Science and Technology Goals and Notable Outcomes

- GOAL 1 – Provide for Efficient and Effective Mission Accomplishment (TBD)
- GOAL 2 – Provide for Efficient and Effective Design, Fabrication, Construction and Operations of Facilities (TBD)
- GOAL 3 – Provide for Effective and Efficient Science and Technology Program Management (25%)

GOAL 1: MISSION ACCOMPLISHMENT

JSA’s S&T Programs produce high-quality, original, and creative results that advance science and technology; demonstrate sustained scientific progress and impact; receive appropriate external recognition of accomplishments; and contribute to overall research and development goals of the Department and its customers.

THEORY PROGRESS AND PUBLICATIONS:

1. A new analysis of the strange-antistrange parton distribution function (PDF) asymmetry in the proton has been performed in the framework of chiral effective theory, including the full set of lowest order diagrams with off-shell and contact interactions, in addition to the usual on-shell contributions. The analysis identifies $\delta$-function contributions to the $s$ PDF at zero parton momentum fraction, $x=0$, with a corresponding valence-like component of the $s$-quark PDF at larger $x$. These findings allow greater flexibility for the shape of the $s$-$s$ difference and will impact the extraction of strange quark PDFs in global QCD analysis.

2. Quantum Chromodynamics describes the strong interactions of quarks and gluons as mediated by a fundamental charge called "color." While in Nature the number of color charges is three, many interesting insights can be obtained by considering a hypothetical world with a large number of color charges, in which the dynamics simplifies and baryons behave like heavy classical bodies. Recent work has applied this method to study the Generalized Parton Distributions measured in high-momentum meson production experiments at Jefferson Lab ($x^D$ and $\eta$) and found the predictions to be in good agreement with the CLAS 6 GeV results.

3. In a new paper, lattice QCD is used to compute the tritium axial coupling, as well as the axial nuclear matrix element relevant to proton-proton fusion. The calculations are performed using flavor SU(3) symmetric quarks at the physical strange quark mass. At this quark mass, the Gamow-Teller matrix element in tritium is found to be $0.979(0.1)(1.0)$ fm$^2$, and the leading two-nucleon axial counterterm of pionless effective field theory is determined to be $L_{1A}=3.9(0.1)(1.0)(0.3)(0.9)$ fm$^2$ at a renormalization scale set by the physical pion mass.

4. A new Theory Center paper presents an exact solution to the Landau-Khalatnikov-Fradkin transformation for massive fermion propagators in momentum space in Quantum Electrodynamics by introducing a spectral representation. With this solution, the conditions required to ensure the gauge covariance of propagators have been deduced as constraints on the truncation of the Schwinger-Dyson equations. Such covariance requirements are essential to claims that the correct electromagnetic form factors of the pion and proton have been deduced from bound state calculations inputing such propagators.

5. The Landau-Khalatnikov-Fradkin transformations show how a Green's function translates between gauges. These relations have been previously deduced in coordinate space. In a new paper, members of the Theory Center re-derive these in momentum space by using a spectral representation for certain Green's functions, valid in QED. This simplifies the demonstration that the transformations between covariant gauges form a group in any number of dimensions. In a further paper, it is shown that this procedure enables key equations of the theory to be evaluated explicitly as Feynman-like integrals even in a strong coupling limit in both the spacelike and timelike regions of Minkowski space. This is a step towards understanding the strong dynamics that controls the confinement of quarks and gluons in QCD.

6. Collaboration between researchers in the Theory Center and the Center for Accelerator Science at Old Dominion University has computed the energy spectra from Compton scattering within a linear plane wave model for an incident laser beam. In contrast to previous nonrelativistic calculations, the use of the relativistic Klein-Nishina scattering cross section allows the electron beam energy spread and emittance effects on the spectrum to be accurately calculated. The method is used to predict the energy spectrum of radiation passing through an aperture for the proposed Old Dominion University inverse Compton source.

7. A new Joint Physics Analysis Center paper studies the photoproduction of $\eta$ mesons, using the framework of Finite Energy Sum Rules to match the information from the resonance region with data in the high-energy regime. This approach allows one to constrain the unknown Regge couplings, and to predict the energy dependence of the beam asymmetry at high energies.

8. A new paper presents a detailed examination of the kinematical requirements needed for the factorization theorem for semi-inclusive deep-inelastic scattering processes to be valid. The current-region factorization is found to be valid only in...
The isovector charges of the nucleon are key measures of our ability to study the properties of the nucleon from first principles, and are crucial to certain experiments seeking evidence of new theories beyond the Standard Model. A recent Theory Center paper calculated these charges from first principle using lattice QCD, and showed that one of the main systematic uncertainties in their calculation, namely that due to the contribution of excited states, could be effectively removed through the use of the variational method. The calculation was performed at rather larger-than-physical quark masses, and lays the groundwork for future calculations using lattices generated by the JLab lattice group at physical quark masses that will be able to directly confront experiment.

A new method for computing hadronic matrix elements from lattice QCD has been introduced, which has the potential to improve systematic errors on the ground state matrix elements from excited state contamination. The method may therefore offer a solution to a practical problem that has plagued lattice QCD calculations of hadronic matrix elements for some time. As a benchmark calculation, the nucleon axial charge has been computed at a single lattice spacing with a pion mass of 310 MeV.

PUBLISHED JOURNAL ARTICLES FYTD:

2. X. Zheng and the CLAS Collaboration. "Measurement of Target and Double-spin Asymmetries for $\text{vec e}^-\text{vec p}$ to $\text{epi}^\pm(n)\text{S}$ Reaction in the Nucleon Resonance Region at Low $Q^2$." *Phys. Rev. C* **94**, 045206.

SIGNIFICANT AWARDS AND SCIENTIFIC CONTRIBUTIONS:

- Andrew Hutton, Associate Director – Accelerators, was awarded a Fellowship in the American Physical Society (APS) “for extensive technical contributions to accelerators world-wide as designer and adviser; for leading the commissioning and operation of world’s first large scale superconducting radio frequency accelerator at Jefferson Lab; and for fostering graduate education in accelerator science and technology.”

- Peter Bosted, Jefferson Lab User, was awarded a Fellowship in the American Physical Society (APS) “for invaluable contributions to unraveling the structure of the proton and neutron via elastic, inelastic, and spin-dependent electron scattering from nucleons and nuclei.”
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- Cynthia Keppel, a senior scientist and the group leader for experimental halls A and C at Jefferson Lab, recently received the 2016 Francis G. Slack Award from the Southeastern Section of the American Physical Society (SESAPS) for her “excellence in service to Physics.”

- JLab scientists, led by Robert Edwards, a senior staff scientist of the Theory Center, have been awarded $2.1 million as part of a multi-institutional project, the “Exascale Lattice Gauge Theory Opportunities and Requirements for Nuclear and High Energy Physics”, sponsored by the US Department of Energy’s Exascale Computing Project.

- Phiala Shanahan, incoming staff scientist in the Theory Division, was nominated as a member of Forbes ‘30 under 30’ in Science.
GOAL 2: CONSTRUCTION AND OPERATIONS

JSA provides effective and efficient strategic planning; fabrication, construction and/or operations of Laboratory research facilities; and is responsive to the user community.

12 GEV UPGRADE:
- At the request of DOE’s Office of Nuclear Physics, Stephen Meador, Director of the Office of Project Assessment in DOE’s Office of Science, convened a team of 10 experts and eight observers for a Status Review of the 12 GeV CEBAF Upgrade Project at Jefferson Lab, held October 25-26, 2016. The purpose of the review was to assess all ongoing aspects of the project, including technical, cost, schedule, management, and environment, safety and health. The review team provided valuable feedback in all areas, with a total of six recommendations in the closeout report. The committee enthusiastically congratulated all team members working in support of the 12 GeV Upgrade on the significant amount of work completed since a similar review last October and was supportive of the team’s planned approach to completing the project on schedule and cost.
- Hall C Magnets: By the end of FY17 Q1, all three remaining magnets for the SHMS spectrometer had been delivered from the French vendor, Sigma Phi. All three magnets (Dipole, Quad2, and Quad3) passed their receipt inspections, and were installed on the spectrometer carriage. Significant progress was made commissioning Q2 with power tests successfully reaching more than 90% of the anticipated operations current by years end. For the Dipole, connection of the Cryo-Control Reservoir (CCR) to the magnet is well underway.
- Hall B Magnets: Final acceptance tests of the Torus magnet were completed in November, marking the successful completion of this project scope. Significant technical progress was made on the Solenoid magnet at ETI including integration of coils 1 through 4 with coil 5 resulting in a single cold mass and thus retiring a prominent technical risk. However schedule performance at the vendor remained a concern. The JLab team is working ahead on all Solenoid scope that can be done prior to magnet delivery, and has taken over responsibility for magnet transportation planning and hardware to facilitate ETI engineering focus on final assembly.
- Hall B Detectors etc.: The last of the six Region 3 Drift Chamber sectors for CLAS12 have been installed into the Torus magnet. A temporary support shell for the Central-Time-of-Flight detectors was designed, built, and installed; 6 (of 48) counters were installed by years end. Final beamline components were procured and installation began.
- As the 12 GeV Upgrade project nears the commissioning phase for Halls B and C, the last of the scheduled modules of the Accelerator Readiness Review (ARR) is scheduled for January 9-10, 2017. The ARR committee is charged with determining if Jefferson Lab is prepared to deliver beam for the commissioning and operation of Experimental End Stations (Halls) B and C, and the experimental equipment associated with the 12 GeV Upgrade Project, in a safe and efficient manner. Both Halls are on track in preparation for this critical review.

EXPERIMENTAL RESEARCH:
- The scheduled phase of an experiment in Hall A to verify understanding of the Deeply-Virtual Compton Scattering (DVCS) process was completed. In this measurement, the momentum transfer dependence of the DVCS process can be determined and compared with the expected scaling behavior. Mostly in parallel but with a small dedicated component, a measurement of the proton magnetic form factor at high momentum transfer with high precision was completed. The latter constitutes the second completed experiment in the 12-GeV era, but the first completed experiment also taking advantage of the upgraded beam energy.
- The experiment readiness review for the Q2, Q3 and Dipole Superconducting Magnets in Hall C was held. This constitutes the last experiment readiness review to initiate the pre-operations and early physics phases in Hall C.
- The experiment readiness review for the beam line and detector components in Hall B was held. This review included the scope for both the pre-operations phase and the initial engineering run.
- A week of beam delivery to Hall D/Gluex allowed check out of one of two new 50 micron thick diamonds, of massive changes made in the DAQ and electronics towards a robust and efficient DAQ system (now doubling our capacity of Level-1 trigger rates), and tests towards a basic software (level-3) L3 trigger up to rates of 70 kHz. The latter test was to better bench mark the computer requirements to fully implement the L3 trigger. This engineering week will allow us to expedite the start of the GlueX physics run.
- A Director’s Review of the MOLLER experiment was held on December 15-16, 2016 to assess the scientific, technical, cost and schedule status of this potential future project. The review committee contained 8 external reviewers and 5 internal reviewers, and was chaired by Prof. Doug Beck from the University of Illinois.
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- A Software and Computing Review was held on November 10-11, 2016 to assess the readiness of the collaborations in Halls A, B, C, and D to produce publishable scientific results during the early running of the 12 GeV upgraded CEBAF. The review committee consisted of 5 external reviewers and was chaired by Torre Wenaus from Brookhaven National Lab.

EIC/JLEIC:
- The Jefferson Lab Electron-Ion Collider (JLEIC) baseline was slightly updated in preparation for an EIC Accelerator R&D review. Even if the baseline for the JLEIC design has been stable, some of the parameters were slightly adjusted to optimize performance taking into account the recent finding of the first pulsed-beam electron cooling test experiment at IMP/Lanzhou. This resulted in a higher projected luminosity over the JLEIC energy range.
- Increased the luminosity of the baseline design of the JLEIC accelerator design from 4.5x10^{33} cm^{-2} sec^{-1} to 2x10^{34} cm^{-2} sec^{-1}. That was achieved by adopting an electron cooler design based on an ERL and a multi-turn cooler ring able to provide stronger ion cooling. This development was made possible by good progress on the fast kicker R&D and on the design of the ERL cooler.
- Prepared for the comprehensive ONP Community Review of the EIC Accelerator R&D that was held on November 29-December 2, 2016. A panel of top accelerator experts was tasked to review in depth the design concepts for the EIC and the associated accelerator R&D.
- The JLEIC design team timely provided the extensive input asked by The Panel including overall design information and R&D plans. We identified 32 R&D CTE (Critical Technology Elements), self-assessed the technical readiness level, and presented a plan – including cost and schedule – to reduce the overall technical risk of the design to ‘low’ in 4 years.
- The design and the R&D plans were well received by the Panel and we are expecting a final report in January 2017 that will guide our future activities.

ACCELERATOR OPERATIONS:
- CEBAF delivered beam on 1st, 3rd, 4th and 5th passes in support of two experiments, DVCS and GMp, in the Hall-A end-station. Both experiments completed the scheduled portion in FY17 Q1 beam operations. Hall-D experiment, GlueX, received beam in the final week of beam operations in preparation for their first production operations in Spring 2017. Beam studies were used in this period to commission the reconfigured 5th pass separation system. The measured amount of separation, 20% increase over Spring 2016 configuration, agreed with the estimates. Unfortunately a vacuum leak in one of the separator cavities prevented subsequent separated beam operation in November/December. The cavity has been repaired and will be used in Spring 2017. Decoupling of the photo-cathode high voltage from the CEBAF machine protection system has resulted in an improved photo-cathode lifetime due to the reduction in high voltage cycling on the cathode.
- Completed the acceptance test, installation and commissioning of the C50-12 cryomodule for CEBAF gradient maintenance. Completed the assembly and acceptance test of the new injector quarter cryomodule, meeting all performance specifications.
- In the Center for Injectors and Sources (ACCCIS), a new photocathode was evaluated that demonstrated record level photoelectron yield, or quantum efficiency, with beam polarization greater than 80%. Photocathode QE was 6.4%, representing an enhancement of approximately six over photocathodes used today. Such a photocathode could be used in the production of milliampere-current polarized electron beams, for example, to generate polarized positron beams at CEBAF or in support high current polarized electron beams for the eRHIC EIC proposal. This work was part of a successful SBIR collaboration.
- Completed the assembly of the prototype cryomodule and began acceptance test in the Cryomodule Test Facility for LCLS-II. Completed the qualification of production cavities and assembled the first production cavity string assembly. Successfully completed Production Readiness Review with full release of production activities.
- Completed welding and began processing of two double quarter wave cavities for the U.S. LHC Accelerator Research Program (US LARP).
- Completed and delivered a budgetary estimate for the Spallation Neutron Source (SNS) Proton Power Upgrade Project.

NOTABLE OUTCOME STATUS:
- Objective 2.2: Execute the assigned LCLS-II project scope in compliance with the technical performance specifications and within the established DOE performance goals for cost and schedule.
  - JSA is on schedule and cost with a SPI=1.01 and a CPI of 1.00.
The cryogenics plant 4.5 K cold box procurement required significant focus this quarter. The vendor was forecasting a late delivery of the first cold box eliminating all float to first light milestone. JLab worked with the vendor to develop a recovery plan. This plan was successful in recovering the scheduled delivery of the first cold box to the original contract date. The plan was presented at a Director’s Review at Jefferson Lab in November 2016.

The SRF cavities have required a significant amount of work to maintain the technical performance. Cavity performance has been impacted by material and fabrication processes, which have only been realized while working to the unprecedented high quality factor specification of the LCLS-II project. The SLAC/FNAL/JLab collaboration has developed a working group to provide technical recommendations to the project to maintain the required performance while minimizing the schedule impact. JSA is working closely with the SRF cavity vendors to implement the required production changes in a controlled way.

Objective 2.2: Complete the CD-4B (Approve Experimental Equipment Project Completion) key performance parameters (KPPs) for the 12 GeV CEBAF Upgrade project.

- Hall C: A detailed, resource-loaded installation plan for the remaining work required prior to beam delivery was prepared and vetted by a Director’s Review panel and by the DOE SC OPA Review panel. Work is on track for readiness to receive beam and demonstrate the KPP in March 2017.

- Hall B: The JLab team prepared a revised installation plan, which re-sequenced demonstration of the KPP in order to decouple completion of all other scope and CD-4B criteria from Solenoid magnet delivery. This plan was vetted in two parts by Director’s Review panels and by the DOE SC OPA Review panel. That plan, known as “Plan C”, was implemented in November 2016, and work is on track for demonstration of the KPP in February 2017.
GOAL 3: PROGRAM MANAGEMENT

JSA provides effective program vision and leadership; strategic planning and development of initiatives; recruits and retains a quality scientific workforce; and provides outstanding research processes, which improve research productivity.

- JSA’s LDRD program began its fourth year in FY17 Q1. The formal LDRD Annual Summary Report was submitted for the three projects funded in FY16: Riad Suleiman and Matt Poelker, “Generation and Characterization of Magnetized Bunched Electron Beam from a DC Photogun for MEIC Cooler”; Christian Weiss, “Nuclear gluons with charm at EIC”; and He Zhang, “Enhancing Simulation Capability for Electron Cooling in MEIC Project”.

- A total of eight proposals were received for FY17 funding: two were for continuation of projects begun in FY16 (Suleiman and Poelker; and Weiss, identified above) and six were new proposals. Following our now standard procedure, all of the proposals were reviewed by the lab’s LDRD Project Review team supplemented by subject matter experts. The team was impressed with the progress of the projects started in FY16 and requesting continuation, and recommended their continuation along with two new projects, both related to a future EIC at Jefferson Lab: Markus Diefenthaler, “Phenomenological Study of Hadronization in Nuclear and High-Energy Physics Experiments”; and Pawel Nadel-Turonski, “Geometry Tagging for Heavy Ions at JLEIC.”

- Hundreds of scientists convened at Jefferson Lab and the surrounding area for several meetings, conferences, and workshops that were sponsored and/or hosted by the Lab during this performance period, including JLEIC Collaboration Meeting, October 5-7, 2016, JLab; Photocathode Physics for Photoinjectors (P3) Workshop, October 17-19, 2016; Excited Hyperons in QCD Thermodynamics at Freeze-Out Workshop, November 16-17, 2016, JLab; and Heavy Photon Search Collaboration Meeting, November 16-18, 2016, JLab. These collaborations provide important opportunities for discussions of scientific results and future opportunities.

- JSA’s Science Education outreach statistics through FY17 Q1 included interactions with 2,436 students (4,912 contact hours) and 132 teachers (484 contact hours) through the BEAMS (Becoming Enthusiastic About Math and Science) program, Physics Fest program, JSAT (JLab Science Activities for Teachers) visits, and other school visits. Significant activities during FY17 Q1 include:
  - JSA was invited and participated in Science Day with the Virginia School for the Deaf and Blind. Two such events were held in the state; October 8, 2016 in Stafford County, VA and November 5, 2016 in Staunton, VA. A total of 22 deaf, hard of hearing, and visually impaired students engaged in hands-on, inquiry-based activities designed to strengthen and promote STEM interest.
  - JSA partnered with Newport News Public Schools on October 28, 2016 to present the Newport News Public School Engineering Design Challenge. Ninety-six elementary students from across the school division convened for a challenge that required them to collaborate, innovate, and think critically to solve a laser maze problem.
  - Fifty-seven students from Carver Elementary School in Newport News participated in the Hour of Code at Jefferson Lab on December 9, 2016. Students were introduced to computer programming using an interactive Star Wars-themed activity. In addition to members of the Science Education staff, five staff members from the Jefferson Lab Computer Center volunteered to assist students in the classroom.
Goal 4: Provide Sound and Competent Leadership and Stewardship of the Laboratory

- OBJ 4.1 – Leadership and Stewardship of the Laboratory (33%)
- OBJ 4.2 – Management and Operation of the Laboratory (33%)
- OBJ 4.3 – Contractor Value-Added (34%)

NOTABLE PERFORMANCE ITEMS:

4.1 Jefferson Lab Senior Leadership regularly interacts with local organizations to develop and maintain long term relationships that are beneficial to the lab. During FY17 Q1, the Lab Director attended two Greater Peninsula NOW meetings. In addition, the Lab Director, Deputy Director Science & Technology, Chief Planning Officer, Chief Operating Officer, Chief Financial Officer/Business Services Manager, Facilities and Logistics Manager, and the SURA Corporate Secretary attended the Newport News State of the City address by Mayor McKinley Price.

- The Jefferson Lab Director hosted a delegation from the People's Republic of China (PRC) on December 21, 2016 following the joint US-PRC meeting hosted by SURA in Washington, DC. Discussions took place regarding increased collaboration on areas of common interest in hadron spectroscopy.

- The Jefferson Lab Director convened two internal Reviews to vet the detailed installation and commissioning plans for Hall B in preparation for the DOE SC-OPA Review of the 12 GeV Project, and in preparation for beam delivery in Spring 2017 to demonstrate the Key Performance Parameter. The first Review on October 5, 2016, endorsed the proposed plan to mitigate schedule risk due to delayed Solenoid delivery, and requested the plan be fully developed and resubmitted for evaluation. On November 21, 2016, the panel was re-convened to review the detailed plan, which received full panel support.

- The GlueX collaboration presented first preliminary results at the fall APS Division of Nuclear Physics meeting in Vancouver, BC, Canada.

Jefferson Lab Senior Leadership actively participates in numerous scientific, national, and international organizations.

New Appointments:
- LBNL Director’s Review Committee for LZ Project Robert McKeown, Deputy Director for S&T
- Mainz PRISMA Cluster of Excellence Scientific Council Robert McKeown, Deputy Director for S&T
- Institute of Electrical and Electronics Engineers (IEEE) Executive Committee Chair Fulvia Pilat, Deputy Associate Director – Accelerator Division
- High Energy Physics Advisory Panel (HEPAP) member Fulvia Pilat, Deputy Associate Director – Accelerator Division
- American Physical Society’s Topical Group on Hadron Physics (GHP) Vice Chair David Richards, Theory Group Senior Staff Scientist
- Institute of Electrical and Electronics Engineers (IEEE) Particles and Beams Executive Committee National Member at Large, George Neil, Accelerator Division scientist
- Institute of Electrical and Electronics Engineers (IEEE) Senior Member George Neil, Accelerator Division scientist
- 2017 IRMMW-THz Society Board Member and International Organizing Committee member George Neil, Accelerator Division scientist
- International Committee for Future Accelerators (ICFA), Panel on Light Sources Chair George Neil, Accelerator Division scientist
- Free Electron Laser International Executive Committee member George Neil, Accelerator Division scientist
- International Society for Infrared Millimeter and Terahertz Wave Executive Board member George Neil, Accelerator Division scientist
- FNAL Long Baseline Neutrino Committee (LBNC) member Amber Boehnlein, Chief Information Officer
- NSF Computing Project ‘Diana’ Advisory Board member Amber Boehnlein, Chief Information Officer
Continuing Appointments:

- International Union of Pure and Applied Physics (IUPAP) Working Group 9 (WG9) member
  Hugh Montgomery, Laboratory Director
- International Committee for Future Accelerators (ICFA) Panel on Sustainable Accelerators and Colliders
  Andrew Hutton, Associate Director – Accelerators
- Division of Nuclear Physics (DNP) American Physical Society (APS) Executive Committee member
  Rolf Ent, Associate Director – Experimental Physics
- Division of Nuclear Physics (DNP) American Physical Society (APS) Nominating Committee member
  Cynthia Keppel, Halls A/C Group Leader
- Division of Nuclear Physics (DNP) American Physical Society (APS) Program Committee member
  Rocco Schiavilla, Theory Group scientist
- National Laboratories Chief Operations Officers (NLCOO) point person
  Mike Maier, Chief Operating Officer
- SC Operations Improvement Council (OIC) member
  Mike Maier, Chief Operating Officer
- Institute of Electrical and Electronics Engineers (IEEE) Executive Committee Vice Chair
  Fulvia Pilat, Deputy Associate Director – Accelerator Division
- Institute of Electrical and Electronics Engineers (IEEE) Executive Committee voting member
  George Neil, Accelerator Division scientist
- Compute Canada International Advisory Committee (IAC) member
  Amber Boehnlein, Chief Information Officer
- DESY Physic Research Committee (PRC) member
  Amber Boehnlein, Chief Information Officer
- National Labs’ HR Director Group Vice Chair
  Rhonda Barbosa, Human Resources Director
- National Laboratory Technology Transfer (NLTT) working group member
  Drew Weisenberger, Chief Technology Officer
- Nuclear Science Advisory Committee (NSAC) member
  Cynthia Keppel, Halls A/C Group Leader
- SC Operations Improvement Council ESH Group Chair
  Mary Logue, Associate Director – ESH&Q

4.2 JSA maintained a robust contractor assurance system during FY17 Q1. During this period, we operated in a transparent fashion with regular meetings with the TJSO staff to provide progress and status updates and early insight into developing issues. There were three ORPS reportable events that were communicated in a timely fashion, as well as several events that fell below the ORPS criteria that were nonetheless reported to TJSO for visibility. We held meetings on October 21, 2016 and November 18, 2016 with the JSA Operations and Safety Committee to maintain awareness within the joint venture partner organizations of progress and issues and where corporate reach back might become necessary.

JSA maintained uninterrupted operations this period despite the lack of an FY17 appropriation and resulting continuing resolutions. We provided TJSO timely reporting of when available funds would be exhausted and recommendations on how funding could be redistributed between projects. JSA also took action to carefully prioritize non-labor commitments to manage through delays in funding disbursements and prevent any operations impact.

JSA worked closely with the Office of Science (SC) to maintain awareness of the developing security challenges resulting from international agreements. Jefferson Lab’s COO attended classified briefings for the laboratory director at DOE Headquarters on November 2, 2016 and again on December 14, 2016. Unclassified synopsis of these meetings was shared with JSA leadership.

JSA agreed to host the December meeting of the Lab Operations Board (LOB). The LOB met on December 8, 2016 and then toured the CEBAF on December 9, 2016. We believe this meeting increased awareness of Jefferson Lab’s mission and science capabilities within a number of DOE leaders who had not visited, or do not regularly visit the laboratory.

JSA reinforced our excellent relationship with the Commonwealth by hosting Delegate Marcia Price on November 29, 2016 for a lab overview briefing and tour of the CEBAF. Delegate Price represents the 95th District in the Virginia House of
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Delegates and is a member of the Health, Welfare, and Institutions Committee. The Commonwealth has been a strong supporter of Jefferson Lab and provides valuable financial support to the lab and its scientists.

- Jefferson Lab’s COO was a member of the DOE Order 232.2 Integrated Product Team that was charged with the responsibility to provide a revised order for DRB approval by December 15, 2016. This was an enormously challenging undertaking that required participation in a two day meeting at DOE Headquarters’ on October 12-13, 2016, followed by a series of conference calls. One particularly important contribution was to quantify the cost of the existing order, estimated to be on the order of 16 FTE’s annually across the entire complex (something on the order of 0.01%). This obviated the long held belief the existing order was excessively burdensome, allowing the team to move on to needed and achievable process improvements rather than revisit the perceived need to eliminate labor.

- On October 27th, 2016, Jefferson Lab’s COO, Engineering Director, and members of the technical staff were hosted by the NASA Langley Research Center for a tour of their facilities and discussion of systems they use to optimize power and water consumption. We also discussed ideas on how to best manage the impending Virginia Dominion Power Skiffs Creek outage scenarios. Collaboration with other large industrial users provides good shared insights and lessons learned we can carryover in our operations.

4.3 Corporate Governance. Members of the JSA Board, company officers, Committee members, owner representatives, board liaison/JSA CAS representative, and corporate staff provided governance support, ensuring the governance structure and function support the Lab and DOE and enable the Lab to capitalize on opportunities and address challenges that arise.

- JSA Board of Directors held a special meeting in October at which it discussed the report of the director search committee and rendered its decision regarding the director hire. See discussion under 4.3 Notable Outcome.

- JSA board liaison met with TJISO managers throughout the quarter discussing various topics including: director search status, JSA committee activities, DOE governance changes, SURA’s relations program activities, 2016 PEMP results, ethics review CAP status, state sales tax audit status; IF program status; etc.

- JSA board liaison coordinated with the Lab QA manager on enhancements to the performance management reporting process including periodic review and discussion of outstanding actions. See also discussion in 6.4.

- JSA representatives attended the Lab Director’s All-hands meeting at which he discussed Lab safety record, diversity & inclusion efforts, upcoming ethics training, 12 GeV project status, commissioning highlights, physics operation and Fall run, collaborative projects (LCLS-II, FRIB), FY2017 budget outlook, EIC developments, director search status, etc.

- JSA Programs Committee met during the SURA Board meeting in November at which it discussed the SURA relations program for JLab, Users Group activities, director search progress, JLab science program and operational status, JLEIC developments, Initiatives Fund Program activities, and other contractor value add. In addition to the Lab Director and Deputy Director, the JLEIC Physics Group Leader participated in the Committee meeting. The Lab Director gave the Jefferson Lab report to the SURA Board at its plenary session.

- JSA Operations & Safety Committee members met with Lab managers regularly discussing impact of CR on Lab operations; FY16 PEMP assessment; ARR preparations; LCLS-II reviews; CAS compliant G&A methodology; cafeteria contract; diversity and inclusion training; ethics training; UIM status; network architecture and operations review; MFA implementation; Virginia sales tax audit status; etc. See also discussion in 4.2.

- JSA, along with the TJISO and JLab, completed the annual CAS effectiveness self-assessment reviewing JSA’s governance performance over the past year against the CAS tenets.

- JSA Finance & Audit Committee held its annual meeting at which it discussed the FY2017 audit plan, corporate reach back, EthicsPoint reports, IPERA activity, insurance renewals, outstanding corrective actions, Lab budget update and status.

- JSA continued working with the Lab security officer to provide Board (directors) information to enable DOE to complete the FOCI determination process. During Q2, SURA as one of the JSA owners, will submit similar information for its organization, board and key managers.

- The JSA Governance Library was updated regularly during Q1 to ensure that the Board had ready access to information related to the Lab including its operational status. Examples of materials available include: information related to the meetings and actions of the six JSA committees, results of PEMP performance (TJSO feedback, DOE’s FY2016 report), Lab annual plan, risk registry, monthly safety reports, key operations metrics, etc.

Owners Commitment: JSA Initiatives Fund (IF) Program. An evaluation committee appointed by the JSA Programs Committee chair recommended award of $390K for 31 projects in the FY2017 IF Program. See press release at: http://www.jsallc.org/news/JSAIF20161208.pdf. This year’s Program includes ~$450K contributing funds in monetary and in-kind support: 70% from sources outside of Jefferson Lab, and 30% from the Lab (including monetary support for scientific
JSA/JLab Graduate Fellowship Program, PI: Elizabeth Lawson for the JSA Programs Committee. The eight graduate fellowship recipients, Abha Rajan, UVa; Kurtis Bartlett, W&M; Oleksandr Koshchii, GWU; Caryn Palatchi, UVa; Sebouh Paul, W&M; Holly Szumila-Vance, ODU; Nguyen Ton, UVa; and, Xuefei Yan, Duke, began their studies and research during this quarter.

Nathan Isgur Research Fellow Grant, PI’s: Elizabeth Lawson, Robert McKeown. Lab theory post doc Raúl Briceño who was appointed as the Nathan Isgur Research Fellow in August 2016, collaborated with colleagues at the University of Washington Institute of Nuclear Theory during the Spectrum and Structure of Excited Nucleons from Exclusive Electroproduction Conference in November.

Junior Scientist Travel Support. PI’s: Marco Battaglieri (INFN), Dipangkar Dutta (MS State), Doug Higinbotham (JLab) During Q1, eight students received travel funds to attend national and international conferences and workshops, at which they made presentations and gave talks about their JLab research. See http://www.jsallc.org/IF/IndexJSTF.html for information about student participation at meetings.

3D Parton Distributions and the LHC, PI’s: Harut Avagyan; Kawtar Hafidi (Argonne); Kyungseon Joo (UConn) Held at INFN Frascati and drawing almost 60 international participants, the workshop was aimed at increasing theoretical and experimental support for the nucleon 3D PDF programs by identifying common interests of 3D PDF & LHC communities. JSA supported the registration fees for several presenters. See workshop report at: http://www.jsallc.org/IF/Reports/17-Harut.pdf.

Data Mining Collaboration Meeting, PI: Larry Weinstein (ODU). The focus of this meeting held in December at MIT was Quantitative Challenges in EMC and SRC Research and Data Mining. Over 40 participants from U.S. and international institutions shared what has been learned and what still can be learned from data mining and how those efforts can be complemented by theory. JSA support for this sixth collaboration meeting helped defray travel expenses for half a dozen presenters. See http://web.mit.edu/schmidta/www/src_workshop/index.html for more information.

Jefferson Lab Science Activities for Teachers (JSAT) Program, PI’s: Lisa Surles-Law, Christine Wheeler. Now in its ninth year, the JSAT Program begin its AY providing 60 local 5th, 6th, and 8th grade science teachers with essential knowledge in the physical sciences and effective teaching methodologies. Teachers receive sets of the materials associated with the topics that are used immediately in the classrooms with the students. The 2016-2017 curriculum in this award-winning program includes: matter, energy transfer, force and motion, magnetism and electricity, atomic structure, waves and sound, simple machines, watershed and optics.

FIRST Robotics Team Competition, PI’s: David Lawrence, Nate Laverdure. JSA provided support (registration, competition kits and supplies) for student teams to participate in the FIRST Lego League (grades 4-8), FIRST Tech Challenge (grades 7-12) and FIRST Robotics Challenge (grades 9-12) competitions. These competitions introduce students to relevant STEM concepts at an early age, capturing their inherent curiosity and directing it toward discovering the wonders of science and technology. Past teams have been successful at recruiting females and minorities.

Activities in other IF projects during this period include: Director’s Discretionary Fund; Users Group Board Travel Support; Student Tour Guide Program; JSA Post Doctoral Research Grant; Graduate Students & Post Doc Activities; JSA/JLab Cooperative Education Program, Undergraduate Support for Jefferson Lab Research.

Owner (PAE Applied Technologies) Commitment: Skillport. A distance learning program, Skillport, remains a value added resource for employee development and continued learning. The availability of this computer based training tool for self-directed learning on various topical subjects fulfills the needs of the Lab in workforce training. Of the 47 licenses, 43 seats are currently allocated, the most queried courses included Diversity & Inclusion, and Implicit Bias, likely the result of the Diversity & Inclusion Council’s efforts to increase awareness among Lab supervisors and managers. Two staff members completed the project management qualification program during Q1.

Owner (SURA) Commitment: Relations and Outreach Program. SURA continues to provide support to the Lab in its relations and outreach program. The intent of the program is to establish effective working relationships with federal, state, and local authorities and with universities and industry leaders that have a vested interest in the Lab and in support of the nation’s science goals. During Q1 the relations team engaged in the following activities.
SURA representative attended with Lab leadership the State of the City (of Newport News) luncheon where Mayor Price delivered the address Delivering Greatness highlighting an urban design vision for the redevelopment of downtown NN. See also discussion in 4.1.


SURA and Lab leaders participated in a strategy session regarding a legislative remedy for the Virginia sales and use tax situation. SURA public affairs officer continues to coordinate with the state lobbyist and state officials toward an optimal legislative remedy. SURA general counsel continues to support the Lab in the appeal of the audit, including the development of supplemental information.

SURA participated with the Energy Science Coalition on communications to the transition team, specifically a statement advocating support for the national labs, elimination of the sequester and predictable, sustained-growth budgets, and maintenance of US leadership in science and technology.

SURA and the Lab hosted Virginia delegate Marcia Price for Lab visit, at which the Lab provided a briefing and tour of the MCC and Hall B. See also discussion in 4.2.

SURA continues to work with the state lobbyist to secure JSA priorities in the Virginia legislative session. The Governor’s budget for FY2017-2018 recommends the anticipated 5% reduction in general support and retained the full $1M EIC planning funds, along with the prospective sales tax relief.

