December 4, 2018

MEMORANDUM FOR PETER D. RODRIK
                             MANAGER
                             LIVERMORE FIELD ▮▮▮▮▮▮

FROM: WILLIAM I. WHITE
                       ASSOCIATE PRINCIPAL DEPUTY ADMINISTRATOR

SUBJECT: Lawrence Livermore National Security, LLC,
                       DE-AC52-07NA27344 Fiscal Year 2018 Award Fee Determination

The National Nuclear Security Administration (NNSA) has completed its assessment of Lawrence Livermore National Security, LLC's (LLNS) performance of the contract requirements for the period of October 1, 2017, through September 30, 2018, as evaluated against the Goals defined in the Performance Evaluation and Measurement Plan (PEMP). Based on assessments provided in the NNSA Performance Evaluation Report, award fee amounts are as follows:

	At Risk %	Available	Final	Percent	Award Term
Goal 1: Manage the Nuclear Weapons Mission	35%	$9,921,537	$9,028,598	91%	Met
Goal 2: Reduce Nuclear Security Threats	10%	$2,834,725	$2,692,989	95%	Met
Goal 3: DOE & Strategic Partnership Project Mission Objectives	5%	$1,417,362	$1,346,494	95%	Met
Goal 4: Science, Technology & Engineering (ST&E)	10%	$2,834,725	$2,692,989	95%	Met
Goal 5: Operations & Infrastructure	25%	$7,086,812*	$6,023,790*	85%	Met
Goal 6: Leadership	15%	$4,252,087	$3,869,399	91%	Met
Total		**$28,347,248**	**$25,654,259**	**91%**	

*Amount includes $250,000 available fee for Key Outcome 5.3 for Expand Electrical Distribution System (EEDS) Project and $212,500 earned fee based on a rating of Very Good (85%).

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In addition, the fixed fee and total fee summaries are provided below for your information:

Fixed Fee	$12,148,820	$12,148,820
SPP (Fixed Fee)	$ 6,209,000	$ 6,209,000
Total Fixed Fee	$18,357,820	$18,357,820
Total Summary	**$46,705,068**	**$44,012,079**

National Nuclear Security Administration

Lawrence Livermore National Security, LLC

Performance Evaluation Report (PER)

NNSA Livermore Field Office

Evaluation Period:
October 1, 2017 – September 30, 2018

December 3, 2018

Executive Summary

This Performance Evaluation Report (PER) provides the National Nuclear Security Administration (NNSA) assessment of Lawrence Livermore National Security, LLC's (LLNS') performance of the contract requirements for the period of October 1, 2017 through September 30, 2018, as evaluated against the Goals defined in the Performance Evaluation and Measurement Plan (PEMP). The NNSA took into consideration all input provided (e.g. Contractor Assurance System (CAS), Program Reviews, etc.) from NNSA Program and Functional Offices both at Headquarters and in the field.

LLNS earned Excellent ratings on all Goals with the exception of Goal 5, exceeding expectations on nearly all Objectives and Key Outcomes. It continued to successfully deliver on our nation's challenging stockpile requirements and lead the Weapons Laboratories in strengthening the underpinning and future of stockpile stewardship. LLNS also continued to successfully deliver at a very high level across the balance of the NNSA mission portfolio including Non-Proliferation, Emergency Management, Incident Response, and Nuclear Counterterrorism while effectively supporting DOE and Strategic Partnership Project (SPP) programs. The National Security missions were successfully executed by leveraging and advancing the frontiers of Science, Technology, and Engineering (ST&E). LLNS earned a Very Good rating on Goal 5 by exceeding expectations on many Objectives and Key Outcomes with relatively few issues or concerns.

Performance against the Goals summarized below, resulted in an overall rating of Excellent for LLNS. Specific observations for each Goal are provided in the following pages.

Goal-1: Manage the Nuclear Weapons Mission   Fee Allocation: 35%

LLNS earned a rating of Excellent and an award fee of 91% under this Goal. LLNS exceeded expectations on nearly all Objectives and Key Outcomes and met or exceeded the overall cost, schedule, and technical performance requirements on Nuclear Weapons Mission work as evidenced by the following significant accomplishments.

