CORAL RFP B604142 Attachment 3

PROPOSAL EVALUATION
and
PROPOSAL PREPARATION INSTRUCTIONS

December 31, 2013

CORAL: Collaboration of Oak Ridge, Argonne and Livermore National Laboratories

Department of Energy

Office of Science's Advanced Scientific Computing Research (ASCR) Program and the National Nuclear Security Administration's

Advanced Simulation and Computing (ASC) Program

Contents

1 PROPOSAL EVALUATION & AWARD INFORMATION

1.1 Evaluation Factors & Basis for Selection

The CORAL evaluation will be performed by members of the staff from Argonne National Laboratory (ANL), Lawrence Livermore National Laboratory (LLNL), and Oak Ridge National Laboratory (ORNL), collectively known as the Laboratories herein. LLNL is managed by Lawrence Livermore National Security, LLC (LLNS) and operates under LLNS procurement policies and procedures consistent with the Prime Contract between LLNS and the United States Government, represented by the DOE NNSA. ANL is managed by UChicago Argonne, LLC. ORNL is managed by UT-Battelle LLC.

LLNL staff will seek assistance from Sandia National Laboratory (SNL) and Los Alamos Laboratory (LANL) staff in the proposal evaluation process.

Evaluation factors that the Laboratories will use to evaluate proposals are performance features, diversity, supplier attributes, and price. The Laboratories have identified the performance features, diversity factors, and supplier attributes listed below, which should be discussed in the proposal. Offerors may identify and discuss other performance features, diversity factors, and supplier attributes that they believe may be of value to the Laboratories. If the Laboratories agree, consideration may be given to them in the evaluation process. The Laboratories' assessment of each proposal's evaluation factors will form the basis for selection. The Laboratories intend to select the set of two responsive and responsible Offerors whose proposals contain the combination of price, performance features, diversity and supplier attributes that offer the best overall value to the Laboratories. The Laboratories will determine the best overall value by comparing differences in performance features, diversity and supplier attributes offered with differences in price, striking the most advantageous balance between expected performance, supplier attributes, diversity and the overall price. Offerors must, therefore, be persuasive in describing the value of their proposed performance features, diversity factors, supplier attributes and price in enhancing the likelihood of successful performance or otherwise best achieving the Laboratories' objectives for CORAL.

The Laboratories envision NRE (Non-Recurring Engineering, also known as Research and Development) and machine build awards to two companies (Company Alpha, Company Gemini). The Laboratories seek diversity, as judged by the Laboratories, between the system architectures offered by Company Alpha and Company Gemini. Refer to Section 1.8 below for related information.

Subject to annual appropriated funding from Congress: 1.) LLNS intends to award the two NRE subcontracts, one to Company Alpha and the other to Company Gemini; 2.) ANL intends to award a machine build subcontract to Company Alpha; 3.) ORNL intends to award a machine build subcontract to Company Gemini; 4.) LLNS intends to award a machine build subcontract to either Company Alpha or Company Gemini; and 5.) the Laboratories may award second machine build subcontracts (with machine purchase as a unilateral option) as a risk mitigation strategy or as an option to provide additional computing resources for a site. For example, under the scenario listed in 2.) above, one laboratory may award a second machine build subcontract to Company Gemini to mitigate risk in the event that a "no-go" decision is made for the build of the Company Alpha solution (for more information on the CORAL Go/No-Go decision process, please see Article 16 of the LLNL Sample Build Subcontract).

The Laboratories reserve the right to: 1) make selections on the basis of initial proposals; 2) negotiate with any or all Offerors for any reason; 3) award subcontracts to one or more Offerors; 4) award subcontracts based on all or part of an Offeror's proposal, including any options contained in the proposal; 5) reject any or all proposals; 6) waive any minor irregularities in any proposal; and 7) cancel this RFP at any time prior to award without cost to the Laboratories.

1.2 Description of Requirement Categories

Mandatory Requirements (designated MR) in the Draft Coral Build Statement of Work (SOW) are performance features that are essential to the Laboratories' requirements, and an Offeror must satisfactorily propose all Mandatory Requirements in order to have its proposal considered responsive.

Mandatory Option Requirements (designated MO) in the Draft SOW are features, components, performance characteristics or upgrades whose availability as options to the Laboratories are mandatory, and an Offeror must satisfactorily propose all Mandatory Option Requirements in order to have its proposal considered responsive. The Laboratories may or may not elect to include such options in the resulting subcontract(s). Therefore, each Mandatory Option Requirement shall appear as a separately identifiable item in the Coral Build Technical Proposal (Volume 1) and Coral NRE and Build Price Proposal (Volume 5). MOs are alternative features, components, performance characteristics or system sizes that may be considered for technical and/or budgetary reasons.

Technical Option Requirements (designated TO-1, TO-2, or TO-3) in the Draft SOW are features, components, performance characteristics, or upgrades that are important to the Laboratories, but which will not result in a nonresponsive determination if omitted from a proposal. Technical Options add value to a proposal. Technical Options are prioritized by dash number. TO-1 is most desirable to the Laboratories, while TO-2 is more desirable than TO-3. Technical Option Requirement responses will be considered as part of the proposal evaluation process; however, the Laboratories may or may not elect to include Technical Options Requirements in the resulting subcontract(s). Each proposed Technical Option Requirement should appear as a separately identifiable item in the Coral Build Technical Proposal (Volume 1) and Coral NRE and Build Price Proposal (Volume 5). Technical Option Requirements may also affect the Laboratories' perspective of the ideal CORAL system(s), depending on future budget considerations.

Target Requirements (designated TR-1, TR-2, or TR-3), identified throughout the Draft SOW, are features, components, performance characteristics, or other properties that are important to the Laboratories, but which will not result in a nonresponsive determination if omitted from a proposal. Target Requirements add value to a proposal. Target Requirements are prioritized by dash number. The aggregate of MRs and TR-1s form a baseline system. TR-2s are goals that boost a baseline system, taken together as an aggregate of MRs, TR-1s and TR-2s, into the moderately useful system. TR-3s are stretch goals that boost a moderately useful system, taken together as an aggregate of MRs, TR-1s, TR-2s and TR-3s, into the highly useful system. Therefore, the ideal CORAL system will meet or exceed all MRs, TR-1s, TR-2s and TR-3s. Target Requirement responses will be considered as part of the proposal evaluation process.

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MRs, MOs, TOs, TRs, and additional features proposed by the selected Offeror(s), and of value to the Laboratories, will be included in a final negotiated SOW(s) and incorporated within the resulting subcontract(s).

It should be noted that verb forms such as "will", "will provide", or "will include" are used generally throughout the Draft SOW to describe desired outcomes and not mandatory requirements.

1.3 Performance Features

Performance Features - Technical Proposal Excellence

The Laboratories will validate that an Offeror's technical proposal satisfies the Mandatory Requirements and Mandatory Option Requirements. The Laboratories will assess how well an Offeror's technical proposal addresses the Technical Option Requirements and Target Requirements. An Offeror is not solely limited to discussion of these features. An Offeror may propose other features or attributes if the Offeror believes they may be of value to the Laboratories. If the Laboratories agree, consideration may be given to them in the evaluation process. In all cases, the Laboratories will assess the value of each proposal as submitted.