Other Owner Contributions

SURA continues to provide the services and functions related to its role as the Administrative and Tax Member of JSA, including in Q1: reviewed and approved the Lab’s submission of FY2016 performance results for Commonwealth of Virginia funds; reviewed and submitted Form 5500 for the health care plans to the Department of Labor (SURA is the plan sponsor); negotiated insurance renewal policies; provided insurance certification to new customs broker; completed annual SAM registration including reps & certs and compensation report.

SURA supported the 37th Meeting of the US-PRC Joint Committee on High Energy Physics in December at its headquarters facilities, assisting with the transportation and lodging arrangements, and other logistics.

SURA was invited to submit a proposal following a submission of a letter of interest to the Commonwealth of Virginia’s Center for Innovative Technology (CIT) through the Commonwealth Research Commercialization Fund (CRCF) matching funds program for Development of a Superconducting Radio-Frequency Cavity for an Electron Accelerator for the Treatment of Flue Gases, PI: Gianluigi Ciovati. See also discussion in 6.5.

SURA’s Retirement Plan Subcommittee continues to provide fiduciary oversight of the retirement plans and during Q1 discussed SEC rule changes with TIAA representatives and conducted the annual due diligence reviews of plan assets.

SURA Board Trustee Ed Brash (CNU) continues to serve on the Director’s Safety Council representing the Users Group Board and has contributed to the Lab’s focus on student safety training and supervision.

SURA continues to provide the Residence Facility for temporary housing of students, researchers, and other guests associated with the various Lab programs. During Q1, guests included users on experiments and shift work, participants at collaboration meetings (GlueX, CLAS, Moller, SoLID) and other meetings (JLEIC, P3, Qweak, HPS, YSTAR, TMS MC), seminar speakers, and relocating and visiting employees.

**NOTABLE OUTCOME STATUS:**

- **Objective 4.3: Select and bring on board a new Laboratory Director by the end of FY17.**
  - An international committee chaired by former NSAC chair Donald Geesaman conducted an extensive search that included interaction with over 100 individuals including 3 dozen Lab staff members and users to solicit input and advice, followed by interviews during this quarter with a dozen candidates. The search committee was appointed by the JSA Board chair in 2016 and included five JSA Board directors with the JSA owner representatives Jerry Draayer and Karl Williams as search committee vice chairs. The result of the search was JSA’s appointment of Argonne’s APS Director Stuart Henderson as the next Jefferson Lab Director effective April 3, 2017. JSA kept DOE apprised of the status of the director search throughout the process to ensure complete transparency while maintaining the requisite confidentiality. See JSA press release at: http://www.jsallc.org/news/JSAPR20170106.pdf.
**Goal 5: Sustain Excellence and Enhance Effectiveness of Integrated Safety, Health and Environmental Protection (30%)**

- OBJ 5.1 – Provide Efficient/Effective Worker Health and Safety Program (80%)
- OBJ 5.2 – Provide Efficient/Effective Environmental Management System (20%)

### NOTABLE PERFORMANCE ITEMS:

**5.1** JSA’s Integrated Safety Management System (ISMS) continues to be effective, as evidenced by injury rates, events reported, and the results of assessments performed.

- JSA experienced one occupational injury during FY17 Q1, which resulted in restrictions affecting the worker’s ability to perform assigned routine functions. These limitations classified this injury as a DART case; JSA’s first recordable in over one million hours worked. Three other incidents were classified as Notable Events. All four were reported upon discovery and investigated as required by organizational processes. Three events were categorized as ORPS reportable, and those reports were submitted within the required timeframes. In one event, technicians discovered the 450 ton press in the Test Lab had more than one power source. This resulted in an extent of condition review, which is currently being performed by Division Safety Officers (DSO).

- Per JSA’s Risk-Based Assessment Process, the following six program areas were evaluated during this performance period confirmed process compliance, with limited findings; none pointing to programmatic concerns: Electrical Safety Self-Assessment (joint with TJSO), Lead Exposure Records Review, Ergonomics Program Effectiveness Review (joint with TJSO), Personal Protection Equipment Independent Assessment, ISMS Effectiveness Review, and Fire Protection Management Self-Assessment. Action plans are in place for these findings and identified opportunities for improvement (OFI) that were determined to add value to JSA’s ISMS.

- Members of the SLAC LCLS-II project team were onsite to conduct informal reviews of JSA’s Welding Program and the Integrated Safety Management (ISM) program. In both cases reviewers were more than satisfied with how project activities are integrated into the organizations systems.

- JSA did not detect any evidence of inadequate hazard analysis, disregard of hazards, or evidence that researchers were accepting unmitigated cumulative risk in their research activities during a recent review of the organization’s small-scale research activities. This exercise, led by JSA’s Directors’ Safety Council (DSC) in response to efforts by DOE’s Office of Science Operations Improvement Committee (SC-OIC), generated valuable feedback from lab staff and users. DSOs will incorporate these ideas into future efforts to improve work-planning processes.

- JSA successfully completed all elements of the Industrial Hygiene (IH) Monitoring Plan; which ensured a comprehensive and up-to-date data set for evaluating and mitigating hazards that are associated with chemical stressors and high volume noise. A review of the Lab’s CY2016 IH sampling data showed no personal exposures that exceeded the limits. This demonstrated compliance with the personal exposure limits outlined in 10 CFR 851, by the inclusion of the hierarchy of engineering and administrative controls over personal protective equipment as part of the organization’s work processes.

**5.2** JSA’s Environmental Management System (EMS) continues to be effective, as evidenced by no excursions, releases, or permit violations. In addition, viability of the EMS was demonstrated as noted:

- As a continuous improvement action, JSA’s Environmental Management System (EMS) Green Team met and discussed changes to the ISO 14001 standard. In general, the team concluded the system required no significant changes to conform to the revised standard.

- JSA continued its participation in the Virginia Environmental Excellence Program (VEEP) by submitting information on our environmental programs, initiatives and performance. Participation in this voluntary program strengthens the lab's relationship with the VA Department of Environmental Quality (DEQ).

- JSA applied and qualified for awards under the Electronic Product Environmental Assessment Tool (EPEAT) program and the Green Buy program, which recognizes excellence in the procurement of sustainable products.

- JSA prepared and submitted to TJSO, a NEPA Categorical Exclusion related to DOE’s Utility Energy Service Contracting (UESC) project, to help satisfy that federal requirement.

- JSA underwent a successful inspection by the Hampton Roads Sanitation District (HRSD); an application was submitted to extend the lab's HRSD discharge permit for an additional five years.
JSA received a 5-year extension on the existing Virginia Pollution Discharge and Elimination System (VPDES) industrial wastewater discharge permit, from the Virginia Department of Environmental Quality (DEQ). JSA also responded to a request from DEQ to provide comments on the draft Groundwater Withdrawal permit.

JSA environmental and facilities management staff reviewed and provided comments on the TECH Center’s stormwater system design, as requested by the developer W.M. Jordon, Co., to ensure DOE would not be subject to any adverse storm water effects from the adjacent property.

JSA developed and finalized a water quality compliance tool for future on-site land disturbing activities; this new tool is designed to ensure compliance with recently revised state regulations.

**NOTABLE OUTCOME STATUS:** None set for Goal 5
Goal 6: Sustain and Enhance Core Business Systems that Provide Efficient/Effective Support to Lab (25%)

- OBJ 6.1 – Provide Efficient, Effective, Responsive Financial Management System (20%)
- OBJ 6.2 – Provide Efficient, Effective, Responsive Acquisition Management and Property Management Systems (20%)
- OBJ 6.3 – Provide Efficient, Effective, Responsive Human Resources Management System and Diversity Program (20%)
- OBJ 6.4 – Provide Efficient, Effective, Responsive Contractor Assurance Systems, Including Internal Audit and Quality (25%)
- OBJ 6.5 – Demonstrate Effective Transfer of Technology and Commercialization of Intellectual Assets (15%)

NOTABLE PERFORMANCE ITEMS:

6.1 JSA provides an efficient, effective and responsive financial management system. Accomplishments during FY17 Q1 to demonstrate such performance is noted below:

- JSA was responsive to DOE’s request for an accelerated close of the FY16 Financials, which were completed and submitted by noon on October 5, 2016. This enabled DOE to have actual data for FY16 vs accruals to close out their books. It also allows easier reconciliations between JSA contract costs and DOE’s financial records; evident by JSA’s 3-week early submission of the FY16 Statement of Costs Incurred.
- JSA completed and submitted the FY16 Institutional Cost Report (ICR) to DOE on November 11, 2016; a week in advance of the actual due date.
- JSA participated in an ICR Consistency Review Workshop in December, along with representatives from other National Labs and DOE Program Offices, to examine data submissions from the individual laboratories and to confirm the information is interpreted consistently throughout and with no discrepancies in reporting. Workshop participants discussed proposed changes to the reporting categories and recommendations on how to perform further analysis to enhance cost management and assess operational effectiveness.
- JSA developed an electronic wage report that breaks out the hours by week for its semi-monthly pay period, in response to updated guidance regarding Executive Order 13673 – Fair Pay and Safe Workplaces. Compliance with this final ruling on paycheck transparency, allows the employee to see regular hours worked, overtime hours, rate of pay, gross pay, and itemization of each addition to and deduction from gross pay, listed on a supplemental Wage Statement. JSA reports time on a semi-monthly period; therefore, various scenarios were taken into consideration in efforts to determine the best path forward with minimum impact to the employees and business processes. Analysis, testing, and program development were completed in less than two months to meet the requirement; which is effective January 1, 2017.

6.2 JSA provides an efficient and effective acquisition management system through the provisions for purchasing of supply and services including major system components, subcontracting support and leasing support, P-card and E-commerce support, construction subcontracting and through an aggressive Small Business Program.

- JSA’s Women-owned and Disadvantaged Small Business Program Goals were exceeded during this performance period; Women-owned business purchases were 8.4% against a goal of 5.0% and Disadvantaged business purchases were 8.0% against a goal of 5.0%. Overall Small Business and the remaining program goals were significantly impacted by a $4M large business procurement for the LCLS-II project. Small Business purchases were 26.9% against a goal of 50.0%; Veteran-owned business purchases were 2.7% against a goal of 3.0%; Service-Disabled business purchases were .7% against a goal of 3.0%; and HubZone business purchases were 2.0% against a goal of 3.0%.
- JSA’s procurement staff worked diligently on several critical requisitions during this performance period. This includes finalizing the non-subsidized food services subcontract re-compete; efforts to improve the procurement schedule of the CLAS 12 Solenoid Magnet in support of the 12 GeV Project; and the procurement of Higher Order Mode Beam Line Absorbers (HOM BLA) for the LCLS-II Project. A Procurement Readiness Review (PRR) was conducted on November 10, 2016 by the SLAC LCLS-II Project team; a Request for Proposal (RFP) for the HOM BLA was issued on November 14, 2016.
- JSA’s Subcontracting Officer Technical Representative (SOTR) program has been recognized in past reviews as a Noteworthy Practice within DOE; as a result, the Lab’s procurement staff was invited to Fermilab in December to provide training for their SOTRs.
- JSA exceeded the reporting requirements set forth by the Management and Operations Subcontract Reporting Capability (MOSRC) to submit the first monthly report by November 20, 2016 and the Annual Top 20 Small Business actions by
JSA continues to strengthen its property system by ongoing efforts to organize and catalog engineering replacement parts that were previously stored in shipping containers; two of the containers are empty and ready for disposal. The organization was reimbursed $35K for recycled excess wire. These funds are being used to dispose of about 50 pieces of concrete demolished from one of the experimental halls.

6.3 JSA’s Diversity & Inclusion (D&I) Council delivered a course to all supervisors and managers, titled ‘Recognizing Potential Communication Barriers in a Diverse Population’. The course focused on understanding the impact culture, gender, and implicit bias has on communications and highlight ways to communicate effectively while interacting with others. Feedback was positive and the Council will be working with HR to bring the message to all employees.

JSA’s D&I Council launched a Climate Survey to assess employee’s perception of diversity and inclusion at the Lab. A 64% participation rate represents a notable 20% increase over the baseline survey conducted in 2014. The results are being analyzed for distribution to senior managers FY17 Q2.

JSA prioritized the Human Resource department’s planned outreach and recruiting events to ensure an effective use of resources. Maintaining strong community partnerships, promoting STEM careers in the community, and continuing to build a strong, diverse pipeline of candidates is critical to remaining competitive and responsive. The following FY17 Q1 outreach events were attended in support of this goal:

- **AbilityLinks Virtual Job Fair** (October 12, 2016): The Virtual Career Fair offered a cost-effective solution to broaden recruitment efforts with a specific focus on Individuals with Disabilities. While this event did not yield a direct increase in applicant flow, it did support general Affirmative Action objectives and established a relationship with a new community partner.

- **National Laboratories Career Day** (October 20, 2016): All of the National Labs, in collaboration with the DOE, were invited to Atlanta, GA for a second National Laboratories Career Day. Each of the DOE/NNSA Labs participated in this one-day coordinated event. Spelman, Morehouse College, Clark Atlanta University and Georgia Tech promoted this event to their students. Activities included Lab panel discussions, student panel discussions, and a job fair.

- **VEC Employer Conference** (December 5, 2016): The Virginia Employment Commission Employer Conference was held in December 2016 and is a critical community partner. Attendance at this event provided networking opportunities and served to inform HR of recent and upcoming changes impacting Human Resources operations in Virginia.

6.4 JSA implemented a more robust Performance Management reporting process in FY17 Q1. As the primary vehicle for the organization’s performance assessment, this process collates input from over 20 people in ten departments, as well as the Corporate parent. Examples of improvements include a prescribed, detailed schedule for quarterly, semi-annual and annual inputs and reviews, notable outcome discussion and proposals, and expectations regarding actions related to TJSO feedback. The enhanced process was coordinated with the TJSO Contracting Officer counterparts and their comments incorporated prior to implementation.

JSA’s FY2017 Internal Audit Plan is on target. The Allowable Cost – Transaction Testing FY16 audit is well underway for completion in the second quarter. Internal Audit has begun discussions with Cherry Bekaert to assist with the LDRD Implementation and CAS 405 audits. The Internal Audit Plan is currently under consideration for revisions to replace the audit on Classification of Personal Property, which assesses compliance with DOE O 580.1A with another risk based property audit. The potential revision is founded on the expectation that the Order will be rescinded once the recent changes to 41 CFR 109 are implemented in the near future; therefore, eliminating the risk of non-compliance.

In order to comply with The Fair Pay and Safe Workplaces Executive Order (E.O.13673), JSA’s Management Information Systems (MIS) worked with Finance to develop a new timesheet report to show hourly pay for non-exempt employees that otherwise could have required an overhaul of JSA’s payroll processes, saving the costs that would be associated with such a transition and minimizing impact to Lab employees. As a follow-up to the DOE small business reporting requirements implemented last year in the MOSRC project, MIS worked with procurement to transition all of their internal reports to the same underlying small business data.

As part of the Data Center Renovation Project with Facilities Management and in support of DOE’s Data Center Optimization Initiative (DCOI) efforts, JSA’s Information Technology (IT) Division moved HPC systems into a new hot aisle containment system to complete phase 3 of the project. When complete, the Data Center Renovation Project will improve power utilization efficiencies to meet DOE’s DCOI goals and will consolidate two existing Data Centers into the space of one.
As part of the ESnet Site Coordinators Committee (ESCC), JSA’s IT Division is sharing its knowledge and experience with newer networking technologies to aid Pacific Northwest National Laboratory (PNNL) in the design of their next campus network and to provide improved reliability.

Working with Facilities Management, JSA’s IT Division completed the design for an external WiFi system. Funding has not yet been secured, but once implemented this will improve communications and provide additional network functionality for the laboratory.

6.5 JSA’s FY17 Q1 performance in technology transfer activities is laying the basis to exceed expectations for the year. During this period, we were contacted by 20 small business entities active in SBIR/STTR Phase I and II Funding Opportunity Announcements and have submitted 48 support letters; 31 in the October Phase I proposal calls and 17 in the November Phase II proposal calls for support letters for their proposals to DOE. In cooperation with SURA, JSA/JLab is pursuing grant funding from the Commonwealth of Virginia’s Center for Innovative Technology (CIT) – Commonwealth Research Commercialization Fund (CRCF) program for R&D for development of Superconducting Radio-Frequency (SRF) Cavity technology for an Electron Accelerator for the treatment of flue gases. Ten Cooperative Research and Development Agreements (CRADAS) and one Strategic Partnership Project, including modifications, were initiated in FY17 Q1. The organization hosted meetings with two different companies interested in licensing JLab IP. In addition, five invention disclosures were received and one intellectual property license was executed during this period as noted:

**Invention Disclosures**
- 1429 Neutron Detector for use in Strong Gamma-Radiation Fields
- 1430 Transition Radiation Light Sources
- 1431 Boron Nitride Nanotube Transition Radiation Detectors and Sources
- 1432 Transaction Radiation Light Sources

**Patents Awarded**
- 9,463,433 Nano-Material for Adhesive-Free Absorbers for Bakable Extreme High Vacuum Cryopump Surfaces

JSA’s Staff Services coordinated more than 70 events during FY17 Q1. There were a total of 535 registered participants representing 238 institutions. All workshops were tracked through the DOE reporting system, iPortal, meeting all DOE requirements. Registrations from sensitive countries were screened for potential security threats as they were received. Support was also provided for informational and training activities hosted onsite by local mutual aid organizations that provide emergency response services to the Lab.

**NOTABLE OUTCOME STATUS:** None set for Goal 6
### Goal 7: Sustain Excellence in Operating, Maintaining, Renewing the Facility and Infrastructure Portfolio (25%)

- **OBJ 7.1** – Manage Facilities/Infrastructure in Effective Manner to Optimize Usage/Minimize Life Cycle Costs (40%)
- **OBJ 7.2** – Provide Planning for and Acquire Facilities/Infra Required to Support Future Lab Program (60%)

#### NOTABLE PERFORMANCE ITEMS:

##### 7.1
- JSA upgraded the facilities’ computerized maintenance management system to version 7.6 and expanded preventative maintenance to include the fire detection and suppression systems. New fall protection standards were established for building maintenance activities in collaboration with ESH&Q. Oversight of the Material handling program has been moved to the Facilities Operations and Maintenance group.
- JSA upgraded three Fire Protection Network Command Centers from 16 node to 32 node capacity in support of infrastructure optimization and to ensure site capability to meet mission needs. This doubles the number of nodes that can be directly monitored across the site and it facilitates meeting critical expanded monitoring requirements.

##### 7.2
- JSA emphasizes contractor safety by continuous monitoring of work activities and weekly walk-thru inspections. There have been no subcontractor recordable injuries since November 2012.
- The Computer Center is currently being upgraded under the Utility Infrastructure Modernization (UIM) project. UIM is 90.7% complete and very close to scheduled performance and cost index; SPI = 0.98 and CPI = 1.01. The Project continues to maintain a perfect safety record after 125,582 hours worked. The third phase of work is in process.
- Construction of the new ESH&Q building is 76% complete, with a perfect safety record after 18,098 hours worked.

#### NOTABLE OUTCOME STATUS: None set for Goal 7
Goal 8: Sustain/Enhance Effectiveness of ISSM and Emergency Management Systems (20%)
- OBJ 8.1 – Provide Efficient/Effective Emergency Management System (25%)
- OBJ 8.2 – Provide Efficient/Effective Cyber Security System for the Protection of Classified/Unclassified Information (50%)
- OBJ 8.3 – Provide Efficient/Effective Physical Security Program for Protection of SNM, Classified Matter, Classified and Sensitive Information, and Property (25%)

NOTABLE PERFORMANCE ITEMS:

8.1 JSA’s goal for FY17 is to maintain an efficient and effective emergency management system. Significant during FY17 Q1:

8.2 JSA demonstrates an effective Cyber Security Program evidenced by the number of Cyber Security Incidents (CSI), the effectiveness of configuration and patch management via vulnerability scanning, and the time required to investigate and remediate alerts identified by the laboratory’s Intrusion Detection Systems. Several enhancements to the cybersecurity program were implemented. JSA also continues to collaborate with DOE on cybersecurity initiatives.
   - **Key Cyber Security Metrics:**
     - Cyber Security Incidents: 0, 0, 0
     - Average Number of Systems Scanned with Critical Vulnerabilities Detected: 1.25%, 2.06%, 0.14%
     - Mean Time to Remediate Intrusion Events: 0.6 days, 0.6 days, 0.45 days
   - **Cybersecurity Program Enhancements:**
     - Strengthened IDS system by decrypting web traffic and having the IDS systems process it to identify and block known malware and other nefarious activity.
     - Added additional email monitoring capabilities of attachments to the IDS systems. Analysis is currently a manual process; provides additional data needed to conduct forensics on email attacks (phishing) and expands our scanning of attachments malware and other types of nefarious software.
   - **Collaborations with DOE on Cybersecurity Initiatives:**
     - Participated in DOE data sharing and iJC3 initiatives for creation of an unclassified Security Operations Center (SOC)
     - Responded to several data calls: Multiple MFA status updates; Cloud Service Providers; Network Infrastructure
     - Device Critical Hygiene Measures; High Value Asset Inventory
     - Responded to Cooperative Protection Program (CPP) investigation request from iJC3
   - **DOE Multi-Factor Authentication (MFA) Project:** As part of DOE’s MFA project, JSA completed the deployment of MFA for privileged users in FY16 but did not complete deployment for standard users by DOE’s deadline. Per SC’s guidance, a Plan of Action and Milestones (POA&M) was created for tracking progress. Key initiatives for this quarter include:
     - Delivering tokens to over 200 standard users
     - Configuring the authentication environment to support the initiative
     - Separating the central file server to enforce boundaries for out of scope open science user accounts
     - Adding MFA to IT managed configurations for LINUX and MACs
     - Upgrading JLab’s account and certificate management systems
     - Developing a pilot project for microsegmentation (private vlans), in preparation for future improvements to network security

8.3 JSA’s goal is to maintain an efficient and effective Physical Security Program for protection of SNM, classified matter, classified and sensitive information, and government property during FY17. Significant during FY17 Q1:
   - JSA increased the effectiveness of the site surveillance system by replacing the obsolete Video System, tripling the camera resolution, and allowing Lab security to control and limit down time to the program required 24-hours for 37 active cameras.
   - JSA continued security planning and training through preparation of a Nuclear Materials Management Plan and Active Threat-Bomb detection training with FBI, Homeland Security, and regional police departments. JSA provided security assistance to Governor Terry McAuliffe’s protective detail while at the Cyber Physical Systems Summit at Jefferson Lab.
| NOTABLE OUTCOME STATUS: None set for Goal 8: |   |   |   |   |
GOAL 1: MISSION ACCOMPLISHMENT

JSA’s S&T Programs produce high-quality, original, and creative results that advance science and technology; demonstrate sustained scientific progress and impact; receive appropriate external recognition of accomplishments; and contribute to the overall research and development goals of the Department and its customers.

EXPERIMENTAL PHYSICS RESULTS:
Results from 6 GeV era experiments continue to be reported, as well as early results from the 12 GeV era.

- In Hall A, the Rosenbluth technique was used to separate the longitudinal and transverse responses of $\pi^0$ electroproduction off both the proton and the neutron (from data on the deuteron). There is indication of a non-zero longitudinal contribution both by the interference structure functions and the longitudinal component at small $-t$. Nonetheless, a fair agreement is obtained with models based on transversely Generalized Parton Distributions. The proton data are published in Physical Review Letters, and the extracted neutron data are submitted for publication.

- In Hall B, the cross section for $\eta$ electroproduction was determined with 5.75 GeV beam energy over a wide range of kinematics, to add to the earlier published neutral-pion data. At low $-t$, the data are reasonably described by a dominance of chiral-odd transversely Generalized Parton Distributions. Significant deviations are found at larger $-t$. This archival-type publication is published in Physical Review C.

- In Hall C, the QWeak collaboration approved the unblinding of the data. The data are still not to be disclosed, but preparations have started towards publication and first presentation.

- The first GlueX/Hall D early science result was accepted for publication in Physical Review C Rapid Communications. The photon beam asymmetry was measured for the $\pi^0$ and $\eta$ photoproduction reactions on the proton using a 9 GeV linearly-polarized, tagged photon beam incident on a liquid hydrogen target. The results for the $\pi^0$ asymmetry represent a significant increase in precision relative to previous measurements, and the $\eta$ measurements are the first above 3-GeV photon energies.

THEORY PROGRAM RESULTS:

- The Joint Physics Analysis Center (JPAC), working closely with the GlueX and CLAS12 collaborations, studied the photoproduction of $\eta$ mesons by using the framework of Finite Energy Sum Rules to match the information from the resonance region with data in the high-energy regime. This approach allows one to constrain the unknown Regge couplings, and to predict the energy dependence of the beam asymmetry at high energies.

- The Center is known for pioneering the application of lattice QCD techniques to problems of hadron spectroscopy, such as the spectrum of isovector and isoscalar mesons. Using Wilson-clover fermions with stout smearing and tree-level tadpole improved Symanzik gauge action at lattice spacings $a = 0.114$ and 0.080 fm and with pion mass $\approx 315$ and 200 MeV, lattice QCD calculations of isovector charges were carried, and found that the results of all three charges, $g_A$, $g_S$ and $g_T$, are in good agreement with calculations done using the clover-on-HISQ lattice formulation with similar values of the lattice parameters.

- Going beyond the traditional lattice QCD calculation of local matrix elements, the Center research develops lattice QCD study of nucleon-nucleon scattering in terms of nuclear lattice effective field theory (NLEFT). A new study of neutron-proton scattering at next-to-next-to-leading order in NLEFT was carried out. The results were given for lattice spacings ranging from $a = 1.97$ fm down to $a = 0.98$ fm, and found to be agreed well with the Nijmegen partial-wave analysis for S-wave and P-wave channels.

- An exact solution to the Landau-Khalatnikov-Fradkin transformation for massive fermion propagators in momentum space in Quantum Electrodynamics was carried out by introducing a spectral representation. With this solution, the conditions required to ensure the gauge covariance of propagators have been deduced as constraints on the truncation of the Schwinger-Dyson equations. Such covariance requirements are essential to claims that the correct electromagnetic form factors of the pion and proton have been deduced from bound state calculations with such propagators. This is a step towards understanding the strong dynamics that controls the confinement of quarks and gluons in QCD.

4/25/17 ★Exceeds Performance ●Meets Performance ▼Needs Attention ■Not Meeting Performance
PUBLISHED JOURNAL ARTICLES:
Total published journal articles through FY17 Q2 = 29. Significant for this performance period:


SIGNIFICANT AWARDS, SCIENTIFIC CONTRIBUTIONS, PROFESSIONAL MEMBERSHIPS:

- **SECRETARIAL DISTINGUISHED SERVICE AWARD:** Jefferson Lab Director Hugh Montgomery received The Secretary’s Distinguished Service Award from Energy Secretary Ernest Moniz on January 9, 2017 “in recognition of more than three decades of leadership, distinguished service, and exceptional contributions to research at the high energy frontier of particle physics at Fermi National Accelerator Laboratory, and to enabling world leading capability and unprecedented research opportunities for the nuclear science community for decades to come…”.

- **2017 APS FELLOW:** William Detmold, JLab User and Assistant Professor of Physics at MIT, was awarded an APS Fellowship for “pioneering work in calculating few-body hadronic systems from first principles using lattice quantum chromodynamics, including the spectrum of the light nuclei and hypernuclei, Bose-condensed multimeson systems, and the first inelastic nuclear reaction.”

- **2017 APS FELLOW:** Peter Bosted, JLab User and Adjunct Professor at William & Mary, was awarded an APS Fellowship “for invaluable contributions to unraveling the structure of the proton and neutron via elastic, inelastic, and spin-dependent electron scattering from nucleons and nuclei.”

- **2017 TOM W. BONNER PRIZE IN NUCLEAR PHYSICS:** Charles Perdrisat, JLab User and Emeritus Professor of Physics at William & Mary, was recipient of the 2017 Tom W. Bonner Prize in Nuclear Physics “for groundbreaking measurements of nucleon structure, and discovering the unexpected behavior of the magnetic and electric nucleon form factors with changing momentum transfer.”

- **2017 SCHEV OUTSTANDING FACULTY AWARD:** Anatoly Radyushkin, a senior staff scientist with a joint professor position at Old Dominion University, was awarded the 2017 Outstanding Faculty Awards by The Virginia State Council of Higher Education for his superior accomplishments in teaching, research, and public service, which are the Commonwealth’s highest honor for faculty at Virginia’s public and private colleges and universities.

- **INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE):**
  - Fulvia Pilat, Deputy Associate Director – Accelerator Division: Executive Committee Chair
  - George Neil, Accelerator Division Scientist – Particle and Beams Executive Committee National Member at Large

- **INTERNATIONAL SOCIETY FOR INFRARED MILLIMETER AND TERAHERTZ WAVE:**
  - George Neil, Accelerator Division Scientist – Executive Board Member
GOAL 2: CONSTRUCTION AND OPERATIONS

JSA provides effective and efficient strategic planning; fabrication, construction and/or operations of Laboratory research facilities; and are responsive to the user community. Significant during the first half of FY17:

12 GEV UPGRADE:

- The Solenoid magnet construction work at ETI focused on preparing for the transfer of the cold mass load to the cryostat, including welding of the support pockets, and made good progress on the chimney work and MLI application on the radiation shield. A contract is in place with a local rigging company to transport the Solenoid magnet from ETI to JLab once completed, and the shipping frame is built. Hall B is ready to receive the magnet.

- Starting on February 3, 2017, high-energy beam was delivered to the upgraded CLAS12 spectrometer for the first time. The beam delivery and the performance of the new Hall B spectrometer were quite impressive. All components of CLAS12 (Torus, Detectors, Electronics, Data Acquisition) worked well and the CLAS12 team was poised for real-time analysis, monitored through event displays and histograms that had been vetted in advance using cosmic rays. This beam run was focused on demonstrating the Key Performance Parameter (KPP) required for completion of this part of the 12 GeV Upgrade Project. The CLAS12 data from the weekend run has been reviewed by DOE and concurrence that the KPP has been met was received on February 7, 2017.

- With all equipment installed for the 12 GeV Upgrade of Hall C, the hall was swept and locked. The Counting Room was staffed and the accelerator started delivering electrons to the hall on March 8, 2017. A thin carbon target was positioned in the scattering chamber and checkout of the new Super High Momentum Spectrometer began. The five superconducting magnets in the spectrometer were turned on and signals from the detectors showed high-energy particles. Researchers collected and quickly analyzed the data and began to optimize the magnet polarities and currents, detector high voltages, trigger timing and data-acquisition settings. The results of the data analysis, including beam properties, were compiled as a demonstration of the Key Performance Parameter. Concurrence that this milestone has been met was received from the DOE Federal Program Manager and Federal Project Director.

EXPERIMENTAL RESEARCH OPERATIONS AND CONSTRUCTION:

- The Accelerator Readiness Review was held early January 2017 for both Halls B and C. This review included the scope for the pre-operations phase to establish the Key Performance Parameter for Hall B and C, respectively. The Accelerator Readiness Review folded in the reports and closure of relevant recommendations of the earlier experiment readiness reviews.

- The MOLLER experiment received the DOE CD-0 “Mission Need” approval, but is considered in a paused stat due to uncertainty of budgets.

- In Hall A, another experiment to measure the spectral function of Argon was completed. This measurement both will give information on the impact of short-range correlations towards shifting spectroscopic strength towards large proton momenta and energies, and provide experimental input to model the response of liquid argon detectors to neutrino beams towards a reliable estimate of neutrino cross sections.

- This quarter saw the start of the GlueX physics operations phase. Some 50B events were recorded in a time period corresponding to roughly ¼ of the approved GlueX Phase-I experiment. This can be compared to the 22B accumulated during the GlueX engineering phase.

- Hall A completed the planned run for the "DVCS" and "GMp" experiments E12-06-114 and E12-07-108, Measurements of the Electron-Helicity Dependent Cross Sections of the Deeply Virtual Compton Scattering with CEBAF at 12 GeV, and Precision Measurement of the Proton Elastic Cross Section at High Q2. This marks the completion of the first experimental effort using the 11 GeV beam in the hall.

- Hall A is celebrating the timely, successful completion of the Super BigBite Spectrometer (SBS) project. This DOE capital equipment project has successfully constructed 40 planes of large Gas Electron Multiplier (GEM) tracking detectors, a dipole magnet and associated moveable support and beamline systems, and a novel scintillator-based coordinate detector. Five approved experiments will use this new spectrometer, which will also involve a new hadron calorimeter, electron calorimeter and state-of-the-art polarized helium-3 target. Hall A received additional good news this week with the announcement that Critical Decision-0 was awarded (although paused for funding) for the MOLLER experiment.

- The first physics run of the GlueX experiment started a week ago, one year after the engineering run demonstrated that the experiment had achieved the designed parameters. A limited amount of physics-quality data collected during the engineering run has already superseded the existing polarized photoproduction data in the given energy range. It allowed
the GlueX collaboration to study beam asymmetry effects in pseudoscaler photoproduction, resulting in the first GlueX physics paper recently submitted to Physical Review Letters. This also happens to be the first Jefferson Lab physics result from the 12 GeV upgrade.

ACCELERATOR OPERATIONS:

- CEBAF delivered beam to all four end-stations in FY17 Q2, in a dynamic mix of production beam delivery for physics and beams for 12 GeV key performance parameter demonstrations. The majority of the beam time consisted of two-hall operations, with a brief period of three hall operations. The period of three hall operations represents the first time in the 12 GeV era that two high current halls (A&C) were operated simultaneously. Unfortunately beam operations were terminated early on March 10th by a cold-compressor failure in the SC1 2K cold-box. Cryogenics configuration changes required to inspect the failed cold-compressor are on-going. In the meantime, options and plans for future 2K operations are being developed.

- The beam energy for FY17 Q2 operations was 2.1 GeV/pass (same energy as in FY17 Q1). The RF performance supports this energy with an acceptable RF trip rate and with sufficient margin for effective operations. The RF trip rate in the final weeks of operation improved to about 3 trips/h through the efforts of Gradient Team.

- The 5th pass RF separation system was repaired in January and was operated successfully during FY17 Q2 beam operations without issue. The 5th pass separator was used for the majority of this period to separate the Hall-D on 5th pass.

- The upgrade to the injector laser system to support 4-hall operation was installed in the final week of FY17 Q2. The initial commissioning and injector beam tests have been successful. Commissioning efforts will continue through the Summer with plans for opportunistic 4-hall operation in Fall 2017.

- A new photogun and alkali-antimonide photocathode deposition chamber have been commissioned. The photocathode is immersed in a magnetic field to produce magnetized beam. That is to say, beam that possesses mechanical angular momentum. Magnetized beam could be necessary for proton cooling for the electron ion collider. This is the first time magnetized beam has been produced from a dc high voltagephotogun. And already, our demonstrations have set world record for the highest average beam current for magnetized beam.

- Refurbished and qualified three C50 cavity pairs for the C50-07B Cryomodule, the next refurbished cryomodule for CEBAF. Completed individual performance test on three C75 cavities, of which two will be used as the fourth pair in this module. Commenced the cryounit assembly. Installation in CEBAF is on track for FY17 Q4.

- Installed the new injector cryomodule into the upgraded injector test facility (UITF) for commissioning and characterization prior to installation in CEBAF.

- Completed the first round of acceptance test on the LCLS-II prototype cryomodule in the Cryomodule Test Facility, successfully meeting all measured performance parameters. Completed the qualification of LCLS-II production cavities and assembled the second production cavity string assembly. Completed the cold mass assembly for the first production cryomodule.

- Completed the processing, assembly and RF testing of one double-quarter wave (DQW) and one RF dipole (RFD) cavity. Both cavities exceeded performance requirements.

- Completed and delivered a revised budgetary estimate for the Spallation Neutron Source (SNS) Proton Power Upgrade Project.

