in addition to updating previous requirements should also include:
    - Draft software and planned software requirements for operating the Fault-Tolerant Prototype system

1.5.4. **Utility-Scale Quantum Computer Concept Design Review Update**

Purpose

- Provide an update of the Utility-Scale Quantum Computer baseline design to confirm that the design target remains consistent with the US2QC goals
- Confirm that key Utility-Scale Quantum Computer system performance metrics have been completely and properly identified and that a mutual understanding between the Government and contractor exists
- Confirm that all components and sub-systems of the Utility-Scale Quantum Computer have initial specification targets

Example Structure

- Delivery of an updated Utility-Scale Quantum Computer Complete System Description
- Delivery of an updated Utility-Scale Quantum Computer Components and Sub-systems Research and Development Plan
- Delivery of an updated Utility-Scale Quantum Computer software and drawings package

1.5.5. **Fault-Tolerant Prototype System Final Design Review**

Purpose

- Provide a final update of the Fault-Tolerant Prototype system design
- Review the key Fault-Tolerant Prototype system performance metrics
- Finalize the specification targets for the components and sub-systems of the Fault-Tolerant Prototype
- Specifically identify the current component and sub-system performance, showing how they enable the system key performance metrics

Example Structure

- Delivery of a final Fault-Tolerant Prototype Complete System Description
- Delivery of a final Components and Sub-systems Research and Development Plan, which should provide at a minimum:
    - Final performance analysis for key components and sub-systems
        - Experimentally validated performance characterization against target specifications for components and sub-systems should be included

    - An initial test plan to verify the fully-assembled Fault-Tolerant Prototype system specifications (to include proposed plan for independent Government test and evaluation)
    - Final results of the modeling and simulation of system performance targets
- Delivery of an updated Fault-Tolerant Prototype software and drawings package, which should provide at a minimum:
    - Final software for analyzing system trades and component requirements within the Fault-Tolerant Prototype design manifold
    - A final full system drawing package

2. PS AUTHORITY

This PS may result in the award of Other Transaction (OT) for Prototype Projects, which can include not only commercially-available technologies fueled by commercial or strategic investment, but also concept demonstrations, pilots, and agile development activities that can incrementally improve commercial technologies, existing Government-owned capabilities, and/or concepts for broad defense and/or public application(s). The Government reserves the right to award an OT for Prototypes under 10 U.S.C. § 4003 (formerly 10 U.S.C. § 2371b) or make no award at all. In all cases, the Government Agreements Officer shall have sole discretion to negotiate all agreement terms and conditions with selected proposers. The OT agreement will not require cost sharing unless the proposer is a traditional defense contractor who is not working with a non-traditional defense contractor participating in the program to a significant extent. In such cases, the statute requires a minimum non-Federal resource share of 1/3 of the total cost of the program.

3. ELIGIBILITY INFORMATION

3.1 Eligible Applicants

All responsible sources capable of satisfying the Government's needs may submit an Abstract that will be considered by DARPA.

3.1.1 Federally Funded Research and Development Centers (FFRDCs) and Government Entities

3.1.1.1 FFRDCs

FFRDCs are subject to applicable direct competition limitations and cannot propose to this PS in any capacity unless they meet the following conditions: (1) FFRDCs must clearly demonstrate that the proposed work is not otherwise available from the private sector, and (2) FFRDCs must provide a letter on official letterhead from their sponsoring organization citing the specific authority establishing their eligibility to propose to Government solicitations and compete with industry, and their compliance with the associated FFRDC sponsor agreement’s terms and conditions. This information is required for FFRDCs proposing to be awardees or subawardees.

FFRDCs proposing as prime awardees must be able to accept an OT for Prototype agreement as the award instrument. FFRDCs that can only be funded through their existing sponsor contracts

should not submit an Abstract directly to this PS.

3.1.1.2 Government Entities

Government Entities (e.g., Government/National laboratories, military educational institutions, etc.) are subject to applicable direct competition limitations. Government entities must clearly demonstrate that the work is not otherwise available from the private sector and provide written documentation citing the specific statutory authority and contractual authority, if relevant, establishing their ability to propose to Government solicitations, and compete with industry. This information is required for Government Entities invited to submit Oral Proposal Packages as either awardees or subawardees.