Performance Features - General

- How well the proposed solution meets the overall programmatic objectives expressed in the Draft SOW.
- The degree to which the technical proposal meets or exceeds the Target Requirements and Technical Option Requirements.
- Functionality, performance, and scalability of the proposed systems.
- Quality and quantity of the CORAL Benchmark results. Each benchmark result will be assessed. The TR-1 "Scalable Science Benchmarks" and "Throughput Benchmarks" projected results in Offeror responses are of highest priority. The TR-1 "Data-Centric Benchmarks" and "Skeleton Benchmarks" are also of high priority. The TR-2 "Throughput Benchmarks", "Data-Centric Benchmarks" and "Skeleton Benchmarks" are of secondary importance. The TR-3 "Micro Benchmarks" are of lowest priority and are provided primarily to assist Offeror in projecting results of higher priority benchmarks.
- Delivered performance and scalability, including the delivered bandwidth and latency to applications expressed as MPI only and hybrid MPI+X with X being chosen from a set that includes OpenMP, pthreads and OpenACC. Of particular interest is scalability of MPI implementation in terms of delivered performance of collective operations and required memory buffering per MPI task.
- Reliability, availability, and serviceability of the system, such as MTABF, MTTR, hardware and software failsafe features, effectiveness of diagnostics and data protection mechanisms.
- Features, reliability, performance and scalability of the proposed IO nodes, burst buffer solution and flexibility and robustness of the IO interfaces to the CORAL file system.
- Features, reliability, performance and scalability of the proposed CORAL file system.
- Minimization of physical plant requirements, such as facilities modifications for installation, system footprint, power, and cooling.

- Credible roadmaps for hardware and software. The Laboratories are not interested in acquiring technology for which DOE is the sole market, nor are we interested in acquiring end of life technology.
- The proposed NRE activities leading to the CORAL systems for impact, risk reduction, effectiveness, and DOE application performance.
- The quality of the coupling of the NRE proposal to the proposal for the delivered system as demonstrated through the Go/No-Go linkage.
- The degree of innovation in the proposed NRE activities.
- The extent to which the proposed NRE achieves substantial gains over existing industry roadmaps and trends.
- The extent to which the proposed NRE will impact HPC and the broader marketplace.
- Credibility that the proposed NRE will achieve stated results.
- Realism and completeness of project work breakdown structure.
- Support of official and de facto standards for hardware and software and open source development of software.
- The proposed hardware and software support models and how these models will provide at least five years of practical system maintenance. The feasibility of the support models for open source components must be realistically and persuasively addressed. Specifically, the Laboratories will assess how well the maintenance model will work in practice.
- The proposed Open Source software development projects, which address key technological areas for HPC systems that directly address CORAL requirements with an Open Source solution.
- Total Cost of Ownership of the systems including capital and license costs, maintenance costs, siting costs, and operating costs among others.

Performance Features - Feasibility of the Schedule of Deliverables

Schedule is of critical importance to the Laboratories.

- The Laboratories will assess the proposed delivery schedule relative to the delivery requirements for the machine(s).
- The Laboratories will consider the realism of the proposed schedule including how Offeror would manage the tactical overlap of multiple large system deliveries and deployments in a similar time frame given the Offeror's development, manufacturing, testing facilities, support offering and the quality and roll out of technology proposed in the project and management plans.
- The Laboratories will evaluate the realism and completeness of the proposed project Gantt chart.

Performance Features - Feasibility of Successful Performance

- The Laboratories will assess the likelihood that the Offeror's machine(s) will work as proposed.
- The Laboratories will assess the risks, to both the Offeror and the Laboratories, associated with the proposed solution as well as the Offeror's assessment of those risks.

- The Laboratories will evaluate how well the proposed technical approach and solutions align with the Offeror's corporate product roadmap and the level of corporate commitment to the project.

1.4 Supplier Attributes

The Laboratories will evaluate the following supplier attributes.

Supplier Attributes - Capability

- The Offeror's experience and past performance in providing high-end computing systems and its demonstrated commitment to high-end computing customers.
- The Offeror's strong commitment to providing high-end computing systems for the indefinite future.
- The Offeror's demonstrated ability to meet complex and far-reaching schedule and delivery obligations.
- The alignment of this proposal with the Offeror's product strategy.
- The Offeror's demonstrated ability to work as a member of a successful large-system integration project.
- The Offeror's history of working with third parties to ensure third-party software or other components operate correctly on the system.
- The expertise and skill level of key Offeror personnel.
- The contribution of the management plan and key personnel to successful and timely completion of the work.
- The Offeror's ability to diagnose and to determine root cause of hardware and software problems in a timely manner.
- The Offeror's manufacturing and testing facilities.

If other companies (i.e., lower-tier subcontractors) are significant parties to some proposals, the Laboratories will evaluate the prime contractor on its ability to ensure the responsiveness of its partners to the performance requirements for the duration of the subcontracts. The Laboratories believe that only aggressive, top-level management relationships that clearly identify who is responsible for what among the partners can reduce the performance risk posed by this approach.

Supplier Attributes - Open Source Position

Solutions based on Open Source are highly desirable to the Laboratories.

- The alignment of this proposal with the Offeror's Open Source software strategy.
- The Offeror's experience and past performance in working with communities to provide solutions based on Open Source software including working with communities to integrate enhancements and bug fixes back upstream.
- The Offeror's development and support resources available to the partnership.

Supplier Attributes - Financial Condition

An Offeror's financial condition is of critical importance to Laboratories. The successful Offeror should have sufficient financial resources to perform the resulting subcontracts.

- The Offeror's financial condition (refer to Section 8 of this document).

Supplier Attributes - Consortium

If a proposal is submitted by a consortium led by an integrating subcontractor (as opposed to the primary original equipment manufacturer), the Laboratories will assess the likelihood that the

integrating subcontractor can ensure the responsiveness of its partners in the consortium to the performance requirements for the duration of the subcontracts. This assessment will be based on the proposed detailed consortium management plan that explains the corporate relationships and responsibilities between or among the parties to the consortium and any other information provided by the Offeror or otherwise available to the Laboratories. The Laboratories believe that only aggressive, top-level management relationships that clearly identify who is responsible for what among the members of the consortium can reduce the performance risk posed by the integrating subcontractor-led consortium approach. In particular, the Laboratories will assess how component hardware and software development, hardware and software bug fix, system testing and problem root cause identification and resolution (*FOR ALL PROPOSED HARDWARE AND SOFTWARE,* not only those developed directly by the consortium) responsibility is assigned and committed to in the proposed management plan.

1.5 Price

The Laboratories will evaluate the following price related factors.

- Reasonableness of the total proposed price and the prices of proposed components and options in a competitive environment.
- Reasonableness, transparency and workability of Offeror's memory price risk sharing model.
- Proposed price compared to the perceived value.
- Life cycle costs including siting, power, cooling and floor space as compared to those of the competition.
- Price trade offs and options embodied in the Offeror's proposal.
- Financial considerations, such as price versus value and financial incentives.

1.6 Diversity

This acquisition is unique in that DOE/SC has a mission need for architectural diversity between systems at the two Leadership Computing Facility centers at ANL and ORNL. Systems can vary from one another in many different dimensions and the Laboratories will consider multiple dimensions, including:

- System (architecture, interconnect, input/output (IO) subsystem, density, resilience, etc.);
- Node (heterogeneous, homogeneous, memory and processor architectures, etc.);
- Software (Operating system (OS), programming environment, IO, file system, etc.);
- Hardware (memory types and technology, fat-thin-accelerated cores, network, etc.).

In determining how much is sufficient diversity, the Laboratories will consider if the systems have:

- Few big differences;
- Many little differences;
- Different technologies (the greater value to DOE is diversity in key technologies such as nodes and interconnects rather than diversity in racks, power supplies, etc.)
- Different ecosystems (i.e., vendors involved and supply chains).

