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SAND2020-4411C

Vanguard II Pre-bid Conference



VANGUARD

PRESENTED BY

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Sandia National Laboratories is a multimission laboratory managed and operated by National Technology & Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International Inc., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525.

Before We Get Started

- Just because I don't cover it here does NOT mean it is not important!
- I'm presenting a largely technical view of the RFQ
- You will notice that I will skip over sections contained in the RFQ
 - Does not mean they are not important!!!
- Please address ALL questions after this session to Matthew Stewart
- Matthew will involve me as appropriate
- Please interrupt me with questions as I move forward

RFQ Overview

- Section 2b Magnitude of Effort \$15,000,000
 - Should be noted that like all organizations Sandia has overheads.
 - You should not assume that we have all of this projected budget.
- Section 2c Small Business Set-Aside
 - Prime needs to be a small business.
 - We would like you to communicate anticipated partnerships (Section 2d).
- Section 2e Questions
 - Save us all some time and address your questions to Matthew Stewart, he will involve me as appropriate.
- Section 2h Mandatory Pre-bid Conference
 - This is it
 - Opportunity for bi-weekly calls following this pre-bid conference

RFQ Overview

- Section 2i

All responses to this RFQ shall first list the requirement as stated in this RFQ, verbatim, including requirement number, followed by the Offeror's response to that requirement. Requirements often state a desired system characteristic. The Offeror shall describe and quantify, where appropriate, how they satisfy the desired characteristic. Responses to requirements should be in a form appropriate for inclusion in a final Statement of Work (SOW). Additional descriptive and/or explanatory information that is not intended for inclusion in a final SOW should be clearly delineated.

- Example:

RFQ Overview

- Section 2i continued
 - Mandatory Hardware Requirements (must meet them all)
 - Mandatory Software Requirements (must meet them all)
 - Mandatory means mandatory

RFQ Overview

- Section 2i continued
- **A. Technical proposals**

Requirements and Objectives will be categorized as follows:

(MR) Mandatory Requirement

(TO) Target Objective

(DO) Descriptive Objective

(VO) Value add Objective

Attached to this RFQ is a document titled "Vanguard II Technical Objectives." This document will govern evaluation of technical proposals. Failure to meet any Mandatory Requirement (MR) will result in a proposal being deemed unresponsive and the proposal will not be considered. Target Objectives designated (TO), while not mandatory are important to the success of the project therefore if an Offeror cannot fully meet a (TO) the Offeror shall provide a response describing what can be provided and a plan to ultimately meet the objective. Offerors that meet most or all the target objectives will receive a higher evaluation rating than Offerors that can only meet a few and/or cannot provide an alternate solution. Mandatory Requirements and Target Objectives (MR and TO) take the form of declarative sentences, e.g. the Offeror shall provide. The Offeror shall also provide a response to all Descriptive Objectives labeled (DO). A typical objective labeled (DO) will ask for a description of what the Offeror can provide in a particular technical area. Objectives may also be labeled (VO), indicating that the response to the objective is an opportunity for the Offeror to provide information in a general technology area that was not more directly solicited. Statement of Work (SOW) items will be developed from responses to objectives marked (TO). SOW items may or may not be developed based on responses to objectives marked (DO) and (VO).

All proposals will be evaluated by a tri-lab team composed of personnel from Sandia National Laboratories (SNL), Lawrence Livermore National Laboratories (LLNL), and Los Alamos National Laboratories (LANL). All proposals will be protected by Non-Disclosure Agreements.

RFQ Overview

- Section 2i continued
- **B. Ability to support and collaborate on the development of a heterogeneous system infrastructure**

In addition to investigating advanced technologies and their applicability to the Advanced Simulation and Computing mission, respondents will be measured on their ability as a supplier to collaborate and contribute to the development of a system infrastructure (software and hardware) that can support heterogeneity, both node level and system level. A supplier must be capable of delivering a wide range of technologies integrated at the node level as well as disparate node architectures integrated together at the system level. This will require broad capabilities in both hardware integration and software development by the supplier.

- **C. Related experience and past performance**

Related experience is a measure of the degree to which the projects referenced are similar in scope, size and complexity to the proposed project. NTESS wants to ensure that the Offeror is capable of and has completed jobs similar to what is outlined in the Technical Objectives document. The Offeror must demonstrate prior experience and knowledge of projects similar to this one in regard to project complexity, coordination with other projects, and scope of work. Please include at least one (1) Government customer in your list of references. Offer must also demonstrate a thorough knowledge of and experience with their proposed solution. Please include years of service, applicable earned certifications, and training received, if applicable.