Government Entities submitting Abstracts as prime awardees must be able to accept an OT for Prototype agreement as the award instrument. Government Entities that can only be funded through their existing sponsor contracts should not submit Abstracts directly to this PS.

3.1.1.3 Authority and Eligibility

At the present time, DARPA does not consider 15 U.S.C. § 3710a to be sufficient legal authority to show eligibility. While 10 U.S.C. § 4892 (formerly 10 U.S.C. § 2539b) may be the appropriate statutory starting point for some entities, specific supporting regulatory guidance, together with evidence of agency approval, will still be required to fully establish eligibility. DARPA will consider FFRDC and Government entity eligibility submissions on a case-by-case basis; however, the burden to prove eligibility for all team members rests solely with the proposer.

3.1.2 Other Applicants

Non-U.S. organizations and/or individuals may participate to the extent that such participants comply with any necessary nondisclosure agreements, security regulations, export control laws, and other governing statutes applicable under the circumstances.

3.2 Organizational Conflicts of Interest

Without prior approval or a waiver from the DARPA Deputy Director, a contractor cannot simultaneously provide scientific, engineering, technical assistance (SETA), advisory and assistance services (A&AS), or similar support and also be a technical performer. As part of the Oral Proposal Package, all members of the proposed team (including any potential subawardees or consultants) must affirm whether they (their organizations and individual team members) are providing SETA or similar support to any DARPA office(s) through an active award or subaward. All facts relevant to the existence or potential existence of Organizational Conflicts of Interest (OCI) must be disclosed in the Administrative and National Policy Requirements document, should the proposer be invited to submit an Oral Proposal Package.

If SETA, A&AS, or similar support is being or was provided to any DARPA office(s), the Oral Proposal Package must include in the Administrative and National Policy Requirements document:

- The name of the DARPA office receiving the support;
- The prime contract number;
- Identification of proposed team member (subawardee, consultant) providing the support; and
- An OCI mitigation plan.

Under this section of the Oral Proposal Package, the proposer is responsible for providing this disclosure with each Oral Proposal Package submitted in response to this PS. The disclosure must include the proposer's, and as applicable, proposed team member's OCI mitigation plan. The OCI mitigation plan must include a description of the actions the proposer has taken, or intends to take, to avoid, neutralize, or mitigate such conflict, prevent the existence of conflicting roles that might bias the proposer's judgment, and prevent the proposer from having unfair competitive advantage. Prior to the start of Oral Proposal Package evaluations, the Government will assess potential conflicts of interest based on the Oral Proposal Packages submitted. DARPA will promptly notify the proposer if any appear to exist. The Government assessment does NOT affect, offset, or mitigate the proposer's responsibility to give full notice and planned mitigation for all potential organizational conflicts.

If, in the sole opinion of the Government after full consideration of the circumstances, a proposal fails to fully disclose potential conflicts of interest and/or any identified conflict situation cannot be effectively mitigated, the Oral Proposal Package will be rejected without technical evaluation and withdrawn from further consideration for award.

If a prospective proposer believes a conflict of interest exists or may exist (whether organizational or otherwise) or has questions on what constitutes a conflict of interest, the proposer should send his/her contact information and a summary of the potential conflict via the specific email address identified in this PS before time and effort are expended in preparing a Oral Proposal Package and mitigation plan.

4. GUIDELINES FOR ABSTRACTS AND ORAL PROPOSAL PACKAGES

4.1. General Guidelines

a. Do not include elaborate brochures or marketing materials; only include information relevant to the submission requirements or evaluation criteria.

b. Use of a diagram(s) or figure(s) to depict the essence of the proposed solution is permitted.

c. All Proposer Submissions must be unclassified.

d. Proposers are responsible for clearly identifying proprietary information in all submitted or presented materials. Submissions containing proprietary information must have the cover page and each page containing such information clearly marked with a label such as "Proprietary" or "Company Proprietary." NOTE: "Confidential" is a classification marking used to control the dissemination of U.S. Government National Security Information as dictated in Executive Order 13526 and should not be used to identify proprietary business information.

e. Questions regarding Abstracts can be sent to US2QC@darpa.mil by March 14, 2022 5:00PM (EST).

f. Send Abstracts to US2QC@darpa.mil by March 23, 2022 5:00PM (EST).

g. Submissions sent through other mediums, channels, or after the prescribed PS deadline may not be considered, reviewed, or evaluated.

h. Proposers providing Abstracts that are not invited to submit an Oral Proposal Package will be notified in writing as soon as practicable.