Selecting a diverse set of system architectures provides many advantages. It promotes a rich and healthy high performance computing (HPC) ecosystem with a competition of ideas and price. The HPC ecosystem is important to DOE and national competitiveness. Further, diversity

reduces risk that may be caused by delays or failure of a particular technology or shifts in vendor business focus, staff or financial health.

1.7 Options

The Laboratories may, at their sole discretion, award any proposed Mandatory Option(s) or Technical Option(s) at the time of initial award. The Laboratories may also decide to include any proposed Mandatory Option(s) or Technical Option(s) in the Coral Build subcontracts subject to mutually acceptable option exercise date(s).

The Laboratories may include a fixed price option to reduce the system later if annual appropriated funding from Congress makes the reduction necessary. This option, if exercised prior to CORAL build, would reduce the total fixed price of the CORAL Build subcontract(s).

The Laboratories intend to award the CORAL Build subcontracts with the maximum DRAM and NVRAM sizes (Byte:FLOP/s) that are affordable within the CORAL budgets and to include language in the resulting CORAL Build subcontracts that shares the DRAM and NVRAM price risk between the Laboratories and the selected Offeror. The anticipated risk sharing approach will budget a fixed amount of funding for CORAL memory. The Laboratories and the selected Offeror will mutually agree to the actual amount of memory (and associated price) prior to building the CORAL systems.

Any technology refresh options or alternate configurations proposed by the Offeror may be awarded by the Laboratories at their sole discretion. In addition, any other proposed mandatory or technical options may be awarded by the Laboratories at their sole discretion.

2 PROPOSAL FORMAT

Offerors must submit ONE electronic copy of their entire proposal to the LLNS Contract Administrator as indicated in the RFP letter. Hardcopy (i.e., printed) proposals are not required. Submission of your proposal by electronic media (i.e., standard CD-ROM) shall be considered by the Laboratories to be Certification that the media is virus free. All proposals should be presented using 8 1/2 by 11-inch paper format. “Page limit” is defined as consecutively numbered pages. Page limits for each proposal volume are stated in Table 1 below. Electronic copies of the complete proposal should be in Microsoft Office 2007 or 2010 (Word, Excel, PowerPoint, Project and Visio), PDF format, or Rich Text Format.

An Offeror’s proposal submission should be structured in accordance with Table 1 below. Proposal volumes should NOT be consolidated. In other words, each volume should be a separate file. Electronic file titles should identify the corresponding volume number and description.

Table 1
Coral Proposal(s) Format

VOLUME—SECTION NUMBER
Volume 1 CORAL Build Technical Proposal ***(200 page limit total)***
Section 1. Introduction
Section 2. Program Overview and Mission Need
Section 3. CORAL High-Level System Requirements
Section 4. CORAL Application Benchmarks

VOLUME—SECTION NUMBER
Section 5. CORAL Compute Partition Section 6. Input/Output Subsystem Section 7. CORAL High Performance Interconnect Section 8. Base Operating System, Middleware and System Resource Management Section 9. Front-End Environment Section 10. System Management and RAS Infrastructure Section 11. CORAL Maintenance and Support Section 12. CORAL Parallel Filesystem and SAN Section 13. CORAL Facilities Requirements Section 14. Project Management Section 15. Glossary Section 16. Subcontracting
Volume 2 Business Proposal ***(40 page limit total)*** Section 1. Supplier Attributes Section 2. Proposed Open Source Development Partnerships
Volume 3 CORAL NRE Technical Proposal ***(50 page limit total)*** Section 1. Overview Section 2. Specific NRE Activities and Objectives Section 3. Impacts of NRE on CORAL Machine Section 4. Project Management Section 5. Subcontracting
Volume 4 CORAL Build and NRE Price Proposal (***no page limit***) Section 1. NRE Fixed Price Section 2. Build – CORAL Machine Fixed Prices Section 3. Build – Mandatory Option and Technical Option Fixed Prices Section 4. Lower-Tier Subcontractor Prices Section 5. Milestone Payment Schedule
Volume 5 Other Documents ***(no page limit)*** Section 1. Royalty Information Section 2. Small Business Subcontracting Plans Section 3. Software Branding and Licenses, if applicable Section 4. System Warranty Information Section 5. Representations and Certifications Section 6. EEO Pre-Award Clearance Request Form (applies only to ORNL) Section 7. Workplace Substance Abuse Program Plan (applies only to LLNL)
Volume 6 Offeror Financial Information (*no page limit*)
Volume 7 Performance of the System (*no page limit*) Section 1. Benchmarks, makefiles, scripts and output results. Section 2. CORAL_Benchmark_Results spreadsheet Section 3. Scaling benchmark results to CORAL Report Section 4. CORAL_Summary_Matrices spreadsheet

3 CORAL BUILD TECHNICAL PROPOSAL (VOLUME 1)

For the purposes of preparing the CORAL Build Technical Proposal, Offerors should assume that they will be selected for one CORAL NRE subcontract award (see Section 5, below). This assumption allows the Offeror to put forward the most advantageous proposal. The Offeror's CORAL NRE Technical Proposal should indicate the areas where the Offeror's CORAL Build Technical Proposal depends on specific CORAL NRE activities and the impact if those specific CORAL NRE activities are not funded.

In the CORAL Build Technical Proposal, the Offeror should describe the proposed CORAL machine. This should be written in the form of an integrated narrative **and should include a point-by-point response to the technical requirements contained in the Draft SOW with the same numbering scheme as the Draft SOW**. Draft SOW text should be included, but may be formatted with a smaller font (but no smaller than 6 point). Offeror does not need to make any changes to Sections 1 and 2. Offeror's proposal should include text font no smaller than 10 point. Each section should start a new page. The CORAL Build Technical Proposal should be divided into the following tabbed sections.

Offeror's CORAL Build Technical Proposal (Volume 1, Sections 3 through 14) should contain a detailed point-by-point response to Sections 3 through 14 of the Draft SOW with the same numbering scheme as the Draft SOW. This response, which should immediately follow the corresponding Draft SOW text, should include a detailed discussion of **how** all of the mandatory requirements (MR), mandatory option requirements (MO), proposed technical options (TO-1, TO-2 and TO-3) and proposed target requirements (TR-1, TR-2 and TR-3) will be met or exceeded, as well as a discussion of any Offeror identified additional performance features included in the technical solution. For any technical option (TO-1, TO-2 or TO-3) or target requirement (TR-1, TR-2 or TR-3) that will not be met, Offeror should include an explicit statement to that effect as well as any proposed remediation. **The Laboratories will assess the technical appropriateness or viability of the proposed technical response to each requirement. Offeror should not respond simply with "Offeror understands and accepts this requirement" or "Offeror Complies" type of content free and judgmental response.** Responses should be direct, explicit, concise, self-contained and understandable by technically sophisticated reviewers. Broad discussions and marketing hype should be avoided.

3.1 Section 3: System Overview

Offeror's Coral Build Technical Proposal response (Volume 1, Section 3) should contain an executive summary of the proposed hardware and software systems. The executive summary should provide a brief overview of what will be delivered, major functional and performance capabilities and fully completed summary matrices**.** Details on what information should be included for each of these items are listed in the following subsections.

Offeror should complete the tables summarizing all major system characteristics in the CORAL_Summary_Matrices spreadsheet as described in Sections 3.1.1, 3.1.2 and 3.1.3. The completed tables should be included at the beginning of Volume 1, Section 3. As discussed in Section 9.4, the completed spreadsheet must also be submitted as part of Volume 7. Offeror should include any additional tables necessary to summarize the system fully in addition to the specific tables described in the following sections. All entries should be cross-referenced to the section and/or page number in the proposal that contains this information. If an entry is not

applicable to a specific aspect being described then the entry for that type should be "N/A" followed by a brief explanation of why the entry is not applicable. The following definitions apply throughout these tables. FLOPs is "FLoating point OPerations". FLINs is "FLoating point Instructions". The F in the B:F ratio is FLOP/s (FLOPs per second).