RFQ Overview

- Section 2j Subcontract Award by **Best Value Determination – Superior Technical Features Most Important**

Offeror shall quote its most favorable terms, from both a price/cost and technical standpoint, since any subcontract or agreement resulting from this solicitation may be awarded on the basis of initial offers. The proposal determined to be the overall best-value to NTESS will be selected. Best overall value will be determined by comparing differences based on Offeror's relative capabilities and price/cost in relation to all other offers received.

NTESS is more concerned with obtaining superior technical features than with making an award at the lowest overall price/cost to NTESS. However, NTESS will not make an award at a significantly higher overall cost to NTESS to achieve slightly superior technical features.

In order to maximize its expenditure of Government (taxpayer) funding, NTESS reserves the right to accept, reject, or negotiate any or all terms of the Offeror's proposal.

Technical Objectives

Vanguard II Technical Objectives

1. Introduction

- Read the introduction
- Overview of the scope of the Vanguard Program in general and Vanguard II more specifically
- Recall Section 2i
 - The Technical Objectives document states our objectives.
 - At a high level we are looking for a platform that primarily consists of the target technology listed in the Mandatory Requirement 2.1.1
 - The platform WILL run the Advanced Tri-lab Software Environment (ATSE) and you must provide any vendor/hardware specific software components required to accomplish this, see Mandatory Requirements 2.2.1 and 2.2.2
 - Also see Software section 3.4 and Programming Environment 3.5 for more detail
 - Our broader goal is to a partner to develop a hardware and software infrastructure for a heterogeneous platform, see Introduction and Section 3.6

Technical Objectives

2. Mandatory Requirements

2.1 Mandatory Hardware Requirements

2.1.1 (MR) The node architecture shall consist of a combination of general-purpose processor(s), accelerator(s) and memory that are tightly integrated.

2.1.2 (MR) All platform hardware shall be Nationally Recognized Testing Laboratories (NRTL) certified and bear appropriate NRTL labels.

2.1.3 (MR) The Offeror shall provide all applicable safety requirements introduced by any novel or custom mechanical or electrical characteristics beyond commonly known and established datacenter technologies, including but not limited to specialized power bus bars, coolants, rail hardware, etc.

2.2 Mandatory Software Requirements

2.2.1 (MR) The proposed system shall support running a Linux-based operating system on all nodes of the system.

2.2.2 (MR) The Offeror shall provide all required proprietary and optimized Linux drivers for the proposed system, as well as any vendor-specific diagnostics, for integration into the Advanced Tri-lab Software Environment (ATSE) and Tri-lab Operating System Stack (TOSS) (ref 3.4). Open source drivers are strongly preferred.

2.3 Mandatory Response Format

2.3.1 (MR) All responses to this RFP shall first list the requirement (MR) or objective (TO, DO, VO) as stated in this RFP, verbatim, including requirement or objective number, followed by the Offeror's response to that requirement or objective. The Offeror shall state and or describe and quantify, where appropriate, how they satisfy the requirement or objective. Responses to requirements and objectives should be in a form appropriate for inclusion in a final Statement of Work (SOW). Additional descriptive and/or explanatory information that is not intended for inclusion in a final SOW should be clearly delineated.

Technical Objectives

3. Objectives (TO, DO and VO)

- (TO) – From Introduction: Target Objectives designated (TO), while not mandatory are important to the success of the project therefore if an Offeror cannot fully meet a (TO) the Offeror shall provide a response describing what can be provided and a plan to ultimately meet the objective.
 - Declarative sentences, “Offeror shall provide, shall be capable, shall support, shall include, etc.”
 - Example: 3.4.3 (TO) The proposed system shall be capable of running the Advanced Tri-lab Software Environment (ATSE) described in the preceding paragraphs, with reasonable modifications made for the proposed system hardware.
- (DO) – From Introduction: A typical objective labeled (DO) will ask for a description of what the Offeror can provide in a particular technical area.
 - “Offeror shall describe”
 - Example: 3.4.4 (DO) The Offeror shall describe their proposed approach for integrating vendor-supplied software or other required software components with ATSE. Spack packages are the preferred software delivery mechanism.
- (VO) – From Introduction: indicating that the response to the objective is an opportunity for the Offeror to provide information in a general technology area that was not more directly solicited.
 - Example: Example: 3.4.9 (TO) The proposed system shall support running the SLURM workload manager for scheduling user applications on the system.
 - 3.4.10 (VO) The Offeror shall identify any additional workload manager solutions being offered for the proposed system and describe their potential benefits.