- A workshop was held to explore potential scientific opportunities in the LERF. Many local researchers got a chance to see what equipment and capabilities were available at the LERF and at the ODU Applied Research Center (ARC) labs. One opportunity discussed was an option to use the LERF as a positron source. The possibility of a user-organized positron workshop to further develop this idea will be explored by the advocates.

EIC/JLEIC

The Jefferson Lab Electron-Ion Collider (JLEIC) baseline was updated in preparation for the EIC Accelerator R&D Community Panel Review held November 29-December 2, 2016, resulting in a higher projected luminosity over the JLEIC energy range. The maximum luminosity increased from $4.5 \times 10^{33}$ cm$^{-2}$ sec$^{-1}$ to $2 \times 10^{34}$ cm$^{-2}$ sec$^{-1}$. This was achieved by adopting an electron cooler design based on an ERL and a multi-turn cooler ring able to provide stronger ion cooling. This development was made possible by good progress on the fast kicker R&D and on the design of the ERL cooler. In preparation for the Panel review we identified 34 critical elements of R&D (CTE, Critical Technology Elements), self-assessed the technical readiness level, and presented a plan – including cost and schedule – to reduce the...
overall technical risk of the design to ‘low’ in 4 years.

- The design and the R&D plans were well received by the EIC Panel. A preliminary report was issued in February 2017 and the final report was issued in March 2017. The JLEIC design team analyzed the comprehensive report and recast the R&D plans to respond to EIC Panel priorities and feedback, and to prepare for the upcoming FOA whose funding priorities will be aligned with the Report. In general, the Review panel endorsed our self-assessed R&D priorities, but added a few technical areas such as fast kickers for feedback and emphasized others like an experimental test of CEBAF operations in JLEIC filling mode.

- Another area greatly emphasized by the Review Panel has been accelerator R&D that is common to all EIC concepts, JLEIC and the eRHIC concepts (ERL-ring and ring-ring) such as strong ion cooling, IR regions magnets, crab cavities, and benchmarking of beam dynamics codes as a few examples. We have been working with BNL staff to establish topics and ways to collaborate on common EIC R&D and we laid the foundations for a joint R&D proposal for the upcoming FOA. In parallel, we have been working with our established collaborators (OSU, TAMU, SLAC, ANL, LBL) to plan for a JLEIC project specific collaborative proposal for the FOA.

- Preparations were ongoing during this performance period for the 5th JLEIC Collaboration Meeting on April 2-3, 2017.

- The energy reach and resulting luminosity of JLEIC was evaluated during this performance period. In the initial configuration, 3T magnets in the ion ring allow to reach a center of mass of 65 GeV. We can reach 100 GeV by doubling the field to 6T in the ion ring and by injecting 12 GeV electrons in the electron ring. LHC technology magnets of 8.5 T would allow us to reach a center of mass of about 120 GeV while 140 GeV COM can be achieved with 12 T magnets (15 T magnets are on the drawing board for the FCC project). The resulting luminosity is well above $2 \times 10^{34} \text{cm}^2 \text{s}^{-1}$.

**NOTABLE OUTCOME STATUS:**

- **Objective 2.2: Execute the assigned LCLS-II project scope in compliance with the technical performance specifications and within the established DOE performance goals for cost and schedule.**
  - JSA is on schedule and cost with a SPI=0.94 and a CPI of 0.98 at the end of March.
  - The SPI of 0.94 results from JSA placing one SRF cavity vendor on a production hold for quality reasons. After working with the vendor to establish new procedures and controls, the vendor is back in production.
  - The cryogenics plant 4.5 K cold box procurement required significant focus during FY17 Q1. The vendor was forecasting a late delivery of the first cold box eliminating all float to first light milestone. JLab worked with the vendor to develop a recovery plan. This plan was successful in recovering the scheduled delivery of the first cold box to the original contract date. The plan was presented at a Director’s Review at Jefferson Lab in November 2016.
  - The schedule recovery plan for the cryogenics plant 4.5 K cold box was developed during FY17 Q1 and implemented in FY17 Q2. The vendor has recovered the schedule slip and is now forecasting an on time delivery of the first Cold Box.
  - The 75% design review of the cryoplant installation package was held at SLAC along with a vendor day for potential installation contractors.
  - The SRF cavities have required a significant amount of work to maintain the technical performance. In FY17 Q1, cavity performance has been impacted by material and fabrication processes, which have only been realized while working to the unprecedented high quality factor specification of the LCLS-II project. The SLAC/FNAL/JLab collaboration has developed a working group to provide technical recommendations to the project to maintain the required performance while minimizing the schedule impact. JSA is working closely with the SRF cavity vendors to implement the required production changes in a controlled way.
  - During FY17 Q2, the SRF cavities continued to require a significant amount of work to maintain technical performance. JSA worked with the cavity vendor to update their fabrication procedures and monitored the implementation of these new procedures. We are maintaining a continuous presence at the vendor until the new procedures are fully integrated into the work practices.
  - LCLS-II Production Cryomodule Readiness Review held January 10-13, 2017 was successfully completed. Cryomodule production has started and 3 production cryomodules are in process at this time.
  - Diligent monitoring of safety practices during performance of LCLS-II work remains a high priority. During the first half of FY17, there was a single first aid incident reported in Q2; a technician received a scrape to their forearm. Engineering mitigations have been put in place, a cover, to avoid future occurrences.
Objective 2.2: Complete the CD-4B (Approve Experimental Equipment Project Completion) key performance parameters (KPPs) for the 12 GeV CEBAF Upgrade project.

- Hall C: With all equipment installed, the beam delivery began on March 8, 2017 to commission the new Super High Momentum Spectrometer. All components worked as planned. The five superconducting magnets in the spectrometer were operational and detector data was analyzed and compiled as a demonstration of the Key Performance Parameter. Concurrence that this milestone has been met was received from the DOE Federal Program Manager and Federal Project Director on March 15, 2017.

- Hall B: Starting on February 3, 2017, high-energy beam was delivered to the upgraded CLAS12 spectrometer. All components of CLAS12 (Torus, Detectors, Electronics, Data Acquisition) worked well. The CLAS12 team performed real-time analysis, monitored through event displays and histograms that had been vetted in advance using cosmic rays. This beam run was focused on demonstrating the Key Performance Parameter (KPP). The CLAS12 data collected was reviewed by DOE, and concurrence that the KPP has been met was received on February 7, 2017.
Jefferson Science Associates
FY2017 Q2 PEMP Performance Evaluation

GOAL 3: PROGRAM MANAGEMENT

JSA provides effective program vision, leadership, strategic planning, and development of initiatives. The Laboratory Directed Research and Development (LDRD) program is funding several projects that support the possibility of EIC at Jefferson Lab. The final set of drawings for the Facility for Rare Isotope Beams (FRIB) has been delivered after the end of a 2-year journey. Over 1,000 conference participants were hosted onsite during this performance period. Science Education staff, in addition to interactions with students and teachers, also participated in local events promoting Science, Technology, Engineering, and Math (STEM) careers. Significant during the first half of FY17:

- JLab LDRD program is now in its fourth year. Three projects are currently underway. Two are projects begun in FY16; ‘Generation and Characterization of Magnetized Bunched Electron Beam from DC Photogun for MEIC Cooler’ (Matt Poelker and Riad Suleiman) and ‘Nuclear Gluons with Charm at EIC’ (Christian Weiss). The third project was launched in FY17; ‘Phenomenological Study of Hadronization in Nuclear and High Energy Physics Experiments’ (Marcus Diefenthaler). All three of these projects are related to a future EIC at Jefferson Lab.

- JSA Mechanical Engineering Group completed the final set of drawings on the ‘FRIB Cryomodule Engineering and Design Finalization’ work package. This represents the end of two years of work involving the Beta 0.041 and 0.29 modules, where the group took conceptual-design models from the Facility for Rare Isotope Beams as a starting point and developed them into complete engineering packages ready for cryomodule fabrication. In February, the 0.041 cryomodule was placed and aligned in the FRIB tunnel. The 0.29 cryomodule/coldmass assembly is proceeding, and FRIB is looking forward to early beam commissioning of these cryomodules starting in 2018.

- JLab staff scientists and users are active participants at reviews, meetings, conferences, and workshops that are attended by hundreds of representatives from scientific institution, organizations, and higher education facilities nationwide. These collaborations provide important opportunities for discussion of scientific results and future opportunities. During the first half of FY17, Staff Services coordinated more than 124 onsite events. There were a total of 1,055 registered participants representing 436 institutions. All workshops were tracked through the DOE reporting system, iPortal, meeting all DOE requirements. Registrations from sensitive countries were screened for potential security threats as they were received. Support was also provided for informational and training activities hosted onsite by local mutual aid organizations that provide emergency response services to the Lab. Significant during this period:
  
  - **JLEIC Collaboration October 5-7, 2016:** Organized by Jefferson Lab, forty-eight participants representing SC laboratories and college universities were to review progress of the JLEIC baseline design; review and discuss R&D on SC magnets for ion booster, collider ring and final focusing; and to discuss and initiate inter-lab/institution collaboration for JLEIC and for EIC in general.
  
  - **Photocathode Physics for Photoinjectors (P3) Workshop, October 17-19, 2016:** Organizing committee includes JLab, Cornell University, Tech-X Corp, SLAC, NRL, LBNL, UCLA, and BNL. Sixty-six participants representing SC laboratories, college universities, military organizations, international research centers, and technology were charged with exploring the current state of art in accelerator photocathodes from a theoretical and materials science perspective. The goal to establish directions for future research and to identify opportunities for collaboration within the community.

  - **Excited Hyperons in QCD Thermodynamics at Freeze-Out Workshop, November 16-17, 2016:** Organizing committee includes JLab, ODU, MIT, University of Houston, GWU, Ruhr-Universität Bochum, and the Institute of Nuclear Physics (IKP) at Forschungszentrum Jülich. Seventy-one participants representing SC laboratories, college universities, and international research institutions were onsite to discuss the influence of possible ‘missing’ hyperon resonances on QCD thermo-dynamics, on freeze-out in heavy ion collisions and in the early universe, and in spectroscopy. The goal to sharpen comparisons, advance understanding of the formation of baryons from quarks gluons microseconds after the Big Bang, and to connect the developments to experimental searches.

  - **New Opportunities with High-Intensity Photon Sources, February 6-7, 2017:** Organizing committee includes JLab, CUA, IPNO, and GWU. Forty-three participants representing JLab, college universities, and international research institutions convened in Washington, D. C. to discuss an optimized photon source concept with potential increase of scientific output at Jefferson Lab and to discuss refining the science for hadron physics experiments that benefit from high-intensity photon sources.

  - **3D Nucleon Tomography Workshop, March 15-17, 2017:** Organizing committee includes JLab, CEA Saclay, and UCONN. Forty-nine participants representing SC laboratories, college universities, and international research institutions were onsite to discuss the requirements for an analysis framework, examine theoretical and
experimental components that need to be incorporated, and study approaches to the computational challenges these requirements will entail. The outcome of is a white paper, and the establishment of collaborative efforts aimed at tackling the challenges identified above, and ensuring that the resultant framework can be applied across the emerging nuclear experimental and theoretical programs, including a future EIC.

- JSA Science Education outreach statistics through FY17 Q2 included interactions with 5,884 students (13,664.74 contact hours) and 417 teachers (1,370.48 contact hours) through the BEAMS (Becoming Enthusiastic About Math and Science) program, Physics Fest program, JSAT (JLab Science Activities for Teachers) visits, and other school visits. Significant accomplishments for the first half of FY17 are noted below:
  - JSA was invited and participated in Science Day with the Virginia School for the Deaf and Blind. Two such events were held in the state; October 8, 2016 in Stafford County, VA and November 5, 2016 in Staunton, VA. A total of 22 deaf, hard of hearing, and visually impaired students engaged in hands-on, inquiry-based activities designed to strengthen and promote STEM interest.
  - JSA partnered with Newport News Public Schools on October 28, 2016 to present the Newport News Public School Engineering Design Challenge. Ninety-six elementary students from across the school division convened for a challenge that required them to collaborate, innovate, and think critically to solve a laser maze problem.
  - Fifty-seven students from Carver Elementary School in Newport News participated in the Hour of Code at Jefferson Lab on December 9, 2016. Students were introduced to computer programming using an interactive Star Wars-themed activity. In addition to members of the Science Education staff, five staff members from the Jefferson Lab Computer Center volunteered to assist students in the classroom.
  - JSA hosted Regional Science Bowls for High School on February 4, 2017 and for Middle School on March 4, 2017. There were a total of 176 students and 46 coaches in attendance, competing in a verbal forum to answer questions in science and math. There were 56 Jefferson Lab volunteers, serving as room officials.
  - The two-day Engineering Career Days, sponsored by the Peninsula Engineer’s Council, took place on February 23-24, 2017. The event hosted by Jefferson Lab, Newport News Ship Building and NASA, reaches 600 high-school students to encourage them in STEM fields. Students interacted with 14 Jefferson Lab staff members.
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**NOTABLE PERFORMANCE ITEMS:**

4.1 Jefferson Lab Senior Leadership regularly interacts with local government, business organizations, and higher education leaders to cultivate and maintain long term relationships that are beneficial to the lab. During the 1st half of FY17, the directorate, several senior managers, and JSA corporate representatives participated in meetings with the Greater Peninsula NOW, the United Way of the Virginia Peninsula, the Peninsula Workforce Development, CNU Peninsula Insiders, and attended the Newport News State of the City Address that was given by Mayor McKinley Price. Jefferson Lab hosted a delegation from the People’s Republic of China (PRC), following a joint US-PRC meeting held at SURA in Washington, D.C., to discuss increased collaboration on areas of common interest in hadron spectroscopy. They also welcomed onsite local government representatives and military leaders to give them an overview of Jefferson Lab programs and a tour of the facility.

Jefferson Lab Senior Leadership is actively recruited to serve on and participate in numerous scientific, national, and international organizations, committees, and review panels. During FY17 Q2, Laboratory Director Hugh Montgomery was appointed to the CERN Scientific Policy Committee and the Helmholtz Society Review of DESY. Mary Logue, Associate Director - ESH&Q, was invited to serve on an operational review committee for Ames Laboratory.

4.2 JSA maintained a robust contractor assurance system during the first half of FY17. We operated in a transparent fashion with regular meetings with the TJSO staff to provide progress and status updates and early insight into developing issues. There were five ORPS reportable events that were communicated in a timely fashion, as well as several events that fell below the ORPS criteria that were nonetheless reported to TJSO for visibility. At the CAS Quarterly Status Meeting on March 6, 2017, JSA outlined a roadmap for enhancing the TJNAF CAS that integrates lessons learned from over 60 PAE (and previously CSC) contracts and infuses best practices to improve assurance that contract requirements are consistently met. These enhancements will be incrementally bolted on to the existing CAS process during the course of the year.

JSA maintained uninterrupted operations during the first half of FY17, despite the lack of a current fiscal year appropriation and resulting continuing resolutions. We provided TJSO timely reporting of when available funds would be exhausted and recommendations on how funding could be redistributed between projects. JSA also took action to carefully prioritize non-labor commitments to manage through delays in funding disbursements and prevent any operations impact.

JSA worked closely with the Office of Science (SC) during the first half of FY17, to maintain awareness of the developing security challenges resulting from international agreements. Jefferson Lab’s COO attended classified briefings for the laboratory director at DOE Headquarters on November 2, 2016 and again on December 14th. Unclassified synopsis of these meetings was shared with JSA leadership. In January 2017 we immediately elevated to the Site Office an inquiry from the City of Newport News Sister Cities committee regarding a potential visit by a high level delegation from the Sichuan Province in China. This enabled the Site Office to coordinate the visit with larger DOE and prevent any surprises or adverse publicity.

JSA reinforced our excellent relationship with the Commonwealth by hosting Delegate Marcia Price on November 29, 2016 for a lab overview briefing and tour of the CEBAF. Delegate Price represents the 95th District in the Virginia House of Delegates and is a member of the Health, Welfare, and Institutions Committee. The Commonwealth has been a strong supporter of Jefferson Lab and provides valuable financial support to the lab and its scientists.

JSA agreed to host the December meeting of the Lab Operations Board (LOB). The LOB met on December 8, 2016 and then toured the CEBAF on December 9th. We believe this meeting increased awareness of Jefferson Lab’s mission and science capabilities within a number of DOE leaders who had not visited, or do not regularly visit the laboratory.

Jefferson Lab’s COO was a member of the DOE Order 232.2 Integrated Product Team that was charged with the responsibility to provide a revised order for DRB approval by December 15, 2016. This was an enormously challenging undertaking that required participation in a two day meeting at DOE Headquarters’ on October 12-13, 2016, followed by a series of conference calls. One particularly important contribution was to quantify the cost of the existing order, estimated to be on the order of 16 FTE’s annually across the entire complex (something on the order of 0.01%). This obviated the long held belief the existing order was excessively burdensome, allowing the team to move on to needed and achievable process improvements rather than revisit the perceived need to eliminate labor.

On January 18, 2017, JSA introduced Lauren Hansen as the new TJNAF Communications Office manager. This action...
completes a national search started in June 2016. Over 106 applications were received; 40 were found to meet the Jefferson Lab requirements, and onsite interviews were conducted with six candidates before Lauren was selected. She brings substantial experience in the transportation and construction industry, extensive local media networking, previous experience as an employee of the Commonwealth of Virginia, as well as how to integrate social media into an effective corporate communications program.

4.3 Members of the JSA Board, company officers, Committee members, owner representatives, board liaison, and corporate staff provided governance support, ensuring the governance structure and function support the Lab and DOE and enable the Lab to capitalize on opportunities and address challenges that arise. During the first half FY2017 (October-March) reporting period, JSA interactions included communications and meetings with TJSO managers, Lab leadership and managers, internal auditor, Users Group Board, CAS quarterly leadership team, Operations & Safety Committee, Finance & Audit Committee, Compensation Committee, and JSA Programs Committee. These interactions and meetings—many of which are specifically referenced throughout this assessment—addressed: performance status on PEMP goals and TJSO feedback; current and emerging issues and risk mitigation efforts; safety events, responses, and lessons learned; JSA board and corporate activities; ongoing CAS activities and continuous improvement efforts; etc.

Owner Commitments

- SURA and PAE provided for the 2017 JSA Initiatives Fund (IF) Program. An evaluation committee appointed by the JSA Programs Committee chair recommended award of $390K for 31 projects in the FY2017 IF Program. See press release at: http://www.jsallc.org/news/JSAIF20161208.pdf. This year’s Program included over $450K contributing funds in monetary and in-kind support: 70% from sources outside of Jefferson Lab, and 30% from the Lab (including monetary support for scientific meetings, conferences, and workshops) Sixty-five percent of the awarded funds are for educational and outreach activities; 22% is for the Director’s Discretionary Fund. The remaining 13% of funds support meetings, workshops, and conferences. Combined with the prior year in-process projects, the current $530K IF Program is ~20% expended. Several IF-supported meetings and activities are referenced elsewhere in this assessment including: Science at LERF Workshop, New Opportunities with High Intensity Photon Sources at JLab Workshop (HIPS2017), 3D Nucleon Tomography and Extraction Methodology Workshop, JLab Science Activities for Teachers Program.

- PAE continues to provide for Skillport, a distance learning program that remains a value added resource for employee development and continued learning. The availability of this web-based training tool for self-directed learning fills many of the Lab’s needs for workforce training. These include common desktop computer applications, project management, and soft skills such as communication, interpersonal relations, etc. The most queried courses included Diversity & Inclusion and Implicit Bias, likely the result of the D&I Council’s efforts to increase awareness among Lab supervisors and managers. Two staff members completed the project management qualification program. Two Skillport courses form the foundation for a series of seminars on communication for Lab supervisors and managers. Of the 47 licenses, 44 seats are currently allocated.

- SURA continues to provide support to the Lab in its relations and outreach program. The intent of the program is to establish effective working relationships with federal, state, and local authorities and with universities and industry leaders that have a vested interest in the Lab and in support of the nation’s science goals. Significant activities engaged in during this reporting period included: meeting of the JSA federal relations team (including Lab director designate Stuart Henderson), the Brookhaven and FRIB relations teams and APS/DNP representative with Congressional staff to deliver a unified Nuclear Physics funding message focused on the 2015 NSAC Long Range Plan; development of a FY2018 budget briefing paper shared with Congressional members and their staff including Senators Kaine and Warner and Congressmen McEachin, Taylor, Wittman and Scott; successful efforts of the state relations team in the budget process in the Virginia General Assembly, resulting in $1.3M in general appropriations and $1.0M in EIC planning funds, along with language providing for prospective sales tax relief.


- The SURA Board of Trustees passed a resolution commending Hugh Montgomery for his leadership at Jefferson Lab and expressing its appreciation for his commitment to the success of the Lab (http://www.sura.org/Meetings/2016Fall/PlenF-Pic-HM.pdf).

- SURA assumed lead responsibility for facilitating the work of external auditor KPMG for the JSA financial audit. KPMG issued the JSA 2016 certified financial statements with an unmodified opinion, no material internal control findings, and no management letter comments.

- SURA was invited to submit a proposal following a submission of a letter of interest to the Commonwealth of Virginia’s Center for Innovative Technology (CIT) through the Commonwealth Research Commercialization Fund (CRCF) matching...
funds program for *Development of a Superconducting Radio-Frequency Cavity for an Electron Accelerator for the Treatment of Flue Gases*. Award announcement expected in Q3.

- SURA continues to provide the Residence Facility for temporary housing of students, researchers, and other guests associated with the various Lab programs and meetings. Work was completed on one of two capital improvement projects at the Facility (replacements of roofs) and work continues with the renovation of a sleeping building (Bldg. 3) During this reporting period, the 50.3% occupancy is moving closer to the 55% break-even projected for the FY.

### NOTABLE OUTCOME STATUS:

- **Objective 4.3: Select and bring on board a new Laboratory Director by the end of FY17.**
  - An international committee chaired by former NSAC chair Donald Geesaman conducted an extensive search that included interaction with over 100 individuals including 3 dozen Lab staff members and users to solicit input and advice, followed by interviews with a dozen candidates. The result of the search was JSA’s appointment of Argonne’s APS Director Stuart Henderson as the next Jefferson Lab Director effective April 3. JSA kept DOE apprised of the status of the director search throughout the process to ensure complete transparency while maintaining the requisite confidentiality. See JSA press release at: http://www.jsallc.org/news/JSAPR20170106.pdf.
  - Following Henderson’s appointment, JSA worked with the Lab director designate during his transition from Argonne to Jefferson Lab, enabling and supporting him as he became oriented to the Lab. Before his April arrival, Henderson met with Lab leadership and other staff members, JSA vice chair, JSA CAS representative, SURA relations director, and DOE officials. Henderson participated with the SURA relations team including the federal lobbyists to update the Jefferson Lab white paper and meet with congressional delegates, subcommittees, and their staffers during the transition period. He was involved with the preparation for and presentation to DOE of the annual budget in February; NLDC meetings; Big Ideas Summit; and the draft annual Lab plan to be presented to DOE in June.
Jefferson Science Associates
FY2017 Q2 PEMP Performance Evaluation

Goal 5: Sustain Excellence and Enhance Effectiveness of Integrated Safety, Health and Environmental Protection (30%)

- OBJ 5.1 – Provide Efficient/Effective Worker Health and Safety Program (80%)
- OBJ 5.2 – Provide Efficient/Effective Environmental Management System (20%)

NOTABLE PERFORMANCE ITEMS:

5.1 JSA’s Integrated Safety Management System (ISMS) continues to be effective, as evidenced by injury rates, events reported, and the results of assessments performed.

- JSA experienced one occupational injury during the first half of FY17, which resulted in restrictions affecting the worker’s ability to perform assigned routine functions. These limitations classified this injury as a DART case; JSA’s first recordable in over one million hours worked. Five other incidents were classified as Notable Events. All six were reported upon discovery and investigated as required by organizational processes. Five events were categorized as ORPS reportable, and those reports were submitted within the required timeframes. In one event, technicians discovered the 450 ton press in the Test Lab had more than one power source. This resulted in an extent of condition review, which was completed in February 2017. Devices with multiple power sources are being labelled as appropriate. In another event, the gate to the Hall C Beam Dump Cooling Building 95 was discovered unlocked subsequent to Beam Authorization. The gate is a credited control in the Accelerator Safety Envelope (ASE), and so an ASE violation was reported to TJSO.

- JSA welcomed members of the SLAC LCLS-II project team onsite during FY17 Q1, to conduct informal reviews of JSA’s Welding Program and the Integrated Safety Management (ISM) program. In both cases reviewers were more than satisfied with how project activities are integrated into the organizations systems.

- JSA did not detect any evidence of inadequate hazard analysis, disregard of hazards, or evidence that researchers were accepting unmitigated cumulative risk in their research activities during a review of the organization’s small-scale research activities in FY17 Q1. This exercise, led by JSA’s Directors’ Safety Council (DSC) in response to efforts by DOE’s Office of Science Operations Improvement Committee (SC-OIC), generated valuable feedback from lab staff and users. DSOs will incorporate these ideas into future efforts to improve work-planning processes.

- JSA successfully completed all elements of the Industrial Hygiene (IH) Monitoring Plan during FY17 Q1, which ensured a comprehensive and up-to-date data set for evaluating and mitigating hazards that are associated with chemical stressors and high volume noise. A review of the Lab’s CY2016 IH sampling data showed no personal exposures that exceeded the limits. This demonstrated compliance with the personal exposure limits outlined in 10 CFR 851, by the inclusion of the hierarchy of engineering and administrative controls over personal protective equipment as part of the organization’s work processes.

- JSA is committed to providing a safe work environment for staff and users, evidenced during the 1st half of FY17 by the timely notification of JLab’s winter weather operations procedures on January 6th in anticipation of a major snowstorm predicted for the Hampton Roads area on January 7th. All members of the JLab community were urged to stay away from the lab until further notification that all onsite roads, parking lots, and sidewalks were cleared of snow and ice. A site-wide alert was issued on January 9th to inform the community of the resumption of regular operations at 8:00 a.m. on Tuesday, January 10th. One minor slip was reported to the Occupational Medicine Office.

- JSA conducted Accelerator Readiness Review – Phase 4, January 9 – 11, 2017, to determine whether Halls B and C were positioned to be operated in a safe manner. Led by ESH&Q, reviewers from JLab, SLAC and FNAL provided positive feedback and identified pre-start conditions for commissioning and operations. Pre-start actions were verified as complete by quality control support (formerly “The Green Team”), a member of the ARR review team, the Federal Project Director, and the QA/CI Manager. Approval to commission, which includes conducting 12 GeV Upgrade Project Key Performance Parameter operations, was received from the Thomas Jefferson Site Office (TJSO) on January 30, 2017.

- Jefferson Lab’s ES&H Manual was identified as a valuable resource for Jarden Zinc Products, the largest manufacturer of zinc strip and zinc-based products in North America. The organization based out of Greenville, Tennessee requested permission to use applicable sections of the Lab’s ES&H Manual. Permission was granted with the caveat that this material may not be offered for sale and that JSA and DOE are credited for the information.

- JSA ESH&Q Reporting Officer worked in partnership with Management Information Systems (MIS) staff to develop a Notable Event database. The database is operational and training will be provided to investigators leads during FY17 Q3. In addition to streamlining the process, the database will also allow for better collection and examination of causal analysis data.

- JSA’s Jefferson Laboratory Site Occupational Medicine Clinic is featured on DOE’s PowerPedia Occupational Medicine Programs website to ensure the President’s transition teams and appointees have instant access to and are well informed about the programs’ invaluable contribution to the success of DOE.
5.2 JSA’s Environmental Management System (EMS) continues to be effective, as evidenced by no excursions, releases, or permit violations. In addition, viability of the EMS was demonstrated during the first half of FY17 as noted:

- JSA was congratulated on March 1, 2017 as recipient of the 2016 HRSD Pollution Prevention (P2) Gold Award for exemplary permit compliance. The award will be presented at a ceremony on April 18, 2017.
- JSA applied and qualified for awards under the Electronic Product Environmental Assessment Tool (EPEAT) program and the Green Buy program, which recognizes excellence in the procurement of sustainable products. The FY16 Bronze Level GreenBuy Award was received on March 10, 2017 for “achieving excellence in Sustainable Acquisition by reaching the Leadership Goal for 4 products in 2 different categories.” This is the fifth time Jefferson Lab was recognized with a GreenBuy award.
- JSA underwent a successful inspection by the Hampton Roads Sanitation District (HRSD) during FY17 Q1; an application was submitted to extend the lab’s HRSD discharge permit for an additional five years. Final permit is pending.
- JSA received a 5-year extension on the existing Virginia Pollution Discharge and Elimination System (VPDES) industrial wastewater discharge permit, from the Virginia Department of Environmental Quality (DEQ) during FY17 Q1. JSA also responded to a request from DEQ to provide comments on the draft Groundwater Withdrawal permit.
- JSA received a notice of violation (NOV) from HRSD in January 2016 for elevated levels of a zinc in our discharge. Laboratory-wide sampling resulted in the identification of a sediment source located in the sump of the Counting House that contains high levels of zinc. Although the root cause has not yet been determined, a contract has been issued to remove this sediment to prevent another NOV. The sump will be monitored routinely so that any reintroduction of contaminants will be detected early and the investigation to identify the root cause will continue.
- JSA ES&H Department Manager was notified that Facilities Management & Logistics has been underreporting to the Virginia Department of Environmental Quality (VADEQ) the amount of groundwater withdrawn on-site, under the TJNAF Groundwater Withdrawal Permit, for an unknown extent of time. It does not appear that the total amount withdrawn exceeds permit limits. A meeting is scheduled with the regulators on April 7, 2017. Additional information regarding this issue is noted in Objective 7.1.

**NOTABLE OUTCOME STATUS:** None set for Goal 5
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Goal 6: Sustain and Enhance Core Business Systems that Provide Efficient/Effective Support to Lab (25%)

- OBJ 6.1 – Provide Efficient, Effective, Responsive Financial Management System (20%)
- OBJ 6.2 – Provide Efficient, Effective, Responsive Acquisition Management and Property Management Systems (20%)
- OBJ 6.3 – Provide Efficient, Effective, Responsive Human Resources Management System and Diversity Program (20%)
- OBJ 6.4 – Provide Efficient, Effective, Responsive Contractor Assurance Systems, Including Internal Audit and Quality (25%)
- OBJ 6.5 – Demonstrate Effective Transfer of Technology and Commercialization of Intellectual Assets (15%)

NOTABLE PERFORMANCE ITEMS:

6.1 JSA provides an efficient, effective and responsive financial management system. Accomplishments during the first half of FY17 to demonstrate such performance is noted below:

- JSA was responsive to DOE’s request for an accelerated close of the FY16 Financials, which were completed and submitted by noon on October 5, 2016. This enabled DOE to have actual data for FY16 vs accruals to close out their books. It also allows easier reconciliations between JSA contract costs and DOE’s financial records; evidenced by JSA’s 3-week early submission of the FY16 Statement of Costs Incurred.
- JSA completed and submitted the FY16 Institutional Cost Report (ICR) to DOE on November 11, 2016; a week in advance of the actual due date.
- JSA participated in an ICR Consistency Review Workshop in December, along with representatives from other National Labs and DOE Program Offices, to examine data submissions from the individual laboratories and to confirm the information is interpreted consistently throughout and with no discrepancies in reporting. Workshop participants discussed proposed changes to the reporting categories and recommendations on how to perform further analysis to enhance cost management and assess operational effectiveness.
- JSA developed an electronic wage report that breaks out the hours by week for its semi-monthly pay period, in response to updated guidance regarding Executive Order 13673 – Fair Pay and Safe Workplaces. Compliance with this final ruling on paycheck transparency, allows the employee to see regular hours worked, overtime hours, rate of pay, gross pay, and itemization of each addition to and deduction from gross pay, listed on a supplemental Wage Statement. Analysis, testing, and program development were completed in less than two months to meet the requirement; which was effective January 1, 2017.
- JSA financial management staff worked in coordination with MIS developers to create an online travel expense system that will expedite travel processes. The new Electronic Travel Expense Report System was initiated with a pilot group of the Lab’s travel coordinators in FY17 Q2; the timeframe for full implementation is FY17 Q3.
- JSA made concerted efforts in FY17 Q2 to conduct needed analysis of revisions to Cost Accounting Standards compliance disclosure methodologies. The results will form the basis for revised disclosure statements, supporting analysis, and discussions with ORO Facilities Engineering and Acquisition Division (FEAD); ORO FEAD approval of the changes is required. Further discussion and information exchanges are planned for FY17 Q3. This will allow sufficient time for DOE review and approval of the changes and financial system updates; implementation is scheduled for October 1, 2017.

6.2 JSA provides an efficient and effective acquisition management system through the provisions for purchasing of supply and services including major system components, subcontracting support and leasing support, P-card and E-commerce support, construction subcontracting and through an aggressive Small Business Program. Significant during the first half of FY17:

- JSA Small Business Program Goals were exceeded during the first half of FY17. However, prospective large and foreign procurements during the second half of the fiscal year may have an impact on final results.

<table>
<thead>
<tr>
<th>SMALL BUSINESS PROGRAM GOAL</th>
<th>FY17 TARGET</th>
<th>FY17 ACTUAL</th>
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<tr>
<td></td>
<td>M$</td>
<td>%</td>
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</tr>
<tr>
<td>Disadvantaged</td>
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<td>5.0%</td>
</tr>
<tr>
<td>Veteran-Owned</td>
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</table>
JSA procurement staff worked diligently on several critical requisitions during the first half of FY17; including finalizing the non-subsidized food services subcontract re-compete, efforts to improve the procurement schedule of the CLAS 12 Solenoid Magnet in support of the 12 GeV Project, and the procurement of Higher Order Mode Beam Line Absorbers (HOM BLA) for the LCLS-II Project. A Procurement Readiness Review (PRR) was conducted on November 10, 2016 by the SLAC LCLS Project team; a Request for Proposal (RFP) for the HOM BLA was issued on November 14, 2016.

JSA Subcontracting Officer Technical Representative (SOTR) program has been recognized in past reviews as a Noteworthy Practice within DOE. As a result, the Lab’s procurement staff was invited to Fermilab in December 2016 to provide training for their SOTRs.

JSA exceeded the reporting requirements set forth by the Management and Operations Subcontract Reporting Capability (MOSRC) to submit the first monthly report by November 20, 2016 and the Annual Top 20 Small Business actions by December 1, 2016; both submitted on November 11, 2016. Subsequent monthly reports have been submitted as scheduled. The successful completion of the reporting capability was a collaboration effort between members of the Procurement, Finance and IT Departments.

JSA’s small business program and the administrators are acknowledged for excellence in performance:

- In recognition of JSA’s contributions towards DOE's mission and the FY16 Small Business Goals and achievement, Dr. Hugh Montgomery, Laboratory Director, was selected as DOE Laboratory Director of the Year. The award will be presented at DOE’s 16th Annual Small Business Forum & Expo in Kansas City, MO. May 16-18, 2017.
- In recognition of nearly 30 years of small business support to DOE, JSA and the Carolinas & Virginia regions, JSA’s Purchasing and Small Business Manager, Danny Lloyd has been selected for DOE’s Office of Small and Disadvantaged Business Utilization (OSDBU) Director’s Excellence Award. The award will be presented at DOE’s 16th Annual Small Business Forum & Expo in Kansas City, MO. May 16-18, 2017.
- JSA was awarded the 2017 EPEAT Purchaser Award from the Green Electronics Council for excellence in green procurement of sustainable electronics. As per the Green Electronics Council, Jefferson Lab went beyond sustainable acquisition requirements to reduce negative health and environmental impact.

JSA continued to strengthen its property system during the first half of FY17 by ongoing efforts to organize and catalog engineering replacement parts that were previously stored in shipping containers; three of the containers are empty and ready for disposal. The organization was reimbursed $35K for recycled excess wire. These funds were used to recycle about 190 pieces of concrete weighing 167 tons, demolished from one of the experimental halls.

