STATEMENT OF CONSIDERATIONS

CLASS ADVANCE WAIVER OF THE GOVERNMENT'S DOMESTIC AND FOREIGN PATENT RIGHTS AND COPYRIGHTS UNDER DOMESTIC FIRST- AND SECOND-TIER SUBCONTRACTS, ISSUED BY OAK RIDGE NATIONAL LABORATORY (ORNL), ARGONNE NATIONAL LABORATORY (ANL), OR LAWRENCE LIVERMORE NATIONAL LABORATORY (LLNL) FOR THE CORAL-2 NRE PROGRAM; DOE WAIVER NO. W(C) 2018-001; ORO-821

The Department of Energy (DOE) and the National Nuclear Security Administration (NNSA), an agency within DOE, have a long history of deploying leading-edge computing capability for science and national security. Going forward, DOE and NNSA's compelling science, energy assurance, and national security needs will require a thousand-fold increase in usable computing power, delivered as quickly and energy-efficiently as possible.

The DOE's Office of Science (SC) is the lead Federal agency supporting fundamental scientific research for energy and the nation's largest supporter of basic research in the physical sciences. The SC portfolio has two principal thrusts: direct support of scientific research and direct support of the development, construction, and operation of unique, open-access scientific user facilities. These activities have wide-reaching impact. SC supports research in all 50 States and the District of Columbia, at DOE laboratories, and at more than 300 universities and institutions of higher learning nationwide. The SC user facilities provide the nation's researchers with state-of-the-art capabilities that are unmatched anywhere in the world.

Within SC, the mission of the Advanced Scientific Computing Research (ASCR) program is to discover, to develop, and to deploy computational and networking capabilities to analyze, to model, to simulate, and to predict complex phenomena important to the DOE. A particular challenge of this program is fulfilling the science potential of emerging computing systems and other novel computing architectures, which will require numerous significant modifications to today's tools and techniques to deliver on the promise of exascale science.

The NNSA is responsible for the management and security of the nation's nuclear weapons, nuclear nonproliferation, and naval reactor programs. The NNSA Strategic Plan supports the Presidential declaration that the United States will maintain a "safe, secure, and effective nuclear arsenal." The Plan includes ongoing commitments to understand the condition of the nuclear stockpile and to extend the life of U.S. nuclear warheads.

Within NNSA, the mission of the Advanced Simulation and Computing (ASC) program supports NNSA Defense Programs to shift emphasis from test-based confidence to simulation-based confidence. Under ASC, computer simulation capabilities are developed to analyze and predict the performance, safety, and reliability of nuclear weapons and to certify their functionality. Modern simulations on powerful computing systems are key to supporting that national security mission. As the nuclear stockpile moves further from the nuclear test base through either the natural aging of today's stockpile or through the introduction of modifications, the realism and accuracy of ASC simulations must further increase through development of improved physics models and methods requiring ever-greater computational resources.

While DOE's extreme-scale computer requirements are a driving factor, these projects must also exhibit the potential for technology adoption by broader segments of the market outside of DOE supercomputer installations. The public-private partnership between industry and the DOE ensures development of technology that reduces economic and manufacturing barriers to constructing exaflop-sustained systems, but also ensures the selected technologies have broad market impact for low-power embedded, cloud/datacenter, and midrange HPC applications. This ensures the DOE investment forms the center of a sustainable software/hardware ecosystem that is supported by applications across the broader IT industry. DOE expects this technology transfer to increase DOE's ability to leverage commercial developments. It is not DOE's intent to fund the engineering of near-term capabilities that are on existing product roadmaps.

Scientific computation has come into its own as a mature technology in all fields of science. Never before have we accurately been able to anticipate, to analyze, and to plan for complex events yet to occur—from the operation of a reactor running at 100 million degrees to better predicting potentially catastrophic weather events, such as floods. Combined with the more traditional approaches of theory and experiment, it provides a profound tool for insight and solution as we look at complex systems containing billions of components. Nevertheless, scientific computation cannot yet do all that we would like. Much of its potential remains untapped in areas such as materials science, earth science, energy assurance, fundamental science, biology and medicine, engineering design, and national security because the scientific challenges are too enormous and complex for the computational resources at hand. Many of these challenges have immediate and global importance.