3.1.1 Node Summary Matrices

The Node Summary Matrix tab in the CORAL_Summary_Matrices spreadsheet should be duplicated and completed in its entirety for each type of node (e.g., compute node (CN), I/O node (ION) or front end node (FEN)) proposed**.** <TYPE OF NODE> should be replaced with the type of the node being described. The Processor Type entry should clearly identify the type of processor. If nodes with multiple types of processors are proposed, Offeror should duplicate and complete rows 4 through 14 for each type of processor contained in that node type. The Memory Type entry should clearly identify the type of memory (e.g., stacked memory, DDR4 or NVRAM) being described. For each processor type, Offeror should duplicate and complete rows 12 through 14 for each level of cache and <LEVEL> should be replaced with the level (e.g., L1 or L2). If nodes with multiple types of memory are proposed, Offeror should duplicate and complete rows 16 through 23 for each memory type contained in that node type. If the node type includes multiple processor types, Offeror should duplicate and complete rows 21 through 23 for each processor type contained in that node type for each memory contained in that node type. Offeror should duplicate and complete rows 24 through 35 for each interconnect type relevant to that node type. The Interconnect Type entry should clearly identify the type of interconnect being described. Offeror should duplicate and complete rows 39 through 41 for each disk type relevant to that node type. Offeror should include any additional node characteristics that will assist in the evaluation of the proposed architecture.

3.1.2 Interconnect Summary Matrices

The Interconnect Summary Matrix tab in the CORAL_Summary_Matrices spreadsheet should be duplicated and completed in its entirety for each type of interconnect proposed, whether between nodes of the same or different types. <TYPE OF INTERCONNECT> should be replaced with the same identifier used for the type of interconnect in any node summary tables relevant to the interconnect type.

3.1.3 System Summary Matrix

The System Summary Matrix tab in the CORAL_Summary_Matrices spreadsheet should be completed in its entirety for the proposed final CORAL system.

3.1.4 Section 3.7.1 Scale the System Size

Offeror should provide details on options for scaling the total size of the system. These details should discuss whether scaling the system requires changes to the system other than the number of compute nodes. The details should also include any limitations on the scaling such as only certain multiples of compute nodes are viable choices or any upper or lower limit on the number of compute nodes. Overall, Offeror should provide sufficient details such that CORAL can assess the performance and, combined with related information in the CORAL_Price_Schedule spreadsheet, cost implications of the scaling choices.

3.1.5 Section 3.7.2 Scale the System Memory

Offeror should provide details on options for scaling the CORAL system memory. These details should discuss memory options for each node type. The details should include any implications for other memory characteristics listed in the summary matrix for that node type. Overall, Offeror should provide sufficient details such that CORAL can assess the performance and, combined with related information in the CORAL_Price_Schedule spreadsheet, cost implications of the memory scaling options.

3.1.6 Section 3.7.3 Scale the System Interconnect

Offeror should provide details on options for scaling the CORAL system interconnect(s). These details should discuss interconnect options for each node type. The details should include any implications for other interconnect characteristics listed in the summary matrix for that interconnect type or any of the node type summary matrices. Overall, Offeror should provide sufficient details such that CORAL can assess the performance and, combined with related information in the CORAL_Price_Schedule spreadsheet, cost implications of the interconnect scaling options.

3.1.7 Section 3.7.4 Scale the System I/O

Offeror should provide details on options for scaling the CORAL system I/O subsystem that are described in Volume 3, Section 6. These details should discuss whether scaling the system I/O requires changes to the system other than the number of I/O nodes. The details should also include any limitations on the scaling such as only certain multiples of I/O nodes are viable choices or any upper or lower limit on the number of I/O nodes. Overall, Offeror should provide sufficient details such that CORAL can assess the performance and, combined with related information in the CORAL_Price_Schedule spreadsheet, cost implications of the I/O scaling options.

3.2 Section 4. CORAL Application Benchmarks

Offeror's CORAL Build Technical Proposal (Volume 1, Section 4) should contain a detailed point-by-point response to Section 4 of the Draft SOW with the same numbering scheme as the SOW. **Most benchmarking results will be reported (without page limits) in Volume 7. See Section 9, below, for proposal preparation instructions on what should be reported in Volume 7 of Offeror's proposal.**

For Volume 1, Section 4, Offeror should provide the following detailed information. For each benchmark, Offeror should describe any modifications to source code, makefile or scripts written to run the benchmarks and why these modifications were required and consistent with the allowed modifications described in SOW Section 4.5.6. Offeror should explain the methodology used to obtain all projected results.

Refer to Draft SOW Section 4.2 for discussion of Marquee and Elective Benchmarks.

3.3 Section 11. CORAL Maintenance and Support

This section should describe in detail the proposed hardware and software maintenance strategies throughout the life of the CORAL Build subcontract**.** Include the level of service Offeror intends to provide at various points during the CORAL Build subcontract period (i.e., system build, system installation, acceptance testing, capability period and general availability period)**.**

Specific roles and responsibilities for the Laboratories, Offeror, and lower-tier subcontractor personnel should be delineated**.** Identify the number of full-time maintenance personnel dedicated to servicing the systems as well as their level of experience on the equipment and software being provided, their training, and other relevant qualifications. Include problem escalation procedures and the process for generating, tracking, and closing trouble tickets**.** Identify the job category level of the Analysts to be provided as well as your company's job description of that job category**.** The Laboratories will provide office space for on-site support personnel and storage space for spare parts, and, in the case of LLNL, Q-clearance allocations**.** Specific elements of the spare parts cache and on-site hot spares should be itemized**.** Failed hardware return mechanism and parts cache refresh policy should be discussed. Software maintenance procedures should be delineated**.**

3.4 Section 13. Facilities Requirements

Offeror's CORAL Build Technical Proposal (Volume 1, Section 13) should contain a detailed point-by-point response to Section 13 of the Draft SOW with the same numbering scheme as the Draft SOW**.** Include detailed information about projected **actual** power loads that will be present based on the proposed systems, not projected "fully configured" estimates. Give the basis for the estimates**.** In other words, are these theoretical estimates or are they based on component or full rack measurements? If estimates are provided, indicate how and when these estimates will be improved over time.

Floor Plans**.** Provide a separate floor plan, including any subsystems (e.g., I/O cabinets, disks, cabling, and external networking), for each laboratory. The floor plan will include a diagram of asset placement, as well as floor-loading information, and under-floor clearance requirements (if appropriate) and placement and type of required electrical outlets. Please provide weight estimates for each type of rack and the number of those racks in the system.

Provide the estimated total amount of power in kW (kilowatts) required, including any subsystems (e.g., I/O cabinets, disks, cabling and external networking). Provide power required for each rack type and the number of those racks in the system. The plan should also include the estimated total amount of cooling in BTU (British Thermal Units) or Tons AC required for each of the systems proposed. Provide cooling required for each rack type and the number of those racks in the system. List any other facilities requirements.

3.5 Section 15. Glossary

Offeror should revise Draft SOW Section 15 glossary elements to reflect terminology used in the Offeror's proposal. In addition, a list definitions and acronyms used throughout the Offeror's CORAL Build Technical Proposal should be placed in Volume 1, Section 15.