JSA completed the donation by Gift Agreement to the University of Indiana Bloomington of the Spark 400 robot valued at $50,000.00 (OAC $201,239.24). The equipment is an advanced teaching tool used for advanced robotics and computer assembly benefiting both the Lab and University through its reutilization.

### 6.3 JSA’s Diversity & Inclusion (D&I) Council

JSA’s Diversity & Inclusion (D&I) Council delivered a course to all supervisors and managers during FY17 Q1, titled ‘Recognizing Potential Communication Barriers in a Diverse Population’. The course focused on understanding the impact culture, gender, and implicit bias has on communications and highlighted ways to communicate effectively while interacting with others. Feedback was positive and the Council will be working with HR to bring the message to all employees.

JSA D&I Council launched a Climate Survey in FY17 Q1, to assess employee’s perception of diversity and inclusion at the Lab. A 64% participation rate represented a notable 20% increase over the baseline survey conducted in 2014. D&I shared the results of the Climate Survey with senior managers in FY17 Q2. While analysis and follow up continues, preliminary feedback was provided to staff as well. In general, the results were encouraging and reflect a clear recognition of implicit bias as a result of awareness training and management support.

JSA hosted several high school students on February 21, 2017 for the 7th Annual ‘Introduce a Girl to Engineering Day’. Jefferson Lab female STEM professionals met with 14 local students to discuss their own individual career choices and to offer insights into their personal educational journeys. A new ‘round robin’ format was introduced for this annual event to allow for more student inclusion and to improve opportunities for meaningful dialogue between mentors and attendees. Feedback from participants was very positive.

### 6.4 JSA’s FY2017 Internal Audit Plan

JSA’s FY2017 Internal Audit Plan is progressing as scheduled. The Allowable Cost – Transaction Testing FY16 audit is complete and the draft report has been issued to management for review and comments. In addition, the closeout subcontract audit for the Cafeteria has commenced. In compliance with the FY 2017 Internal Control Evaluations Guidance, JSA made the timely submission of its Risk Profile in February, and is in the process of reviewing with the process owners, the risks,
controls, and exposure risk ratings, and updating the Financial Management Assurance Tool. The Internal Audit Plan was revised to replace the Classification of Personal Property audit with the Accountability and Recording of Personal Property audit, and submitted to DOE for approval on February 8, 2017.

- JSA Management Information Systems (MIS) worked with Finance to develop a new timesheet report to show hourly pay for non-exempt employees that otherwise could have required an overhaul of JSA’s payroll processes, saving the costs that would be associated with such a transition and minimizing impact to Lab employees. This is to ensure compliance with The Fair Pay and Safe Workplaces Executive Order (E.O. 13673). As a follow-up to the DOE small business reporting requirements implemented last year in the MOSRC project, MIS worked with procurement to transition all of their internal reports to the same underlying small business data.

- JSA Information Technology (IT) Division moved HPC systems into a new hot aisle containment system to complete phase 3 of the project. When complete, the Data Center Renovation Project will improve power utilization efficiencies to meet DOE’s DCOI goals and will consolidate two existing Data Centers into the space of one. This effort is part of the Data Center Renovation Project with Facilities Management and in support of DOE’s Data Center Optimization Initiative (DCOI) efforts.

- JSA IT Division, as part of the ESnet Site Coordinators Committee (ESCC), shared its knowledge and experience with newer networking technologies to aid Pacific Northwest National Laboratory (PNNL) in the design of their next campus network and to provide improved reliability.

- JSA MIS group collaborated with scientific workgroups to install the DocDB package for managing documents related to SoLID, GlueX, PREX, Moller, and JLEIC. In addition, MIS contributed to process efficiencies in ESH&Q and Human Resources by automating the Notable Events system and by deploying Job-Related Training (JRT) and Educational Reimbursement Program (ERP) forms.

6.5 JSA FY17 Q1 performance in technology transfer activities is laying the basis to exceed expectations for the year. During this period, we were contacted by 20 small business entities active in SBIR/STTR Phase I and II Funding Opportunity Announcements and have submitted 54 support letters for their proposals to DOE. In FY17 Q2, proposal support letters were also provided to Old Dominion University and Temple University for NSF research funding. In cooperation with SURA, JSA/JLab is pursuing grant funding from the Commonwealth of Virginia’s Center for Innovative Technology (CIT) – Commonwealth Research Commercialization Fund (CRCF) program for R&D for development of Superconducting Radio-Frequency (SRF) Cavity technology for an Electron Accelerator for the treatment of flue gases. Ten Cooperative Research and Development Agreements (CRADAS) and one Strategic Partnership Project, including modifications, were initiated in FY17 Q1. The organization also hosted meetings during that time frame with two different companies interested in licensing JLab IP.

- During the first half of FY17, seven invention disclosures were received and three intellectual property licenses were executed:

  **Invention Disclosures**
  - 1429 Neutron Detector for use in Strong Gamma-Radiation Fields
  - 1430 Transition Radiation Light Sources
  - 1431 Boron Nitride Nanotube Transition Radiation Detectors and Sources
  - 1432 Transaction Radiation Light Sources
  - 1433 Method of improving sensitivity and energy response of neutron detectors using moderators with embedded Beryllium-loaded materials, and new type of neutron dose rate measurement devices utilizing said method
  - 1434 Neutron Detector for use in Strong Gamma-Radiation Fields
  - 1435 Radiation Monitor Based on Wavelength Dependent Optical Absorption in Fused Silica Optical Fibers

  **Patents Awarded**
  - 9,463,433 Nano-Material for Adhesive-Free Absorbers for Bakable Extreme High Vacuum Cryopump Surfaces
  - 9,590,384 Absorber for Wakefield Interference Management at the Entrance of The Wiggler of a Free Electron Laser
  - 9,589,757 Nano-Patterned Superconducting Surface for High Quantum Efficiency Cathode

**NOTABLE OUTCOME STATUS:** None set for Goal 6
### Goal 7: Sustain Excellence in Operating, Maintaining, Renewing the Facility and Infrastructure Portfolio (25%)

- **OBJ 7.1** – Manage Facilities/Infrastructure in Effective Manner to Optimize Usage/Minimize Life Cycle Costs (40%)
- **OBJ 7.2** – Provide Planning for and Acquire Facilities/Infra Required to Support Future Lab Program (60%)

### NOTABLE PERFORMANCE ITEMS:

#### 7.1

- JSA upgraded the facilities’ computerized maintenance management system to version 7.6 and expanded preventative maintenance to include the fire detection and suppression systems. New fall protection standards were established for building maintenance activities in collaboration with ESH&Q. Oversight of the Material handling program has been moved to the Facilities Operations and Maintenance group.

- JSA upgraded three Fire Protection Network Command Centers from 16 node to 32 node capacity in support of infrastructure optimization and to ensure sit capability to meet mission needs. This doubles the number of nodes that can be directly monitored across the site and it facilitates meeting critical expanded monitoring requirements.

- JSA has established a Facilities Preventive Maintenance (PM) program for electrical spare breakers that include annual test and environmental storage. These spares program will contribute to reliability improvement of various systems. The spares support general lighting, branch circuitry such as general receptacles, exhaust fans, emergency lights and signs, small horse powered motors, and mechanical equipment. A spares inventory list has been established and shared with Jefferson Lab's Electrical Design Authority in the ES&H Group, should these spares be required to support non-Facilities operations.

- JSA completed Annual Crane Inspections of 292 material handling pieces of equipment related to Bridge, Gantry, Monorail and Jib Cranes, as well as Hoists, Chain Falls, Come A-Longs, Slings and Mobile Equipment Attachments in March 2017. From the annual inspection 12 repair orders were generated; 7 have been completed, 2 are being completed in April 2017, and 3 are in planning. No repairs were significant enough to take any cranes out of service, except for the time necessary to replace damaged parts or make required adjustments. This material handling equipment is key in accelerator, experimental hall, and SRF activities.

- JSA completed facility condition assessments for 73 buildings and 4 real property trailers (963,811 GSF in total) in compliance with DOE O 430.1C Real Property Asset Management. The data obtained is being used to inform a five-year forecast of financial investments for sustainment of real property assets to support DOE strategic plans, program guidance, and departmental performance targets. While these assessments are typically subcontracted to an outside firm, the assessments this year were performed in-house by FM&L engineering and operations staff with an estimated cost savings of $212,038.

- JSA installed flood rated overhead doors for the truck ramps at Halls A, B, & C. These doors provide increased protection against high storm water from entering the halls each time the doors are closed as opposed to having to manually install flood gates for the hall truck ramp doors. Previous storm runoff has caused damage of equipment in the halls exceeding $1M.

- JSA continued to work with TJSO and Chicago Service Center reviewing and providing comments on the UESC proposal. Implementation of the energy and water reduction projects included in the UESC proposal is critical to JSA’s achievement of sustainability goals (ie: energy intensity reduction (BTU’s / GSF), water intensity reduction (Gallons of Potable Water / GSF) and high performance sustainable buildings guiding principles compliance). Further, financial benefits (reduction in utility expense and rebate for energy efficiency) are unrealized every month the award and subsequent installation of projects is delayed.

- JSA has determined the quantity of groundwater being pumped from beneath Halls A, B, and C was being under-reported by about half. This under reporting was the result of the large vertical turbine pumps being placed back into service after the End Station flood in 2014 without reconfiguration of the metering. Groundwater withdrawal reporting has been corrected and working to reconfigure the metering.

#### 7.2

- JSA emphasizes contractor safety by continuous monitoring of work activities and weekly walk-thru inspections. There have been no subcontractor recordable injuries since November 2012.

- The Computer Center is currently being upgraded under the Utility Infrastructure Modernization (UIM) project; the third phase of work is in process. Installation of the first Hot Aisle Containment system for the UIM Computer Center project is noteworthy as the first step in acquiring 1.4 PUE. Installation of the CTF cold box began February 17, 2017 and work is progressing as scheduled. UIM is 92.4% complete and very close to scheduled performance and cost index; SPI = 0.98 and CPI = 1.01. The Project continues to maintain a perfect safety record after 130,000 hours worked.

- Construction of the new ESH&Q building is 88% complete, with a perfect safety record after 18,098 hours worked.

NOTABLE OUTCOME STATUS: None set for Goal 7
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FY2017 Q2 PEMP Performance Evaluation

Goal 8: Sustain/Enhance Effectiveness of ISSM and Emergency Management Systems (20%)

- OBJ 8.1 – Provide Efficient/Effective Emergency Management System (25%)
- OBJ 8.2 – Provide Efficient/Effective Cyber Security System for the Protection of Classified/Unclassified Information (50%)
- OBJ 8.3 – Provide Efficient/Effective Physical Security Program for Protection of SNM, Classified Matter, Classified and Sensitive Information, and Property (25%)

NOTABLE PERFORMANCE ITEMS:

8.1 JSA’s goal for FY17 is to maintain an efficient and effective emergency management system. Significant during the first half of FY17:


- JSA participated in the statewide Tornado Awareness Week, March 20-24, 2017, by charging supervisors to review shelter locations and the accountability procedure with staff. In addition, ESH&Q tested the accountability procedure by asking division staff to report to their supervisors as if it were a real-time situation. All division members were accounted for within 20 minutes. Further improvements to the procedure will be defined and tested throughout the year as a continuous improvement effort.

- Jefferson Lab’s Emergency Management Team (EMT) conducted a tabletop exercise on January 27, 2017. The main objective was to discuss how the information flow process would work from an emergency scene to the Emergency Operation Center and vice versa. An after action report was developed and the issues are being tracked through the Lab’s Issues Management process.

8.2 JSA demonstrates an effective Cyber Security Program evidenced by the number of Cyber Security Incidents (CSI), the effectiveness of configuration and patch management via vulnerability scanning, and the time required to investigate and remediate alerts identified by the laboratory’s Intrusion Detection Systems. Several enhancements to the cybersecurity program were implemented. JSA also continues to collaborate with DOE on cybersecurity initiatives. Significant accomplishments during the first half of FY17 are noted below.

- Key Cyber Security Metrics:

<table>
<thead>
<tr>
<th>Metric</th>
<th>FY17 Q2</th>
<th>FY16</th>
<th>FY15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyber Security Incidents</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Average Number of Systems Scanned with Critical Vulnerabilities Detected</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(*New vulnerability scanning software changed the baseline midyear FY16 Percent of scanned machines with important/critical vulnerabilities is much higher than previous quarters due to the MS12-036 (Remote Desktop Vulnerability) false positive test and the MS17-010 (Security Update for Microsoft Windows SMB Server) signature. We anticipate returning to the usual level for Q3.)</td>
<td>8.9%</td>
<td>2.06%*</td>
<td>0.14%</td>
</tr>
<tr>
<td>Mean Time to RemEDIATE Intrusion Events</td>
<td>0.8 days</td>
<td>0.6 days</td>
<td>0.45 days</td>
</tr>
</tbody>
</table>

- Cybersecurity Program Enhancements:

- Strengthened IDS system by decrypting web traffic and having the IDS systems process it to identify and block known malware and other nefarious activity.

- Added additional email monitoring capabilities of attachments to the IDS systems. Analysis is currently a manual process; provides additional data needed to conduct forensics on email attacks (phishing) and expands our scanning of attachments malware and other types of nefarious software.

- Investigated and purchased a commercial tool that will build documentation necessary for compliance with the updated Office of Science (SC) Program Cyber Security Plan (PCSP). NIST 800-53 (rev. 4), Security Controls and Assessment Procedures for Federal Information Systems and Organizations, became the SC standard when the updated plan was released in November 2016. This requires updated Cyber Security Plans for all 10 enclaves, which currently use NIST 800-53 (rev. 3), Recommended Security Controls for Federal Information Systems and Organizations. In anticipation of this new standard, JSA purchased the commercial tool to facilitate migrating from in-house software that is no longer maintainable. A Plan of Action and Milestones (POA&M) has been created, with a projected completion date of February 15, 2018.
Collaborations with DOE on Cybersecurity Initiatives:
- Participated in DOE data sharing and iJC3 initiatives for creation of an unclassified Security Operations Center (SOC)
- Responded to several data calls: Multiple MFA status updates; Cloud Service Providers; Network Infrastructure; Device Critical Hygiene Measures; High Value Asset Inventory
- Responded to Cooperative Protection Program (CPP) investigation request from iJC3
- Worked with other labs to define reporting norms for the Quarterly FISMA metrics

DOE Multi-Factor Authentication (MFA) Project: As part of DOE’s MFA project, JSA completed the deployment of MFA for privileged users in FY16 and completed the standard user deployment by February 15, 2017. Per SC’s guidance, a Plan of Action and Milestones (POA&M) was created for tracking progress. Key initiatives included:
- Delivering tokens to 333 standard users
- Configuring the authentication environment to support the initiative
- Separating the central file server to enforce boundaries for out of scope open science user accounts
- Adding MFA to IT managed configurations for LINUX and MACs
- Upgrading JLab's account and certificate management systems
- Developing a pilot project for microsegmentation (private vlans), in preparation for future improvements to network security
- This POA&M closed out in FY17 Q2.

FISMA/CAP metrics: Each Federal Agency reports Cyber Security metrics against FISMA/CAP goals. For the DOE labs, FISMA is implemented in a risk based approach. While not contractually required to comply with FISMA targets, CAP metric results are provided to DOE on a quarterly basis. During FY17 Q2, the Office of Science (SC) made efforts to rationalize the reporting definitions across the SC National Laboratories. Jefferson Lab has 21 of the 24 CAP metrics within target; the remaining 3 are shared by the majority of the SC Labs as they reflect the nature of computing at research labs, rather than computing strictly in an office environment.
- SC Laboratories have exceptions for unprivileged users to use LOA 3, while the metric is for LOA 4.
- Encryption of data at rest is handled through a risk based process. Encryption degrades performance and is most relevant for sensitive data. Open Science data is not sensitive and requires high performance access.
- Anti-exploitation tools are deployed on JLab Windows platforms, but there is no tool available that runs on Linux platforms.

JSA underwent an Inspector General (IG) Audit “Security over Infrastructure and Mission Systems at JLlab”, March 27-30, 2017. Auditors from the IG office were onsite to review implementation of security controls and the standards and best practices for managing or measuring internet of things (IOT). The audit focused on the Core enclave and Accelerator controls system and included visual inspection of devices to ensure alignment of database records and physical devices.

8.3 JSA’s goal is to maintain an efficient and effective Physical Security Program for protection of SNM, classified matter, classified and sensitive information, and government property during FY17. Significant during the first half of FY17:
- JSA increased the effectiveness of the site surveillance system by replacing the obsolete Video System, tripling the camera resolution, and allowing Lab security to control and limit down time to the program required 24-hours for 37 active cameras. Security planning and training through preparation of a Nuclear Materials Management Plan and Active Threat-Bomb detection training with FBI, Homeland Security, and regional police departments continued during this performance period.
- JSA upgraded all JLab portable hand-held radios with encryption and 911 alerting capabilities to the Newport News police department, fire department, and regional HAZMAT response. Improved emergency response communications equipment and hands-on training enables emergency responders to more effectively avoid road hazards and to position vehicles and people in a tactical manner.

NOTABLE OUTCOME STATUS: None set for Goal 8:

Exceeds Performance ★ Meets Performance ● Needs Attention ▼ Not Meeting Performance ◆
**Science and Technology Goals and Notable Outcomes**

- **GOAL 1** – Provide for Efficient and Effective Mission Accomplishment (TBD)
- **GOAL 2** – Provide for Efficient and Effective Design, Fabrication, Construction and Operations of Facilities (TBD)
- **GOAL 3** – Provide for Effective and Efficient Science and Technology Program Management (25%)

**GOAL 1: MISSION ACCOMPLISHMENT**

Throughout the past three quarters, JSA’s science and technology programs have continued to generate high-quality, original, and creative results; have continued to demonstrate sustained scientific progress and impact; have received appropriate external recognition of accomplishments; and have continued to contribute to the overall research and development goals of the Department of Energy and its customers. Significant performance highlights noted below.

**EXPERIMENTAL PHYSICS RESULTS**

- The first scientific publication following the 2016 Hall D/12GeV engineering run was published in Physical Review C Rapid Communications of April 24, 2017.
- Following the successful Key Performance Parameter runs in Halls B and C, efforts have moved in Hall B towards preparation both for the Solenoid arrival and of gas systems designs and reviews for cosmic-ray tests of all six sectors of CLAS12 drift chambers. In Hall C work combines a series of cryogenic fixes and cooldown of all HMS and SHMS superconducting magnets in preparation of a global End Station Refrigerator load test with the Hall C magnets, the Hall A superconducting HRS magnets and the torus magnet in Hall B.
- In Hall A, the installation of the scattering chamber, target, and associated engineering infrastructure for the series of experiments with a 3H target has started.
- Jefferson Lab users and staff were active and visible during the 25th International Workshop on Deep Inelastic Scattering and Related Topics (DIS2017) in Birmingham, April 3-7, 2017, in sessions related to Structure Functions and Parton Densities, Spin and 3D Structure, and Future of DIS. Many plenary and parallel-session presentations pointed to the impact of the anticipated 12-GeV science program, and the strong synergy to DIS topics of a Jefferson Lab-based Electron-Ion Collider.
- All preparations for receiving the new solenoid magnet in Hall B are complete.
- Cosmic ray tests are ongoing to test all drift chambers for efficiency. The region-2 chambers were found to be more sensitive to coherent noise rate that was traced to a material.
- In collaboration with Facilities, parts of the salvaged Hall D/12 GeV clean room have been used to erect two adjacent small clean rooms in the Test Lab High Bay. These two rooms are intended for further testing of the SBS-constructed GEM chambers presently at UVa, and for the PbWO4 crystals acquired for Hall C Neutral Particle Spectrometer and Hall D Primakoff-type experiments.
- Experiment readiness reviews and progress reviews have been held for the PREX-II/CREX experiments in Hall A, for the BoNUS12 experiment in Hall B, and for the ongoing DIRC-based Cherenkov capital equipment project and the data acquisition/computing for the future high-intensity GlueX-II phase II data taking.
- The Project Closeout/Transition to Operations Review of the Super BigBite Spectrometer (SBS) was held on June 8th. The SBS project was successfully completed.
- Integration of the MicroMegas Barrel and Forward tracking planes with the Silicon Vertex Tracker was completed by CEA/Irfu and JLab staff. Cosmic ray testing to the completed Central Vertex Tracker system is underway. Track reconstruction is working well but showed one 120 degree segment of the outermost layer needs to be replaced, which will be done before final installation.
- Experiment readiness reviews and progress reviews have been held for the initial SBS experiment (SBS/GMn) in Hall A, for the next phase of the Heavy Photon Search experiment in Hall B, for a series of experiments in Hall C requiring a variety of (nuclear) targets and a Cu radiator, and for the Primakoff experiment in Hall D.
- Reanalysis, after a tracking algorithm change, of the 2016 Hall D/GlueX data was completed, to facilitate Hall D Ph.D. thesis projects. Production analysis of the Spring 2017 GlueX physics production data has now fully started on the JLab cluster.
THEORY PROGRAM RESULTS

- The Theory Center is known for pioneering the application of lattice QCD techniques to problems of hadron spectroscopy, such as the spectrum of isovector and isoscalar mesons. To better connect with experimental measurements, Theory Center staff scientists have been developing quantum connection between the resonances to the scattering amplitudes using lattice QCD techniques. Working in relativistic quantum field theory, they recently derived the quantization condition satisfied by coupled two- and three-particle systems of identical scalar particles confined to a cubic spatial volume with periodicity $L$ on a lattice, which gives the relation between the finite-volume spectrum and the infinite-volume $2→2$, $2→3$, and $3→3$ scattering amplitudes for such theories.

- The verification of the sign change for the Sivers functions measured in SIDIS and Drell–Yan processes is one of the high priorities of DOE’s effort on QCD and hadron structure. With the latest data from JLab, HERMES and COMPASS, Theory Center staff scientists extracted the most up-to-date Sivers functions from SIDIS; and using new RHIC/STAR data on the transverse single spin asymmetry, $A_{NC}$, of hadronic $W/Z$ production (a Drell–Yan like process), they performed a critical assessment of the significance of the STAR data in verifying the sign change, and concluded that better data from Drell–Yan processes are needed in verifying the predicted and very important sign change.

- The tensor charge is one of the most fundamental properties of QCD and hadron structure, and its determination is one of the key motivations to build the new detector, SoLID, for upgrading experimental capabilities of Hall A. JLab12 and the future EIC might be the best and complementary facilities to extract and pin down this very important quantity to have a meaningful test by comparing with lattice QCD calculation. Theory Center staff scientists apply recent theoretical advances of the global QCD extraction of the transversity distributions to study the impact of future experimental data from the SoLID experiments, and find that the SoLID measurements with the proton and the effective neutron targets can improve the precision of the $u$- and $d$-quark transversity distributions up to one order of magnitude in the range $0.05<x<0.6$, leading to a unprecedented accuracy on the determination of the tensor charge.

- Precise matching between the JLab12 measurements of elastic electron-proton scattering and the electromagnetic elastic nucleon form factor will be critically important for extracting these form factors reliably, which carry rich information on QCD dynamics and hadron structure. Theory Center staff scientists examined the two-photon exchange corrections to elastic electron-proton scattering within a dispersive approach, including contributions from both nucleon and Δ intermediate states. The dispersive analysis avoids off-shell uncertainties inherent in traditional approaches based on direct evaluation of loop diagrams and guarantees the correct unitary behavior in the high-energy limit. Results are compared with recent measurements of $e^+p$ to $e^-p$ cross section ratios from the CLAS, VEPP-3, and OLYMPUS experiments, as well as with polarization transfer observables, which give important resources for JLab12 program.

PUBLISHED JOURNAL ARTICLES

Significant published articles during this performance period listed below:


- J. P. Lees et al. (BaBar Collaboration), “Dalitz Plot Analyses of $J/\psi \rightarrow \pi^+ \pi^- \pi^0$, $J/\psi \rightarrow K^- K^+ \pi^0$, and $J/\psi \rightarrow K^0_S K^{\pm} \pi^{\mp}$ Produced via $e^+e^-$ Annihilation with Initial-State Radiation.” Phys. Rev. D95, 072007 (April 2017)

- S. Jeschonek, J. W. Van Orden, “Factorization Breaking of $A_{2u}$ for Polarized Deuteron Targets in a Relativistic


**SIGNIFICANT AWARDS, SCIENTIFIC CONTRIBUTIONS, PROFESSIONAL MEMBERSHIP**

- **2017 Kenneth G. Wilson Award for Excellence in Lattice Field Theory**: Raul Briceno of Theory Center, who is the JLab’s Nathan Isgur Research Fellow, was presented with the 2017 Kenneth G. Wilson Award for Excellence in Lattice Field Theory for his “groundbreaking contributions to the study of resonances using lattice QCD.”

- **SECRETARIAL DISTINGUISHED SERVICE AWARD**: Jefferson Lab Director Hugh Montgomery received the Secretary’s Distinguished Service Award from Energy Secretary Ernest Moniz on January 9, 2017 “in recognition of more than three decades of leadership, distinguished service, and exceptional contributions to research at the high energy frontier of particle physics at Fermi National Accelerator Laboratory, and to enabling world leading capability and unprecedented research opportunities for the nuclear science community for decades to come…”.

- **2017 APS FELLOW**: William Detmold, JLab User and Assistant Professor of Physics at MIT, was awarded an APS Fellowship for “pioneering work in calculating few-body hadronic systems from first principles using lattice quantum chromodynamics, including the spectrum of the light nuclei and hypernuclei, Bose-condensed multimeson systems, and the first inelastic nuclear reaction.”

- **2017 APS FELLOW**: Peter Bosted, JLab User and Adjunct Professor at William & Mary, was awarded an APS Fellowship “for invaluable contributions to unraveling the structure of the proton and neutron via elastic, inelastic, and spin-dependent electron scattering from nucleons and nuclei.”

- **2017 TOM W. BONNER PRIZE IN NUCLEAR PHYSICS**: Charles Perdrisat, JLab User and Emeritus Professor of Physics at William & Mary, was recipient of the 2017 Tom W. Bonner Prize in Nuclear Physics “for groundbreaking measurements of nucleon structure, and discovering the unexpected behavior of the magnetic and electric nucleon form factors with changing momentum transfer.”

- **2017 SCHEV OUTSTANDING FACULTY AWARD**: Anatoly Radyushkin, a senior staff scientist with a joint professor position at Old Dominion University, was awarded the 2017 Outstanding Faculty Awards by The Virginia State Council of Higher Education for his superior accomplishments in teaching, research, and public service, which are the Commonwealth’s highest honor for faculty at Virginia’s public and private colleges and universities.

- **INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)**: Fulvia Pilat, Deputy Associate Director – Accelerator Division; Executive Committee Chair
  George Neil, Accelerator Division Scientist – Particle and Beams Executive Committee National Member at Large

- **INTERNATIONAL SOCIETY FOR INFRARED MILLIMETER AND TERAHERTZ WAVE**: George Neil, Accelerator Division Scientist – Executive Board Member
GOAL 2: CONSTRUCTION AND OPERATIONS

During the first three quarters of FY17, JSA provided effective and efficient strategic planning; fabrication, construction and operations of Laboratory research facilities; and were responsive to the user community. Significant accomplishments are noted.

12 GEV UPGRADE

- Solenoid magnet construction work at ETI in April focused on recovering from the unsuccessful attempt to transfer the load of the cold mass to its vacuum cryostat. All eight of the "pockets" that carry the suspension system that supports the cold mass were removed from the central cryostat shell and re-worked. The load transfer of the cold mass weight from the temporary support structure to the cryostat proper was successfully completed, thus retiring a technical risk for the project.

- Installation of the Solenoid thermal radiation shield completed early in May, but several unacceptable thermal contacts with the cold mass were found during testing. In consultation with Jefferson Lab, fifty custom-made fiberglass and epoxy standoff spacers were fabricated and installed by ETI, after which no additional thermal shorts were found.

- The DOE SC OPA Status Review of the 12 GeV Upgrade was held May 10 – 11, 2017. The purpose of the review was to evaluate the project’s readiness for approval of Critical Decision 4B (CD-4B), Project Completion. The review team found that the Project’s CD-4B scope is complete, with the exception of the Hall B Solenoid, and that completion of the remaining scope by September 30, 2017 is achievable but tight. The review team congratulated all team members working in support of the 12 GeV Upgrade Project on the “real and substantial progress” since the review held last October and provided two recommendations in the Closeout Report.

- Lab Director, Stuart Henderson, and 12 GeV Project Director, Allison Lung, visited the Solenoid magnet vendor, ETI, in Pennsylvania in early June to discuss plans for magnet completion and delivery. Agreement was reached to work together to support a June 23rd assembly complete date and June 26th to have the magnet ready to transport. When ETI welder staffing proved insufficient to support these dates, Jefferson Lab arranged for a welding crew to work on-site for two weeks. Negotiations included ETI adding two tasks (one electrical, one gas purge) in parallel with final welding to save schedule following delivery; Jefferson Lab also provided electrical and vacuum SMEs.

- The Solenoid magnet was delivered to Jefferson Lab and taken into Hall B on Tuesday, June 27, after a 10-hour road-trip from Pennsylvania. Following unloading and successful completion of initial receipt inspections on the morning of June 28, the magnet was placed on the CLAS12 spectrometer carriage. The Solenoid magnet is the last component of the 12 GeV Upgrade Project.

EXPERIMENTAL RESEARCH OPERATIONS AND CONSTRUCTION

- The Accelerator Readiness Review was held early January 2017 for both Halls B and C. This review included the scope for the pre-operations phase to establish the Key Performance Parameter for Hall B and C, respectively. The Accelerator Readiness Review folded in the reports and closure of relevant recommendations of the earlier experiment readiness reviews.

- The MOLLER experiment received the DOE CD-0 “Mission Need” approval, but is considered in a paused stat due to uncertainty of budgets.

- In Hall A, another experiment to measure the spectral function of Argon was completed. This measurement both will give information on the impact of short-range correlations towards shifting spectroscopic strength towards large proton momenta and energies, and provide experimental input to model the response of liquid argon detectors to neutrino beams towards a reliable estimate of neutrino cross sections.

- This quarter saw the start of the GlueX physics operations phase. Some 50B events were recorded in a time period corresponding to roughly ¼ of the approved GlueX Phase-I experiment. This can be compared to the 22B accumulated during the GlueX engineering phase.

- Hall A completed the planned run for the "DVCS" and "Gmp" experiments E12-06-114 and E12-07-108, Measurements of the Electron-Helicity Dependent Cross Sections of the Deeply Virtual Compton Scattering with CEBAF at 12 GeV, and Precision Measurement of the Proton Elastic Cross Section at High Q2. This marks the completion of the first experimental effort using the 11 GeV beam in the hall.

- Hall A is celebrating the timely, successful completion of the Super BigBite Spectrometer (SBS) project. This DOE capital equipment project has successfully constructed 40 planes of large Gas Electron Multiplier (GEM) tracking detectors, a dipole magnet and associated moveable support and beamline systems, and a novel scintillator-based
coordinate detector. Five approved experiments will use this new spectrometer, which will also involve a new hadron calorimeter, electron calorimeter and state-of-the-art polarized helium-3 target. Hall A received additional good news this week with the announcement that Critical Decision-0 was awarded (although paused for funding) for the MOLLER experiment.

- The first physics run of the GlueX experiment started a week ago, one year after the engineering run demonstrated that the experiment had achieved the designed parameters. A limited amount of physics-quality data collected during the engineering run has already superseded the existing polarized photoproduction data in the given energy range. It allowed the GlueX collaboration to study beam asymmetry effects in pseudoscaler photoproduction, resulting in the first GlueX physics paper recently submitted to Physical Review Letters. This also happens to be the first Jefferson Lab physics result from the 12 GeV upgrade.

ACCELERATOR OPERATIONS

- CEBAF delivered beam to all four end-stations in FY17 Q2, in a dynamic mix of production beam delivery for physics and beams for 12 GeV key performance parameter demonstrations. The majority of the beam time consisted of two-hall operations, with a brief period of three hall operations. The period of three hall operations represents the first time in the 12 GeV era that two high current halls (A&C) were operated simultaneously. Unfortunately beam operations were terminated early on March 10th by a cold-compressor failure in the SC1 2K cold-box. Cryogenics configuration changes required to inspect the failed cold-compressor are on-going. In the meantime, options and plans for future 2K operations are being developed.

- The beam energy for FY17 Q2 operations was 2.1 GeV/pass (same energy as in FY17 Q1). The RF performance supports this energy with an acceptable RF trip rate and with sufficient margin for effective operations. The RF trip rate in the final weeks of operation improved to about 3 trips/h through the efforts of Gradient Team.

- The 5th pass RF separation system was repaired in January and was operated successfully during FY17 Q2 beam operations without issue. The 5th pass separator was used for the majority of this period to separate the Hall-D on 5th pass.

- There were no scheduled CEBAF beam operations for Physics in FY17 Q3. Shutdown maintenance work continues through to the end of the fiscal year.

- The upgrade to the injector laser system to support 4-hall operation, installed in the final week of FY17 Q2, was successfully commissioned in FY17 Q3. Plans for commissioning the complete 4-Hall system (Laser+RFseparators) are planned for FY18 Q1.

- A Director’s “Cold-Compressor Review” was held in the first week of June. The committee reviewed the plan for establishing 2K operations after the March 10th event in which cold-compressor #5 failed. Cold-compressor #5 has been repaired and tested to 10% of its full speed in an external test stand. Assembly of the sub-atmospheric and full speed test of the cold-compressors is on-going and on track to support beam operations in FY18 Q1.

- A new photogun and alkali-antimonode photocathode deposition chamber have been commissioned. The photocathode is immersed in a magnetic field to produce magnetized beam. That is to say, beam that possesses mechanical angular momentum. Magnetized beam could be necessary for proton cooling for the electron ion collider. This is the first time magnetized beam has been produced from a dc high voltage photogun. And already, our demonstrat

- Refurbished and qualified three C50 cavity pairs for the C50-07B Cryomodule, the next refurbished cryomodule for CEBAF. Completed the qualification of the C75 cavity pair, which serves as the fourth pair for the refurbished CEBAF cryomodule. Completed cryounit assembly with all units on the cryomodule assembly rail. Assembly of the refurbished cryomodule will be completed in early August; installation and commissioning will follow in mid to late August.

- Installed the new injector quarter cryomodule into the upgraded injector test facility (UITF) for commissioning and characterization prior to installation in CEBAF.

- Completed the first round of acceptance testing on the LCLS-II prototype cryomodule in the Cryomodule Test Facility during FY17 Q2; successfully meeting all measured performance parameters. Completed the second round of acceptance testing during FY17 Q3. Completed the qualification of LCLS-II production cavities and completed the assembly of four production cavity strings, numbers 3 through 6. Completed the assembly of the first production cryomodule and ramped four others into sequential phases of assembly. The first production module will test in FY17 Q4.

- Completed the processing, assembly and RF testing of the second double-quarter wave (DQW) and RF dipole (RFD) cavities during FY17 Q3. Both cavities exceeded performance requirements. The remaining scope includes additional
cavity performance test and the design and fabrication of prototype HOM absorbers for the RFD cavity.

- Completed and delivered a revised budgetary estimate for the Spallation Neutron Source (SNS) Proton Power Upgrade Project.
- A workshop was held to explore potential scientific opportunities in the LERF. Many local researchers got a chance to see what equipment and capabilities were available at the LERF and the ODU Applied Research Center (ARC) labs. One opportunity discussed was an option to use the LERF as a positron source. The possibility of a user-organized positron workshop to further develop this idea will be explored by the advocates.