4.2. Abstract Content

a. Abstracts should not exceed eight (8) single-sided written pages using 12-point Times New Roman font with 1" margins all around. Abstracts that do not conform to these requirements may not be evaluated. See Attachment B: Abstract Template.

b. Abstracts must include the following:

1. ***Abstract Summary Slide:*** See Attachment A: Abstract Summary Slide template
2. ***Title page*****:** Proposer Name, Title, Date, E-Mail Addresses, Phone Numbers, and Addresses for both a Technical Point of Contact and Administrative Point of Contact. The proposer shall include a statement that no people on the proposer's team work for DARPA as Scientific Engineering Technical Assistance (SETA), Advisory and Assistance Services (A&AS), or similar support services, as DARPA has a policy prohibiting such people from working as a technical performer. Include this statement on the title page. The title page will NOT count as part of the eight (8) written pages limit.
3. ***Technical Understanding*****:** Provide a summary of the technical problem the US2QC program seeks to solve. This summary shall be stated in the proposer's own words without any "copy and paste" of this solicitation. The goal is for the proposer to demonstrate clear understanding of US2QC's purpose and goals. The summary shall be no more than one (1) page and is included in the eight (8) written pages limit.
4. ***Proposed Approach*****:** Provide a summary of the proposed technical approach to construct a Utility-Scale Quantum Computer. The summary shall be no more than two (2) pages and is included in the eight (8) written pages limit.
5. ***Technology Challenges*****:** Identify specific technical challenges associated with this proposed approach. The proposer should include what they think the primary risks are to successful development in the US2QC program. In other words, what are the critical technical challenges related to this approach? The summary shall be no more than three (3) pages and is included in the eight (8) written pages limit.
6. ***Technical Ability*****:** Detail why the proposer believes their team has the ability to be successful at achieving program goals, if selected to participate in US2QC. The proposer may include past experience, organizational capabilities, team members' qualifications, or anything else that demonstrates competence in designing and building the US2QC system. The summary shall be no more than one (1) page and

is included in the eight (8) written pages limit.

7. ***ROM Cost:*** Provide budget estimates and a proposed period of performance for Phase 0. Budget breakdown should be by proposed milestone and/or purpose. The ROM cost should not exceed one (1) page and is included in the eight (8) written pages limit.
8. ***References:*** Provide a list of citations, references, or end notes. References do not count against the eight (8) written pages limit.

4.3. Abstracts – Process and Basis of Evaluation

Abstract evaluation criteria are listed in order of importance. Individual Abstracts will be evaluated against the evaluation criteria described below:

a. **Technical Comprehension**: The proposed technical understanding is accurate, and key technical challenges and risks are identified.

b. **Technical Ability:** The proposer's team and organization are capable of realizing the proposed path to a Utility-Scale Quantum Computer.

Abstracts will be evaluated by DARPA using the evaluation criteria listed above and not against other Abstracts submitted in response to this PS. The Government will endeavor to complete the evaluation of Abstracts within thirteen business days of the closing of the submittal period. As stated above, proposers are required to submit an Abstract for evaluation by DARPA to minimize effort and reduce the potential expense of preparing an unsuccessful proposal. DARPA will respond to the 8-page Abstract with a statement as to whether DARPA requests submission of an Oral Proposal Package. If DARPA is not interested in obtaining an Oral Proposal Package, it will state this in a communication to the proposer. Upon review of Abstracts, the Government may elect to invite all, some, or none of the proposers to submit Oral Proposal Packages. *Only Abstract submitters invited by DARPA to submit Oral Proposal Packages are eligible to provide one.*

4.4. Oral Proposal Package Content

If DARPA selects a proposer to submit an Oral Proposal Package, specific submission instructions (including content submission guidelines and templates) will be provided in the invitation to participate. If selected, proposers can expect to be asked to participate as follows. In the event the instructions in the invitation to participate deviate from the following list of expectations, the instructions in the invitation to participate take precedence.