3.6 Section 16. Subcontracting

This section should describe any use of subcontracting or third parties for major software, hardware components, or services and associated areas of risk and risk mitigation. Offeror must specifically identify all key lower-tier subcontractors, partners, third parties, etc. by name, and not ambiguous "TBD" type references. If working with Open Source Software communities includes subcontracts for deliverables, these should be described. It should also include a description of how Offeror's organization intends to integrate the Subcontractor's product or services to achieve CORAL goals. Describe your previous experience with the proposed third-

party subcontractors and the experience that the proposed third-party subcontractors have had on projects for similar equipment or services as being provided under the anticipated CORAL Build subcontract.

4 SUPPLIER ATTRIBUTES (VOLUME 2)

Provide the following background information on those contracts during the past two years that the Offeror considers the most comparable to the requirements of this RFP in terms of providing high-end computing systems and working with high-end customers and partners to advance the high-end computing state-of-the-art: contract number; contract type; contract value; contract effective date and term; place of performance; client contacts (include the name and phone number of contractual contact and the name and phone number of technical contact); and similarities to CORAL requirements. Offeror is encouraged to include a self-assessment of its performance on these projects including what went well and, more importantly, what did not. Every computer related project has major problems, so a credible response will not say "everything went fine." The Laboratories are very interested in how the Offeror's organization overcame difficulty and ultimately became successful in the face of adversity, not that they avoided obstacles in the first place. Offeror may discuss these challenges in the context of a lessons learned scenario.

Discuss your company's manufacturing and testing facilities. Discuss the expertise and skill level of your company's key personnel who will work on this project.

Offeror financial information is considered a Supplier Attribute. However, Offerors should submit financial information in Volume 6, Offeror Financial Information.

If a proposal is submitted by a consortium led by an integrating subcontractor (as opposed to the primary original equipment manufacturer), refer to Section 1.4 above for consortium related information.

The Offeror should provide information on the capabilities and history of its corporation to engage in an open source development partnership and meet the goals set out in the Draft SOW. This information should include the willingness of the Offeror to participate in the open source development, with other partners, of key missing High Performance Technical Computing (HPTC) cluster technology components.

5 CORAL NRE TECHNICAL PROPOSAL (VOLUME 3)

The Offeror will submit an NRE Technical Proposal in support of the CORAL effort. The Offeror's CORAL NRE Technical Proposal should indicate the areas where the Offeror's CORAL Build Technical Proposal depends on the proposed CORAL NRE activities.

5.1 Section 1. Overview

This section should provide the high level context for the NRE proposed in the subsequent sections. The Offeror should identify the gaps between the Offeror's NRE activities and those prerequisite to meet or to exceed CORAL target requirements. For the purposes of this NRE proposal, these gaps should be beyond the scope of, or accelerations of, the Offeror's existing product roadmap and NRE incorporated in the build/delivery activities of the CORAL Build subcontract. However, Offeror should assume in the CORAL Build proposal that this NRE

proposal is also selected and write an integrated CORAL Build response that includes end-results of both efforts funded under separate subcontracts (one or two CORAL Build and one CORAL NRE). Offeror should identify the specific NRE activities to be funded by this accompanying NRE proposal. Offeror should also make clear how this NRE proposal reduces the schedule or performance risk associated with the proposed CORAL configuration, timescale and budget. As such, this proposal should integrate into the Offeror's overall CORAL Build risk plan in the response to the Draft SOW section 14.

5.2 Section 2. Specific NRE Objectives and Activities

This section should list the specific proposed NRE objectives and activities in support of the CORAL design, productization, test and scaling. NRE milestones should be identified and a milestone schedule defined that allows for a phased delivery. Milestones should be of sufficient granularity to facilitate down selecting among proposed activities in case annual appropriated funding levels require reductions. These activities should be split into four major categories, if applicable:

- Hardware;
- Software;
- Systems testing and scaling; and
- DOE application porting and performance.

The Offeror should include in their NRE proposal a task to support the Laboratories in porting key DOE applications to the CORAL system and improving the performance of DOE applications on the CORAL system. Support will be required from the successful Offeror and all of its key advanced technology providers, e.g. processor vendors. Activities will require the support of experts in the areas of application porting and performance optimization, who will work with laboratory personnel on porting and tuning of key applications, which may include some of the CORAL benchmarks, or full applications – to be determined during contract negotiation - for the target architecture. This task should be run as its own project, with a coordinator/project manager overseeing and coordinating issues across labs as appropriate. Co–location of staff at the laboratory sites is desirable, but not necessary. Support is required from the date of subcontract execution through two (2) years after final acceptance

This section should be a detailed Offeror prepared SOW that describes the activities in sufficient detail to be appropriate for the level of payment received. This section should identify proposed deliverable items. The Laboratories do not anticipate delivery of hardware or software resulting from NRE activities. However, Offeror should propose monthly and quarterly reviews and the delivery of specific architectural and/or software functionality and API descriptions or other reports documenting the work performed and results achieved. Prototype hardware for testing at Offeror's site that supports the Build Go/No-Go decision is strongly desired. CORAL anticipates an assessment of such hardware will support the conversion of target requirements in the CORAL Build subcontract to performance requirements following a successful Go/No-Go decision.

5.3 Section 3. Impacts of NRE on CORAL Systems

This section should indicate the direct impacts of the proposed NRE activities and milestones on the CORAL systems. This impact may include schedule improvements, productization, improving system qualities such as the system interconnect, RAS or MTABF, and performance of DOE applications. If the major impacts are risk reduction, then explain what risks are addressed and how the risks are reduced.

5.4 Section 4. Project Management

This section should describe how the NRE project will be managed and results integrated into the CORAL Build subcontracts deliverables. If managed separately from the CORAL Build subcontracts, Offeror should describe the NRE proposed project management structure and team.

Offeror should describe the major phases of the project and any proposed reviews and decision dates. Offeror should include a table in three parts (corresponding to the three major categories in Section 2) with each line in the table providing a deliverable title with dates and paragraph description, but not payments.

After reading Sections 1, 2, and 4 of the NRE proposal, the Laboratories should be able to understand exactly what is proposed and the corresponding delivery / completion schedule. After reading Section 3, the Laboratories should be able to understand the full impact of this NRE proposal on the CORAL systems and risk plan.

5.5 Section 5. Subcontracting

This section should describe any use of subcontracting or third parties for major software, hardware components, or services and associated areas of risk and risk mitigation. Offeror must specifically identify all key lower-tier subcontractors, partners, third parties, etc. by name, and not ambiguous "TBD" type references. If working with Open Source Software communities includes subcontracts for deliverables, these should be described. It should also include a description of how Offeror's organization intends to integrate the subcontractor's product or services to achieve CORAL goals. Describe your previous experience with the proposed third-party subcontractors and the experience that the proposed third-party subcontractors have had on projects for similar equipment or services as being provided under this subcontract.

6 CORAL BUILD AND NRE PRICE PROPOSAL (VOLUME 4)

6.1 Section 1. NRE Fixed Price

Offeror shall identify the proposed total firm fixed price corresponding with its CORAL NRE Technical Proposal. Offer should include a basis of estimate (BOE) for its proposed total firm fixed price. The BOE should include, at a minimum, an estimate of labor categories, labor hours by category, and fully burdened hourly labor rates by category to perform each proposed NRE activity and milestone commensurate with the value to be received. The BOE should also identify proposed material, travel, or other expenses to perform each proposed NRE activity / task. Offer should include a projected funding expenditure profile by Government Fiscal Year (October – September) for each proposed NRE activity / task. The Laboratories do not anticipate a need for Certified Cost or Pricing Data (as defined at FAR Part 15); however, the Laboratories

reserve the right to request submission of Certified Cost or Pricing Data from the selected Offeror(s).