**EIC/JLEIC**

- Software efforts are near-final to release a JLEIC detector/interaction region and physics simulation package to be installed and used as a “Virtual Machine” on user computer systems. This package includes the GEMC-based simulation package and various physics generators. This should facilitate users to do JLEIC physics and detector simulations.
- JLab staff and users, in collaboration with the EIC Users Group Steering Committee and BNL, have continued to work on slides to be passed on to the ongoing National Academy of Sciences study related to the EIC. These slides address the charge elements related to the EIC context in the international scene, the benefits to US leadership in nuclear physics, and the benefits to other fields of science and society.
- The ERL-based bunched beam cooler was significantly advanced to a more detailed design. Features such as timing, beam brightness preservation in a cooling ring, high charge pulse production and transport, and control of the cooling partition were studied. Good progress was made on the design of an exchange region in which the bunches of the cooling ring are exchanged with the energy recovery linac.
- The baseline design of the Jefferson Lab Electron-Ion Collider (JLEIC) has not changed in the past quarter. The maximum luminosity is $2 \times 10^{34} \text{ cm}^{-2} \text{sec}^{-1}$. Work continues on key technology elements to reduce the overall technical risk of the design.
- Jefferson Lab hosted a JLEIC collaboration meeting on April 3-5, 2017. Progress on key aspects of the design were presented and discussed. The meeting was attended by the majority of our collaborators (ODU, TAMU, SLAC, ANL, and LBL) and BNL representatives. Following a recommendation of the November 2016 EIC R&D Review Panel, collaboration with BNL was discussed. It was later decided to make the next collaboration meeting a joint JLEIC and eRHIC event and to hold it at BNL.
- A plan for EIC R&D was prepared at DOE’s request. The plan is for two years, FY17 and FY18, and assumes $1.5M of base funding and $1.5M of additional funding in each year. The specific R&D activities were prepared according to the priorities identified in the November 2016 EIC R&D Review Panel Report. Each of the 34 specific activities includes a general description, goals, deliverables, schedule, and detailed cost. The plan was submitted to DOE at the end of May.
- Work continued on the most important aspects of the JLEIC design: electron-cooling, magnets, crab cavities, ring design, polarization design and beam dynamics simulations. In particular, an essential component of bunched electron cooling, a harmonic kicker, has been manufactured and will be tested with beam. Beam dynamics in the presence of the RF fields of crabbing cavities has been simulated. The results provide guidance for the ongoing cavity design. A start-to-end spin tracking simulation for the ion beam has been completed for the whole acceleration cycle. A smaller-emittance electron ring design has been completed.
- Work continued on the full-acceptance detector design for the interaction region. Engineering design of key detector components and simulation of detector performance has begun.
NOTABLE OUTCOME STATUS:

- **Objective 2.2:** Execute the assigned LCLS-II project scope in compliance with the technical performance specifications and within the established DOE performance goals for cost and schedule.
  - JSA has schedule and cost indices of SPI=0.92 and a CPI of 0.98 at the end of June. The SPI of 0.90 results from having one SRF cavity vendor on a production hold for quality reasons and delayed delivery of the Cryogenics Plant warm helium compressors for CP2.
  - After working with the SRF cavity vendor to establish new procedures and controls, the vendor is back in production. Cavity performance has significantly improved since the restart and production continues at the original contract rate. JSA has developed rework procedures for the early cavities that failed performance testing. The vendor has implemented these recovery procedures and the cavities are performing well.
  - LCLS-II Production Cryomodule Production is in full swing. The production lines and test facilities are fully loaded with cryomodules.
  - The cryogenics plant warm helium compressors for CP2 will start delivery in August.
  - The 4.5 K cold box procurement required significant focus during FY17 Q3. The vendor is forecasting a late delivery of the first cold box eliminating all float to first light milestone. JLab is working with the vendor to develop a recovery plan.
  - Diligent monitoring of safety practices during performance of LCLS-II work remains a high priority. During the first half of FY17, there was a single first aid incident reported in Q2; a technician received a scrape to their forearm. Engineering mitigations have been put in place, a cover, to avoid future occurrences.

- **Objective 2.2:** Complete the CD-4B (Approve Experimental Equipment Project Completion) key performance parameters (KPPs) for the 12 GeV CEBAF Upgrade project. [NOTABLE OUTCOME ACHIEVED FY17 Q2]
  - This Notable Outcome was achieved FY17 Q2. Concurrence on the demonstration of the Key Performance Parameter for Halls B and C from the DOE Federal Program Manager and Federal Project Director was received in February and March 2017, respectively.
JSA provides effective program vision, leadership, strategic planning, and development of initiatives that facilitate improved research productivity. The Laboratory Directed Research and Development (LDRD) program is now in its fourth year of providing funds for selected projects; four currently underway in FY17 support the possibility of EIC at Jefferson Lab. Nine new proposals were submitted for consideration in FY18. The final set of drawings for the Facility for Rare Isotope Beams (FRIB) was delivered in FY17 Q2, after the end of a 2-year journey. The path forward for this project continues to be defined.

There were 1,745 registered participants hosted onsite during this performance period. Science Education staff, in addition to several thousand hours interacting with student and teachers, were also invited to participate in local events promoting Science, Technology, Engineering, and Math (STEM) careers. Significant during the first three quarters of FY17:

- JLab’s LDRD program is now in its fourth year. By the April 28, 2017 deadline a total of twelve proposals for FY18 projects (three for continuation and nine for new projects) were received, and the peer review/selection process began. Evaluations by the lab’s LDRD Project Review Team have been completed and recommendations forwarded to the director for action this Fall. In addition, mid-year progress reports were received for the four FY17 projects; all are making excellent progress.

- Andrew Hutton, Associate Director for Accelerators, stepped down April 28, after 25 years. Fulvia Pilat, formerly the Deputy Associate Director for Accelerators, is currently serving as the Acting Associate Director. A search committee has been formed that includes Stuart Henderson, Jefferson Lab Director (Chair); Steven Holmes, Fermilab; Krishna Kumar, Stony Brook University; Patrizia Rossi, Jefferson Lab – Experimental Nuclear Physics; Rik Yoshida, Jefferson Lab – Experimental Physics; George Neil, Jefferson Lab – Accelerator Division; Mary Logue, Jefferson Lab – ESH&Q; and Rhonda Barbosa, Jefferson Lab – Human Resources.

- JSA Mechanical Engineering Group completed the final set of drawings on the ‘FRIB Cryomodule Engineering and Design Finalization’ work package. This represents the end of two years of work involving the Beta 0.041 and 0.29 modules, where the group took conceptual-design models from the Facility for Rare Isotope Beams as a starting point and developed them into complete engineering packages ready for cryomodule fabrication. In February, the 0.041 cryomodule was placed and aligned in the FRIB tunnel. The 0.29 cryomodule/coldmass assembly is proceeding, and FRIB is looking forward to early beam commissioning of these cryomodules starting in 2018.

- JLab staff scientists and users are active participants at reviews, meetings, conferences, and workshops that are attended by hundreds of representatives from scientific institution, organizations, and higher education facilities nationwide. These collaborations provide important opportunities for discussion of scientific results and future opportunities. During the first nine months of FY17, Staff Services coordinated more than 171 onsite events. There were a total of 1,745 registered participants representing 567 institutions. All workshops were tracked through the DOE reporting system, iPortal, meeting all DOE requirements. Registrations from sensitive countries were screened for potential security threats as they were received. Support was also provided for informational and training activities hosted onsite by local mutual aid organizations that provide emergency response services to the Lab. Significant during this period:
  - **JLEIC Collaboration Meeting Spring 2017, April 3-5, 2017**: The 5th JLEIC collaboration meeting was held at Jefferson Lab in April. A high energy high luminosity polarized electron-ion collider was identified and recommended by the US DOE/NSF Nuclear Science Advisory Committee (NSAC) as the next major US nuclear science research facility in its 2015 Long Range Plan (LRP). JLEIC, an electron-ion collider based on the CEBAF recirculating Superconducting RF linac, has been proposed at Jefferson Lab for responding to this NSAC-LRP recommendation and as the lab's future nuclear science program beyond 12 GeV CEBAF fixed target program. The design studies and accelerator R&D of JLEIC have been actively pursued over the last ten years by Jefferson Lab staff and external collaborators.
  - **US Lattice Quantum Chromodynamics (USQCD), April 28-29, 2017**: USQCD is a collaboration of US scientists developing and using large-scale computers for calculations in lattice quantum chromodynamics. Lattice QCD calculations allow us to understand the results of particle and nuclear physics experiments in terms of QCD, the theory of quarks and gluons. The annual All Hands Meeting was held at Jefferson Lab with 50 participants from SC laboratories, college universities, international research centers and institutions.
  - **Future Trends in Nuclear Physics Computing, May 2-5, 2017**: This workshop examines the hardware and software strategy at a time horizon of ten years. Goal is working towards the definition of a common vision for Nuclear Physics (NP) computing and data and recommend future directions for development. Discussions adopt a data perspective and focus on resource management and the interplay of I/O, compute and storage, machine learning for enhancing scientific productivity and appropriate task based approaches, software portability, reusability and common infrastructure components. Committee members included representatives from JLab,
QCD Evolution Workshop, May 22-26, 2017: The workshop is a continuation of a series of workshops held during six consecutive years, in 2011, 2012, 2013, 2015 at Jefferson Lab, and in 2014 in Santa Fe, NM, and in 2016 at the National Institute for Subatomic Physics (Nikhef) in Amsterdam. There are rapid developments in the understanding of the evolution of parton distributions including TMDs, GPDs, low-x, higher-twist correlation functions, and the associated progress in perturbative QCD, lattice QCD and effective field theory techniques. The program of QCD Evolution 2017 will pay special attention to the topics of importance for ongoing experiments, in the full range from Jefferson Lab energies to RHIC and LHC energies or future experiments such as a future Electron Ion Collider, recently recommended as a highest priority in U.S. Department of Energy’s 2015 Long Range Plan for Nuclear Science. Committee members included representatives from JLab, Penn State Berks, UCLA, ODU, UConn and LANL.

- JSA Science Education outreach statistics through FY17 Q3 included interactions with 9,988 students (17,551.34 contact hours) and 682 teachers (1,718.8 contact hours) through the BEAMS (Becoming Enthusiastic About Math and Science) program, Physics Fest program, JSAT (JLab Science Activities for Teachers) visits, and other school visits. Significant accomplishments through FY17 Q3 are noted below:
  - JSA collaborated with Newport News Public Schools on October 28, 2016 to present the Newport News Public School Engineering Design Challenge. Ninety-six elementary students from across the school division convened for a challenge that required them to collaborate, innovate, and think critically to solve a laser maze problem.
  - JSA was invited and participated in Science Day with the Virginia School for the Deaf and Blind. Two such events were held in the state; October 8, 2016 in Stafford County, VA and November 5, 2016 in Staunton, VA. A total of 22 deaf, hard of hearing, and visually impaired students engaged in hands-on, inquiry-based activities designed to strengthen and promote STEM interest.
  - Fifty-seven students from Carver Elementary School in Newport News participated in the Hour of Code at Jefferson Lab on December 9, 2016. Students were introduced to computer programming using an interactive Star Wars-themed activity. In addition to members of the Science Education staff, five staff members from the Jefferson Lab Computer Center volunteered to assist students in the classroom.
  - JSA hosted Regional Science Bowls for High School on February 4, 2017 and for Middle School on March 4, 2017. There were a total of 176 students and 46 coaches in attendance, competing in a verbal forum to answer questions in science and math. There were 56 Jefferson Lab volunteers, serving as room officials.
  - The two-day Engineering Career Days, sponsored by the Peninsula Engineer’s Council, took place on February 23-24, 2017. The event hosted by Jefferson Lab, Newport News Ship Building and NASA, reaches 600 high-school students to encourage them in STEM fields. Students interacted with 14 Jefferson Lab staff members.
  - JSA was invited, on April 10, 2017, to participate in the 22nd Annual School of Science Research Symposium at Hampton University. Twenty participants attended a daylong series of activities, including a panel with national laboratories, graduate physics programs and professional physics societies.
  - Virginia Air & Space Center’s Homeschool Appreciation Day was held on May 10, 2017. JSA staffed a booth at the event, sharing hands-on activities, on-line resources and opportunities for homeschool students to interact with Jefferson Lab.
  - At the CNU & NNPS STEM Community Day on May 20, 2017, Jefferson Lab’s Science Education staff had the opportunity to interact with the 4,000 students, teachers and parents from the community. Hands-On activities, Lab and web resources, and upcoming educational programs were shared.
Jefferson Science Associates
FY2017 Q3 PEMP Performance Evaluation

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**NOTABLE PERFORMANCE ITEMS:**

4.1 Jefferson Lab Senior Leadership regularly interacts with local government, business organizations, and higher education leaders to cultivate and maintain long-term relationships that are beneficial to the lab. During the first three quarters of FY17, the directorate, several senior managers, and JSA corporate representatives participated in meetings with the Greater Peninsula NOW, the United Way of the Virginia Peninsula, the Peninsula Workforce Development, CNU Peninsula Insiders, and attended the Newport News State of the City Address that was given by Mayor McKinley Price. Jefferson Lab hosted a delegation from the People’s Republic of China (PRC), following a joint US-PRC meeting held at SURA in Washington, D.C., to discuss increased collaboration on areas of common interest in hadron spectroscopy. They also welcomed onsite local government representatives and military leaders to give them an overview of Jefferson Lab programs and a tour of the facility.

- Jefferson Lab Senior Leadership is actively recruited to serve on and participate in numerous scientific, national, and international organizations, committees, and review panels. During FY17 Q2, Laboratory Director Hugh Montgomery was appointed to the CERN Scientific Policy Committee and the Helmholtz Society Review of DESY. Mary Logue, Associate Director - ESH&Q, was invited to serve on an operational review committee for Ames Laboratory.

- Jefferson Lab Senior Leadership participated in a DOE SC led meeting on April 3, 2017, to review the implementation of a revolutionary contract model at SLAC and to discuss implementation at TJNAF and other SC sites. Following this meeting, JSA and the TJNAF Site Office worked closely to review the contract and identify opportunities for streamlining by removing redundant, outdated, or inappropriate requirements. We reviewed a total of 53 H Clauses, 54 DOE Orders, Manuals, and Policies, and 162 FAR and DEAR clauses. We jointly identified 18 H Clauses, 19 DOE Orders, Manuals, and Policies, and 28 DEAR clauses that can be deleted or modified. We also reorganized all requirements into the eight PEMP goals and subordinate objectives and grouped requirements into 41 processes using the TJNAF Requirements Traceability Matrix. DOE has already taken action to modify the TJNAF contract based on this effort and work is proceeding to the next phases to tailor requirements to eliminate processes, reviews, and other work that adds little to no value.

4.2 JSA maintained a robust contractor assurance system during the first three quarters of FY17. We continued to operate in a transparent fashion with regular meetings with the TJSO staff to provide progress and status updates and early insight into developing issues. There were six ORPS reportable events communicated in a timely fashion, as well as several events that fell below the ORPS criteria that were nonetheless reported to TJSO for visibility. At the CAS Quarterly Status Meeting on June 5, 2017, JSA provided rolling 12-month metrics and implementation updates for On-time Assessment performance and On-time development of Corrective Action Plans, both identified for improvement by the Lab in previous discussions. Additionally, rationale was presented for the removal of three risks from the Risk Registry, as action plans were considered to be sufficiently advanced such that Lab Leadership level monitoring was no longer necessary. This aligns with our previously identified roadmap for enhancing the CAS through utilization of over 60 PAE (and previously CSC) contracts and best practices to better provide assurance to the customer.

- JSA maintained uninterrupted operations during the first three quarters of FY17, despite the challenges created by incremental funding under the continuing resolution. We provided TJSO timely reporting of when available funds would be exhausted and recommendations on how funding could be redistributed between projects. JSA also took action to carefully prioritize non-labor commitments to manage through delays in funding disbursements and prevent any operations impact.

- JSA worked closely with the Office of Science (SC) during the first half of FY17, to maintain awareness of the developing security challenges resulting from international agreements. Jefferson Lab’s COO attended classified briefings for the laboratory director at DOE Headquarters on November 2, 2016 and again on December 14th. Unclassified synopsis of these meetings was shared with JSA leadership. In January 2017, we immediately elevated to the Site Office an inquiry from the City of Newport News Sister Cities committee regarding a potential visit by a high-level delegation from the Sichuan Province in China. This enabled the Site Office to coordinate the visit with larger DOE and prevent any surprises or adverse publicity.

- JSA reinforced our excellent relationship with the Commonwealth by hosting Delegate Marcia Price on November 29, 2016 for a lab overview briefing and tour of the CEBAF. Delegate Price represents the 95th District in the Virginia House of Delegates and is a member of the Health, Welfare, and Institutions Committee. The Commonwealth has been a strong...
supporter of Jefferson Lab and provides valuable financial support to the lab and its scientists.

- JSA agreed to host the December meeting of the Lab Operations Board (LOB). The LOB met on December 8, 2016 and then toured the CEBAF on December 9th. We believe this meeting increased awareness of Jefferson Lab’s mission and science capabilities within a number of DOE leaders who had not visited, or do not regularly visit the laboratory.

- Jefferson Lab’s COO was a member of the DOE Order 232.2 Integrated Product Team charged with the responsibility to provide a revised order for DRB approval by December 15, 2016. This was an enormously challenging undertaking that required participation in a two day meeting at DOE Headquarters’ on October 12-13, 2016, followed by a series of conference calls. One particularly important contribution was to quantify the cost of the existing order, estimated to be on the order of 16 FTE’s annually across the entire complex (something on the order of 0.01%). This obviated the long held belief the existing order was excessively burdensome, allowing the team to move on to needed and achievable process improvements rather than revisit the perceived need to eliminate labor.

- On January 18, 2017, JSA introduced Lauren Hansen as the new TJNAF Communications Office manager. This action completes a national search started in June 2016. Over 106 applications were received; 40 were found to meet the Jefferson Lab requirements, and onsite interviews were conducted with six candidates before Lauren was selected. She brings substantial experience in the transportation and construction industry, extensive local media networking, previous experience as an employee of the Commonwealth of Virginia, as well as how to integrate social media into an effective corporate communications program.

4.3 Members of the JSA Board, company officers, Committee members, owner representatives, board liaison, and corporate staff provided governance support, ensuring the governance structure and function support the Lab and DOE and enable the Lab to capitalize on opportunities and address challenges that arise. During the Q3 (March-June 2017) reporting period, JSA interactions included communications and meetings with DOE HQ and program officials, TJSO managers, federal and state relations consultants, Virginia state officials, Lab leadership and managers, internal auditor, Users Group Board, CAS quarterly leadership team, and the six JSA board committees. These interactions and meetings, referenced throughout this assessment, addressed: performance status on PEMP goals and TJSO feedback; current and emerging issues and risk mitigation efforts; safety events, responses, and lessons learns; JSA board and corporate activities; on-going CAS activities and continuous improvement efforts; etc. Q3 highlights include:

- JSA Board vice chairs (owner representatives) submitted the annual CAS assurance following review of committee CAS assessments and other supporting information. Assurance included half dozen areas in which board vigilance would continue to ensure effective CAS program execution through timely risk identification and mitigation and attention to potential opportunities to improve mission delivery.

- JSA Board reviewed and approved the draft Annual Lab Plan presented by the Lab to SC in June. JSA officials attended with the Lab Director, Deputy Director, COO, CPO, and Facilities Manager. DOE’s feedback was positive including note of “JSA’s continuing encouragement of talented young scientists through JSA awards, and its artful handling, in full coordination with DOE/SC of the search for and transition to a new Director with little to no negative impact on the existing talent pool at the laboratory.”

- JSA Board approved the Lab Director’s proposed budget for Commonwealth of Virginia funds which includes funds for salary supplements, GDCP/GCS honors, industry-lead research efforts, etc.

- The CAS leadership team (TISO, JSA, JLab) discussed at its quarterly status meeting: status of action items from April 2015 CAS review; process performance status; risk registry update; and, requirements traceability matrix. Work progressed on the FY2018 assessment schedule planning including discussions with operations managers from procurement, finance, human resources, RadCon, facilities, engineering, physics, accelerator, SRF, quality assurance, EH&S, self assessment, 12GeV & LCLS-II. A focus of this year’s planning was tying contract requirements to scheduled assessments. See also discussion in 4.2.

- The JSA Programs Committee met during the SURA Board meeting at Louisiana State University. In addition to reports on relations support for the Lab and PEMP goal 4.3 contractor leadership status, the Committee heard reports on the Lab science program with an emphasis on the theory program and Users Group activities. Committee members met with the Users Group Board at its June meeting to discuss program activities and other JSA matters.

- The JSA Compensation Committee reviewed and discussed performance of key personnel and staff supported by Virginia state funds and approved merit increases; reviewed the Finance & Audit Committee’s appraisal of the internal auditor and approved merit increase; approved honoraria for Governor’s Distinguished CEBAF Professors (GDCP’s); discussed benefits program change in dependent life insurance coverage and status of Virginia sales tax audit appeal.

- The Operations & Safety Committee held monthly teleconferences with the Lab COO and operations managers discussing
such topics as: budget status including the first increment of $8M SLI funding to replace the aging CHL-1; PEMP mid-year review; annual plan review; FY2018 President’s budget; requirements traceability matrix status in support of revolutionary contract reform; safety incidents, causes, corrective actions, and lesson learned; status of Virginia sales tax audit appeal; progress on compliant Cost Accounting Standards methodology; DOE compensation audit; status of ESH&Q building; renewal of ARC lease; comments and feedback to Utility Energy Services Contract task order proposal; Utility Infrastructure Modernization project status; etc.

- The Finance & Audit Committee reviewed and submitted the proposed 2018 internal audit plan; transmitted Allowable Cost Transaction testing audit report; and reviewed the internal auditor’s FMA summary report.

**OWNER COMMITMENTS**

- Through Q3, the $530K JSA Initiatives Fund (IF) Program is over 47% expended. Highlights of the specific IF projects during this reporting period include:
  
  - **Outstanding Nuclear Physicist Award**. PI: Elizabeth Lawson, for the JSA Programs Committee. A selection panel, headed by Lab Deputy director Bob McKeown, named joint recipients for the 2017 Outstanding Nuclear Physicist award. W&M professor emeritus Charles Perdrisat and former Cornell professor/former Jefferson Lab staff member Charles Sinclair received their awards at the June Users Group meeting. Award citation: The 2017 JSA Outstanding Nuclear Physicist Award is jointly awarded to Charles Perdrisat for his pioneering implementation of the polarization transfer technique to determine proton elastic form factors, and to Charles Sinclair for his crucial development of polarized electron beam technology, which made such measurements, and many others, possible. The JSA Program Committee established the award in 2011 to recognize individuals who have made outstanding and sustained contributions to the nuclear physics program at Jefferson Lab. PR at:


  - **JSA/JLab Graduate Fellowship Program**. PI: Elizabeth Lawson, for the JSA Programs Committee. An evaluation committee, chaired by SURA board trustee CNU’s Ed Brash, awarded eight graduate fellowships for AY 2017-2018 to students studying at UVa, U of SC, W&M, GWU, and HU. Seven of the student proposals are in experimental physics and one is in theory. Four of the awardees are males; four are females. Of the 25 applications received this year (an historical high, and not including 3 late submittals that were not considered), 19 were experimental physics proposals, 4 were theory proposals, 1 accelerator physics proposal, and 1 LERF proposal. Since the program was started by SURA in 1989, 208 fellowships have been awarded to 21 different SURA universities. PR at:


  - **JSA/JLab Sabbatical/Research Leave Support Program**. PI: Elizabeth Lawson, for the JSA Programs Committee. JSA awarded sabbatical support to Florida International professor Lei Guo who will be working with Lab collaborator Eugene Pasyuk on the *Photoproduction of the very strangest baryon on a proton target in CLAS12* and to Idaho State professor Dustin McNulty who will be working with Lab collaborator Robert Michaels on *Neutron Skin Measurements: PREX-II and CREX*. The program provides subsistence support for faculty relocating to Jefferson Lab to conduct research during their institutionally approved sabbatical leave. Twenty-six awards have been made since inception in 1997 to faculty from 16 different universities.

  - **JSA Post Doc Research Grant**. PI: Larry Weinstein for the Users Group Board. The Users Group Board awarded the 2017 research grant to Nobuko Sato, a post doc at UConn based on his proposal First universal analysis of unpolarized and polarized parton distributions and fragmentation functions. PR at: https://www.jlab.org/news/releases/computing-takes-prize. The grant is a way to recognize, reward, and honor the finest postdocs and support the Lab’s scientific mission. Over the years, the prize has helped encourage students to see that excellence is recognized at every stage of their careers, including their post graduation, career building phase.


  - **JSA Poster Prizes**, PI: Larry Weinstein for the Users Group Board. The competition held during the annual Users Group meeting among over a dozen posters resulted in awards to: HU’s Ishara Fernando (Baryon masses in ChPT combined with the 1/Nc expansion) – 1st; Wuhan’s Shuang Han (Survey of the 4gamma final state) – 2nd; and ODU’s Salvador Sosa (Modeling Local Crabbing Dynamics in the JLEIC Ion Collider Ring) – 3rd; and three Honorable Mentions to: Richard Trotta (Catholic), Yan Wang (W&M), and Yunjie Yang (MIT)

  - **JSA Minority/Female Undergraduate Research Assistantship**, PI’s: Rhonda Barbosa, Brita Hampton. W&M undergraduate Alexandra Cramer was selected from among 14 applicants (a record high) to receive this year’s grant. Cramer will be working with her advisor W&M professor Justin Stevens on photo-production data analysis from GlueX experiment in Hall D. The M/FURA program provides opportunities for minority and female students who are
pursuing undergraduate degrees in physics, giving them a chance to turn their studies into real-world research applications and experience.

- **HUGS International Fellowship for Graduate Students in Developing Countries.** PI’s: Cesar Fernandez-Ramirez (UNAM), Alberto Accardi (HU). Four fellowships were awarded from a field of ten applicants from Argentina, South Africa, Mexico, India, Colombia, Rwanda, Central Africa, and Cameroon. Recipients receiving support allowing them to participate in the annual HUGS program included: David Molina (Columbia), Estefania Berrueta Martinez (Argentina), Yves Omon (Cameroon), and Esther Othieno (Kenya)

- **Accelerator Physics Education Outreach with Mexican Universities.** PI’s: Carlos Hernandez-Garcia, Matthew Poelker. The Division of Particles and Fields of the Mexican Physical Society, organizer of the Mexican Universities National competition, selected Anahí Segovia Miranda, Universidad Autónoma de Zacatecas, to participate in the Lab’s summer REU/SULI program. Miranda received travel support from the IF program.

- IF-supported meetings and other IF activities during the Q3 reporting period include:
  - Nucleon and Resonance Structure with Hard Exclusive Processes Workshop. PI’s: Kyungseon Joo (UConn), Michel Guidal (IPN-Orsay), Herve Moutarde (CEA-Saclay), Wooyoung Kim (Kyungpook), Latifa Elouadhrhi
  - Annual JLab Users Group Meeting. PI: Larry Weinstein for the Users Group Board. PR at: https://www.jlab.org/memo/researchers-explore-science-jefferson-lab
  - Software Carpentry Workshop for Students and Post Docs. PI’s: Torri Roark and Holly Szumila-Vance (ODU)
  - Nuclear Physics Capitol Hill Day. Nadia Fomin (UTenn), Dipangkar Dutta (MS State)
  - Director’s Discretionary Fund; PI’s: Elizabeth Lawson, Joe Scarcello for Lab Director
  - Users Group Board Travel Support. PI: Larry Weinstein for the Users Group Board
  - Junior Scientist Travel Support. PI’s: Marco Battaglieri (INFN), Dipangkar Dutta (MS State), Douglas Higinbotham
  - ExCARE (Extra Childcare). PI’s: Xiaochao Zheng (UVa), John Arrington and Buddhini Waidyawansa (ANL), Latifa Elouadhrhi
  - Graduate/Post Doc Student Association Activities. PI’s: Torri Roark and Holly Szumila-Vance (ODU)
  - JLab Science Activities for Teachers; PI’s: Lisa Surles-Law, Christine Wheeler
  - Undergraduate Support in Accelerator Physics. PI’s: Hari Areti, Wally Melnitchouk

- JSA issued the call for proposals for the FY2018 IF Program in June. Proposals are due in Q4 and award announcements are anticipated Q1 FY2018. JSA owners committed $350K to continue the Program.

- SURA continues to provide support to the Lab in its relations and outreach program, establishing effective working relationships with federal, state, and local authorities and with universities and industry leaders that have a vested interest in the Lab and in support of the nation’s science goals. Significant activities engaged in by the relations team (including federal and state lobbyists) during Q3 include:
  - Coordination of and participation with Lab Users Group for Nuclear Physics Day on the Hill. Over two dozen Lab users joined users from FRIB and RHIC in an organized visit with congressional staffers, senators, and representatives, to encourage congressional support for DOE nuclear physics funding. As mentioned above, support from the IF Program helped to defray travel costs for participants. As part of the Hill Day visit, coordination and support were provided for a meeting by users with SC director Steve Binkley.
  - Coordination and conduct of meetings following FY2018 President’s budget release with staffers for Virginia Senators Kaine and Warner, Congressmen Taylor, McEachin, Scott and with Congressman Wittman, sharing one-pager discussing impact of budget on Lab. Work with Lab Users Group strategizing interactions with appropriations committees following budget release.
  - Distribution of letter to the chair and ranking member of the Subcommittee on Energy and Water Development of the Senate appropriations committee signed by Virginia, Michigan and New York senators supporting strong nuclear physics funding and urging continued strong investment in DOE research in FY2018 budget.
  - Interactions and meetings with officials from Virginia Governor’s policy office, Secretary of Education, and Department of Planning and Budget for support for Lab, through state and federal funding.

- SURA and PAE officials continue to work with the Lab COO and CFO to support the DOE revolutionary contract initiative following meeting with and guidance from SC. See also discussion in 4.1.

- PAE officials and managers met with Lab operations managers reviewing the Lab’s procurement process in preparation for the upcoming PERT audit.

- PAE chief ethics and compliance officer continues to assist with refinements to the Lab’s ethics program addressing the outcome of the 2015 ethics review, including recommendations to enhance the contents of the management ethics training program. See also discussion in 6.3.
PAE internal audit managers reviewed the work papers for the Allowable Cost internal audit. Discussions are underway with PAE managers regarding resolution of a corrective action resulting from the audit.

PAE continues to provide its eLearning tools, including Skillport, to the Lab work force. This distance learning program remains essential for staff development and training, offering 24/7 accessibility, enhanced collaboration and reach, and more cost effective training solutions. In this reporting period, an increase in activity related to Diversity & Inclusion/Self-help courses reflects the heightened awareness of the Lab’s diverse population.

SURA’s GDCP review committee (presidents of W&M, VA Tech, UVa, ODU, and VCU) finalized the appointment of Jefferson Lab AD for Theoretical and Computational Physics Jianwei Qiu as a GDCP at W&M. The GDCP program in place since the mid-1980’s has enabled the Lab to attract distinguished, uniquely qualified individuals to join its leadership team.

SURA general counsel continues work with Lab staff to support efforts to mitigate the tax burden of the Virginia sales tax audit, participating in meetings with State auditors and providing additional supporting documentation.

SURA completed the Foreign Ownership, Control, or Influence (FOCI) process, receiving a favorable FOCI determination at the Secret/Restricted Data facility clearance level. See also discussion in 8.3.

SURA continues to provide the Residence Facility for temporary housing of students, researchers, and other guests associated with the various Lab programs and meetings. Work was completed on the renovation of a sleeping building, the second of two FY2017 capital improvement projects in time for the influx of summer students. Through Q3, the 56.6% occupancy will enable break-even operations for the FY.

**NOTABLE OUTCOME STATUS:**

- **Objective 4.3: Select and bring on board a new Laboratory Director by the end of FY17.** [NOTABLE OUTCOME ACHIEVED FY17 Q2]
  - An international committee chaired by former NSAC chair Donald Geesaman conducted an extensive search that included interaction with over 100 individuals including 3 dozen Lab staff members and users to solicit input and advice, followed by interviews with a dozen candidates. The result of the search was JSA’s appointment of Argonne’s APS Director Stuart Henderson as the next Jefferson Lab Director effective April 3. JSA kept DOE apprised of the status of the director search throughout the process to ensure complete transparency while maintaining the requisite confidentiality. See JSA press release at: http://www.jsallc.org/news/JSAPR20170106.pdf.
  - Following Henderson’s appointment, JSA worked with the Lab director designate during his transition from Argonne to Jefferson Lab, enabling and supporting him as he became oriented to the Lab. Before his April arrival, Henderson met with Lab leadership and other staff members, JSA vice chair, JSA CAS representative, SURA relations director, and DOE officials. Henderson participated with the SURA relations team including the federal lobbyists to update the Jefferson Lab white paper and meet with congressional delegates, subcommittees, and their staffers during the transition period. He was involved with the preparation for and presentation to DOE of the annual budget in February; NLDC meetings; Big Ideas Summit; and the draft annual Lab plan to be presented to DOE in June.
NOTABLE PERFORMANCE ITEMS:

5.1 JSA’s Integrated Safety Management System (ISMS) continues to be effective, as evidenced by injury rates, events reported, and the results of assessments performed.

- JSA experienced two occupational injuries during the first nine months of FY17. One resulted in restrictions affecting the worker’s ability to perform assigned routine functions. These limitations classified this injury as a DART case; JSA’s first recordable in over one million hours worked. Six other incidents were classified as Notable Events. All events were reported upon discovery and investigated as required by organizational processes. Six events were categorized as ORPS reportable, and those reports were submitted within the required timeframes. One event, in which unauthorized personnel transported radioactive Gallium in their personal vehicle, was initially determined not to be ORPS reportable. However, the investigation revealed that because the package was not secured as required under 49 CFR 171.1-1, it did require reporting to DOE through ORPS.

- JSA welcomed members of the SLAC LCLS-II project team onsite during FY17 Q1, to conduct informal reviews of JSA’s Welding Program and the Integrated Safety Management (ISM) program. In both cases, reviewers were more than satisfied with how project activities are integrated into the organizations systems.

- JSA did not detect any evidence of inadequate hazard analysis, disregard of hazards, or evidence that researchers were accepting unmitigated cumulative risk in their research activities during a review of the organization’s small-scale research activities in FY17 Q1. This exercise, led by JSA’s Directors’ Safety Council (DSC) in response to efforts by DOE’s Office of Science Operations Improvement Committee (SC-OIC), generated valuable feedback from lab staff and users. DSOs will incorporate these ideas into future efforts to improve work-planning processes.

- JSA successfully completed all elements of the 2016 Industrial Hygiene (IH) Monitoring Plan during FY17 Q1, which ensured a comprehensive and up-to-date data set for evaluating and mitigating hazards that are associated with chemical stressors and high volume noise. A review of the Lab’s CY2016 IH sampling data showed no personal exposures that exceeded the limits. This demonstrated compliance with the personal exposure limits outlined in 10 CFR 851, by the inclusion of the hierarchy of engineering and administrative controls over personal protective equipment as part of the organization’s work processes.

- JSA is committed to providing a safe work environment for staff and users, evidenced during the 1st half of FY17 by the timely notification of JLab’s winter weather operations procedures on January 6th in anticipation of a major snowstorm predicted for the Hampton Roads area on January 7th. All members of the JLab community were urged to stay away from the lab until further notification that all onsite roads, parking lots, and sidewalks were cleared of snow and ice. A site-wide alert was issued on January 9th to inform the community of the resumption of regular operations at 8:00 a.m. on Tuesday, January 10th. One minor slip was reported to the Occupational Medicine Office.

- JSA conducted Accelerator Readiness Review – Phase 4, January 9 – 11, 2017, to determine whether Halls B and C were positioned to be operated in a safe manner. Led by ESH&Q, reviewers from JLab, SLAC and FNAL provided positive feedback and identified pre-start conditions for commissioning and operations. Pre-start actions were verified as complete by quality control support (formerly “The Green Team”), a member of the ARR review team, the Federal Project Director, and the QA/CI Manager. Approval to commission, which includes conducting 12 GeV Upgrade Project Key Performance Parameter operations, was received from the Thomas Jefferson Site Office (TJSO) on January 30, 2017.