- **Location**. Oral Presentations will be delivered at DARPA or at an alternate location in the Washington, DC, metro area of DARPA's choosing.
- **Timing**. In the invitation to submit an Oral Proposal Package, DARPA will include information about how to select a date for the Oral Presentation.
- **Oral Presentation Format.** Oral Presentations will consist of several distinct presentations. Each presentation will have its own goals and required content, with time for breaks. Each presentation will include time for questions. In the event a proposer does not use all of their allotted time for a presentation, the Government evaluation team may elect to use that time for additional questions. The Government will withhold

questions until the end of each presentation (although see "Clarifying Questions" below).

- **Supplementary Documents.** The following documents are part of the Oral Proposal Package and must be submitted at the same time Oral Presentation Slides are submitted:
    - Oral Presentation Summary Slide (single slide summarizing Oral Proposal Package)
    - Cost Proposal for Phase 0 (including both a cost proposal document and cost proposal spreadsheet)
    - Administrative and National Policy Requirements document (note this document addresses intellectual property)
    - Schedule of Milestones and Payments for Phase 0
    - Certifications for Agreement document
    - Task Description Document (i.e., Statement of Work) for Phase 0
    - Model OT for Prototypes
- **Virtual Attendance.** Rules for in-person vs. virtual attendance at the Oral Presentation for both the proposers and the Government evaluation team will be included in the invitation to participate and will take into account relevant guidance related to the ongoing COVID-19 pandemic. In-person attendance will be preferred, if prevailing conditions make this possible and prudent.
- **Oral Presentation Slides and Supplementary Document Submission.** Oral Presentation Slides in Microsoft PowerPoint or PDF format, along with all Supplementary Documents will be due on May 19, 2022 for all proposers, regardless of the day of their planned Oral Presentation. All presented material is to be submitted to US2QC@darpa.mil.
- **Clarifying Questions.** One (1) week before the scheduled Oral Presentation, DARPA will provide a list of questions they anticipate asking during the presentation, based on the Oral Presentation Slides and the Supplementary Documents. Questions may refer to any aspect of the Oral Proposal Package.
- **Additional Slides with Answers.** Proposers may optionally include additional slides to answer the Clarifying Questions in a supplementary submission to DARPA due two days before the Oral Presentation. Additional information that is submitted but that does not address the Clarifying Questions may not be reviewed. All presented material is to be submitted to US2QC@darpa.mil. The Government evaluation team may not review these materials before the Oral Presentation. These Additional Slides with Answers will be available to proposers during question time (see below) but not during presentation time.

If invited to submit an Oral Proposal Package, a proposer can expect to be asked to provide the following presentations with the requested content and with appropriate scheduled breaks. All three presentations are expected to occur on the same day.

- **Presentation 1: Executive Summary**

- *Timing:* 30 minutes to present, 45 minutes for questions
- *Presentation Requirements:* No more than 30 slides. Only the first 30 slides will be presented or reviewed. Do not include "notes" pages or supplemental voice tracks. Slides will be presented from a DARPA computer.
- *Presentation Recommendations:* Do not include animations or videos, as slides should be understandable when printed. Slides should be understandable as read-aheads, without narration. For clarity of presentation, DARPA recommends no more than 15 slides, with no more than 150 words per slide.
- *Requested Content*
  - Proposer team introduction, including concise, high-level overview of proposer personnel and facilities, including relevant subcontractors or partners.
  - Concise, high-level overview of the proposer's technical approach to building a Utility-Scale Quantum Computer.
  - Concise, high-level overview of proposer's current plan for constructing a Utility-Scale Quantum Computer, assuming no additional support from US2QC.
  - Concise, high-level overview of anticipated work plan and schedule for the US2QC program by phase.