6.2 Section 2. Build – CORAL System Fixed Prices

Offeror shall provide a firm fixed price for each system offered. Offeror shall fully complete the price schedules contained in the Base System tab of the CORAL_Price_Schedule spreadsheet, as described herein, and include its completed price schedules in Section 2 of the CORAL NRE and Build Price Proposal. Modifications to the spreadsheet may be made as necessary.

An entry must be made for each line item. If the price of a line item is being offered at "No Charge" to the Laboratories insert "NC" for that entry. If a line item cannot be separately priced, insert "NSP" for that entry. In the Note column, the Offeror must also insert an entry that identifies which line item includes that price.

All notes will also be included in a separate narrative that clearly indicates the row of which tab of the CORAL_Price_Schedule to which the note corresponds. If any note entry exceeds a single sentence in length then Offeror may make the note entry a reference to this notes narrative.

For each node type, Offeror shall duplicate and complete the Base <TYPE OF NODE> tab in the CORAL_Price_Schedule spreadsheet. Offeror should duplicate and complete the <TYPE OF PROCESSOR> row for each processor type included in the summary matrix for that node type. Offeror should duplicate and complete the <TYPE OF MEMORY> row for each memory type included in the summary matrix for that node type. Offeror should duplicate and complete the <TYPE OF INTERCONNECT> Adapter row for each interconnect type included in the summary matrix for that node type. Offeror should duplicate and complete the <TYPE OF DISK> row for each disk type included in the summary matrix for that node type. All other costs of a rack of this node type, such as costs of PDUs and the actual rack should be included in the Other Rack Costs row. Offeror should include a note for this row that explains the components included in those costs.

For each node, Offeror should complete a <TYPE OF NODE> Rack row in the Base System tab of the CORAL_Price_Schedule tab. For each node type, the Unit Price entry should be set to a link to the entry in column D of the Total Price row of the corresponding Base <TYPE OF NODE> tab. For each interconnect type, Offeror should provide sufficient details to form a firm fixed price. These details should be provided in a <TYPE OF INTERCONNECT> row, possibly modified to incorporate additional details of the interconnect type. The price of any adapters for this interconnect type should be included in the node price as discussed above.

The total price proposed for each system should include all software and software license costs, unless explicitly noted. Offeror should include a note that describes all software included in the Miscellaneous Software price row.

Software Maintenance pricing should be based on the model described in Section 11.2 of the draft SOW, starting with system acceptance and extending for five (5.0) years. Hardware Maintenance prices should be based on models with on-site parts cache and "overlap" RMA process for all systems proposed starting with system acceptance and extending for five (5.0) years. Offeror should link to the Total Price cell (D8) of the HW maintenance tab of the option that the Offeror suggests including in the Base System price. Hardware maintenance options

should include at least the 24x7 and 12x7 models although Offeror may propose additional models as options as discussed in Section 11.1.1 of the draft SOW.

The Base System should include Base Options that form a complete system. The CFS price instructions are provided below. The Unit Price entry of the CFS row of the Base System tab should be set to a link to the entry in column D of the Total Price row of the CFS tab. The Unit Price entry of the Preferred Parallel Debugger row of the Base System tab should be set to a link to the Total Price cell (D4) of the debugger tab (DDT or TotalView) of the option that the Offeror suggests including in the Base System price.

The firm fixed-price should also include all delivery and installation costs. Offeror should provide separate estimates for each facility if installation costs vary due to facility differences as detailed in Section 13 of the draft SOW.

6.3 Section 3. Build – Mandatory Option and Technical Option Fixed Prices

Offeror shall fully complete the Optional Pricing tabs contained in the CORAL_Price_Schedule spreadsheet for the Mandatory Options and Technical Options. An entry must be made for each line item. Offeror may include additional options that they think would be of interest to the Laboratories. Offeror-defined options must include relevant technical, business, and price information in the appropriate proposal volume.

6.3.1 Scale the System Size

Offeror will provide an entry in the Note column that indicates viable quantities for each row of the Base System tab of the CORAL_Price_Schedule spreadsheet. If any options to scale the size of the system require changes to the Base System price beyond changing quantities in the Base System tab, Offeror will duplicate and complete the Base System tab and any necessary auxiliary tabs to provide a total firm fixed price for those options.

6.3.2 Memory Scaling

Offeror will provide all details necessary to determine the cost implications of memory scaling options that are described in Volume 1, Section 3.7.2. Offeror should duplicate and complete row 3 of the Memory Scaling tab of the CORAL_Price_Schedule spreadsheet for each memory scaling option. The completed row should include a note that describes how to compute a total firm fixed price for a system that uses that option. The note should clearly indicate which row should be replaced in which copy of the Base <TYPE OF NODE> tab in order to compute a fixed firm price of that option.

6.3.3 Interconnect Scaling

Offeror will provide all details necessary to determine the cost implications of interconnect scaling options that are described in Volume 1, Section 3.7.3. Offeror should duplicate and complete row 3 of the Interconnect Scaling tab of the CORAL_Price_Schedule spreadsheet for each interconnect scaling option. The completed row should include a note that describes how to compute a total firm fixed price for a system that uses that option. The note should clearly indicate which row should be replaced in which copy of the Base <TYPE OF NODE> tab in order to compute a fixed firm price of that option. If any interconnect scaling option requires changes to the interconnect adapter pricing, Offeror should duplicate and complete

row 4 of the Interconnect Scaling tab of the CORAL_Price_Schedule spreadsheet for that interconnect scaling option. The completed row should include a note that clearly indicates which row should be replaced in which copy of the Base <TYPE OF NODE> tab in order to compute a fixed firm price of that option.

6.3.4 Scale the System I/O

Offeror will provide notes in the rows of the Base System tab of the CORAL_Price_Schedule that clearly indicate how to compute the firm fixed price of any options for scaling the system I/O that are described in Volume 1, section 3.7.4. If necessary, Offeror will complete additional worksheets that provide any additional pricing details to calculate the firm fixed of those I/O scaling options.

6.3.5 CORAL-SU

Offeror shall provide note entries in the Base System tab of the CORAL_Price_Schedule that clearly indicate how to compute the firm fixed price of the CORAL-SU system that is described in Volume 1, section 3.7.5. If necessary, Offeror shall copy and complete the Base System tab to provide a fixed firm price for the CORAL-SU system.

6.3.6 Mid-Life Upgrades

Offeror will provide sufficient details to compute the firm fixed price of any mid-life upgrade options described in Volume 1, Section 3.7.6.

6.3.7 CORAL Parallel Debugger Options

In order to cover the desired range of parallel debugger options, Offeror will complete the DDT and TotalView tabs of the CORAL_Price_Schedule spreadsheet.

6.3.8 CFS

Offeror shall provide a firm fixed price for the CORAL Parallel File System and SAN by completing the CFS tab of the CORAL_Price_Schedule spreadsheet. To support provision of this estimate, Offeror should complete the SSU and SSC tabs of the CORAL_Price_Schedule spreadsheet. To provide the price of a separate CFS Test and Development System that is described in Volume 1, Section 12.1.2, Offeror should complete the CFS T&D System tab of the CORAL_Price_Schedule spreadsheet.

6.4 Section 4. Lower-Tier Subcontractor Price Information

If the Offeror is proposing to use lower-tier subcontractors, price information for each Subcontractor should be furnished in the same format and level of detail as prescribed for the prime Offeror.