- Jefferson Lab’s ES&H Manual was identified as a valuable resource for Jarden Zinc Products, the largest manufacturer of zinc strip and zinc-based products in North America. The organization based out of Greenville, Tennessee requested permission to use applicable sections of the Lab’s ES&H Manual. Permission was granted with the caveat that this material may not be offered for sale and that JSA and DOE are credited for the information.

- JSA ESH&Q Reporting Officer worked in partnership with Management Information Systems (MIS) staff to develop a Notable Event database. The database is operational and training will be provided to investigation leads during FY17 Q3. In addition to streamlining the process, the database will also allow for better collection and examination of causal analysis data.

- JSA’s Jefferson Laboratory Site Occupational Medicine Clinic is featured on DOE’s PowerPededia Occupational Medicine Programs website to ensure the President’s transition teams and appointees have instant access to and are well informed about the programs’ invaluable contribution to the success of DOE.
5.2 JSA’s Environmental Management System (EMS) continues to be effective, as evidenced by no excursions, releases, or permit violations. In addition, viability of the EMS was demonstrated during the first three quarters of FY17 as noted:

- JSA was congratulated on March 1, 2017 as recipient of the 2016 HRSD Pollution Prevention (P2) Gold Award for exemplary permit compliance. The award was presented at a ceremony on April 18, 2017.
- JSA applied and qualified for awards under the Electronic Product Environmental Assessment Tool (EPEAT) program and the Green Buy program, which recognizes excellence in the procurement of sustainable products. The FY16 Bronze Level GreenBuy Award was received on March 10, 2017 for “achieving excellence in Sustainable Acquisition by reaching the Leadership Goal for 4 products in 2 different categories.” This is the fifth time Jefferson Lab was recognized with a GreenBuy award.
- JSA underwent a successful inspection by the Hampton Roads Sanitation District (HRSD) during FY17 Q1; an application was submitted to extend the lab's HRSD discharge permit for an additional five years. Final permit is pending.
- JSA received a 5-year extension on the existing Virginia Pollution Discharge and Elimination System (VPDES) industrial wastewater discharge permit, from the Virginia Department of Environmental Quality (DEQ) during FY17 Q1. JSA also responded to a request from DEQ to provide comments on the draft Groundwater Withdrawal permit.
- JSA received a notice of violation (NOV) from HRSD in January 2016 for elevated levels of zinc in our discharge. Laboratory-wide sampling resulted in the identification of sediment source located in the sump of the Counting House that contains high levels of zinc. On May 4, 2017, the contents of that sump were removed and disposed of offsite. It will be monitored routinely so that any reintroduction of contaminants will be detected early. Follow-on sampling upstream of the sump shows elevated zinc levels, along with other metals, throughout the accelerator floor sump system. Planning is now underway to remove that material. This combined removal action and the planned monitoring should drastically reduce the risk of a future NOV of this nature.
- JSA ES&H Department Manager was notified that Facilities Management & Logistics (FM&L) has been underreporting to the Virginia Department of Environmental Quality (VADEQ) the amount of groundwater withdrawn on-site, under the TJNAF Groundwater Withdrawal Permit, for an unknown extent of time. It does not appear that the total amount withdrawn exceeds permit limits. A meeting with the regulators was held on April 7, 2017. The VADEQ requested that TJNAF provide the correct data, which was transmitted to them on April 28, 2017 and in each subsequent report. VADEQ has indicated that no further action will be taken. Additional information regarding this issue is noted in Objective 7.1.
- JSA's Environmental Program Manager attended two meetings of the Hampton Roads Planning District Commission's Regional Environmental Committee. Involvement with this committee allows JSA to engage on regional environmental issues and monitor the interests of the lab's stakeholders.
- JSA provided training on the concepts and tool developed to assure compliance with revised stormwater regulations during future development projects. Staff from both ESH&Q and FM&L participated.
- The EMS Green Team met to discuss the status of several environmental initiatives, as well as progress on the improvement objectives established during the first quarter. All objectives have either been completed or are on schedule for completion before the end of the fiscal year. A new member of the team, Barbara Rice, was welcomed as the Procurement Department representative. Direct involvement from this organization is imperative as the TJNAF's life cycle approach to environmental stewardship often begins with progressive procurement efforts.

**NOTABLE OUTCOME STATUS: None set for Goal 5**
Goal 6: Sustain and Enhance Core Business Systems that Provide Efficient/Effective Support to Lab (25%)

- OBJ 6.1 – Provide Efficient, Effective, Responsive Financial Management System (20%)
- OBJ 6.2 – Provide Efficient, Effective, Responsive Acquisition Management and Property Management Systems (20%)
- OBJ 6.3 – Provide Efficient, Effective, Responsive Human Resources Management System and Diversity Program (20%)
- OBJ 6.4 – Provide Efficient, Effective, Responsive Contractor Assurance Systems, Including Internal Audit and Quality (25%)
- OBJ 6.5 – Demonstrate Effective Transfer of Technology and Commercialization of Intellectual Assets (15%)

NOTABLE PERFORMANCE ITEMS:

6.1 JSA provides an efficient, effective, and responsive financial management system that is demonstrated by the following list of significant accomplishments during the first three quarters of FY17:

- JSA was responsive to DOE’s request for an accelerated close of the FY16 Financials, which were completed and submitted by noon on October 5, 2016. This enabled DOE to have actual data for FY16 vs accruals to close out their books. It also allows easier reconciliations between JSA contract costs and DOE’s financial records; evidenced by JSA’s 3-week early submission of the FY16 Statement of Costs Incurred.

- JSA completed and submitted the FY16 Institutional Cost Report (ICR) to DOE on November 11, 2016; a week in advance of the actual due date.

- JSA participated in an ICR Consistency Review Workshop in December, along with representatives from other National Labs and DOE Program Offices, to examine data submissions from the individual laboratories and to confirm the information is interpreted consistently throughout and with no discrepancies in reporting. Workshop participants discussed proposed changes to the reporting categories and recommendations on how to perform further analysis to enhance cost management and assess operational effectiveness.

- JSA developed an electronic wage report that breaks out the hours by week for its semi-monthly pay period, in response to updated guidance regarding Executive Order 13673 – Fair Pay and Safe Workplaces. Compliance with this final ruling on paycheck transparency, allows the employee to see regular hours worked, overtime hours, rate of pay, gross pay, and itemization of each addition to and deduction from gross pay, listed on a supplemental Wage Statement. Analysis, testing, and program development were completed in less than two months to meet the requirement; which was effective January 1, 2017.

- JSA financial management staff worked in coordination with MIS developers to create an online travel expense system that will expedite travel processes. The new Electronic Travel Expense Report System was initiated FY17 Q2 with a pilot group of the Lab’s travel coordinators. It was fully implemented FY17 Q3, on May 1, 2017 and has resulted in processing efficiencies, accuracies, and a significant cost savings to the Lab. In comparison to off-the-shelf systems, JLab is avoiding annual maintenance costs of at least $80K and will recognize an annual savings of approximately $23K due to the elimination of one half a data entry clerical FTE within the Finance Travel Services Group. For a combined estimated annual savings of $103K.

- JSA made concerted efforts in FY17 Q2 to conduct needed analysis of revisions to Cost Accounting Standards (CAS) compliance disclosure methodologies. The results formed the basis for revised disclosure statements, supporting analysis, and discussions with ORO Facilities Engineering and Acquisition Division (FEAD). Financial management staff reviewed the proposal to adopt the CAS Valued Added Disclosure methodology with Lab Leadership on June 12 and with the Thomas Jefferson Site Office (TJSO) on July 3. The CPO also reviewed the proposal with 12 GeV Program Management personnel during the third quarter. With this work completed in FY17 Q3, it is planned to provide the revised draft disclosure statement and supporting analysis to ORO FEAD no later than July 15 and to meet with them the week of July 24 to review the draft revised statement and the analysis in efforts to expedite the process. This will allow sufficient time for DOE review and approval of the changes and financial system updates to support implementation on October 1, 2017.

- The JSA/JLab Accounting Manager was responsible for creating the agenda, securing speakers, compiling presentations, and chairing the Annual DOE Contractors Accounting Officers Meeting held at Lawrence Livermore National Laboratory (LLNL) during Q3.

- As part of the Federal Accounting Standards Advisory Board (FASAB) work towards enhancing Lease Reporting on Financial Statements, JSA provided DOE with examples, feedback and questions relating to existing and proposed leases based upon the new/proposed lease definitions.
JSA provides an efficient and effective acquisition management system through the provisions for purchasing of supply and services including major system components, subcontracting support and leasing support, P-card and E-commerce support, construction subcontracting and through an aggressive Small Business Program. Significant during the first three quarters of FY17:

- JSA Small Business Program Goals exceeded performance targets through FY17 Q3. However, prospective large and foreign procurements in the remainder of the fiscal year may have an impact on final results. Statistics through June 30, 2017:

<table>
<thead>
<tr>
<th>SMALL BUSINESS PROGRAM GOAL</th>
<th>FY17 TARGET</th>
<th>FY17 ACTUAL</th>
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</thead>
<tbody>
<tr>
<td>Small Business</td>
<td>$34,280</td>
<td>$14,470</td>
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<tr>
<td>Women-Owned</td>
<td>$4,285</td>
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</tr>
<tr>
<td>HubZone</td>
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<td>$0,816</td>
</tr>
</tbody>
</table>

- JSA procurement staff worked diligently on several critical requisitions during the first half of FY17; including finalizing the non-subsidized food services subcontract re-compete, efforts to improve the procurement schedule of the CLAS 12 Solenoid Magnet in support of the 12 GeV Project, and the procurement of Higher Order Mode Line Absorbers (HOM BLA) for the LCLS-II Project. A Procurement Readiness Review (PRR) was conducted on November 10, 2016 by the SLAC LCLS-II Project team; a Request for Proposal (RFP) for the HOM BLA was issued on November 14, 2016.

- JSA’s Subcontracting Officer Technical Representative (SOTR) program is recognized in past reviews as a Noteworthy Practice within DOE. As a result, the Lab’s procurement staff were invited to Fermilab in December 2016 to provide training for their SOTRs.

- JSA exceeded the reporting requirements set forth by the Management and Operations Subcontract Reporting Capability (MOSRC) by submitting monthly reports from November 2016 to May 2017 with an overall error rate of less than 1%. The successful completion of the reporting capability was a collaboration effort between members of the Procurement, Finance and IT Departments.

- JSA’s small business program and the administrators are acknowledged for excellence in performance:
  - In recognition of JSA’s contributions towards DOE’s mission and the FY16 Small Business Goals and achievement, Dr. Hugh Montgomery, Laboratory Director, was selected as DOE Laboratory Director of the Year. The award was presented at the DOE’s 16th Annual Small Business Forum & Expo in Kansas City, MO. May 16-18, 2017.
  - In recognition of nearly 30 year of small business support to DOE, JSA and the Carolinas & Virginia regions, JSA’s Purchasing and Small Business Manager, Danny Lloyd was selected for DOE’s Office of Small and Disadvantaged Business Utilization (OSDBU) Director’s Excellence Award. The award was presented at the DOE’s 16th Annual Small Business Forum & Expo in Kansas City, MO. May 16-18, 2017.
  - JSA received the 2017 EPEAT Purchaser Award from the Green Electronics Council for excellence in green procurement of sustainable electronics. As per the Green Electronics Council, Jefferson Lab went beyond sustainable acquisition requirements to reduce negative health and environmental impact.

- JSA continued to strengthen its property system during the first three quarters of FY17 by ongoing efforts to organize and catalog engineering replacement parts that were previously stored in shipping containers; three of the containers are empty and ready for disposal. The organization was reimbursed $35K for recycled excess wire. These funds were used to recycle about 190 pieces of concrete weighing 167 tons, demolished from one of the experimental halls. The biennial Leadership property utilization walkthrough was completed during FY17 Q3.

- JSA completed the donation by Gift Agreement to the University of Indiana Bloomington of the Spark 400 robot valued at $50,000.00 (OAC $201,239.24). The equipment is an advanced teaching tool used for advanced robotics and computer assembly benefiting both the Lab and University through its reutilization.

6.3 Recognizing the challenges of attracting diversity with young STEM professionals, HR participated in the Higher Education Recruitment Consortium Dual-Career Symposium to work towards solutions surrounding this key Diversity & Inclusion (D&I) issue of work/life balance and challenges with recruiting and retaining dual career couples.
Jefferson Science Associates

FY2017 Q3 PEMP Performance Evaluation

- Jefferson Laboratory Leadership received annual Affirmative Action Plan briefing in support of the larger D&I Plan and goals.
- In response to feedback provided from the 2016 User Group Board of Director's Meeting, HR launched a D&I webpage redesign effort to increase overall web traffic, improve the experience for employees and users seeking D&I information and ensure content is relevant. The D&I Council has been engaged in this effort so that a broader perspective of ideas and information is captured.
- An evaluation of JSA’s best practices and ethics program was conducted by the PAE Ethics Officer in June. Management training content and other notable recommendations from the 2015 Ethics Review were discussed and benchmarked. Feedback was favorable of current processes and practices in place for JSA.
- The Accelerator Associate Director Search Committee was established and convened during this performance period. The Committee consists of a combination of Lab personnel and external subject matter experts. Candidate interviews are targeted for September/October.
- The HR Director, in capacity as chair of the National Laboratory Human Resources Director (NLHRD) Council, remains very engaged and active in the Regulatory Reform Task Force activities.
- JSA’s D&I Council delivered a course to all supervisors and managers during FY17 Q1, titled ‘Recognizing Potential Communication Barriers in a Diverse Population’. The course focused on understanding the impact culture, gender, and implicit bias has on communications and highlighted ways to communicate effectively while interacting with others. Feedback was positive and the Council will be working with HR to bring the message to all employees.
- JSA D&I Council launched a Climate Survey in FY17 Q1, to assess employee’s perception of diversity and inclusion at the Lab. A 64% participation rate represented a notable 20% increase over the baseline survey conducted in 2014. D&I shared the results of the Climate Survey with senior managers in FY17 Q2. While analysis and follow up continues, preliminary feedback was provided to staff as well. In general, the results were encouraging and reflect a clear recognition of implicit bias as a result of awareness training and management support.
- JSA hosted several high school students on February 21, 2017 for the 7th Annual ‘Introduce a Girl to Engineering Day’. Jefferson Lab female STEM professionals met with 14 local students to discuss their own individual career choices and to offer insights into their personal educational journeys. A new ‘round robin’ format was introduced for this annual event to allow for more student inclusion and to improve opportunities for meaningful dialogue between mentors and attendees. Feedback from participants was very positive.

6.4 Closure rates of level three corrective actions continued to improve during FY17 Q3, with 46 of 49 actions, or 94%, being addressed on time and in a robust manner. Performance is measured against a 90% closure rate goal. Multiple improvements have been implemented in the program, including secondary verifications for robustness of closure and closer monitoring of these higher priority issues.

- JSA implemented the primary information collection tool for the improved Performance Management reporting process in FY17 Q3. As identified in the Q1 input, this process reduces the time required to collate input from over 20 people in ten departments, as well as the Corporate parent. Training has been conducted on the process and tool, as well as the timeline. Additionally, the new process provides for information to be collated and built upon throughout the year, providing the customer with an updated summary of accomplishments against PEMP goals from the start of the fiscal year to the date input was submitted.

- JSA’s FY2017 Internal Audit Plan is progressing as scheduled. The Allowable Cost – Transaction Testing FY16 audit is complete and the report has been issued. In addition, the Cafeteria subcontract closeout, and the LDRD Implementation audits are almost complete. In compliance with the FY 2017 Internal Control Evaluations Guidance, JSA made timely submissions of the Risk Profile in February, as well as, the Financial Management Assurance, Quality Assurance, and Entity Assessment Tools in June. The Internal Audit Plan was revised to replace the Classification of Personal Property audit with the Accountability and Recording of Personal Property audit, and submitted to DOE for approval on February 8, 2017. Jefferson Lab Internal Audit has been selected as one of three hosts for the 14th Biennial CIAD DOE Joint Conference to be held in FY 2018. This is a joint conference between DOE Contractor Internal Audit activities and the Office of Inspector General.

6.5 JSA FY17 Q1 performance in technology transfer activities established the basis for exceeding fiscal year expectations. We were contacted by 20 small business entities active in SBIR/STTR Phase I and II Funding Opportunity Announcements and have submitted 54 support letters for their proposals to DOE. In FY17 Q2, proposal support letters were also provided to Old Dominion University and Temple University for NSF research funding. In cooperation with SURA, JSA/JLab is pursuing grant funding from the Commonwealth of Virginia’s Center for Innovative Technology (CIT) – Commonwealth Research...
Commercialization Fund (CRCF) program for R&D for development of Superconducting Radio-Frequency (SRF) Cavity technology for an Electron Accelerator for the treatment of flue gases. Ten Cooperative Research and Development Agreements (CRADAS) and one Strategic Partnership Project, including modifications, were initiated in FY17 Q1. The organization also hosted meetings during that time frame with two different companies interested in licensing JLab IP.

- During the first three quarters of FY17, twelve invention disclosures were received and eight intellectual property licenses were executed:

**Invention Disclosures**
- 1429 Neutron Detector for use in Strong Gamma-Radiation Fields
- 1430 Transition Radiation Light Sources
- 1431 Boron Nitride Nanotube Transition Radiation Detectors and Sources
- 1432 Transition Radiation Light Sources
- 1433 Method of improving sensitivity and energy response of neutron detectors using moderators with embedded Beryllium-loaded materials, and new type of neutron dose rate measurement devices utilizing said method
- 1434 Neutron Detector for use in Strong Gamma-Radiation Fields
- 1435 Radiation Monitor Based on Wavelength Dependent Optical Absorption in Fused Silica Optical Fibers
- 1436 Non-invasive RF Cavity to Measure Beam Magnetization
- 1437 High-Current Conduction Cooled Superconducting Radio-Frequency Cryomodule
- 1438 Lattice Quantum Chromodynamics and Chroma (Book Chapter)
- 1439 Electron Induced Reaction in Boron Nitride
- 1440 Tumbling barrel polishing method to achieve mirror-like finish in metal components for vacuum and high voltage applications

**Patents Awarded**
- 9,463,433 Nano-Material for Adhesive-Free Absorbers for Bakable Extreme High Vacuum Cryopump Surfaces
- 9,590,384 Absorber for Wakefield Interference Management at the Entrance of The Wiggler of a Free Electron Laser
- 9,589,757 Nano-Patterned Superconducting Surface for High Quantum Efficiency Cathode
- 9,618,630 A Radiation Detector Based on a Matrix of Crossed Wave Shifting Readout Fibers with Scintillation Volumes Located at the Intersections
- 9,629,230 RF kicker cavity to increase control in common transport lines
- 9,629,138 Electron Beam Control for Barely Separated Beams
- 9,655,227 A Compact Efficient CW Standing Wave Normal-Conducting Accelerating Cavity
- 9,674,026 Beam Position Monitor for Energy Recovered Linac Beams

- On June 15, JSA CTO, CFO Procurement and Legal conducted an Industry Day to promote JLab's Technology for Temperature-Compensated Silicone Photomultipliers (SiPM). Two representatives from Industry were in attendance and one has expressed an interest in licensing the technology. The Industry representative is developing their business plan and Legal is working up a term sheet to outline the basis to negotiate the license.

**NOTABLE OUTCOME STATUS**: None set for Goal 6
Jefferson Science Associates
FY2017 Q3 PEMP Performance Evaluation

Goal 7: Sustain Excellence in Operating, Maintaining, Renewing the Facility and Infrastructure Portfolio (25%)

- OBJ 7.1 – Manage Facilities/Infrastructure in Effective Manner to Optimize Usage/Minimize Life Cycle Costs (40%)
- OBJ 7.2 – Provide Planning for and Acquire Facilities/Infra Required to Support Future Lab Program (60%)

NOTABLE PERFORMANCE ITEMS:

7.1 Throughout the past three quarters, JSA has continued to upgrade its facilities and infrastructure and continued to expand ongoing preventive maintenance efforts. A new preventive maintenance program is established for electrical spare breakers during FY17 Q2. JSA also continued to provide support to TJISO and the Chicago Service Center regarding the Utility Energy Services Contract (UESC) proposal. Significant accomplishments listed below.

- JSA upgraded the facilities’ computerized maintenance management system to version 7.6 and expanded preventative maintenance to include the fire detection and suppression systems. New fall protection standards were established for building maintenance activities in collaboration with ESH&Q. Oversight of the Material handling program has been moved to the Facilities Operations and Maintenance group.

- JSA upgraded three Fire Protection Network Command Centers from 16 node to 32 node capacity in support of infrastructure optimization and to ensure sit capability to meet mission needs. This doubles the number of nodes that can be directly monitored across the site and it facilitates meeting critical expanded monitoring requirements.

- JSA has established a Facilities Preventive Maintenance (PM) program for electrical spare breakers that include annual test and environmental storage. These spares program will contribute to reliability improvement of various systems. The spares support general lighting, branch circuitry such as general receptacles, exhaust fans, emergency lights and signs, small horse powered motors, and mechanical equipment. A spares inventory list has been established and shared with Jefferson Lab's Electrical Design Authority in the ES&H Group, should these spares be required to support non-Facilities operations.

- JSA completed Annual Crane Inspections of 292 material handling pieces of equipment related to Bridge, Gantry, Monorail and Jib Cranes, as well as Hoists, Chain Falls, Come A-Longs, Slings and Mobile Equipment Attachments in March 2017. From the annual inspection 12 repair orders were generated; 7 have been completed, 2 are being completed in April 2017, and 3 are in planning. No repairs were significant enough to take any cranes out of service, except for the time necessary to replace damaged parts or make required adjustments. This material handling equipment is key in accelerator, experimental hall, and SRF activities.

- JSA completed facility condition assessments for 73 buildings and 4 real property trailers (963,811 GSF in total) in compliance with DOE O 430.1C Real Property Asset Management. The data obtained is being used to inform a five-year forecast of financial investments for sustainment of real property assets to support DOE strategic plans, program guidance, and departmental performance targets. While these assessments are typically subcontracted to an outside firm, the assessments this year were performed in-house by FM&L engineering and operations staff with an estimated cost savings of $212,038.

- JSA installed flood rated overhead doors for the truck ramps at Halls A, B, & C. These doors provide increased protection against high storm water from entering the halls each time the doors are closed as opposed to having to manually install flood gates for the hall truck ramp doors. Previous storm runoff has caused damage of equipment in the halls exceeding $1M.

- JSA continued to work with TJISO and Chicago Service Center reviewing and providing comments on the UESC proposal. Implementation of the energy and water reduction projects included in the UESC proposal is critical to JSA’s achievement of sustainability goals (ie: energy intensity reduction (BTU’s / GSF, water intensity reduction (Gallons of Potable Water / GSF) and high performance sustainable buildings guiding principles compliance). Further, financial benefits (reduction in utility expense and rebate for energy efficiency) are realized every month the award and subsequent installat

7.2 Throughout the past three quarters, JSA has planned for and delivered facilities and equipment that support daily laboratory operations. The Computer Center upgrade is ongoing under the Utility Infrastructure Modernization (UIM) project. The ESH&Q building was completed with a perfect safety record. Commonwealth of Virginia funds supported completion of the JLEIC project. Significant performance listed below.

7/31/17  ★ Exceeds Performance  ● Meets Performance  ▼ Needs Attention  ● Not Meeting Performance  Page 21 of 25
- JSA emphasizes contractor safety by continuous monitoring of work activities and weekly walk-thru inspections. There have been no subcontractor recordable injuries since November 2012.

- The Computer Center is currently being upgraded under the Utility Infrastructure Modernization (UIM) project; the fifth and final phase of work is in process. Installation of the first Hot Aisle Containment system for the UIM Computer Center project is noteworthy as the first step in acquiring 1.4 PUE. Installation of the CTF cold box and CHL C6 Warm Compressor is complete. UIM is 97.8% complete and very close to scheduled performance and cost index; SPI = 1.00 and CPI = 1.01. The Project continues to maintain a perfect safety record after 138,300 hours worked.

- Construction of the new ESH&Q building is complete, with a perfect safety record after 28,900 hours worked.

- Using Commonwealth of Virginia funds, JSA has completed the JLEIC Utility Distribution Study, draft Infrastructure Design Requirements document, Stormwater Management Plan, and Environmental Assessment documentation in preparation for the preliminary conceptual design report.

- Rusty Sprouse and Rick Korynta assisted the SLI program by participating in a short-notice "mini "IPR" which was recognized by Stephanie Short.

**NOTABLE OUTCOME STATUS:** None set for Goal 7
Goal 8: Sustain/Enhance Effectiveness of ISSM and Emergency Management Systems (20%)

- OBJ 8.1 – Provide Efficient/Effective Emergency Management System (25%)
- OBJ 8.2 – Provide Efficient/Effective Cyber Security System for the Protection of Classified/Unclassified Information (50%)
- OBJ 8.3 – Provide Efficient/Effective Physical Security Program for Protection of SNM, Classified Matter, Classified and Sensitive Information, and Property (25%)

NOTABLE PERFORMANCE ITEMS:

8.1 JSA’s goal for FY17 is to maintain an efficient and effective emergency management system. Significant during the first half of FY17:


- JSA participated in the statewide Tornado Awareness Week, March 20-24, 2017, by charging supervisors to review shelter locations and the accountability procedure with staff. In addition, ESH&Q tested the accountability procedure by asking division staff to report to their supervisors as if it were a real-time situation. All division members were accounted for within 20 minutes. Further improvements to the procedure will be defined and tested throughout the year as a continuous improvement effort.

- Jefferson Lab’s Emergency Management Team (EMT) conducted a tabletop exercise on January 27, 2017. The main objective was to discuss how the information flow process would work from an emergency scene to the Emergency Operation Center and vice versa. An after action report was developed and the issues are being tracked through the Lab’s Issues Management process.

- The Lab is prepared for hurricane season, which officially starts June 1, 2017. Hurricane Wardens have performed their checklists and weather monitoring begins.

8.2 JSA demonstrates an effective Cyber Security Program evidenced by the number of Cyber Security Incidents (CSI), the effectiveness of configuration and patch management via vulnerability scanning, and the time required to investigate and remediate alerts identified by the laboratory’s Intrusion Detection Systems. Several enhancements to the cybersecurity program were implemented. JSA also continues to collaborate with DOE on cybersecurity initiatives. Significant accomplishments during the first half of FY17 are noted below.

- **Key Cyber Security Metrics:**
  - Cyber Security Incidents
    - Average Number of Systems Scanned with Critical Vulnerabilities Detected
      - *New vulnerability scanning software changed the baseline midyear FY16*
      - The Q2 percent of scanned machines with important/critical vulnerabilities is much higher than previous quarters (8.9%) due to the MS12-036 (Remote Desktop Vulnerability) false positive test and the MS17-010 (Security Update for Microsoft Windows SMB Server) signature. The Q3 % is slightly elevated relative to historical data due to a low level of failed patches of SMBv1 vulnerabilities associated with the WannaCry virus.
    - Mean Time to Remediate Intrusion Events
      - FY17 Q3 0.8 days
      - FY16 0.6 days
      - FY15 0.45 days

- **Cybersecurity Program Enhancements:**
  - Strengthened Intrusion Detection Systems (IDS) by decrypting web traffic and having the IDS systems process it to identify and block known malware and other nefarious activity.
  - Added additional email monitoring capabilities of attachments to the IDS systems. Analysis is currently a manual process; provides additional data needed to conduct forensics on email attacks (phishing) and expands our scanning of attachments malware and other types of nefarious software.
  - Investigated and purchased a commercial tool that will build documentation necessary for compliance with the updated Office of Science (SC) Program Cyber Security Plan (PCSP). NIST 800-53 (rev. 4), Security Controls and Assessment Procedures for Federal Information Systems and Organizations, became the SC standard when the...
Collaborations with DOE on Cybersecurity Initiatives:
- Participated in DOE data sharing and iJC3 initiatives for creation of an unclassified Security Operations Center (SOC)
- Responded to several data calls: Multiple MFA status updates; Cloud Service Providers; Network Infrastructure

DOE Multi-Factor Authentication (MFA) Project:
- As part of DOE’s MFA project, JSA completed the deployment of MFA for privileged users in FY16 and completed the standard user deployment by February 15, 2017. Per SC’s guidance, a Plan of Action and Milestones (POA&M) was created for tracking progress. Key initiatives included:
  - Delivering tokens to 333 standard users
  - Configuring the authentication environment to support the initiative
  - Separating the central file server to enforce boundaries for out of scope open science user accounts
  - Adding MFA to IT managed configurations for LINUX and MACs
  - Upgrading JLab’s account and certificate management systems
  - Developing a pilot project for microsegmentation (private vlans), in preparation for future improvements to network security
  - This POA&M closed out in FY17 Q2.

FISMA/CAP metrics:
- Each Federal Agency reports Cyber Security metrics against FISMA/CAP goals. For the DOE labs, FISMA is implemented in a risk based approach. While not contractually required to comply with FISMA targets, CAP metric results are provided to DOE on a quarterly basis. During FY17 Q2, the Office of Science (SC) made efforts to rationalize the reporting definitions across the SC National Laboratories. Jefferson Lab has 21 of the 24 CAP metrics within target; the remaining 3 are shared by the majority of the SC Labs as they reflect the nature of computing at research labs, rather than computing strictly in an office environment.
  - SC Laboratories have exceptions for unprivileged users to use LOA 3, while the metric is for LOA 4.
  - Encryption of data at rest is handled through a risk based process. Encryption degrades performance and is most relevant for sensitive data. Open Science data is not sensitive and requires high performance access.
  - Anti-exploitation tools are deployed on JLab Windows platforms, but there is no tool available that runs on Linux platforms.

JSA underwent an Inspector General (IG) Audit “Security over Infrastructure and Mission Systems at JLab”, March 27-30, 2017. Auditors from the IG office were onsite to review implementation of security controls and the standards and best practices for managing or measuring internet of things (IOT). The audit focused on the Core enclave and Accelerator controls system and included visual inspection of devices to ensure alignment of database records and physical devices.

In addition to enhancing the cybersecurity program, JSA IT also enhances the general IT infrastructure. Significant improvements include:
  - Integrating the two 'single sign-on' servers. This will improve the user experience by leading more seamless interoperability, will reduce maintenance overhead and paves the way for federated ID
  - In response to the 2016 IT Governance Audit, a user survey of IT was performed. There were 269 responses, with an overall favorable rating of 4.3/5. The comments have been analyzed to look for areas of improvement, including further improvements to video conferencing.
### JSA activated EDUROAM on the TJNAF campus. EDUROAM is a federated access solution that enables members of affiliated institutions to sign into any EDUROAM WIFI network using their home credentials. This will make life easier for users visiting TJNAF as well as JSA staff visiting other DOE laboratories and affiliated academic institutions.

### IT System Enhancements
- In addition to cybersecurity, JSA IT also enhances the IT infrastructure. The two 'single sign-on' systems have been consolidated into one. This will ease administrative work, provide a basis for future development such as the use of federated identity and provides an improved user experience. JSA activated EDUROAM on the TJNAF campus. EDUROAM is a federated access solution that enables members of affiliated institutions to sign into any EDUROAM WIFI network using their home credentials. This will make life easier for users visiting TJNAF as well as JSA staff visiting EDUROAM institutions.

### 8.3 JSA’s goal is to maintain an efficient and effective Physical Security Program for protection of SNM, classified matter, classified and sensitive information, and government property during FY17. Significant during the first half of FY17:
- JSA increased the effectiveness of the site surveillance system by replacing the obsolete Video System, tripling the camera resolution, and allowing Lab security to control and limit down time to the program required 24-hours for 37 active cameras. Security planning and training through preparation of a Nuclear Materials Management Plan and Active Threat-Bomb detection training with FBI, Homeland Security, and regional police departments continued during this performance period.
- JSA upgraded all JLab portable hand-held radios with encryption and 911 alerting capabilities to the Newport News police department, fire department, and regional HAZMAT response. Improved emergency response communications equipment and hands-on training enables emergency responders to more effectively avoid road hazards and to position vehicles and people in a tactical manner.
- Foreign Ownership Control and Influence (FOCI) documentation was completed for JSA, SURA, and PAE. Separate facility clearance documents were issued for Thomas Jefferson National Accelerator Facility, JSA, and its owners.
- JSA participated in the Hampton Roads Joint Counterterrorism Awareness Workshop
- JSA complete the Nuclear Material Management Plan FY2017 – 2031 and NNSA Isotopes Demand FY2018 –2022 data call.
- JSA coordinated a DOE Fraud Awareness presentation by the Office of Inspector General at the Lab for staff and DOE.

**NOTABLE OUTCOME STATUS:** None set for Goal 8:
GOAL 1: MISSION ACCOMPLISHMENT

Throughout FY17, JSA’s science and technology programs have continued to generate high-quality, original, and creative results; have continued to demonstrate sustained scientific progress and impact; have received appropriate external recognition of accomplishments; and have continued to contribute to the overall research and development goals of the Department of Energy and its customers. Significant performance highlights noted below.

EXPERIMENTAL PHYSICS RESULTS

- The 45th meeting of the Jefferson Lab Program Advisory Committee was held July 10-14. The committee reviewed 2 returning C2 proposals, 10 new proposals, 1 new run group (Hall B), 3 run group additions, and 3 Letters of Intent. Four new proposals were recommended for approval (one with "high impact" status) and one returning C2 proposal was recommended for approval (with no additional beamtime allocation as it can run in parallel with GlueX). The complete final report is posted at [http://www.jlab.org/exp_prog/PACpage/PAC45/PAC45%20FINAL%20Report.pdf](http://www.jlab.org/exp_prog/PACpage/PAC45/PAC45%20FINAL%20Report.pdf).
- Field measurements of the Super High Momentum Spectrometer Q2 and Q3 quadrupole magnets and the dipole magnet have been completed in Hall C to investigate hysteresis effects. Measurements of the Q1 quadrupole magnet are next. The HB magnet had been mapped earlier. The fourth SHMS hodoscope (quartz) plane has been removed in preparation for replacement of the photomultiplier tubes.
- In Hall A, work continued on the installation for the series of $^3$H experiments planned for this Fall, and on the dependencies for the Super BigBite Spectrometer (SBS). The former now concentrates on target and safety-related infrastructure installation, including the preparation of Operational Safety Documents for tasks inside the fence surrounding the target platform. Some long-lead equipment items needed for the planned PREX-II/CREX neutron skin experiments were put into procurement: the septum coil, tungsten and collimator materials, and a workshop fabrication order. Reviews have come in from the committee of the earlier Director's Review of the SoLID experiment on the updated pre-CDR document, overall very complimentary with some useful comments for future consideration.
- The Forward Tagger systems (including the Micromegas tracker) were installed in Hall B and cabling was completed. The fourth sector of the Low-Threshold Cherenkov Counter has been removed to make space for the installation of the Ring-Imaging Cherenkov detector. This fourth sector will be excessed after removal of PMTs etc. Work on the CLAS12 cryogenic target system, as refurbished from the earlier CLAS target after fulfillment of the pressure vessel code design authorization, continues with an initial cooldown completed. The target has been warmed up again to make some repairs, including to a stuck valve.
- Field probe cross calibration measurements of the dipole magnet have been concluded in Hall C. Many parts for the improved shielding of the SMS detector hut, and the Horizontal Bend shield, have arrived for installation. Pointing surveys were done for the HMS and SHMS, and the SHMS and HMS remote rotation has been checked out. The SHMS detector hut wall blocks, and the SHMS beam pipe sections were reinstalled. The target loops have been pumped and purged with helium in preparation for cooldown for the Fall 2017 experiments.
- The physics production analysis of the Spring 2017 GlueX data is ongoing on the JLab cluster. With code rewrites implemented, the physics data processing runs much faster than last year. Delivery of components of the DIRC-based Cherenkov is on schedule, including shipment of the completed frame from Indiana, preparation for the transport of the fragile DIRC bars from SLAC, and the optical box (from MIT) and first DIRC box. This is on schedule for initial DIRC tests around Summer 2018. Startup of the Hall D refrigerator to prepare for solenoid cooldown for the Fall 2017 GlueX run has begun.