LLNS met or exceeded requirements for weapon surveillance activities and special studies on the four LLNS stockpile systems (B83, W78, W80, and W87) and one LANL system (W78 Flight Testing), successfully executing Product Realization Integrated Digital Enterprise activities, CASTLE-PX, Enterprise Modeling and Analysis Consortium decision tasks, and all required Nuclear Explosives Safety Studies. In support of Nuclear Explosive Package (NEP) activities, LLNS successfully developed and tested prototype laser-initiated detonators, achieving the first known direct printing of an HE booster into a HE acceptor, and successfully conducted an Independent Peer Review of the LANL Primary and NEP Final Design Reviews. LLNS supported execution of the limited-life component exchange (LLCE) program for all weapon systems, successfully completing B83 and W80 maintenance and monthly shipments, exceeding the required number of dismantlements, and fully executing weapon component disposition.

LLNS successfully completed all the Cycle 23 Annual Assessment Review process and increased the robustness of the science and understanding behind the process. LLNS included the updated Stockpile to Target Sequence environmental conditions for the W87, and for the B83 LLNS analyzed options to

support the Nuclear Posture Review's decision to retain the system in the stockpile. LLNS also achieved significant progress in collaborating with LANL on initial conditions for an important scientific milestone (Level 1), which has implications for assessing and certifying the future stockpile.

Despite funding delays, LLNS made significant progress in design development for the W80-4, successfully completing Product Realization Team feasibility and component cost gates and conducting Primary and Secondary Physics Certification Reviews. LLNS successfully developed its first Weapons Development and Cost Report for the W80-4 LEP, implemented Earned Value Measurement System tools, and rapidly deployed a trained staff to support the LEP deliverables.

LLNS continued to make advances in Advanced Manufacturing (AM) development, successfully manufacturing fine-featured polymer parts in a 3D configuration, hydrotest parts, and tensile test specimens with Y-12 material. LLNS made progress toward optical initiation of insensitive high explosives and met all the Joint Technology Demonstrator deliverables.

LLNS made substantial capability improvements to the National Ignition Facility (NIF) in preparation for future Stockpile Stewardship experiments, increasing the maximum energy for a NIF shot from 1.8 MJ to 2.1 MJ and enabling access to more extreme high-energy density (HED) material regimes. LLNS executed 393 total shots, including 141 HED and 115 Inertial Confinement Fusion shots. HED experimental campaigns included major advances on high-Z material and plasma properties, burn physics, radiation transport, radiation hydrodynamics, mix, and code validation. LLNS successfully conducted NIF experiments to support LEP design options including material substitution/characterization, removal of a device-specific calibration factor, and vulnerability and hardness. LLNS performed the first dynamic experiments on accelerated aged (AA) Pu alloys at JASPER to characterize beyond-century effects.

LLNS achieved Sierra Initial Delivery System Acceptance and Sierra Applications Development Environment milestones, accepting the initial delivery system in Dec 2017. Tri-Laboratory co-design efforts for Advanced Simulation & Computing (ASC) included developing and demonstrating an improved workflow in the Integrated Code System and demonstrating progress on graphical processing unit performance with ASC Production Codes. LLNS performed a programmatically relevant problem involving hydro and another physics process on the Sierra/Early Access system and demonstrated integration of its modular thermonuclear burn package to multi-physics applications.

Goal-2: Reduce Nuclear Security Threats   Fee Allocation: *10%*

LLNS earned a rating of Excellent and an award fee of 95% under this Goal, exceeding expectations on nearly all Objectives and Key Outcomes for global nuclear security mission work, including Non-Proliferation, Emergency Operations, and Counterterrorism as evidenced by the following significant accomplishments.

LLNS effectively led and expanded multilateral capabilities to improve nuclear security in Africa and provided key support to the International Atomic Energy Agency (IAEA) nuclear material accounting and control efforts. LLNS led the development of cyber security strategy for Defense Nuclear Non-Proliferation. LLNS demonstrated effective leadership in key proliferation identification initiatives, such as, the Helios campaign, Advanced Data Analytics for Proliferation Detection, and the Low Yield Nuclear Monitoring Program (LYNMP). LLNS completed initial development of a physics-based cavity evolution

model and a first-principles calculation of broadband electromagnetic signatures from a low-yield underground nuclear explosion.