Data-intensive computing is of increasing importance to the nation. Not only does it allow new understanding of enormous and often disparate data sets, such as health data, it is also integral to analyzing the data produced by both simulation and experiment in the traditional computational science domains including cosmology, engineering, combustion, energy, and astrophysics. In addition, data science on advanced computing systems is increasingly key for the integration of simulation, experimental, and observational sciences, and the steering of experiments and simulations in real-time. These applications require data science techniques covering a wide area of discovery—including but not limited to statistics, machine learning, deep learning, uncertainty quantification, databases, pattern recognition, image processing, graph analytics, data mining, real time data analysis, and complex and interactive workflows. Thus, exascale systems will need rich data-centric capabilities to meet the mission needs in many areas of science, energy and engineering.

These challenges may be overcome by future high-performance computers that promise real advancement at a greatly accelerated pace, and that can only be accomplished with federal government investments, such as the FastForward, DesignForward, and PathForward collaborations between ASCR and ASC. Planned exascale systems (capable of 10^{18} floating-point operations per second) in the next several years will provide an unprecedented opportunity to attack these global challenges through modeling and simulation.

SC and NNSA have several critical mission deliverables, including annual stockpile certification and safety assurance (for NNSA) and future energy generation technologies (for SC). Computer simulations play a key role in meeting these critical mission needs. Data movement in the scientific codes is becoming a critical bottleneck in their performance. Thus, memory hierarchy and the latencies and bandwidths between all its levels are expected to be the most important system characteristics for effective exascale systems.

Building on the original 'CORAL' partnership, SC and NNSA are again coordinating efforts to acquire advanced computing resources. As with CORAL, the present 'CORAL-2' collaboration involves ORNL, ANL, and LLNL (the "CORAL Laboratories").[1] ORNL issued the CORAL-2 RFP on behalf of the CORAL Laboratories. Subject to annual appropriated funding from Congress, the RFP contemplates awards for systems at ORNL and LLNL, with the potential to award a third system at ANL depending on the outcome of activities that are outside the scope of the CORAL-2 RFP. Each system award will be made by the cognizant laboratory.

As with the systems delivered under CORAL, for the CORAL-2 systems it will be necessary to accelerate key non-recurring engineering (NRE, also known as research & development) as part of the acquisition in order to accelerate technology development, improve capabilities, improve application performance, and lower the total cost of ownership of the delivered systems. The CORAL Laboratories will accordingly make NRE awards either individually or collectively. For example, should two laboratories choose the same awardee, it may be advantageous for the labs to award a single NRE award.

The Allocation of Patent Rights

Any small business or non-profit organization will retain the patent rights to its subject inventions under the Bayh-Dole Act, codified at 35 U.S.C. §§ 200-212. Such subcontracts will contain the standard clause DEAR 952.227-11, *Patent Rights-Retention by the Contractor.*

For non-Bayh-Dole subcontractors, the Government retains title to subcontractor's subject inventions as set forth in the clause DEAR 952.227-13, *Patent Rights-Acquisition by the Government.* However, a subcontractor that agrees to cost-share by an amount of at least 40% of the total cost of the subcontract shall qualify for this Class Advance Waiver where DOE agrees to waive, in advance, patent rights to the subcontractor such that it may elect its subject inventions. This patent rights waiver is subject to a retained government-use license, march-in rights, reporting requirements, DOE approval of assignments, 35 U.S.C. § 204, a U.S. Competitiveness provision (paragraph (t)), and other terms set forth in the *Patent Rights--Waiver* clause in Appendix A, which will replace the 952.227-13 clause in all qualified subcontracts.

[1] In the original 'CORAL' collaboration, the CORAL laboratories coordinated the acquisition of three computing resources for delivery in 2017.

If a non-Bayh-Dole subcontractor under the subject subcontract does not agree to cost-share of at least 40% of the total contract cost, that subcontractor will receive the standard DEAR patent and FAR data clauses in connection with the R&D procurement. However, such a subcontractor can still seek ASCR/ASC approval, with concurrence from DOE's Office of General Counsel (GC), to apply this Class Advance Waiver to the subcontract. In the alternative, the subcontractor may petition the government for either a separate Advance Waiver for its specific subcontract, or for a post-hoc Identified Invention Waiver to obtain title to specific subject inventions developed in the performance of the subcontract.

The Allocation of Rights in Computer Software

The Bayh-Dole Act only applies to the allocation of patent rights. However, many subcontractors prefer to have advance rights in technical data developed under their subcontracts. Therefore, this Class Advance Waiver also allows a domestic subcontractor (small business, non-profit or for-profit organization) to assert copyright in computer software without the Contracting Officer's prior approval. Under the subject CORAL-2 program, DOE agrees, in advance, to authorize the subcontractor to assert copyright, without the Contracting Officer's prior approval, in software produced under the subcontract by its employees. The right to assert copyright in CORAL-2 software is subject to a limited government-use license to allow the subcontractor sufficient opportunity to commercialize the software.