- **Presentation 2: Proposal for Phase 0**
  - *Timing:* 60 minutes to present, 30 minutes for questions
  - *Presentation Requirements:* No more than 60 slides. Only the first 60 slides will be presented or reviewed. Do not include "notes" pages or supplemental voice tracks. Slides will be presented from a DARPA computer.
  - *Presentation Recommendations:* Do not include animations or videos, as slides should be understandable when printed. Slides should be understandable as read-aheads, without narration. For clarity of presentation, DARPA recommends no more than 30 slides, with no more than 150 words per slide.
  - *Requested Content*
    - Important Note: In some cases, the requests below overlap with the research goals of Phase 0. Where a proposer does not know the requested information, they should clearly show how and when their proposed research program will uncover the missing information.
    - Describe completed, ongoing, and planned activities that overlap with the US2QC Phase 0 program goals.
    - Describe the Utility-Scale Quantum Computer proposed. Where system design aspects are unknown, describe the Phase 0 research plan to address them.
    - Summarize the Task Description Document (i.e., the Statement of Work),

the cost proposal, and the proposed schedule of payable milestones for Phase 0.

- Describe the proposed approach to intellectual property.
- Describe the proposed plan for collaborating with the Government test and evaluation team.
- Describe any additional performer-proposed milestones in Phase 0.
- Clearly describe any anticipated performer cost share for the proposed work plan.
- Any additional information you believe will help the Government evaluate your proposal.

- **Presentation 3: Anticipated Path to a Utility-Scale Quantum Computer**
  - *Timing:* 60 minutes to present, 60 minutes for questions
  - *Presentation Requirements:* No more than 60 slides. Only the first 60 slides will be presented or reviewed. Do not include "notes" pages or supplemental voice tracks. Slides will be presented from a DARPA computer.
  - *Presentation Recommendations:* Do not include animations or videos, as slides should be understandable when printed. Slides should be understandable as read-aheads, without narration. For clarity of presentation, DARPA recommends no more than 30 slides, with no more than 150 words per slide.
  - *Requested Content*
    - Important Note: In some cases, the requests below overlap with the existing research goals. Where a proposer does not know the requested information, they should clearly show how and when your existing research program or the proposed US2QC effort will uncover the missing information.
    - Describe why your existing research effort may lead to construction of a Utility-Scale Quantum Computer.
    - Describe your approach to Fault-Tolerant Prototype Design.
    - Describe your approach to component and sub-system research and development.
    - Describe your approach to Fault-Tolerant Prototype construction and characterization.
    - Describe the anticipated plan for collaborating with the Government test and evaluation team after Phase 0.

4.5. Review of Proposer Submissions

Review and Selection Process

It is the policy of DARPA to ensure impartial, equitable, comprehensive evaluations of Proposer Submissions based on the evaluation criteria listed above and to select the source (or sources) whose submission meets the Government's technical, policy, and programmatic goals. DARPA will conduct a scientific/technical review of each conforming Proposer Submissions. Conforming Proposer Submissions comply with all requirements detailed in this PS; Proposer Submissions that fail to do so may be deemed non-conforming and may be removed from consideration. Proposer Submissions will not be evaluated against each other since they are not submitted in accordance with a common work statement.

Award(s) will be made to proposer(s) whose Oral Proposal Package(s) are determined to be the most advantageous to the Government, consistent with instructions and evaluation criteria specified in this PS, and based on availability of funding.

Handling of Source Selection Information

It is the policy of DARPA to treat all Proposer Submissions as source selection information and to disclose their contents only for the purpose of evaluation. Restrictive notices notwithstanding, during the evaluation process, submissions may be handled by DARPA support contractors for administrative purposes and/or to assist with technical evaluation (see Section 5.5). No submissions will be returned. Upon completion of the source selection process, an electronic copy of each proposal received will be retained at DARPA and all other copies will be destroyed. A certification of destruction may be requested, provided that the formal request is received at this office within five (5) days after notification that a proposal was not selected.

4.6. Award Notices

The following notices will be provided as applicable:

- Notice of non-selection (for Oral Proposal Packages)
- Notice of selection (for Oral Proposal Packages)
- Notice of non-selection (for negotiation of an award)
- Notice of selection (for negotiation of an award)

As soon as the evaluation of Abstracts is completed, the abstract submitters will be notified that (1) the abstract has been selected for submission of an Oral Proposal Package, or (2) the abstract has not been selected for submission of an Oral Proposal Package. As soon as the evaluation of Oral Proposal Packages is complete, the proposers will be notified that (1) the proposal has been selected for funding, subject to OT agreement negotiations, or (2) the proposal has not been selected for funding. The above listed notifications will be sent via Electronic Mail to the Technical and Administrative POCs identified on the proposal coversheet.