THEORY PROGRAM RESULTS

- The official announcement of the ASCR/NP SciDAC-4 projects were made in August, 2017. JLab is the lead institution of one of the 5-year projects that will support software and algorithm development within lattice QCD. Robert Edwards of the Theory Center is the PI with Co-PIs coordinating activities in lattice gauge field generation (Balint Joo/JLab), valence analysis including multi-nucleons (William Detmold/MIT), and thermodynamics (Swagato Mukherjee/BNL). Within these areas, there is support from ASCR for software technologies for workflow and optimized code generation.
The project includes researchers at William & Mary, George Washington Univ., Michigan State Univ., LANL, PNNL, MIT, BNL and JLab.

- Despite the decades of concerted experimental and theoretical efforts, the genuine mechanism underlying the \( J/\psi \) production has remained to be mysterious. Published in Phys. Rev. Lett. 119, 032001 (July 18, 2017), Jianwei Qiu of Theory Center, together with external collaborators, proposed a new method to explore the \( J/\psi \) production mechanism by studying its production and polarization inside an energetic jet, which probes the emergence of a \( J/\psi \) meson at a much more differential level, and should provide the unprecedented sensitivities on the production mechanism. This new method has been adopted by the LHCB collaboration, and will impact the quarkonium study at the future Electron-Ion Collider.

- Theory Center hosted a focused workshop on “Ab initio nuclear structure and electroweak response: status and prospects” at Jefferson Lab on August 7-11, 2017. Rocco Schiavilla of Theory Center and ODU is the lead organizer of the workshop with participants from JLab, Argonne National Lab, and Los Alamos National Lab, as well as universities in the US and Italy. The workshop summarizes the current status and future prospects of ab initio calculations of nuclear structure and electroweak response at low- and intermediate energies, and sets up priorities for the next stage of calculations.

- Theory Center hosted the workshop on "Hadronic Physics with Lepton and Hadron Beams" during September 5-8, 2017, bring together theoretical and experimental physicists from the lepton and hadron scattering communities to discuss synergies between the communities. The workshop covered a broad range of topics relevant to JLab 12 and the experimental physics programs at other facilities, such as the new Facility for Antiproton and Ion Research (FAIR) and others. The workshop succeeded in focusing attention on the opportunities and challenges presented for hadronic structure and spectroscopy studies at JLab and other lepton and hadron scattering facilities, creating fruitful exchange of ideas and plans for future collaboration.

**PUBLISHED JOURNAL ARTICLES**


SCIENTIFIC AWARDS, RECOGNITION, PROFESSIONAL MEMBERSHIPS

DOE EARLY CAREER AWARD:
Ted Rogers, Theory Center staff and Joint Professor at Old Dominion University: “Fundamental QCD Theory and Transverse Momentum Dependent Physics.”

DOE SECRETARIAL DISTINGUISHED SERVICE AWARD:
Hugh Montgomery, Jefferson Lab Director: “in recognition of more than three decades of leadership, distinguished service and exceptional contributions to research at the high energy frontier of particle physics at Fermi National Accelerator Laboratory, and to enabling world leading capability and unprecedented research opportunities for the nuclear science community for decades to come…”

AAAS FELLOW:
Jerry Draayer, SURA President: “…for his distinguished contributions to the field of Nuclear Theory and Computational Physics…”

APS FELLOWS:
Andrew Hutton, Associate Director – Accelerators: “for extensive technical contributions to accelerators world-wide as designer and adviser; for leading the commissioning and operation of world’s first large scale superconducting radio frequency accelerator at Jefferson Lab; and for fostering graduate education in accelerator science and technology.”

Peter Bosted, Jefferson Lab User: “for invaluable contributions to unraveling the structure of the proton and neutron via elastic, inelastic, and spin-dependent electron scattering from nucleons and nuclei.”

William Detmold, Jefferson Lab User and Assistant Professor of Physics at MIT: for “pioneering work in calculating few-body hadronic systems from first principles using lattice quantum chromodynamics, including the spectrum of the light nuclei and hypernuclei, Bose-condensed multimeson systems, and the first inelastic nuclear reaction.”

2016 FRANCIS G. SLACK AWARD:
Cynthia Keppel, Halls A&C Group Leader: for her “excellence in service to Physics.”

2017 KENNETH G. WILSON AWARD FOR EXCELLENCE IN LATTICE FIELD THEORY:
Raul Briceno, Theory Center – Nathan Isgur Research Fellow: for his “groundbreaking contributions to the study of resonances using lattice QCD.”

2017 TOM W. BONNER PRIZE IN NUCLEAR PHYSICS:
Charles Perdrisat, Jefferson Lab User and Emeritus Professor of Physics at William & Mary: “for groundbreaking measurements of nucleon structure, and discovering the unexpected behavior of the magnetic and electric nucleon form factors with changing momentum transfer.”

JSA 2017 OUTSTANDING NUCLEAR PHYSICISTS AWARD:
W&M professor emeritus Charles Perdrisat and former Cornell professor/former Jefferson Lab staff member Charles Sinclair: Perdrisat “for his pioneering implementation of the polarization transfer technique to determine proton elastic form factors” and Sinclair “for his crucial development of polarized electron beam technology, which made such measurements, and many others, possible.”

2017 SCHEV OUTSTANDING FACULTY AWARD:
Anatoly Radyushkin, Senior Staff Scientist and Joint Professor at Old Dominion University: “for his superior accomplishments in teaching, research, and public service, which are the Commonwealth’s highest honor for faculty at
Virginia’s public and private colleges and universities”.

- **DOE EXASCALE COMPUTING PROJECT $2.1 Million Award:**
  JLab scientists, led by Robert Edwards, a senior staff scientist of the Theory Center, received this award as part of a multi-institutional project, the “Exascale Lattice Gauge Theory Opportunities and Requirements for Nuclear and High Energy Physics”

- **DOE Grant for CLAS Research $235,000:**
  John Price, Jefferson Lab User

- **INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE):**
  Fulvia Pilat, Deputy Associate Director – Accelerator Division: Executive Committee Chair
  George Neil, Accelerator Division Scientist – Particle and Beams Executive Committee National Member at Large

- **INTERNATIONAL SOCIETY FOR INFRARED MILLIMETER AND TERAHERTZ WAVE:**
  George Neil, Accelerator Division Scientist – Executive Board Member
Throughout FY17, JSA provided effective and efficient strategic planning; fabrication, construction and operations of Laboratory research facilities; and were responsive to the user community. Significant accomplishments are noted.

**12 GEV UPGRADE**

- As of September 15, 2017, the project was 99.99% complete with a Schedule Performance Index of 1.00 and a Cost Performance Index of 0.96. Cost contingency was ~69% of work remaining; schedule contingency increased to one week due to the significant progress in commissioning of the Hall B Solenoid magnet. The remaining work is related to the final stage of magnet testing (now complete, see below), contract close-out with two magnet vendors, and spend-down of remaining cost contingency to support reliability improvements in the 12 GeV accelerator.

- Full Solenoid commissioning was completed significantly ahead of the baseline schedule. The magnet was connected to its service tower followed by a pump-down to low vacuum levels. The magnet was then cooled to superconducting temperatures and the low current test plan was successfully completed, thus meeting the DOE requirements for full Project completion. Additional commissioning was carried out to prepare the magnet for the fall beam run. A high current test plan during which the magnet was powered to 5.035T, ~101% of the maximum operating current, was carried out as well as a field map that confirmed the uniformity of the magnetic field. The Team successfully and safely completed the entire Solenoid magnet program within 12 weeks of the magnet’s arrival on site.

- The DOE Office of Science has scheduled the ESAAB meeting for September 27 to evaluate the readiness of the Project to receive approval of Critical Decision 4B (Experimental Equipment Project Completion and Start of Operations). All of the supporting documentation has been submitted to DOE and is under review.

**EXPERIMENTAL RESEARCH OPERATIONS AND CONSTRUCTION**

- The Accelerator Readiness Review was held early January 2017 for both Halls B and C. This review included the scope for the pre-operations phase to establish the Key Performance Parameter for Hall B and C, respectively. The Accelerator Readiness Review folded in the reports and closure of relevant recommendations of the earlier experiment readiness reviews.

- The MOLLER experiment received the DOE CD-0 “Mission Need” approval, but is considered in a paused stat due to uncertainty of budgets.

- In Hall A, another experiment to measure the spectral function of Argon was completed. This measurement both will give information on the impact of short-range correlations towards shifting spectroscopic strength towards large proton momenta and energies, and provide experimental input to model the response of liquid argon detectors to neutrino beams towards a reliable estimate of neutrino cross sections.

- This quarter saw the start of the GlueX physics operations phase. Some 50B events were recorded in a time period corresponding to roughly ¼ of the approved GlueX Phase-I experiment. This can be compared to the 22B accumulated during the GlueX engineering phase.

- Hall A completed the planned run for the "DVCS" and "GMp" experiments E12-06-114 and E12-07-108, Measurements of the Electron-Helicity Dependent Cross Sections of the Deeply Virtual Compton Scattering with CEBAF at 12 GeV, and Precision Measurement of the Proton Elastic Cross Section at High Q2. This marks the completion of the first experimental effort using the 11 GeV beam in the hall.

- Hall A is celebrating the timely, successful completion of the Super BigBite Spectrometer (SBS) project. This DOE capital equipment project has successfully constructed 40 planes of large Gas Electron Multiplier (GEM) tracking detectors, a dipole magnet and associated moveable support and beamline systems, and a novel scintillator-based coordinate detector. Five approved experiments will use this new spectrometer, which will also involve a new hadron calorimeter, electron calorimeter and state-of-the-art polarized helium-3 target. Hall A received additional good news this week with the announcement that Critical Decision-0 was awarded (although paused for funding) for the MOLLER experiment.

- The first physics run of the GlueX experiment started a week ago, one year after the engineering run demonstrated that the experiment had achieved the designed parameters. A limited amount of physics-quality data collected during the engineering run has already superseded the existing polarized photoproduction data in the given energy range. It allowed the GlueX collaboration to study beam asymmetry effects in pseudoscaler photoproduction, resulting in the first GlueX physics paper recently submitted to Physical Review Letters. This also happens to be the first Jefferson Lab physics result.
ACCELERATOR OPERATIONS

- CEBAF did not deliver beam in FY17 Q4. The CHL1 suffered a partial power failure that resulted in severe contamination on the liquefier. The process of clearing the contamination has delayed the test of the SC1 2K sub-atmospheric cold-box that failed in March to FY18 Q1. This CHL1 power event also resulted in a partial warm-up of the CEBAF SRF systems. Detail plans for assessing the gradient post-warm-up are in place and will be executed prior to beam delivery in FY18. CEBAF maintenance work in FY17 Q4 included the 2nd annual PSS certification and preventive maintenance on all systems. The upgrade to the injector laser system to support 4-hall operation, installed in the final week of FY17 Q2, was successfully commissioned in FY17 Q3. Plans for commissioning the complete 4-Hall system (Laser+RFseparators) are planned for FY18 Q1.

- A Director’s “Cold-Compressor Review” was held in the first week of June 2017. The committee reviewed the plan for establishing 2K operations after the March 10th event, in which cold-compressor #5 failed. It has since been repaired and tested to 10% of its full speed in an external test stand. Assembly of the sub-atmospheric and full speed test of the cold-compressors is on track to support beam operations in FY18 Q1.

- A new photogun and alkali-antimonode photocathode deposition chamber have been commissioned. The photocathode is immersed in a magnetic field to produce magnetized beam; which is beam that possesses mechanical angular momentum. Magnetized beam could be necessary for proton cooling for the electron ion collider. This is the first time it has been produced from a dc high voltage photogun and early demonstrations have already set a world record for the highest average beam current for magnetized beam.

- Completed assembly and installation of the refurbished C50-07B cryomodule for CEBAF. Commissioning is scheduled for late August.

- Installed the new injector quarter cryomodule into the upgraded injector test facility (UITF) for commissioning and characterization prior to installation in CEBAF.

- Completed acceptance testing for the first LCLS-II production cryomodule in FY17 Q4 and have started testing the second unit. Completed the qualification of LCLS-II production cavities and completed the assembly of six production cavity strings. Completed the assembly of the second production cryomodule, J1.3-3, and have four more in sequential phases of assembly. The third production cryomodule will be completed in FY17 Q4 and tested in FY18 Q1.

- Completed the processing, assembly and RF testing of the second double-quarter wave (DQW) and RF dipole (RFD) cavities during FY17 Q3. Both cavities exceeded performance requirements. The remaining scope includes additional cavity performance test and the design and fabrication of prototype HOM absorbers for the RFD cavity.

- A workshop was held to explore potential scientific opportunities in the LERF. Many local researchers got a chance to see what equipment and capabilities were available at the LERF and the ODU Applied Research Center (ARC) labs. One opportunity discussed was an option to use the LERF as a positron source. The possibility of a user-organized positron workshop to further develop this idea will be explored by the advocates.

EIC/JLEIC

- Work continued on the full-acceptance detector design for the interaction region. Engineering design of key detector components and simulation of detector performance has begun.

- The JLEIC accelerator R&D plan for FY17 and FY18 has been realigned to the funding level proposed for FY17 additional funding and will be submitted to the DOE Office of Nuclear Physics at the beginning of August.

- A one-day EIC accelerator R&D workshop opened the EIC User Group Meeting in Trieste, Italy on July 18, jointly organized by JLAB and BNL. The workshop was the culmination of a series of outreach events to the accelerator physics community in Europe. The Accelerator R&D program was presented from the European Community, CERN, Italy, France and Germany, and very fruitful discussions were initiated that may potentially lead to international participation in the EIC program. Discussions also included the EIC specific design and R&D status as well as the most challenging issues in beam dynamics, cooling and technology R&D. The collaboration and coordination effort will continue at the joint JLAB-BNL EIC accelerator collaboration meeting planned for October 2017.

- Preparations for a next series of topical EIC-related workshops have started. Planning includes a workshop related to EIC science with polarized deuteron targets – unique for JLEIC, a workshop related to nuclei at short distance scales, a followup meeting of nucleon and nuclear parton information at large Bjorken-x, and a followup meeting on the relation of
pion and kaon structure and our understanding the origin of hadron mass. Related, we have started considering steps towards creation of a Center for Nuclear Femtography, a topic championed by the Jefferson Lab 12-GeV science program with strong connection towards an EIC.

- Funding based on the FY17 EIC supplemental R&D plan was awarded. The specific R&D activities had been submitted to the DOE in May and were based on priorities identified in the November 2016 EIC R&D Review Panel Report. The funded projects include Electron Cooling Simulation Development, Complete and Test a Full Scale Suitable Superferric Magnet, IR FFQ Prototype Definition, Fast Feedback System and Kicker Design, Test of CEBAF Electron Injection Mode and Crab Crossing Design and Simulations. Planning for FY18 R&D proposals is underway.

- Work continued on the most important aspects of the JLEIC design: electron-cooling, magnets, crab cavities, electron ring design, polarization design and beam dynamics simulations. In particular, data analysis of the bunched-beam cooling experiment conducted on the CSRe low energy ion ring at IMP Lanzhou has made significant progress towards confirming the cooling of ion beams in the presence of a bunched electron beam. Simulation of beam dynamics in the presence of the RF fields of crabbing cavities is ongoing. The results provide guidance for the ongoing cavity design. A start-to-end spin tracking simulation for the ion beam has been completed for the whole acceleration cycle. A hybrid multi-bend achromat lattice for the electron collider ring with a similar bending radius to the baseline design has been completed. Down-selection of a final lattice for the electron-collider will be complete in the next quarter.

- Work continued on the full-acceptance detector design for the interaction region. Engineering design of key detector components and simulation of detector performance has begun.

**NOTABLE OUTCOME STATUS:**

- **Objective 2.2: Execute the assigned LCLS-II project scope in compliance with the technical performance specifications and within the established DOE performance goals for cost and schedule.**
  
  - JSA has schedule and cost indices of SPI=0.890 and a CPI of 0.97 at the end of August.
  
  - Schedule delays in the Cryo Plant WBS (SPI=0.89) continue in the design and procurement of smaller equipment required in the plant. The delays resulted from earlier prioritization of critical path design work (plant installation design) ahead of the smaller equipment. The smaller equipment is scheduled for delivery in FY18 Q1. The cost variance in the Cryo Plant WBS (CPI=0.98) includes larger labor efforts and costs than planned to complete the plant installation design.
  
  - Cryo Plant equipment is now arriving on the SLAC sight. All Warm Helium Compressors, WHC, for the first plant have been delivered and the WHCs for the second plant have started shipping in September. Helium storage tanks are being held at the vendor per SLAC’s request until SLAC is ready to receive them.
  
  - The Cryomodule WBS (SPI=0.89) continues to be driven by the late delivery of SRF cavities as previously described. We have modified the contract with the preferred vendor for additional SRF cavities to mitigate late deliveries from the other vendor. We are procuring additional SRF cavities through a new competitive bid contract. The cost variance in the Cryomodule WBS (CPI=0.97) includes unplanned costs associated with managing one SRF cavity contract. Considerable technical and management efforts have been required to get the vendor to produce good quality cavities.
  
  - Cryomodule production continues with CM#8 started and CM#3 in acceptance testing. JLab shipped the JLab prototype cryomodule to FNAL for testing. The cryomodule will be returned after testing is completed at FNAL.

- **Objective 2.2: Complete the CD-4B (Approve Experimental Equipment Project Completion) key performance parameters (KPPs) for the 12 GeV CEBAF Upgrade project. [NOTABLE OUTCOME ACHIEVED FY17 Q2]**
  
  - This Notable Outcome was achieved FY17 Q2. Concurrence on the demonstration of the Key Performance Parameter for Halls B and C from the DOE Federal Program Manager and Federal Project Director was received in February and March 2017, respectively.
GOAL 3: PROGRAM MANAGEMENT

JSA provides effective program vision, leadership, strategic planning, and development of initiatives that facilitate improved research productivity. The Laboratory Directed Research and Development (LDRD) program is now in its fourth year of providing funds for selected projects; four currently underway in FY17 support the possibility of EIC at Jefferson Lab. Nine new proposals were submitted for consideration in FY18. The final set of drawings for the Facility for Rare Isotope Beams (FRIB) was delivered in FY17 Q2, after the end of a 2-year journey. The path forward for this project continues to be defined. There were 1,745 registered participants hosted onsite during this performance period. Science Education staff, in addition to several thousand hours interacting with student and teachers, were also invited to participate in local events promoting Science, Technology, Engineering, and Math (STEM) careers. Significant during FY17:

- The DOE Science and Technology (S&T) Review was held at Jefferson Lab on July 24-26, 2017. This review considered the full Nuclear Physics S&T portfolio of the laboratory spanning the experimental nuclear physics program, theory, facility operations and future upgrades. Three recommendations resulted from the review.

- In FY17, JLab’s formal LDRD plan was submitted as part of the overall Lab Plan so a separate submission was not necessary. At the end of August, the Lab Director reviewed FY2018 LDRD proposals and made a decision on which projects should funded for the year. A request for formal approval of these projects has been submitted to the Site Office and approval is anticipated shortly. The winners will be announced on September 19 as part of the laboratory’s annual LDRD “Jamboree”, which includes presentations of progress by the current projects.

- A search committee for the replacement of Andrew Hutton, Associate Director for Accelerators, was launched FY17 Q3. Fulvia Pilat, formerly the Deputy Associate Director for Accelerators, agreed to serve as the Acting Associate Director until her departure in the fall of FY18 to join Oak Ridge National Laboratory’s Neutron Sciences Directorate. The committee includes Stuart Henderson, Jefferson Lab Director (Chair); Steven Holmes, Fermilab; Krishna Kumar, Stony Brook University; Patrizia Rossi, Jefferson Lab – Experimental Nuclear Physics; Rik Yoshida, Jefferson Lab – Experimental Physics; George Neil, Jefferson Lab – Accelerator Division; Mary Logue, Jefferson Lab – ESHQ; and Rhonda Barbosa, Jefferson Lab – Human Resources.

- JSA Mechanical Engineering Group completed the final set of drawings on the ‘FRIB Cryomodule Engineering and Design Finalization’ work package. This represents the end of two years of work involving the Beta 0.041 and 0.29 modules, where the group took conceptual-design models from the Facility for Rare Isotope Beams as a starting point and developed them into complete engineering packages ready for cryomodule fabrication. In February, the 0.041 cryomodule was placed and aligned in the FRIB tunnel. The 0.29 cryomodule/coldmass assembly is proceeding, and FRIB is looking forward to early beam commissioning of these cryomodules starting in 2018.

- JLab staff scientists and users are active participants at reviews, meetings, conferences, and workshops attended by hundreds of representatives from scientific institution, organizations, and higher education facilities nationwide. These collaborations provide important opportunities for discussion of scientific results and future opportunities. In FY17, Staff Services coordinated more than 205 onsite events, with a total of 2,074 registered participants representing 567 institutions. All workshops were tracked through the DOE reporting system, iPortal, meeting all DOE requirements. Registrations from sensitive countries were screened for potential security threats as they were received. Support was also provided for informational and training activities hosted onsite by local mutual aid organizations that provide emergency response services to the Lab. Significant during this period:

  - **Photocathode Physics for Photoinjectors (P3) Workshop, October 17-19, 2016:** Organizing committee includes JLab, Cornell University, Tech-X Corp, SLAC, NRL, LBNL, UCLA, and BNL. Sixty-six participants representing SC laboratories, college universities, military organizations, international research centers, and technology were charged with exploring the current state of art in accelerator photocathodes from a theoretical and materials science perspective. The goal to establish directions for future research and to identify opportunities for collaboration within the community.

  - **3D Nucleon Tomography Workshop, March 15-17, 2017:** Organizing committee includes JLab, CEA Saclay, and UCONN. Forty-nine participants representing SC laboratories, college universities, and international research institutions were onsite to discuss the requirements for an analysis framework, examine theoretical and experimental components that need to be incorporated, and study approaches to the computational challenges these requirements will entail. The outcome of is a white paper, and the establishment of collaborative efforts aimed at tackling the challenges identified above, and ensuring that the resultant framework can be applied across the emerging nuclear experimental and theoretical programs, including a future EIC.

  - **Future Trends in Nuclear Physics Computing, May 2-5, 2017:** This workshop examines the hardware and
Jefferson Science Associates
FY2017 Q4 PEMP Performance Evaluation

software strategy at a time horizon of ten years. Goal is working towards the definition of a common vision for Nuclear Physics (NP) computing and data and recommend future directions for development. Discussions adopt a data perspective and focus on resource management and the interplay of I/O, compute and storage, machine learning for enhancing scientific productivity and appropriate task based approaches, software portability, reusability and common infrastructure components. Committee members included representatives from JLab, LBL, NYU, BNL, ANL, FRIB/NSCL.

- **DOE Accelerator Safety Workshop, August 15-17, 2017:** The workshop is an open forum for individuals affiliated with US or International accelerator facilities where each organization can present information/experiences on key operational and safety themes and share lessons learned. The ASW is designed to encourage and improve communications across the DOE complex, especially across the DOE Accelerator Community. Improved communications has led to the development of a new Order (DOE 420.2C), development of a new Guide (DOE G 420.2-1), and a new Technical Standard (DOE-STD- 6004-2016) to address Clearance of Material from Accelerator Facilities.

- **International Workshop on Physics with Positrons at Jefferson Lab, September 12-15, 2017:** This workshop is organized to explore the complementary physics potential offered by a polarized positron beam at JLab. We seek presentations and discussions of the application of positron beams in the context of CEBAF 12 GeV, a possible Positron-Ion collider (complementary to an Electron-Ion Collider), and an eventual low-energy positron facility. The physics potential will be evaluated on the basis of beam intensity and polarization. At CEBAF 12 GeV, beam intensities about 10-100 nA CW and >60% polarization are expected, at EIC energies a luminosity of $10^{33}$ cm$^{-2}$/s and >40% polarization are considered and at low energies positron beams with a flux about $10^{10}$ e+/s with >50% polarization are likely. Workshop proceedings are intended to inform a White Paper for a positron physics program at JLab.

- JSA Science Education outreach statistics for FY17 include interactions with 10,391 students (18,974 contact hours) and 813 teachers (4,276 contact hours) through the BEAMS (Becoming Enthusiastic About Math and Science) program, Physics Fest program, JSAT (JLab Science Activities for Teachers) visits, and other school visits. Significant accomplishments are noted below:

  - JSA collaborated with Newport News Public Schools on October 28, 2016 to present the **Newport News Public School Engineering Design Challenge**. Ninety-six elementary students from across the school division convened for a challenge that required them to collaborate, innovate, and think critically to solve a laser maze problem.

  - JSA was invited and participated in **Science Day with the Virginia School for the Deaf and Blind**. Two such events were held in the state; October 8, 2016 in Stafford County, VA and November 5, 2016 in Staunton, VA. A total of 22 deaf, hard of hearing, and visually impaired students engaged in hands-on, inquiry-based activities designed to strengthen and promote STEM interest.

  - Fifty-seven students from Carver Elementary School in Newport News participated in the **Hour of Code at Jefferson Lab** on December 9, 2016. Students were introduced to computer programming using an interactive Star Wars-themed activity. In addition to members of the Science Education staff, five staff members from the Jefferson Lab Computer Center volunteered to assist students in the classroom.

  - JSA hosted **Regional Science Bowls** for High School on February 4, 2017 and for Middle School on March 4, 2017. There were a total of 176 students and 46 coaches in attendance, competing in a verbal forum to answer questions in science and math. There were 56 Jefferson Lab volunteers, serving as room officials.

  - The two-day **Engineering Career Days**, sponsored by the Peninsula Engineer’s Council, took place on February 23-24, 2017. The event hosted by Jefferson Lab, Newport News Ship Building and NASA, reaches 600 high-school students to encourage them in STEM fields. Students interacted with 14 Jefferson Lab staff members.

  - JSA was invited, on April 10, 2017, to participate in the **22nd Annual School of Science Research Symposium** at Hampton University. Twenty participants attended a daylong series of activities, including a panel with national laboratories, graduate physics programs and professional physics societies.

  - Virginia Air & Space Center's **Homeschool Appreciation Day** was held on May 10, 2017. JSA staffed a booth at the event, sharing hands-on activities, on-line resources and opportunities for homeschool students to interact with Jefferson Lab.

  - At the **CNU & NNPS STEM Community Day** on May 20, 2017, Jefferson Lab’s Science Education staff had the opportunity to interact with the 4,000 students, teachers and parents from the community. Hands-On activities,
Lab and web resources, and upcoming educational programs were shared.

- Jefferson Lab participated in SPARK (**Summer Program for Arts, Recreation and Knowledge**). For 2.5 hours every Monday through Thursday, July 10 – August 3, 2017, Science Education staff members worked with a total of 57 Newport News Public School rising 5th graders to provide a variety of interactive design challenges and demonstrations.

- Jefferson Lab hosted 10 students for the **Science Camp for Deaf and Hard of Hearing** from August 7 – 11, 2017. Students participated in a variety of activities designed to engage them in fun, hands-on labs and enhance core science concepts.

- Jefferson Lab hosted 25 **Science Undergraduate Laboratory Internship/Research Experience for Undergraduates/Undergraduate Physics Researchship -- SULI/REU/UPR** students as interns from May 30 – August 5, 2017. These students worked throughout the laboratory in a variety of science and technology fields. The culmination of the program saw the students presenting a scientific poster at the annual poster presentation.

- For Q4, the **Jefferson Lab Science Education Website** received nearly 6.7 million views, with the fiscal year total nearing 229 million page views. The site is often cited by Virginia schools as the one tool that helps students practice for the Virginia Standards of Learning test effectively.
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<th>Goal 4: Provide Sound and Competent Leadership and Stewardship of the Laboratory</th>
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### NOTABLE PERFORMANCE ITEMS:

#### 4.1
- Jefferson Lab Senior Leadership regularly interacts with local government, business organizations, and higher education leaders to cultivate and maintain long-term relationships that are beneficial to the lab. During FY17, the directorate, several senior managers, and JSA corporate representatives participated in meetings with the Greater Peninsula NOW, the United Way of the Virginia Peninsula, the Peninsula Workforce Development, CNU Peninsula Insiders, and attended the Newport News State of the City Address that was given by Mayor McKinley Price. Jefferson Lab hosted a delegation from the People’s Republic of China (PRC), following a joint US-PRC meeting held at SURA in Washington, D.C., to discuss increased collaboration on areas of common interest in hadron spectroscopy. They also welcomed onsite local government representatives and military leaders to give them an overview of Jefferson Lab programs and a tour of the facility.

- Jefferson Lab Senior Leadership is actively recruited to serve on and participate in numerous scientific, national, and international organizations, committees, and review panels.

- Jefferson Lab Senior Leadership participated in a DOE SC led meeting on April 3, 2017, to review the implementation of a revolutionary contract model at SLAC and to discuss implementation at TJNAF and other SC sites. Following this meeting, JSA and the TJNAF Site Office worked closely to review the contract and identify opportunities for streamlining by removing redundant, outdated, or inappropriate requirements. We reviewed a total of 53 H Clauses, 54 DOE Orders, Manuals, and Policies, and 162 FAR and DEAR clauses. We jointly identified 18 H Clauses, 19 DOE Orders, Manuals, and Policies, and 28 DEAR clauses that can be deleted or modified. We also reorganized all requirements into the eight PEMP goals and subordinate objectives and grouped requirements into 41 processes using the TJNAF Requirements Traceability Matrix. DOE has already taken action to modify the TJNAF contract based on this effort and work is proceeding to the next phases to tailor requirements to eliminate processes, reviews, and other work that adds little to no value.

#### 4.2
- JSA improved upon our contractor assurance system during FY17. We improved transparency via regular meetings and coordination with TJSO staff at multiple levels, sharing plans and progress updates on issues such as a revamped Risk Registry, ORPS and Notable Event notifications and updates, CATS 10% audits and Assessment methodology and results. JSA provided rolling 12-month metrics and implementation updates for various performance measures at the CAS Quarterly meetings, including On-time Assessment performance, On-time development of Corrective Action Plans and Level 3 Corrective Action closure performance. Additionally, we continue to progress on a previously identified roadmap for enhancing the CAS through utilization of over 60 PAE (and previously CSC) contracts and best practices.

- JSA maintained uninterrupted operations during FY17, despite the challenges created by incremental funding under the continuing resolution. We provided TJSO timely reporting of when available funds would be exhausted and recommendations on how funding could be redistributed between projects. JSA also took action to carefully prioritize non-labor commitments to manage through delays in funding disbursements and prevent any operations impact.

- JSA worked closely with the Office of Science (SC) during the first half of FY17, to maintain awareness of the developing security challenges resulting from international agreements. Jefferson Lab’s COO attended classified briefings for the laboratory director at DOE Headquarters on November 2, 2016 and again on December 14. Unclassified synopsis of these meetings was shared with JSA leadership. In January 2017, we immediately elevated to the Site Office an inquiry from the City of Newport News Sister Cities committee regarding a potential visit by a high-level delegation from the Sichuan Province in China. This enabled the Site Office to coordinate the visit with larger DOE and prevent any surprises or adverse publicity.

- JSA reinforced our excellent relationship with the Commonwealth by hosting Delegate Marcia Price on November 29, 2016 for a lab overview briefing and tour of the CEBAF. Delegate Price represents the 95th District in the Virginia House of Delegates and is a member of the Health, Welfare, and Institutions Committee. The Commonwealth has been a strong supporter of Jefferson Lab and provides valuable financial support to the lab and its scientists.

- JSA agreed to host the December meeting of the Lab Operations Board (LOB). The LOB met on December 8, 2016 and then toured the CEBAF on December 9. We believe this meeting increased awareness of Jefferson Lab’s mission and science capabilities within a number of DOE leaders who had not visited, or do not regularly visit the laboratory.

- Jefferson Lab’s COO was a member of the DOE Order 232.2 Integrated Product Team charged with the responsibility to provide a revised order for DRB approval by December 15, 2016. This was an enormously challenging undertaking that
4.3 Members of the JSA Board, company officers, Committee members, owner representatives, board liaison, and corporate staff provided governance support, ensuring the governance structure and function support the Lab and DOE and enable the Lab to capitalize on opportunities and address challenges that arise. During the Q4 reporting period, JSA interactions included communications and meetings with DOE HQ and program officials, TJSO managers, federal and state relations consultants, Virginia state officials, Lab leadership and managers, internal auditor, Users Group Board, and members of the JSA board committees. These interactions and meetings, referenced throughout this assessment, addressed: performance status on PEMP goals and TJSO feedback; current and emerging issues and risk mitigation efforts; safety events, responses, and lessons learned; JSA board and corporate activities; on-going CAS activities and continuous improvement efforts; efforts on revolutionary M&O contract model, etc. Q4 highlights include:

- Working with the Lab director and deputy director, JSA is in process of completing the rotation of Science Council members, including the appointment of a director as the committee chair and member of the JSA Board. Anticipated completion date is Q1 FY2018.

- Following the Lab’s decision to implement the FY2017 salary increase program effective mid-August, the Compensation Committee completed its notices to effect the Committee’s June decisions resulting from the summary performance appraisals of key personnel and Lab CFO, the Finance & Audit Committee’s appraisal of the internal auditor, and honoraria for Governor’s Distinguished CEBAF Professors.

- Operations & Safety Committee members held regular teleconferences with Lab operations managers including the COO, CFO/business manager, HR manager, facilities manager, ES&H director, and CIO to discuss significant current and emerging issues and status of performance against PEMP goals, e.g., operational performance in ES&H with discussions of safety events and steps to address them, core business systems issues (HR, finance, procurement, property, quality assurance, tech transfer), facility and infrastructure, physical and cyber security, and emergency management, etc. An on-site committee meeting was held on September 14; report is pending.

- JSA, JLab, and TJSO reviewed and discussed FY2017 assessment status and outcomes through Q3, addressing actions that remained open, and making necessary updates to the schedule. After consideration by the Operations & Safety Committee in response to feedback from the TJSO to the proposed FY2018 assessment schedule, an independent corporate effectiveness review of service subcontractor work planning and control process has been added to the FY2018 schedule in Q4. See also discussion in section 5.1.

- The Finance & Audit Committee received TJSO approval of the proposed FY2018 internal audit plan including FY2017 allowable cost-transaction testing, Hiller Systems subcontract closeout audit, University of Regina subcontract closeout audit, and Environmental water permits. The Committee reviewed the FMA summary report and the internal auditor’s Q3 activities. The reports for the remaining FY2017 internal audits are scheduled for submission by end of FY2017.

- The CAS leadership team (TJSO, JSA, JLab) discussed at its quarterly meeting status of assessments through Q3, actions (done and underway) in support of the revolutionary M&O contract model, Lab’s review of its risk identification and management process and the pending revamp of the risk registry to incorporate contract requirements, and changes for the annual CAS effectiveness review. See also discussion in section 4.2.

- JSA representatives, TJSO, and Lab management coordinated JSA’s response to the August Safety Summit called by DOE (SC-3) following a series of safety incidents (most recently, material movement and electrical safety) across the SC complex. DOE requested feedback from its contractors so that discussions could continue with a goal of developing sustainable solutions to the causes of these safety incidents.

- JSA representatives met with TJSO managers throughout the quarter updating in a timely manner on various issues including: JSA board meeting decisions, FY2018 assessment schedule, JSA board and committee changes and activities, TJSO Q3 PEMP assessment feedback, contract modifications, revolutionary contract working group activities, Initiatives...
Owner Commitments

JSA Initiatives Fund (IF) Program
Thirty-eight timely proposals (an all-time high) were received in response to JSA’s June call for proposals for the FY2018 IF Program, for which SURA and PAE have committed $350K. The Lab Users Group Board and Lab management are in process of conducting their initial reviews. Included are 13 requests for support for scientific conferences and workshops. An evaluation committee to be appointed by the JSA Programs Committee Chair will conduct the final review and make recommendations for award. Anticipated award date is early December.