Via the limited government-use license, the Government reserves, for itself and others acting on its behalf, a paid-up nonexclusive, irrevocable worldwide license in the computer software to reproduce, prepare derivative works, and perform publicly and display publicly (but not to distribute to the public) by or on behalf of the Government. Furthermore, the limited government-use license in copyrighted software will expand to a broad Government license (which allows the Government to distribute copies to the public) if either the subcontractor abandons efforts to commercialize the software or DOE exercises its march-in rights—when, for example, the subcontractor has not taken effective steps to commercialize the software. Separately, the broad Government license will also apply to whatever CORAL-2 software the subcontractor releases under an Open Source Software (OSS) license.

Notwithstanding the above approval to assert copyright in computer software, a subcontractor delivering software under a CORAL-2 subcontract shall comply with the requirements of the subcontract governing copyright and rights in data, including the standard policies and practices regarding submission to DOE's Energy Science and Technology Software Center (ESTSC). CORAL Laboratories' treatment of delivered software shall be governed by the applicable terms of each laboratory's prime contract. Therefore, the CORAL Laboratories should consult with ASCR and ASC (and with DOE Patent Counsel's concurrence) to determine which software developed under specific subcontracts should be (a) delivered to the CORAL Laboratories and/or (b) required by the subcontract to be distributed under an OSS license.

DOE believes that the above approach for allocating rights in CORAL-2 computer software is warranted in order to stimulate the development of end products for future purchase.

The Delayed Release of Unpublished Data—Other Data

Because CORAL-2 subcontracts contemplate long-term commercialization activities, DOE expects that many subcontractors will wish to protect the data generated under the subcontracts from public release and competitor access. However, DOE's policy (stemming from a statutory mandate) is to publicly release technical data that is DOE-funded. This policy promotes both the commercialization of related technologies, as well as supporting the further development of knowledge in the academic and research communities. Accordingly, in an effort to balance competitor-access concerns with the benefits of public dissemination and the pertinent need for CORAL Laboratories to receive and review technical data, ASCR and ASC support up to five years of data protection under this program. DOE and NNSA therefore authorize CORAL-2 subcontractors to appropriately mark technical data generated under CORAL-2 subcontracts. DOE, NNSA, and the CORAL Laboratories shall thereafter refrain from publicly distributing any marked technical data for a period of five years, in order to allow subcontractors a limited competitive advantage for pursuing the commercialization of these related technologies. Notwithstanding any markings, circumstances may arise under which DOE may or must release certain CORAL-2 technical data, for example when responding to a request under the Freedom of Information Act (FOIA).

Foreign Subcontracts

The provisions of this Class Advance Waiver do not automatically apply to any foreign-owned or foreign-controlled subcontractors at any tier. However, the CORAL Laboratories should consult with ASCR and ASC to determine whether DOE and NNSA should grant a foreign subcontractor this waiver's disposition of rights, or require the foreign subcontractor to submit a separate petition for an Advance Waiver to be approved by DOE GC.

Conclusion

This Class Advance Waiver and the terms of the intellectual property clauses included within the subject subcontracts are meant to cover only the scope of the work under the CORAL-2 NRE Program and shall not serve as precedent for any follow-on work to be negotiated separately with the selected subcontractors. This Class Advance Waiver shall apply to domestic second-tier subcontracts that a first-tier subcontractor issues, but shall not apply to foreign-owned or foreign-controlled subcontractors except as provided above.

DOE Patent Counsel will qualify each subcontractor upon written certification by a CORAL Laboratory that this Class Advance Waiver is applicable. Such certification will include verification of the minimum percentage cost share by the subcontractor, a determination that the subcontractor is a U.S. company, and verification of the acceptance of the terms and conditions of the subcontract.

If any company does not qualify for this Class Advance Waiver or is not satisfied with the terms and conditions of the subcontract necessary to qualify for this Waiver, then that company may separately petition DOE for its own Advance Waiver.

For the foregoing reasons, and in view of the objectives and considerations set forth in 10 CFR 784, it is recommended that the requested waiver be granted for domestic first-tier and second-tier subcontracts issued under the CORAL-2 Program.

[redacted]

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Date: 18 May 2018

Based upon the foregoing Statement of Considerations, it is determined that the interests of the United States and the general public will best be served by a waiver of the United States and foreign patent rights, approval to assert copyright in computer software, and delayed public release of technical data as set forth herein, and, therefore, the waiver is granted. This waiver shall not affect any waiver previously granted.

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