5. AWARDS

5.1. Oral Proposal Packages – Process and Basis of Evaluation

Individual presentations will be evaluated against the evaluation criteria described below:

1. **Overall Scientific and Technical Merit.** The proposed technical approach is innovative, feasible, achievable, and complete. The proposed technologies and deliverables align with the objectives of the program. The proposed high-level work plan and associated technical elements provided are complete and in a logical sequence with all proposed deliverables clearly defined such that the successful completion of all program goals can be expected as a result of award. The proposal identifies major technical risks, and planned mitigation efforts are clearly defined and feasible. The proposers were able to clearly answer technical questions during the Oral Presentation.
2. **Potential Contribution and Relevance to the DARPA Mission.** The potential contributions of the proposed effort bolster the national security technology base, and support DARPA's mission to make pivotal early technology investments that create or prevent technological surprise. The proposed intellectual property restrictions (if any) will not significantly impact the Government's ability to transition the technology. The proposed plan for collaboration with the Government test and evaluation team is likely to result in a timely and rigorous verification and validation of the proposed approach.
3. **Cost Realism.** The proposed costs are realistic for the technical and management approach and accurately reflect the technical goals and objectives of the solicitation. The proposed costs are consistent with the proposer's Task Description Document (i.e., Statement of Work) and reflect a sufficient understanding of the costs and level of effort needed to successfully accomplish the proposed technical approach. The costs for the prime proposer and proposed subawardees are substantiated by the details provided in the proposal (e.g., the type and number of labor hours proposed per task, the types and quantities of materials, equipment and fabrication costs, travel, and any other applicable costs and the basis for the estimates). It is expected that the effort will leverage all available relevant prior research in order to obtain the maximum benefit from the available funding. Appropriate direct cost sharing may be a positive factor in the evaluation.

The Government reserves the right to record Oral Presentations. Oral Proposal Packages will be evaluated by the Government Evaluation Team. The Government may have DARPA support contractors provide subject matter expertise, or to be present during Oral Presentations (see Section 5.5 below).

After completing evaluation of Oral Proposal Packages, DARPA will (1) invite the proposer to enter negotiations or (2) inform the proposer that they have not been selected to enter negotiations.

5.2. General Guidelines

Upon favorable review of the proposal and subject to the availability of funds, the Government may choose to award an OT for Prototype agreement.

The Agreements Officer reserves the right to negotiate directly with the proposer on the terms

and conditions prior to execution of the resulting OT agreement, including payment terms, and will execute the agreement on behalf of the Government. Be advised, only a Government Agreements Officer has the authority to enter into, or modify, a binding agreement on behalf of the United States Government.

In order to receive an award:

a. All proposers must be registered in SAM. See http://www.darpa.mil/work-with-us/additional-baa for further information.

   International entities can register in SAM by following the instructions in this link: https://www.fsd.gov/sys_attachment.do?sys_id=c08b64ab1b4434109ac5ddb6bc4bcbb8.

   NOTE: New registrations can take an average of 7-10 business days to process in SAM. SAM registration requires the following information:

   - SAM Unique Entity Identifier (UEI)
   - TIN
   - Commercial and Government Entity (CAGE) Code. If a proposer does not already have a CAGE code, one will be assigned during SAM registration.
   - Electronic Funds Transfer information (e.g., proposer's bank account number, routing number, and bank phone or fax number).

b. Proposers must also register in the prescribed Government invoicing system (Wide Area Work Flow: https://wawf.eb.mil/xhtml/unauth/registration/notice.xhtml). DARPA Contracts Management Office (CMO) personnel will provide assistance to those proposers from whom a proposal is requested.

c. Proposers must be determined to be responsible by the Agreements Officer and must not be suspended or debarred from award by the Federal Government nor be prohibited by Presidential Executive Order and/or law from receiving an award.

d. Being asked to submit a proposal does not guarantee that a proposer will receive an award. The Government reserves the right not to make an award.

5.3. Controlled Unclassified Information (CUI) and Controlled Technical Information (CTI) on Non-DoD Information Systems

Further information on Controlled Unclassified Information identification, marking, protecting and control, to include processing on Non-DoD Information Systems, is incorporated herein and can be found at www.darpa.mil/work-with-us/additional-baa. US2QC will prepare and provide a Controlled Unclassified Information (CUI) guide to performers if they plan on using CUI, to include proprietary information as well as export-controlled technology.