LLNS led the NNSA nuclear forensics efforts and supported nuclear forensic initiatives in 15 countries including the Nuclear Forensics International Technical Working Group and the IAEA. LLNS created high accuracy Plutonium-244 mass spectroscopy standards for the IAEA Network of Analytical Laboratories, supported U.S. Comprehensive Test Ban Treaty initiatives, provided technical support to the Quad Nuclear Verification Partnership, and reached out to international partners to complete exercise activities. LLNS led efforts to strengthen nonproliferation and arms control regimes and conducted multiple export control technical reviews and thousands of end-user reviews for Department of Commerce export license applications and nuclear software code requests.

LLNS provided focused nuclear counterterrorism and counter-proliferation science, technology, and expertise in response to current world situations, such as applying National Atmospheric Release Advisory Center tools and unique technical expertise. LLNS supported robust and enhanced emergency response missions and led efforts to conduct nuclear device defeat assessments in support of contingency planning for real world scenarios. LLNS successfully completed a five-phase project that consisted of computational modeling and experimental assessments. LLNS also provided critical planning efforts and maintained demanding watch bill support for national level Render Safe exercises.

LLNS provided excellent support for Disclosure/Discovery Assessment and Response Rubric requirements. LLNS provided exemplary research and leadership in Standoff Disablement efforts and contributed to critical engagement of domestic and international partners including strong support to international meetings with key international partners, continually enhancing bi-lateral and tri-lateral Nuclear Threat Reduction exchanges.

Goal-3: DOE and Strategic Partnership Project Mission Objectives   Fee Allocation: 5%

LLNS earned a rating of Excellent and an award fee of 95% under this Goal, exceeding expectations on nearly all Objectives and Key Outcomes for DOE and SPP objectives as evidenced by the following significant accomplishments.

LLNS successfully executed high-impact work for DOE and SPP Mission Objectives that leveraged LLNS' unique capabilities, sustained and strengthened science and engineering core competencies, and developed essential workforce skills. LLNS earned numerous prestigious awards from professional societies and U.S. Government sponsors, demonstrating the quality of the work and its strategic value.

LLNS made numerous key scientific and technical achievements for DOE. LLNS achieved a breakthrough in 3D-printed marine grade stainless steel and developed a new extraction methodology to recover rare earth elements using engineered bacteria. LLNS mapped how carbon dioxide might be captured from U.S. ethanol bio-refineries and permanently stored underground. LLNS and several other organizations have shown that human influences significantly impact the size of the seasonal cycle of temperature in the lowest layer of the atmosphere for the first time. In computations, LLNS and collaborators have built an end-to-end simulation framework to precisely capture the detailed geology and physics of earthquake motions and how shaking impacts buildings; have applied high performance computing to improve understanding of traumatic brain injury, advance artificial intelligence capabilities and enable a precision medicine approach; and released the Energy Exascale Earth System Model that will simulate aspects of

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earth system variability and project decadal changes. LLNS developed kinetic models in support of the DOE Co-Optimization of Fuels and Engines (Co-Optima) initiative to predict how high-performance fuels perform in advanced internal combustion engines. Recent work by LLNS and collaborators led to a computational discovery of novel grain boundary structures and multiple grain boundary phases in refractory metals, which is relevant to plasma-facing material in magnetic fusion systems. LLNS' findings have been published in a number of scientific journals including Nature, Journal of Geophysical Research, and Environmental Science & Technology.

LLNS effectively leveraged many of the Laboratory's unique facilities, capabilities and skills such as computations, AM, and biosecurity in support of DOE and SPP cross-cutting initiatives. LLNS developed an optical telescope system that can be used for Earth and space observation, tested it on a NASA aircraft, and then partnered with a commercial satellite developer to integrate it into a miniaturized satellite. LLNS provided key support and leadership to the DOE Exascale Computing Initiative and is leading a co-design center named the Center for Efficient Exascale Discretizations (CEED), which includes two DOE labs and five universities. The biosecurity program continued to make significant contributions to the field and published work that may facilitate progress in developing countermeasures for nerve agents.

Goal-4: Science, Technology, and Engineering — Fee Allocation: *10%*

LLNL earned a rating of Excellent and an award fee of 95% under this Goal, exceeding expectations on nearly all Objectives and Key Outcomes for ST&E as evidenced by the following significant accomplishments.

LLNS continued to successfully execute its research strategy and make investments that advance the frontiers of science while maintaining strong foundational expertise in core competencies and developing the skills of the workforce. LLNS' research consistently remained transformative, innovative, and internationally recognized.