6.5 Section 5. Milestone Payment Schedule

Provide a “draft” Milestone Payment Schedule according to the Government Fiscal Year (GFY) that matches the delivery milestones identified in the CORAL Build Technical Proposal (Volume 1). Provide a “draft” Milestone Payment Schedule according to the Government Fiscal Year (GFY) that matches the delivery milestones identified in the CORAL NRE Technical Proposal (Volume 3). The actual Milestone Payment Schedule contained in any resulting subcontract(s) awarded by LLNS will be based on the system delivery schedule, on LLNS’ best estimate of

anticipated fiscal year allocations for any subcontract(s) at the time of award, and on the value to be received by LLNS for each milestone.

It is LLNS' intent to highly value milestones that demonstrate that the CORAL applications can run successfully across the entire system. Milestones that reflect only the hardware installation without the accompanying software scalability will be considered of less value for milestone payment purposes.

It should be noted that milestone payments will not apply to awards made by ANL and ORNL, which will use lease-to-ownership terms for their respective acquisitions.

7 OTHER DOCUMENTS (VOLUME 5)

7.1 Section 1: Royalty Information

In addition, if specifically requested by the LLNS Contract Administrator before award, the Offeror should furnish a copy of the current license agreement and an identification of applicable claims of specific patents or other basis upon which the royalty may be payable.

7.2 Section 2: Small Business Subcontracting Plan

This applies to the NRE awards, and not to the machine build awards. Unless the Offeror is a small business, or the total value of the offer is less than $650,000, the successful Offeror must provide a Small Business Subcontracting Plan, which includes anticipated total subcontracting amount and the percentage goals and amounts for all of the various small business categories. Refer to the *SMALL BUSINESS SUBCONTRACTING PLAN* clause referenced in the GENERAL PROVISIONS and the Model Small Business Subcontracting Plan for additional information. The approved plan will be made a part of any resulting Subcontract(s). Failure to submit an acceptable subcontracting plan will likely render the Offeror ineligible for award of a Subcontract.

7.3 Section 3: Software Branding and Licensing

Submit licensing policies for all categories of software (compilers, libraries, application development tools, etc.) that will be provided under any resulting subcontract. Identify all third-party software. Include policies for cluster-wide right-to-use licenses for an unlimited number of users for all software that will be delivered under any resulting subcontract. Include any required Software License or Maintenance Agreement as well as any licensing requirements for source code. The following conditions must be incorporated in any resulting license agreement or maintenance agreement:

- (for awards issued by LLNS) The governing laws of the State of California will apply.
- (for awards issued by ANL) The governing laws of the State of Illinois will apply.
- (for awards issued by ORNL) The governing laws of the State of Tennessee will apply.
- The right of assignment of any agreement to the Department of Energy/National Nuclear Security Administration (DOE/NNSA) and /or the Department of

Energy/Office of Science for assignment to any succeeding prime contractor to LLNS.

An Offeror's proposal may be eliminated from consideration for award in the event the Offeror and the Laboratories cannot mutually agree to terms and conditions contained in any Software License or Maintenance Agreement.

7.4 Section 4: System Warranty Information

Provide warranty information for all Offeror-provided items as well as any third-party subcontracted items.

7.5 Section 5: Representations and Certifications

Offeror shall complete, sign, and submit the NRE and (machine) build Representations and Certifications Forms.

7.6 Section 6: EEO Pre-Award Clearance Request Form

Offeror will complete and include ORNL's EEO Pre-Award Clearance Request Form, which only applies to awards issued by ORNL.

7.7 Section 7: Workplace Substance Abuse Program Plan

The Workplace Substance Abuse Program Plan (WSAPP) requirement(s) apply only to awards issued by LLNS, which will include Department of Energy Acquisition Regulation (DEAR) clause 970.5223-4, *Workplace Substance Abuse Programs at DOE Sites*, requiring the Subcontractor to develop, implement, and maintain a workplace substance abuse program consistent with Part 707 of Title 10 of the Code of Federal Regulations (10 CFR 707). The selected Offeror will be required to include the requirements of 10 CFR 707 in any lower-tier subcontract with a value of $25,000 or more that is determined to involve access to or handling of classified information or special nuclear materials; high risk of danger to life, the environment, public health and safety, or national security; or transportation of hazardous materials to or from a DOE site.

Before the work can begin at LLNL, the Offeror(s) selected for award must submit a written WSAPP consistent with 10 CFR 707 for the Laboratories' approvals. Upon execution of LLNS' issued subcontractors and submittal and approval of the Subcontractor's WSAPP, LLNS will issue a written notice to proceed with the on-site work. Any lower-tier subcontractor's WSAPP must be approved before the lower-tier subcontractor is allowed to perform on-site work.

If the CORAL awards issued by LLNS involve employees working in TDPs, such employees will be subject to applicant, random and reasonable suspicion drug testing. TDPs include:

- Positions determined to require a "Q" or "L" access authorization.
- Positions determined to be covered by the DOE/NNSA Human Reliability Program (HRP) (10 CFR Part 712)
- Positions identified by the Subcontractor which entail duties where failure of an employee adequately to discharge his or her position could significantly harm the environment, public health or safety, or national security, such as:
- Pilots
- Firefighters

- Protective force personnel, exclusive of those covered by the HRP, in positions involving use of firearms where the duties also require potential contact with, or proximity to, the public at large
- Personnel directly engaged in construction, maintenance, or operation of nuclear reactors
- Personnel directly engaged in production, use, storage, transportation, or disposal of hazardous materials sufficient to cause significant harm to the environment or public health and safety
- Other positions determined by LLNS or DOE/NNSA, after consultation with the Subcontractor, to have the potential to significantly affect the environment, public health and safety, or national security

After the WSAPP is approved by LLNS, its implementation will be subject to LLNS monitoring for compliance and effective implementation.

8 OFFEROR FINANCIAL INFORMATION (VOLUME 6)

To assist the Laboratories in assessing the financial capability of the Offeror, provide any or all of the following.

- Provide audited and certified balance sheets and profit and loss statements for the Offeror's company for the last six (6) completed financial quarters, including interim statements for the current quarter.
- Provide copies of your Form 10-K filed with the Securities and Exchange Commission for the past two (2) fiscal years, plus any 10-Q Forms filed since the last Form 10-K.
- Furnish affirmative assurance, such as endorsements from financial institutions, that your company has sufficient funds necessary to perform the work.
- State what percentage of your performing organization's estimated total revenue during the period of performance the proposed subcontracts will represent.
- State the distribution of your last complete fiscal year's sales volume among commercial business, Government prime contracts, and subcontracts under Government prime contracts.
- Provide any other relevant and useful information about the financial health of the corporation that will assist the Laboratories in assessing the financial capability of the Offeror.
- Provide tax returns for a minimum of the two most recent completed fiscal years.

9 PERFORMANCE OF THE SYSTEM (VOLUME 7)

The benchmark programs described below will be executed by the Offeror to measure the execution characteristics and compiler capabilities of the proposed CORAL system and to project the performance of a CORAL class platform. The benchmarks are divided into five categories with various TR designations within those categories to give the Offeror a notion of the various workloads and relative priority of effort to their execution. The first three categories deal with application areas and include Scalable Science, Throughput, and Data Centric Benchmarks. The fourth category is the cross cutting Skeleton Benchmarks that include various system functionality and performance tests. The fifth category is the Micro Benchmarks that contain small code fragments ideal for early evaluation and explorations on hardware emulators or simulators. These Micro Benchmarks also serve as single CPU challenges for compilers, for threading and the exploitation of Vector or SIMD hardware, and for floating point, integer and branch prediction performance.