5.4. Representations and Certifications

All proposers are required to submit DARPA-specific representations and certifications for OT for Prototype awards in order to be eligible to receive an OT award. See http://www.darpa.mil/work-with-us/reps-certs for further information on required representations and certifications for OT for Prototype awards.

5.5. Competition Sensitive Information

DARPA policy is to treat all submissions as competition sensitive and to disclose their contents only for the purpose of evaluation. Restrictive notices notwithstanding, during the evaluation process, submissions may be handled by support contractors for administrative purposes and/or to assist with technical evaluation. All DARPA support contractors performing this role are expressly prohibited from performing DARPA sponsored technical research and are bound by appropriate nondisclosure agreements. Input on technical aspects of the proposals may be solicited by DARPA from non-Government consultants/experts who are strictly bound by the appropriate non-disclosure requirements.

5.6. Intellectual Property (IP)

The Government is open to flexible IP proposals from performers that are advantageous to the Government.

IP proposals should, at a minimum allow DARPA to:

1) Flexibly brief U.S. Government stakeholders regarding technical progress and accomplishments,
2) Allow validation of technical performance, capabilities, and accomplishments by independent technical (potentially non-Government) experts, subject to NDA restrictions,
3) Facilitate discussion of technical challenges and applications with the broader technical community – for example, by starting a new DARPA program that attempts to solve a serious technical challenge that limits further progress,
4) Support analyses of alternatives, and
5) Support transition opportunities, including design and performance data required to support other acquisition activities. These latter activities may require the Government to conduct an independent performance analysis.

The Government will consider proposals that allow a proposer to retain the exclusive right to manufacture a quantum computer based on their wholly-owned IP.

The Government will consider proposals for performers to receive favorable rights related to new IP generated as a result of collaboration with the Government test and evaluation team. It is the Government's goal for the collaborative test and evaluation relationship to be clearly beneficial for participating performers.

6. PS DEFINITIONS

"Abstracts" refers to the first of the required Proposer Submissions, which is detailed in Section 4.

"Additional Slides with Answers" refers to a proposer's submission in response to the Government Program Team's Clarifying Questions.

"Clarifying Questions" refers to questions that the Government Program Team will provide to all Proposers one (1) week before their scheduled Oral Presentation.

"Government Evaluation Team" refers to the Program Manager, who will evaluate Abstracts, and U.S. Government employees who will work with the Program Manager to evaluate Oral Proposal Packages.

"Government Purpose" means any activity in which the United States Government is a party, including cooperative agreements with international or multi-national defense organizations, or sales or transfers by the United States Government to foreign governments or international organizations. Government purposes include competitive procurement but do not include the rights to use, modify, reproduce, release, perform, display, or disclose intellectual property for commercial purposes or authorize others to do so.

"Government Purpose Rights" means the rights to use, duplicate, or disclose intellectual property within the Government without restriction; and release or disclose intellectual property outside the Government and authorize persons to whom release or disclosure has been made to use, modify, reproduce, release, perform, display, or disclose that intellectual property for United States government purposes only.

"Intellectual Property" means the intangible creations of the human mind and includes, but is not limited to, subject inventions and data.

"Limited Rights" means the rights to use, modify, reproduce, release, perform, display, or disclose intellectual property, in whole or in part, only within the Government for the limited purpose of evaluation of satisfying the requirements of the Agreement. The Government may not, without the written permission of the party asserting limited rights, release or disclose the intellectual property outside the Government, use the intellectual property for manufacture, or authorize the intellectual property to be used by another party, except that the Government may reproduce, release, or disclose such intellectual property or authorize the use or reproduction of the intellectual property by persons outside the Government if—

(i) The reproduction, release, disclosure, or use is—

(A) Necessary for emergency repair and overhaul; or

(B) A release or disclosure to—

(1) A covered Government support contractor in performance of its covered Government support contract for use, modification, reproduction, performance, display, or release or disclosure to a person authorized to receive limited rights intellectual property; or

(2) A foreign Government, of intellectual property other than detailed manufacturing or process intellectual property, when use of such data by the foreign Government is in the interest of the Government and is required for evaluation or informational purposes;

(ii) The recipient of the intellectual property is subject to a prohibition on the further reproduction, release, disclosure, or use of the technical data; and

(iii) The contractor or subcontractor asserting the restriction is notified of such reproduction, release, disclosure, or use.