Technical Objectives

3.2 System Description

- Very important, used to interpret the balance of the Technical Objectives
- Diagrams are very useful!!
- Stick to the format it will make it easy to reference (for you and for us)
- Will help you with your page limit, for example

Technical Objectives

3.3 Hardware Architecture

*National Nuclear Security Administration (NNSA) leadership class platforms are required to host applications up to the **full-scale of the platform** (capability mode) and required to support multiple applications running simultaneously on the platform (capacity or throughput mode). The goal of the Vanguard program is to demonstrate the viability of new technologies to host NNSA mission applications. This goal includes not only execution but optimization of NNSA mission applications and workflows at the maximum scale of the platform.*

- Lots of Descriptive Objectives, we want you to describe your proposed platform
- 3.3.2 (TO) The proposed platform configuration shall consist of the Offeror's optimal configuration of **approximately 2048 compute nodes** of the proposed node architecture in fully populated racks/cabinets consistent with the Offeror's proposed infrastructure. The proposed number of compute nodes may be rounded up or down to fit into fully populated compute racks to approximately equal 2048.
- Many objectives asking about the node hardware architecture, memory bandwidth, capacity, etc.
- We understand these are projections
- We will work towards finalizing these in the SOW or agree upon a date when they will be finalized

Technical Objectives

3.4 Software

Sandia will be responsible for furnishing and adapting ATSE to the proposed system; however, the platform provider must provide all of the essential information and software drivers necessary to integrate ATSE with the proposed hardware platform.

- We will run ATSE
- We are open to running other stacks
- Section provides a lot of background on what ATSE is, versions are just current examples
- Note the two mandatories
- Lots of opportunity for differentiation
- Looking for a collaborative relationship

Technical Objectives

3.5 Programming Environment

- Programming environment provided via ATSE
- Note the languages, runtimes, libraries that we require in this section
- Proprietary components that are required to make use of the proposed hardware must be provided and integrated into ATSE
- Proprietary components that can enhance use/performance should be proposed
- Lots of value add opportunities here in this section

Technical Objectives

3.6 Collaboration

As part of investigating advanced technologies and their applicability to the Advanced Simulation and Computing mission, the Vanguard II program will begin development of, and investigate the gaps and challenges in fielding a hardware and software infrastructure that is capable of supporting not only a single heterogeneous node architecture but a heterogeneous system consisting of multiple different node architectures. Baseline software objectives are listed in Section 3.4. The ATSE software infrastructure, originally developed for Vanguard I, will be expanded to support any node architectures and associated software components as necessary. We expect that supporting a range of technologies integrated into a single system will present new and significant challenges which the Vanguard program intends to investigate and address going forward. A primary driver for this investigation is to support evolving application types and workflows that can better leverage an increasingly diverse technology landscape.

3.6.1 (VO) The Offeror shall describe both their interest in collaborating with and their ability to contribute with NTESS in the effort described in Section 3.6. In particular, the Offeror shall describe any hardware and software integration capabilities applicable to this effort to integrate multiple disparate node architectures that have not been covered in other sections.

Technical Objectives

3.7 Power and Energy

- Sandia has a long history of leadership in this area.
- We want to know what can be measured and what can be controlled
- We want to know what the interfaces to measurement and control are

3.7.6 (TO) The system shall include an integrated API for all levels of measurement and control of power relevant characteristics of the system compliant with the High Performance Computing Power Application Programming Interface Specification.

- Specification reference: https://github.com/pwrapi/powerapi_spec
- Community sites: <https://github.com/pwrapi/> and <https://eehpcwg.llnl.gov/power-api.html>

Technical Objectives

3.8 Platform Storage

- We basically want to know how you can integrate our to-be existing storage system into your proposed platform
- It will be DDN storage and we have provided contacts at DDN for you to consult with regarding DDN specific technologies
- We have also provided how we intend to use the storage and a metric to measure
- We would like a collaborative partner in this area as with all others

Technical Objectives

3.9 Systems Management

- We need a manageable platform to enhance our ability to stabilize a first of a kind technology
- Section includes objectives that are a product of our experience and past pain points
- Good opportunity to present your skills and experience in this area and wow us
- Can't meet Vanguard goals if we can't boot the system and keep it up and running
- Don't ignore this area, it is often de-emphasized in responses

Technical Objectives

3.10 Performance/Platform Acceptance

- Sandia will execute HPL and HPCG full-scale
- This implies a huge amount of things are working
- System boots and is manageable
- Software stack functioning
- System stable enough to not pop a node for the duration of full-scale runs
- Lots more
- While we will do this Offeror is responsible for supporting our efforts and directly invested in the success of this effort
- Note we do want performance projections for the proposed platform

Technical Objectives

3.11 Facilities and Site Integration

- Should be most if not all the information you need regarding our site
- We are interested in power and cooling efficiency
- 725 is a state-of-the-art facility we would like a resident that lives up to the house it will be put in
- Don't forget the Mandatories in this area!!

Technical Objectives

3.12 Maintenance

- Our basic need is a parts cache that allows us to accomplish troubleshooting and replacement of failed parts
- The parts cache is then replenished
- This is the typical CTS model if you are familiar with it
- We would like to hear about other maintenance models you have or you feel appropriate