The CORAL Benchmarks and details for running each of the benchmarks can be found at https://asc.llnl.gov/CORAL-benchmarks

CORAL Benchmark questions, and only benchmark related questions, may be submitted via electronic mail to "coral-apps@llnl.gov"**.** The LLNS Contract Administrator will be included on this mail list**.** Offeror neutral (i.e., non-proprietary) questions and their LLNS answers, without identification of the submitter, will be posted on the CORAL Benchmark website. Offeror specific or proprietary questions and their LLNS answers will be held in confidence and not posted on the CORAL Benchmark website. The Laboratories, in their sole discretion, will make the determination of the appropriateness of posting Offeror specific Q&A with potentially edited content (to protect anonymity of the source).

The tests may be run on a configuration as described on the CORAL Benchmark website according to the testing procedures described in the SOW Section 4. **In addition to running each benchmark, the Offeror must report any benchmark reference system characteristics and the benchmark results in the CORAL_Benchmark_Results spreadsheet as indicated in SOW Section 4.**

Changes to accommodate unique hardware and software characteristics of a system will be allowed except where specifically prohibited in the constraints for each benchmark. Code modifications will be documented in the form of initial and final source files, with mandatory accompanying text describing the changes. An audit trail will be supplied to Laboratories for any changes made to the benchmark codes. The audit trail will be sufficient for Laboratories to determine that changes made violate neither the spirit of the benchmark nor the specific restrictions on the various benchmark codes. The source code and compile scripts downloaded from the CORAL Benchmark web site may be modified as necessary to get the benchmarks to compile and run on the Offeror's system. Other allowable changes include optimizations obtained from standard compiler flags and other compiler flag hints that don't require modifications of the source code. Likewise, changes in the system software such as expected improvements to compilers, threading runtimes, and MPI implementations can be considered. Once this is accomplished, a full set of benchmark runs must be reported with this "as is" source code.

Beyond this, the benchmarks can be optimized as desired by the Offeror. Performance improvements from pragma-style guidance in C, C++, and Fortran source files are preferred. Wholesale algorithm changes or manual rewriting of loops that become strongly architecture specific are of less value. Modifications must be documented and provided back to CORAL.

In partnership with the Laboratories, Offeror will continue its efforts to improve the efficiency and scalability of the benchmarks between award of the contract and delivery of the system. Offeror's goal in these improvement efforts is to emphasize higher level optimizations as well as compiler optimization technology improvements while maintaining readable and maintainable code, and avoiding vendor-specific or proprietary methodologies.

Results should be reported in the same CORAL_Benchmark_Results spreadsheet used for the required "as is" runs. This is done by creating a new entry on the source change configuration (SCC) worksheet in the CORAL_Benchmark_Results spreadsheet. Then, on the worksheet for

the affected benchmark, rows must be duplicated, new results entered, and the SCC field should be made to reference the newly created source code configuration.

The individual benchmark codes can be downloaded from the above CORAL Benchmarks web site as tar files. Each benchmark is documented with a summary file with general information about that benchmark including a description of the code, how to build and run it, and any specific information about timing or storage issues. The benchmark source code and makefiles are in the tar file. Larger problem sets are available for download on the CORAL Benchmark website.

The Scalable Science and Throughput Benchmark codes will have specific performance levels that may be met and target optimizations for reasonable effort improvements. In addition, several Data Centric, Skeleton, and Micro Benchmarks are required. These include the Graph500, Int Sort, Hashing, SpecInt Peak 2006, CLOMP, IOR, CORAL MPI, Memory, Livermore Loops, Pynamic, FTQ, HACC I/O, XSBench, and miniMADNESS benchmarks. There will also be six optional application micro-benchmarks.

The following is a check list of the above requirements for each benchmark in the CORAL suite. In general for each benchmark the Offeror may:

1. Report reference system characteristic in the CORAL_Benchmark_Results spreadsheet (Volume 7, Section 2).
2. Run benchmarks, “as-is”, on a reference system and include all benchmark output files in Volume 7, Section 1.
3. Project benchmark results to CORAL system for the TR-1, TR-2, and TR-3 benchmarks. These projections may be summarized in the CORAL_Benchmark_Results spreadsheet (Volume 7, Section 2).
4. Describe how benchmark results from reference system were projected to CORAL systems in Volume 7, Section 3. This report should include any additional information Offeror used in the estimation process from simulation results to back-of-the-envelope estimations.
5. Repeat steps 2-5 for any source code modifications to the benchmark suite allowed by SOW Section 4 and by the benchmark summary files.
6. Document and describe all code modifications in the SCC worksheet in the CORAL_Benchmark_Results spreadsheet and provide all modified source code.

It is extremely important for Offeror to provide Laboratories as much benchmark data as possible in Offeror’s Proposal Volume 7, in the form of the CORAL_Benchmark_Results spreadsheet, benchmark output files, and description of any code modifications. Furnishing full results is rewarded more than incremental performance differences between vendors. If Offeror cannot run a particular code or problem for whatever reason, Offeror should justify why they were unable to complete the runs in the benchmark response. All benchmark omissions will be fully described by the Offeror and will be reviewed and evaluated by Laboratories; supporting documentation may be provided. Laboratories will be the sole judge of the validity of any scaled results.

9.1 Section 1: Benchmarks, makefiles, scripts and output files.

Offeror may return all benchmark source files, makefiles, **modifications**, scripts written to run the benchmarks and actual output files. The output of each code build, each run reported, and all run scripts used must be provided in electronic form, organized in a manner that reflects a one-to-one correspondence with the benchmark results spreadsheet.

Correct execution and measurements will be certified by Offeror.

Reported information in this section should be sufficient to convince the Laboratories technical evaluation team that the Offeror did actually run the benchmarks on the reference system and obtained the reported results. In addition, Laboratories will evaluate the modifications to ensure consistency with reported modifications and allowed modifications requirements of SOW Section 4.

9.2 Section 2: CORAL_Benchmark_Results spreadsheet

The Excel spreadsheet "CORAL_Benchmark_Results" (as found on the CORAL Benchmarks web site) may be used by the Offeror to report the official FOM, problem input parameters, and all configuration parameters used for each run.

The data from the sustained Scalable Science and Throughput Benchmark workloads will be reported in the following way. All figures of merit for each benchmark type will reported so that the average and standard deviation of the runs for each benchmark code can be calculated. The final aggregate figure of merit is defined as the geometric average figure of merit for each workload as stated in SOW Section 4.

9.3 Section 3: Scaling benchmark results to CORAL Report

Offeror may submit a report that justifies the scaling between the RFP benchmark runs and Offeror's projected performance for the CORAL system, and otherwise highlights noteworthy aspects of Offeror's performance on the RFP benchmark suite. This report may include a description of the reference system and how it met or did not meet the reference system requirement in SOW Section 4.

The Laboratories will be the sole judge of the validity of any scaled results.

9.4 Section 4: CORAL_Summary_Matrices Spreadsheet

As discussed in Section 3.1, Offeror must fully complete the CORAL_Summary_Matrices spreadsheet. In addition to including all completed matrices into Volume 3, the completed spreadsheet must be submitted as a separate file as part of Volume 7.

Appendix A

Resume Format

Name:

Proposed Title/Assignment on Contract:

Experience Summary: (A succinct summary of overall experience and capabilities including the name and phone number of the client that may be used for reference checking):

Current Assignment (Include description and from/to dates):

Current Client/Customer (Include current address and telephone number):

Education:

Technical Qualifications:

Description(s) of Experience relevant to Proposed Contract Assignment:

Provide Three Business Related References:

List Awards/Honors/Publications:

RESUMES MUST NOT EXCEED TWO (2) PAGES IN LENGTH

References listed in the resumes may be contacted to verify relevant experience as part of the evaluation process.

END OF PROPOSAL EVALUATION AND PROPOSAL PREPARATION INSTRUCTIONS.