"Nontraditional Defense Contractor" is defined in 10 U.S.C. § 3014 (formerly 10 U.S.C. § 2302(9)) as an entity that is not currently performing and has not performed, for at least the one-year period preceding the solicitation of sources by the DoD for the procurement or transaction, any contract or subcontract for the DoD that is subject to full coverage under the cost accounting standards prescribed pursuant to 41 U.S.C. § 1502 and the regulations implementing such section. This includes all small business concerns under the criteria and size standards in 15

U.S.C. 632 and 13 C.F.R. Part 121.

"Oral Presentation" refers to either the live or recorded presentation of a proposer's Oral Presentation Slides and Additional Slides with Answers.

"Oral Presentation Slides" refers to slides to be submitted with the Oral Proposal Package to address Presentation 1, Presentation 2, and Presentation 3.

"Oral Proposal Package" refers to the Proposer Submissions that include the Oral Presentation Slides, the Additional Slides with Answers, the Oral Presentation (live and recorded versions), and the Supplementary Documents.

"Proposer Questions Regarding Abstracts" refers to any questions submitted in response to this Program Solicitation that may be addressed in the posted FAQ document prior to the Abstract submission deadline.

"Proposer Questions Regarding Oral Proposal Packages" refers to any questions submitted in response to this Program Solicitation that may be addressed in the posted FAQ document prior to the Oral Proposal Package submission deadline.

"Proposer Submissions" refers to any information provided to the government in response to this Program Solicitation, including Abstracts and Oral Proposal Packages supplied in oral, electronic, and/or hardcopy form.

"Prototype Other Transaction" refers to the type of OT that may be awarded as a result of this PS. This type of OT is authorized by 10 U.S.C. § 4003 (formerly 10 U.S.C. § 2371b) for prototype projects directly relevant to enhancing the mission effectiveness of military personnel and the supporting platforms, systems, components, or materials proposed to be acquired or developed by the DoD, or for theimprovement of platforms, systems, components, or materials in use by the armed forces. In accordance with 10 U.S.C. § 4003(f) (formerly 10 U.S.C. § 2371b(f)), the Government may award a follow-on production contract or Other Transaction (OT) for any OT awarded under this solicitation if: (1) that participant in the OT, or a recognized successor in interest to the OT, successfully completed the entire prototype project provided for in the OT, as modified; and (2) the OT provides for the award of a follow-on production contract or OT to the participant, or a recognized successor in interest to the OT.

"Prototype Project" is described in the DoD Other Transactions Guide (Version 1, Nov. 2018) issued by the Office of the Under Secretary of Defense for Acquisition and Sustainment: https://www.dau.edu/guidebooks/Shared%20Documents/Other%20Transactions%20(OT)%20Guide.pdf.

"Small Business Concerns" is defined in the Small Business Act (15 U.S.C. § 632).

"Supplementary Documents" refers to additional materials, apart from the Oral Presentation Slides, submitted as part of the Oral Proposal Package.

7. ACRONYMS

A&AS: Advisory and Assistance Services
C.F.R.: Code of Federal Regulations
CMO: DARPA Contracts Management Office
COTS: Commercial Off The Shelf
CTI: Controlled Technical Information
CUI: Controlled Unclassified Information
DARPA: Defense Advanced Research Projects Agency
DoD: Department of Defense
DSO: DARPA Defense Sciences Office
FAPIIS: Federal Awardee Performance and Integrity Information System
FFRDC: Federally Funded Research & Development Center
GFlops: Billion Floating Point Operations per Second
NDA: Non-Disclosure Agreement
NISQ: Noisy Intermediate-Scale Quantum
OT: Other Transaction
PIA: Procurement Integrity Act
PS: Program Solicitation
POC: Point of Contact
R&D: Research and Development
ROM: Rough Order of Magnitude
SAM: System for Award Management
SETA: Scientific Engineering Technical Assistance
TA: Technical Area
US2QC: Underexplored Systems for Utility-Scale Quantum Computing
U.S.C.: United States Code
USG: United States Government