LLNS issued an updated Investment Strategy for Science and Technology in which Laboratory Directed Research and Development (LDRD) and other institutional investments play a key role. More than 260 LDRD proposals were submitted for FY 2018 with 80 proposals making the endorsed/short list for final review. For FY 2019, 290 proposals were submitted. The LDRD program ensures that a quality portfolio of ST&E projects are selected to pursue strategic objectives.

There are many examples of relevant research that enhanced capabilities and produced high-impact, innovative results well aligned with the Laboratory core competencies and that benefit DOE/NNSA and the nation. Notable scientific firsts include the experimental evidence for superionic ice, ultralight silver conductive foams and new applications in fuel cells, energy storage, medical devices, catalysis and sensors. LLNS conducted experiments which advanced the learning and improved the platform to achieve fusion energy output that was double the previous record. LLNS successfully 3D-printed optical-quality glasses, which are on par with commercial glass products. LLNS developed a model that captured the compressive response of specific 3D-printed elastomeric architectures and discovered how to build complex 3D parts in a fraction of the time of traditional layer-by-layer printing.

LLNS continued to excel in developing its ST&E workforce and maintaining a vibrant ST&E environment. Fifteen Laboratory scientists and engineers were named to the fourth annual Early and Mid-Career Recognition Program and four scientists were named Distinguished Members of Technical Staff. LLNS

staff have received numerous notable awards and fellowships from ST&E communities, including 2018 Institute of Electrical and Electronics Engineers (IEEE) Nuclear and Plasma Sciences Society's Charles K. Birdsall Award, 2018 John Dawson Award for Excellence in Plasma Physics Research, and seven R&D 100 awards.

Technology transfer activities have been very effective as LLNS currently has more than 100 active commercial licenses and licensing and royalty income has topped $8 million annually, representing more than $300 million in annual sales of products based on LLNL technologies. LLNS continued to make progress in Public Access reporting and has developed a sustainable process.

Goal-5: Operations and Infrastructure	Fee Allocation: *25%*

LLNS earned a rating of Very Good and an award fee of 85% under this goal, exceeding expectations on many Objectives and Key Outcomes for Operations and Infrastructure as evidenced by the accomplishments that significantly outweigh issues.

LLNS achieved an excellent safety record and continued to maintain effective, efficient, and responsive safety programs supporting mission execution. LLNS served as a leader in enterprise infrastructure initiatives and successfully performed several major acquisitions on behalf of DOE/NNSA in support of critical programs. LLNS demonstrated improved security performance as it significantly reduced the number of incidents of security concern.

LLNS demonstrated continuous improvement in radiation protection and fire protection metrics, while safety committees such as Electrical Safety, Hoisting and Rigging, and Welding effectively analyzed external and internal incidents and initiated appropriate actions. LLNS successfully achieved recertification with zero non-conformances in ISO 14001 (Environmental Management System), OHS 18001 (Health and Safety Management), and ISO 9001 (Quality Management Systems), and the Biosafety Select Agent program passed two major external audits and was re-certified. Nuclear operations have been effective and responsive, supported by strong programs, and knowledgeable and experienced facility managers and technical support staff. Safety basis activities were effective and facility safety systems had high reliability and availability (>97% availability). LLNS could improve performance by increasing integration among LLNS' nuclear facility programs, operations, and safety basis organizations in support of better planning and more effective and efficient use of resources. LLNS continued to make progress on implementing the new work planning and control process but experienced schedule delays due in part to staffing challenges.

LLNS met or exceeded regulatory and program commitments for environmental restoration and waste management and disposal. LLNS maintenance management program was effective; facilities and infrastructure were operated and maintained in an efficient manner based on priorities and LLNS remains a key contributor for the implementation of BUILDER. Although corrective actions have been taken and improvements noted on completing excess facility risk reduction activities, management must remain focused on improving performance in this area.

The Exascale Computing Facility Modernization (ECFM) obtained CD-1 Approval in May and the project is meeting cost and schedule expectations. The Expand Electrical Distribution System (EEDS) is a few weeks ahead of schedule and made significant progress this year, obtaining CD-2/3, signing a firm-fixed design-build contract, and initiating design and construction activities.

LLNS maintained effective and efficient business systems, earning the highest possible ratings from NNSA in financial management and personal property on FY 2018 Performance Measures. NNSA completed a property system review and, based on the very favorable results, approved LLNS' property system for an additional three years. LLNS continued to perform at the highest level in procurement and provided key support for the enterprise by leading the NNSA Cooling and Heating Asset Management Program (CHAMP). LLNS exceeded its overall small business goal despite awarding several large procurements on behalf of the enterprise that could not be met with small businesses and has increased outreach events for underachieving socio-economic programs. Office of General Counsel's effective advocacy was exemplified by resolving an extremely complex subcontracting claim with Alameda County. However, issues involving LLNS' compensation system remain outstanding and LLNS has agreed to a comprehensive NNSA compensation review in early FY 2019.

The emergency management program performed in an excellent manner, significantly improving its capability by developing and implementing a new information management system, the Common Operating Picture System (COPS).

LLNS continued to demonstrate improved security performance, exceeding many performance expectations, and achieved a 36% decrease in incidents of security concern compared to the previous fiscal year. Internal and external assessment activities were successfully resolved, including an assessment by DOE's Office of Enterprise Assessments that concluded LLNS is implementing a compliant and effective protection program. LLNS also continued to progress with the modernization, revitalization, and recapitalization of LLNL's physical security infrastructure, including fence lines and guard posts, resulting in significant operational efficiencies.

LLNS exceeded expectations and demonstrated an effective and mature Cyber Security Program. LLNS underwent a no-notice Command Cyber Readiness Inspection (CCRI) of its classified network and enclave, receiving a rating of Outstanding and a score of 100 percent. LLNS achieved several accomplishments in the cyber security technical collaboration arena and continued leadership of several NNSA enterprise-wide efforts.

Goal-6: Leadership   Fee Allocation: *15%*

LLNS earned a rating of Excellent and an award fee of 91% under this Goal, exceeding expectations on nearly all Objectives and Key Outcomes for Leadership as evidenced by the following significant accomplishments.

LLNS demonstrated outstanding leadership in supporting the overall DOE/NNSA mission and senior management was actively engaged in the overall NNSA enterprise and the DOD. The LLNL Director served as Chairman of the DOE Board of Directors for the Exascale Computing Project (ECP) and the NNSA Management Council. The Deputy Director served on the NNSA Operations and Efficiency Board, Governance Executive Steering Committee, NPO Special Advisory Committee and the Peer Review Committee for Y-12/Pantex. Other senior managers served as Chairs for DOD's Threat Reduction Advisory Committee (TRAC), STRATCOM's Strategic Advisory Group Plenary, and four of the ten subgroups of the National Lab Director's Council (NLDC). LLNL continued to be a leader in defining the

pathway to exascale computing with responsibilities for CORAL, Sierra, PathForward, and the National Strategic Computing Initiative (NSCI).

LLNS effectively supported Enterprise strategic planning, making significant contributions to the Nuclear Posture Review, the Investment Strategy for Science and Technology, and the Stockpile Stewardship Management Plan. LLNS was involved in the development of the guidance for the FY 2018 Strategic Plan process and delivered an updated LLNL strategic plan in response.

LLNS demonstrated an effective Site Governance System, exceeding expectations through its CAS. LLNL completed integrated health of the program (IHOP) reviews, utilizing CAS outputs to assess performance of the programs. LLNL also continued to review and improve its assurance system, completing CAS effectiveness reviews and self-assessments, improving transparency of metrics, and working with LFO on integrated assessment planning.

LLNS provided leadership in science and technological areas critical to the scientific stockpile effort, non-proliferation, and to enhance the economic competitiveness of the country. LLNS led the effort for application of AM in developing new manufacturing capabilities for weapon modernization.   It continued to be a leader in the evolution of high performance computing within NNSA and DOE and coordinated the mainstream computing efforts for all 3 NNSA labs through management of the Commodity Technology Systems effort. LLNS demonstrated leadership of the inertial confinement fusion science effort though the NIF Management Advisory Committee and the Peer Review Panel process.   The LLNL Forensic Science Center maintained its status as one of the few certified testing labs in the world. LLNS continued to engage in numerous Threat Reduction and Strategic Partnership Programs such as the LYNM and leading an international multi-lab and university collaboration for nonproliferation research.

LLNS' strong leadership implementing several Lab-wide security initiatives contributed to a 36 percent decrease in incidents of security concern this year. In addition, LLNS continued to implement its integrated Security Awareness Program through a variety of activities at LLNL and at three other sites as part of a DOE/NNSA enterprise-wide initiative to reduce the potential for security incident occurrences.