Through August, the FY2017 $530K IF Program is over 56% expended. Highlights of the specific IF projects during this reporting period include:

- **LC2017: Frontiers in Light-Front Hadron Physics-Theory & Experiment.** PI: Anuradha Misra (U of Mumbai). Currently underway at host University of Mumbai, LC2017 is part of a series of annual conferences organized by the International Light Cone Advisory Committee (ILCAC) bringing together researchers working in the area of light cone field theory, hadron physics and related topics. JSA supports the Gary McCartor Travel Fellowship Program. Report is pending.

- **JPos17: International Workshop on Physics with Positrons at Jefferson Lab.** PI’s: Eric Voutier (IPN-Orsay), Joe Grames. About 80 participants convened to discuss opportunities with respect to: interference physics, charged current physics, tests of the Standard Model, positron applications, positron production and beam physics. The workshop was a forum to explore the complementary physics potential offered by a polarized positron beam at Jefferson Lab. JSA provided travel support for participants and meeting support. Report is pending. See also discussion in Goal 3.

- **NSTAR2017: International Workshop on the Physics of Excited Nucleons.** PI: Ralf Gothe (U of SC) The 11th in a series of international workshops on the subject of nucleon excitations, the workshop program was held at a time when many new results from CLAS and other experiments world-wide have already led to the experimental discovery of new excited states and on the verge of the next phase of CLAS12 experiments. JSA provided travel support for participants. Report is pending.

- **Nucleon and Resonance Structure with Hard Exclusive Processes Workshop.** PI’s: Kyungseon Joo (UConn) et al. The three-day workshop held at IPN-Orsay, France, focused on new approaches to exploring the short-range structure of baryons and non-perturbative QCD phenomena. Particular emphasis was placed on a unified description of processes in the deep-exclusive regime (generalized parton distributions (GPDs) and the resonance region (N* physics)). JSA provided travel assistance for key speakers. See workshop report at http://www.jsallc.org/IF/Reports/17-Joo.pdf.

- **Annual JLab Users Group Meeting.** PI: Larry Weinstein for the Users Group Board. Over 150 registered participants convened for three days at the Lab for the annual users conference *Exploring the Breadth of Jefferson Lab Research*. Conference highlights included: physics talks, award presentations, formal introduction of Lab director, lunch seminars for graduate students, and a poster competition. JSA provided support for the lunch seminars, travel assistance for key speakers, and registrations fees for students. See PR at: https://www.jlab.org/memo/researchers-execute-science-jefferson-lab.

- **Honorary for Foreign PAC Members.** PI: Elizabeth Lawson for Stuart Henderson. The IF program provided (through SURA) the honors for the five foreign PAC committee members for the July meeting. The 13-member committee, chaired by Temple University physics department chair Jim Napolitano, recommended approval of five proposals following the week-long PAC45 meeting at the Lab.

- **Graduate and Post Doc Activities.** PI’s: Torri Roark and Holly Szumila-Vance (ODU) Coordinating with Lab scientists, the Graduate Student/Post Doc Association held the *Software Carpentry Workshop for Students and Post Docs*, providing a formal introduction to data analysis tools and techniques to improve the quality of their research. Participants had hands-on, example-driven training utilizing the Lab’s computing resources.

- Other IF activities during this reporting period include:
  - **Director’s Discretionary Fund.** PI’s: Elizabeth Lawson, Joe Scarcello for Lab Director
  - **JSA/JLab Graduate Fellowship Program.** PI: Elizabeth Lawson, for JSA Programs Committee
  - **JSA/JLab Sabbatical/Research Support Program.** PI: Elizabeth Lawson, for JSA Programs Committee
  - **JLab Science Activities for Teachers (JSAT) PI’s Lisa Surles-Law, Christine Wheeler
  - **Nathan Isgur Research Fellow Grant.** PI’s Elizabeth Lawson, Robert McKeown
  - **Users Group Prizes.** PI: Larry Weinstein for the Users Group Board
  - **Junior Scientist Travel Support.** PI’s: Marco Battaglieri (INFN), Dipangkar Dutta (MS State), Douglas Higinbotham
  - **FIRST Robotics Team Competition.** PI’s: David Lawrence, Nate Laverdure
  - **Undergraduate Support for Jefferson Lab Research.** PI’s: Hari Areti, Wally Melnitchouk
SURA Relations & Outreach Program

SURA continues to provide support to the Lab in its relations and outreach program. The intent of the program is to establish effective working relationships with federal, state, and local authorities and with universities and industry leaders that have a vested interest in the Lab and in support of the nation’s science goals. During Q4 the relations team, and/or members of the team engaged in the following activities.

- The federal relations team continues work on monitoring the FY2018 appropriations process, keeping the Lab leadership apprised of Senate and House marks. Earlier this month, the House and Senate passed legislation for a two-month continuing resolution. Both House and Senate marks on the appropriations bills contain positive and supportive language for optimal operations for CEBAF.
- The state relations team has scheduled meetings in early FY2018 with key policymakers in Richmond (Department of Planning and Budget, House and Senate appropriations staff and the Governor’s office) to support continued Virginia funding for the Lab.
- SURA relations director interacted with Lab Users Group leadership on the strategy for FY2018 budget letters supporting strong nuclear physics funding going to Capitol Hill (Virginia House and Senate members and to the House and Senate appropriations committee members).
- SURA worked with the Users Group Board to develop a mechanism to disseminate relations, funding, and lobbying information to the community.

Other Owner Commitments

- PAE continues to provide its eLearning tools, including Skillport, to the Lab work force. A distance learning program, Skillport, remains an essential component of staff development and training at the Lab. Advantages of Skillport include: 24/7 accessibility, enhanced collaboration and reach, greener and more cost effective training solutions, and suitability for a diverse workforce. The usage remains constant in Q4 as in Q3.
- PAE managers discussed with the Lab COO potential efforts to streamline the M&O contract under the DOE Revolutionary Working Group concept moving toward more reliable and lower cost operation of critical infrastructure.
- PAE auditors reviewed the JSA internal auditor’s work papers for the Accountability and Recording of Personal Property audit.
- JSA hosted a welcome picnic for Lab director Stuart Henderson, at which the JSA board vice chair gave welcome remarks from JSA Board chair, along with remarks from the Newport News vice mayor and ODU provost.
- Reviewers from SURA member universities (ODU, UVa) participated in an external assessment of the Lab’s records management program, reviewing its current program and plans for future development. See also discussion in section 8.2.
- SURA finalized the parking license agreement, the final step in resolving issues related to the private sector interest in the SURA leased property. After final execution of the agreement, a ground breaking ceremony was held for the construction of the first of eleven research buildings as part of Tech Center Research Park. See also discussion in section 7.1.
- SURA general counsel continued to assist with responses to the tax commissioner and tax audit team to mitigate the tax burden of the 2010-2013 sales tax audit. See also discussion in section 6.1.
- SURA provided the mechanism and honoraria for the five foreign PAC 45 committee members for the July meeting. See also discussion above.
- SURA continued to provide the services and functions related to its role as the Administrative and Tax Member of JSA, including, for example, in this reporting period:
  - Review of biennial Commonwealth of VA Strategic Plan, Executive Progress Report and performance measures including adjustments to performance targets
  - Provision to the SURA Board of Virginia’s required Acknowledgement of Deficit Provisions for state funds
  - Monitoring use of Commonwealth of Virginia funds which are provided to SURA for EIC preliminary work (see also discussion in section 7.2), salary supplements, GDCP honoraria, other recruitment and retention efforts
  - Filing of the JSA 1065 tax return
  - Granting of power of attorney for carrier
  - Update of Lab profile on Virginia Center for Innovative Technology website
  - Provision of board information for processing of re-designation of Lab J-1 Exchange Visitor Program from the U.S. Department of State
SURA continued to provide the Residence Facility for temporary housing of students, researchers, and other guests associated with the various Lab programs. During this reporting period (through August) the Facility accommodated SULI and REU student groups, relocating Lab staff and families, PAC 45 committee members, physics seminar speakers, accelerator review participants, theory collaborators, and researchers and users on shift work. With an occupancy rate of 56.8% through August, projections are for break-even operations for the fiscal year.

**NOTABLE OUTCOME STATUS:**

**Objective 4.3: Select and bring on board a new Laboratory Director by the end of FY17. [NOTABLE OUTCOME ACHIEVED FY17 Q2]**

- An international committee chaired by former NSAC chair Donald Geesaman conducted an extensive search that included interaction with over 100 individuals including 3 dozen Lab staff members and users to solicit input and advice, followed by interviews with a dozen candidates. The result of the search was JSA’s appointment of Argonne’s APS Director Stuart Henderson as the next Jefferson Lab Director effective April 3. JSA kept DOE apprised of the status of the director search throughout the process to ensure complete transparency while maintaining the requisite confidentiality. See JSA press release at: http://www.jsallc.org/news/JSAPR20170106.pdf.

- Following Henderson’s appointment, JSA worked with the Lab director designate during his transition from Argonne to Jefferson Lab, enabling and supporting him as he became oriented to the Lab. Before his April arrival, Henderson met with Lab leadership and other staff members, JSA vice chair, JSA CAS representative, SURA relations director, and DOE officials. Henderson participated with the SURA relations team including the federal lobbyists to update the Jefferson Lab white paper and meet with congressional delegates, subcommittees, and their staffers during the transition period. He was involved with the preparation for and presentation to DOE of the annual budget in February; NLDC meetings; Big Ideas Summit; and the draft annual Lab plan presented to DOE in June.
Goal 5: Sustain Excellence and Enhance Effectiveness of Integrated Safety, Health and Environmental Protection (30%)

- OBJ 5.1 – Provide Efficient/Effective Worker Health and Safety Program (80%)
- OBJ 5.2 – Provide Efficient/Effective Environmental Management System (20%)

NOTABLE PERFORMANCE ITEMS:

5.1 JSA maintained an efficient and effective worker health and safety program as evident by the high volume of work accomplished, over 1.5M labor hours, and only two recordable injuries (one of which was a DART case) experienced by our employees, subcontractors, or visitors. This excellent safety record was achieved through the consistent application of our Integrated Safety Management System (ISMS). ISMS continued to build and extend safety competency across our workforce through training, controls, self-assessment, application of best-practices, and prompt reporting and learning from incidents and near misses. We have placed special emphasis this period on identifying and addressing the cultural factors that have created an environment where employees place expediency over exercising due caution when performing hazardous work. We maintained a best-in-class occupational medicine program that actively works in concert with our industrial hygienists to identify and prevent or minimize exposures or unsafe work practices or conditions which is reflected in our high productive hour rate and low absenteeism. Note-worthy accomplishments and challenges include:

- Through our training and controls radiation exposures remained low. Four job-specific Radiation Work Permits (RWP) were issued in FY17, predicted exposures of over 700 mrem over the course of the work activities. Due to careful work planning, trials runs, etc., JSA staff received less than 70 mrem while performing these jobs, including upgrading the Hall C beam dump.

- JSA conducted Accelerator Readiness Review – Phase 4, January 9-11, 2017, to confirm the readiness of resuming operations in Halls B and C in a safe manner. Led by ESH&Q, reviewers from JLab, SLAC and FNAL provided positive feedback and identified pre-start conditions for commissioning and operations. Approval to commission, including conducting 12 GeV Upgrade Project Key Performance Parameter operations, was received from the Thomas Jefferson Site Office (TJSO) on January 30, 2017.

- JSA hosted members of the SLAC LCLS-II project team to learn more about our ISMS and welding work as they applied to the project. The reviewers were very satisfied with how project activities are integrated and managed.

- JSA hosted the 2017 Accelerator Safety Workshop on August 14-16, 2017. Over 85 participants attended the workshop with representation from the DOE accelerator labs (SC and NNSA), Canada, and Europe. Participants reported the workshop was well organized and very effective and promoted the sharing of best practices and operating experience between sites. The JSA Accelerator Division DSO received an award from SC for his service and leadership at these workshops.

- JSA’s review of our small-scale research activities did not detect any evidence of inadequate hazard analysis, disregard of hazards, or evidence that researchers were accepting unmitigated cumulative risk in their research activities. This exercise, spearheaded by the Directors’ Safety Council (DSC) in response to efforts by DOE’s Office of Science Operations Improvement Committee (SCOIC), generated valuable feedback from lab staff and users. DSOs will incorporate these ideas into future efforts to improve work-planning processes.

- JSA successfully completed all elements of the 2016 Industrial Hygiene (IH) Monitoring Plan; ensuring a comprehensive and up-to-date data set for evaluation and mitigation of hazards associated with chemical stressors and high volume noise. A review of Jefferson Lab’s CY2016 IH sampling data showed no personal exposures that exceeded the limits. This demonstrated compliance with the personal exposure limits outlined in 10 CFR 851, by the inclusion of the hierarchy of engineering and administrative controls over personal protective equipment as part of the organization’s work processes.

- JSA demonstrated commitment to providing a safe work environment for staff and users by making a timely decision to close the laboratory on January 8, 2017 due to unsafe driving conditions. Work resumed on January 9 once conditions improved. Only one minor slip was reported to the Occupational Medicine Office once work resumed.

- The TJNAF ES&H Manual was identified as a valuable resource for Jarden Zinc Products, the largest manufacturer of zinc strip and zinc-based products in North America. The organization based out of Greenville, Tennessee requested permission to use applicable sections of the Lab’s ES&H Manual. Permission was granted with the caveat that this material may not be offered for sale and that JSA and DOE are credited for the information.

- Dr. Chandler, the TJNAF Site Occupational Medical Director, was part of a team that was awarded the EFCCOG John McInerney Team Award for piloting an external peer review process of Occupational Medicine programs. Dr. Chandler was a leader in the development of the process and conducted the inaugural review at BNL. Earlier in FY17, the Site Occupational Medicine Clinic was featured on DOE’s PowerPedia Occupational Medicine Programs website to ensure the
President’s transition teams and appointees had instant access to and were well informed about the programs’ invaluable contribution to the success of DOE.

- JSA safety and incident reporting systems continued to be effective. JSA experienced two occupational injuries during FY17 with only one resulting in restrictions affecting the worker’s ability to perform assigned routine functions. In addition to the two occupational injuries there were eight Notable Events and six of these were categorized as ORPS reportable. In all instances the required reports were timely and process changes or employee training followed. In one event an employee disregarded established procedures and guidance from the subject matter expert and transported a small sample of radioactive Gallium in their personal vehicle to meet a delivery deadline. The employee was called back to the lab by his supervisor as soon as this action was recognized. This was initially determined not to be ORPS reportable but subsequent investigation revealed that because the package was not secured as required under 49 CFR 171.1-1, it did require reporting to DOE through ORPS.

- On July 25, 2017 a member of the TJSO Site Office observed a subcontractor working at heights using an unsuitable fall protection anchor point. Work was stopped, replanned, and proceeded safely. The subsequent investigation identified a number of causal factors related to work planning and control for of service subcontractors. The event triggered an extent of condition review of work involving use of fall protections. In the course of a month, 12 work observations were made; only one of which identified a minor non-compliance, which was quickly addressed. Additional actions are being taken to strengthen the Lab’s work planning and control processes for service subcontractors.

- The Work Planning and Control assessment and several Notable Event investigations point to the potential for over emphasis on the work schedule to following the established work plan. The Safety Culture Survey results also reflect this sentiment. The Director's Safety Council has been involved and are formulating a plan to change this cultural bias, including visible senior management involvement and integration of key Human Performance Improvement tools into the ISMS elements impacting both people at all levels and tools such as work planning and event investigation.

5.2 JSA maintained an effective and efficient Environmental Management System (EMS) with no excursions, releases, or permit violations in FY17. Noteworthy accomplishments and challenges include:

- JSA received the 2016 HRSD Pollution Prevention Gold Award for exemplary permit compliance on April 18, 2017.

- JSA was recognized under the Electronic Product Environmental Assessment Tool (EPEAT) program and the Green Buy program, which recognizes excellence in the procurement of sustainable products. The FY16 Bronze Level GreenBuy Award was received on March 10, 2017 for excellence in sustainable acquisition by reaching the leadership goal for four products in two different categories.

- JSA passed the Hampton Roads Sanitation District (HRSD) inspection and has applied to extend the Lab's HRSD discharge permit for an additional five years. Final permit action is pending.

- JSA was successful in receiving a 5-year extension of the Virginia Pollution Discharge and Elimination System (VPDES) industrial wastewater discharge permit, from the Virginia Department of Environmental Quality (DEQ).

- JSA's Environmental Program Manager participated in the Hampton Roads Planning District Commission's Regional Environmental Committee. Participation in this committee recognizes our leadership position in the community and allows JSA to engage on regional environmental issues and shape policy decisions.

- JSA has now completed 90% of the disposal of over 500,000 pounds of concrete and metal removed from Hall C and the accelerator tunnel in preparations for 12 GeV science and we are on schedule to complete the remaining disposal within the five year plan approved by DOE. The ability to release the material as non-radioactive has resulted in approximately $3 million in cost avoidance had the material been disposed as radioactive waste.

- An entire new suite of manual chapters describing the Environmental Management Program were finalized. Focusing the content has enabled us to reduce the number of controlled documents from 60 to less than 20 thereby reducing the cost of maintaining a compliant and effective program.

- JSA continues to actively monitor storm water discharge across the site. This effort has led to several system maintenance adjustments and improvements such as the installation of rip-rap and channel maintenance. This work, and other performance, is documented in the TJNAF Municipal Separate Storm Sewer (MS4) permit report submitted to the Virginia Department of Environmental Quality in September. We also identified improper discharge into our property from nearby commercial construction and took immediate action to notify the city which in turn worked with the owners to redirect the discharge.

- JSA continues to make progress with the corrective action of the elevated zinc levels detected by HRSD in 2016 in our ground water discharge. Laboratory-wide sampling initially traced the zinc to the Counting House sump and on May 4,
2017, the contents of that sump were removed and disposed of offsite. However, further monitoring suggests the original source may be somewhere in the accelerator tunnel draining into the counting house sump. Work is continuing to definitively identify the source and take enduring corrective action.

- In April 2017 JSA found that we had been underreporting groundwater withdrawal due to oversights in the design of the measurement systems and interpretation of the data. The volume underreported did not exceed permit limits but was nonetheless problematic in that Virginia Department of Environmental Quality (VADEQ) confidence in our reporting systems and quality control program. The oversight was immediately reported and VADEQ requested that TJNAF provide the correct data, which was transmitted to them on April 28, 2017 and in each subsequent report. VADEQ has indicated that no further action will be taken.

NOTABLE OUTCOME STATUS: None set for Goal 5
### Goal 6: Sustain and Enhance Core Business Systems that Provide Efficient/Effective Support to Lab (25%)

- OBJ 6.1 – Provide Efficient, Effective, Responsive Financial Management System (20%)
- OBJ 6.2 – Provide Efficient, Effective, Responsive Acquisition Management and Property Management Systems (20%)
- OBJ 6.3 – Provide Efficient, Effective, Responsive Human Resources Management System and Diversity Program (20%)
- OBJ 6.4 – Provide Efficient, Effective, Responsive Contractor Assurance Systems, Including Internal Audit and Quality (25%)
- OBJ 6.5 – Demonstrate Effective Transfer of Technology and Commercialization of Intellectual Assets (15%)

#### NOTABLE PERFORMANCE ITEMS:

**6.1** JSA maintained an efficient, effective, and responsive financial management system in FY17 by controlling $148,081,669.93 of added funds and all funds managed in full compliance with the approved disclosure statement and promptly processing 19 contract modifications (modifications 295-315). Financial management was complicated by uncertainties introduced by the series of continuing resolutions which required JSA to anticipate changes, forecast needs, and closely coordinate with the site office, service center, and program offices to prevent any interruption to the mission. Noteworthy accomplishments and challenges include:

- JSA responded to the request for an accelerated close of the FY16 financial report, which was completed and submitted by noon on October 5, 2016. This enabled DOE to have actual data for FY16 vs accruals to close out their books. It also allows easier reconciliations between JSA contract costs and DOE’s financial records; evidenced by JSA’s 3-week early submission of the FY16 Statement of Costs Incurred. JSA was also able to accelerate by one week the FY16 Institutional Cost Report (ICR).
- JSA developed and implemented an electronic wage report that breaks out the hours by week for its semi-monthly pay period, in response to expanded requirements under Executive Order 13673 – Fair Pay and Safe Workplaces. Analysis, testing, and program development were completed in less than two months to meet the requirement that was effective January 1, 2017.
- JSA created an online travel expense system that has resulted in processing efficiencies, accuracies, and significant annual cost savings to the Lab estimated at $103K. The Electronic Travel Expense Report System initiated in FY17 Q2 with a pilot group of the Lab’s travel coordinators and was fully implemented on May 1. Compared to off-the-shelf systems, JLab is avoiding annual maintenance costs of at least $80K and will recognize an annual savings of approximately $23K due to the elimination of one half a data entry clerical FTE within the Finance Travel Services Group.
- JSA completed the required cost impact analysis needed to substantiate a revised disclosure methodology to bring our systems into Cost Accounting Standards (CAS) compliance. The non-compliance was first identified in 2013 and JSA committed to implement corrective action once the 12 GeV project was completed. The new methodology carefully balances the need to allocate G&A expense on a value added basis without creating a significant burden to current and future projects that are procurement heavy. JSA provided a revised draft disclosure statement and supporting analysis to ORO FEAD on July 15. In efforts to expedite the process, JSA also met with ORO FEAD the week of July 24 to review the documentation and they have maintained a dialog to provide additional information as requested to support this new methodology. ORO FEAD reviewed and verbally approved the methodology with suggested changes to the Disclosure Statement to finalize the document.
- JSA continued to work with the Virginia Department of Taxation to minimize the tax liability for the Audit started in January of 2013. Through ongoing communications and meetings following the Virginia Tax Commissioner’s opinion letter, in response to JSA’s appeal, JSA continues to mitigate the potential tax liability associated with the assessment. A snapshot of the reduced extrapolated liability will follow the September 12 meeting with the VA Tax Audit team; significant reductions are anticipated. The work continues to exhaust the questioned items list and lays the groundwork for appeal on items that cannot be addressed with the VA Tax Audit team as a part of the audit process.

**6.2** JSA provided an efficient and effective acquisition management system through the provisions for purchasing of supply and services including major system components, subcontracting support and leasing support, P-card and E-commerce support, construction subcontracting and through an aggressive Small Business Program. Noteworthy accomplishments and challenges include:

- JSA Small Business Program Goals exceeded performance targets in Small Business, Women-Owned, and Disadvantaged categories through August 31, 2017 as noted below:
### SMALL BUSINESS PROGRAM GOAL

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<th>FY17 TARGET</th>
<th>FY17 ACTUAL</th>
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<td>HubZone</td>
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- The joint DOE/Contractor Procurement Evaluation and Reengineering Team (PERT) completed the required periodic review of the JSA procurement system August 21 – 25, 2017 and found JSA’s system to be “absolutely acceptable”. PERT is a pass/fail review so acceptable is the desired outcome. Noted during the review is that JSA Procurement department has verifiably surpassed its previous measure of effectiveness, noted during the 2012 PERT, by demonstrating twice the number of Strengths in the procurement process.

- In support of various JLab project and operational initiatives, JSA procurement staff worked diligently to:
  - Minimize delays in completing the CLAS 12 Solenoid Magnet in support of the 12 GeV Project.
  - Award the Motor Control Center subcontract for the LCLS-II Project which was essential to be placed due to funding in support requirements and project milestones.
  - Award procurement of the Helium Purifier System on a timely basis, which was a necessary piece of equipment for the JLab Cryoplant.
  - Recompete and award the non-subsidized Food Services Subcontract, for a $350,000 annual savings to the Lab.

- JSA exceeded the reporting requirements set forth by the Management and Operations Subcontract Reporting Capability (MOSRC) by submitting monthly reports from November 2016 to August 2017 with an overall error rate of less than 1%.

- JSA continued to strengthen its property system during FY17 by ongoing efforts to organize and catalog engineering replacement parts that were previously stored in shipping containers; four of the containers have been removed. Funds exceeding $94,000 were received for 143 tons of recycled metal/electronics and sale of excess property. These funds were used to recycle about 190 pieces of concrete weighing 167 tons, demolished from one of the experimental halls and disposal of 4 trailers. JSA realized cost avoidance over $12,000 as the result of reutilization of material.

- JSA subject matter experts continue to serve on the core group working on a proposal to update and streamline Property Management regulations for DOE Science Labs.

6.3 JSA maintained an efficient, effective, and responsive Human Resources Management System and Diversity Program. Noteworthy accomplishments and challenges include:

- JSA began the delivery of the course titled ‘Recognizing Potential Communication Barriers in a Diverse Population’ to all front-line employees. This action builds on the successful delivery of this course to all of management during Q1. This initiative is expected to continue throughout FY18.

- JSA began the D&I Lunch and Learn series utilizing Dr. Steve Robbin’s acclaimed ‘Inclusion Insights’ videos. The program is designed to serve as another avenue of inclusion and engagement for Lab staff in an informal setting.

- JSA took the initiative to conduct a Mock Audit of its Affirmative Action Program and compliance with associated OFCCP requirements to ensure best practices.

- JSA initiated an Ethics and Integrity training course for all members of management to include line supervisors. The course walks participants through a series of scenarios to reinforce JSA policy for avoiding conflicts of interest in outside business activities and improper use of non-public information. All training sessions are facilitated by the COO, HR Director and Legal Counsel.

- HR Director was engaged and active in her role as the Chair of the NLHRD Council, particularly with the Regulatory Reform Task Force Initiatives.

- An evaluation of JSA’s best practices and ethics program was conducted by the PAE Ethics Officer in June. Management training content and other notable recommendations from the 2015 Ethics Review were discussed and benchmarked. Feedback was favorable of current processes and practices in place for JSA.
JSA D&I Council launched a Climate Survey in FY17 Q1, to assess employee’s perception of diversity and inclusion at the Lab. A 64% participation rate represented a notable 20% increase over the baseline survey conducted in 2014. D&I shared the results of the Climate Survey with senior managers in FY17 Q2. While analysis and follow up continues, preliminary feedback was provided to staff as well. In general, the results were encouraging and reflect a clear recognition of implicit bias as a result of awareness training and management support.

6.4 JSA maintained an efficient, effective, and responsive Contractor Assurance System, quality program, and internal audit capability. Noteworthy accomplishments and challenges include:

- Closure rates of level three corrective actions continued to improve during FY17, with 64 of 66 actions, or 97%, being addressed on time and in a robust manner; the performance goal is 90%. Better closure rates for these higher priority issues was a targeted improvement area for FY17, with multiple process and program adjustments implemented, including review by lead assessors and relevant Associate Directors or Managers, QACI secondary verifications for robustness of closure, and performance measurement.

- JSA implemented the primary information collection tool for the improved Performance Management reporting process. As identified in the Q1 input, this process reduces the time required to collate input from over 20 people in ten departments, as well as the Corporate parent. Training has been conducted on the process and tool, as well as the timeline. Additionally, the new process provides for information to be collated and built upon throughout the year, providing the customer with an updated summary of accomplishments against PEMP goals from the start of the fiscal year to the date input was submitted.

- JSA’s FY2017 Internal Audit Plan is progressing as scheduled. The Allowable Cost – Transaction Testing FY16 audit is complete and the report has been issued. In addition, the Cafeteria subcontract closeout, and the LDRD Implementation audits are almost complete. In compliance with the FY 2017 Internal Control Evaluations Guidance, JSA made timely submissions of the Risk Profile in February, as well as, the Financial Management Assurance, Quality Assurance, and Entity Assessment Tools in June. The Internal Audit Plan was revised to replace the Classification of Personal Property audit with the Accountability and Recording of Personal Property audit, and submitted to DOE for approval on February 8, 2017. Jefferson Lab Internal Audit has been selected as one of three hosts for the 14th Biennial CIAD DOE Joint Conference to be held in FY 2018. This is a joint conference between DOE Contractor Internal Audit activities and the Office of Inspector General. As of the fourth quarter of fiscal year 2017, JSA Internal Audit has successfully completed the FY 2017 Audit Plan. The draft audit reports for LDRD Implementation, CAS 405, and the Accountability and Recording of Personal Property have been issued, with final report distribution expected by September 30, 2017. In addition, Internal Audit is undergoing an in depth self-assessment to assess conformance with the Institute of Internal Auditors Professional Practice of Internal Auditing (Standards). This self-assessment will be used as a reference for the DOE Contractor Internal Audit Directors Quality Assessment Review, which will be conducted in the first quarter of FY 2018.

6.5 JSA was contacted by 20 small business entities active in SBIR/STTR Phase I and II Funding Opportunity Announcements and have submitted 54 support letters for their proposals to DOE. Proposal support letters were also provided to Old Dominion University and Temple University for NSF research funding. In cooperation with SURA, JSA/JLab is pursuing grant funding from the Commonwealth of Virginia’s Center for Innovative Technology (CIT) – Commonwealth Research Commercialization Fund (CRCF) program for R&D for development of Superconducting Radio-Frequency (SRF) Cavity technology for an Electron Accelerator for the treatment of flue gases. Ten Cooperative Research and Development Agreements (CRADAS) and one Strategic Partnership Project, including modifications, were initiated in FY17 Q1. The organization also hosted meetings during that period with two different companies interested in licensing JLab IP. In FY17, 13 Invention Disclosures were received and 11 Patents issued as noted below:

**Invention Disclosures**

- 1429 Neutron Detector for use in Strong Gamma-Radiation Fields
- 1430 Transition Radiation Light Sources
- 1431 Boron Nitride Nanotube Transition Radiation Detectors and Sources
- 1432 Transaction Radiation Light Sources
- 1433 Method of improving sensitivity and energy response of neutron detectors using moderators with embedded Beryllium-loaded materials, and new type of neutron dose rate measurement devices utilizing said method
- 1434 Neutron Detector for use in Strong Gamma-Radiation Fields
- 1435 Radiation Monitor Based on Wavelength Dependent Optical Absorption in Fused Silica Optical Fibers
- 1436 Non-invasive RF Cavity to Measure Beam Magnetization
- 1437 High-Current Conduction Cooled Superconducting Radio-Frequency Cryomodule
- 1438 Lattice Quantum Chromodynamics and Chroma (Book Chapter)
- 1439 Electron Induced Reaction in Boron Nitride
- 1440 Tumbling barrel polishing method to achieve mirror-like finish in metal components for vacuum and high voltage
Jefferson Science Associates
FY2017 Q4 PEMP Performance Evaluation

applications
- 1441 Efficient High Power

Patents Awarded
- 9,463,433 Nano-Material for Adhesive-Free Absorbers for Bakable Extreme High Vacuum Cryopump Surfaces
- 9,590,384 Absorber for Wakefield Interference Management at the Entrance of the Wiggler of a Free Electron Laser
- 9,589,757 Nano-Patterned Superconducting Surface for High Quantum Efficiency Cathode
- 9,618,630 A Radiation Detector Based on a Matrix of Crossed Wave Shifting Readout Fibers with Scintillation Volumes Located at the Intersections
- 9,629,230 RF kicker cavity to increase control in common transport lines
- 9,629,138 Electron Beam Control for Barely Separated Beams
- 9,655,227 A Compact Efficient CW Standing Wave Normal-Conducting Accelerating Cavity
- 9,674,026 Beam Position Monitor for Energy Recovered Linac
- 9,696,517 Insertion Device and Method for Accurate and Repeatable Target Insertion
- 9,699,881 Diaphragm Flange and Method for Lowering Particle Beam Impedance at Connected Beam Tubes of a Particle Accelerator
- 9,711,251 Apparatus and Method for Variable Angle Slant Hole Collimator

- On June 15, JSA conducted an Industry Day to promote JLab’s Technology for Temperature-Compensated Silicone Photomultipliers (SiPM). Two representatives from Industry were in attendance and one has expressed an interest in licensing the technology. The Industry representative is developing their business plan and Legal is working up a term sheet to outline the basis to negotiate the license.

NOTABLE OUTCOME STATUS: None set for Goal 6
### Goal 7: Sustain Excellence in Operating, Maintaining, Renewing the Facility and Infrastructure Portfolio (25%)

- OBJ 7.1 – Manage Facilities/Infrastructure in Effective Manner to Optimize Usage/Minimize Life Cycle Costs (40%)
- OBJ 7.2 – Provide Planning for and Acquire Facilities/Infra Required to Support Future Lab Program (60%)

#### NOTABLE PERFORMANCE ITEMS:

**7.1** Throughout FY17, JSA continued to upgrade its facilities and infrastructure and continued to expand ongoing preventive maintenance efforts. A new preventive maintenance program was established for electrical spare breakers. JSA also continued to provide support to TJSO and the Chicago Service Center regarding the Utility Energy Services Contract (UESC) proposal. Significant accomplishments listed below.

- JSA established a Facilities Preventive Maintenance (PM) program for electrical spare breakers that include annual test and environmental storage. The spares program will contribute to reliability improvement of various systems. The spares support general lighting, branch circuitry such as general receptacles, exhaust fans, emergency lights and signs, small horse powered motors, and mechanical equipment. A spares inventory list has been established and shared with Jefferson Lab's Electrical Design Authority in the ES&H Group, should these spares be required to support non-Facilities operations.
- JSA completed Annual Crane Inspections of 292 material handling pieces of equipment related to Bridge, Gantry, Monorail and Jib Cranes, as well as Hoists, Chain Falls, Come A-Longs, Slings and Mobile Equipment Attachments in March 2017. From the annual inspection 12 repair orders were generated and have been completed. No repairs were significant enough to take any cranes out of service, except for the time necessary to replace damaged parts or make required adjustments. This material handling equipment is key to accelerator, experimental hall, and SRF activities.
- JSA completed facility condition assessments for 73 buildings and four real property trailers (963,811 GSF in total). The data obtained is being used to inform a five-year forecast of financial investments for sustainment of real property assets to support DOE strategic plans, program guidance, and departmental performance targets. While these assessments are typically subcontracted to an outside firm, the assessments this year were performed in-house by FM&L engineering and operations staff with an estimated cost savings of $212,038.
- JSA installed flood rated overhead doors for the truck ramps at Halls A, B, & C. These doors provide increased protection against high storm water from entering the halls each time the doors are closed as opposed to having to manually install floodgates for the hall truck ramp doors. Previous storm runoff has caused damage of equipment in the halls exceeding $1M.
- JSA continued to work with TJSO and Chicago Service Center reviewing and providing comments on the UESC proposal. Implementation of the energy and water reduction projects included in the UESC proposal is critical to JSA's achievement of sustainability goals (ie: energy intensity reduction (BTU's / GSF, water intensity reduction (Gallons of Potable Water / GSF) and high performance sustainable buildings guiding principles compliance). Further, financial benefits (reduction in utility expense and rebate for energy efficiency) are unrealized every month the award and subsequent installation of projects is delayed.
- JSA vacated and prepared four real property trailers for removal from the site, resulting in a reduction of 9,055 SF and 195,000 of deferred maintenance
- JSA negotiated a new Applied Research Center lease (reduction of 15,770 SF and annual savings of $263,000) as well as a new Warwick Warehouse lease (reduction of 1,481 SF and annual savings of $10,172).
- JSA negotiated a parking license, including maintenance of the existing roads and paring associated with the VARC lease for shared parking, with the Tech Center Building One.

**7.2** Throughout FY17, JSA planned for and delivered facilities and equipment that support daily laboratory operations. The Computer Center upgrade is ongoing under the Utility Infrastructure Modernization (UIM) project. The ESH&Q building was completed with a perfect safety record. Commonwealth of Virginia funds supported completion of the JLEIC project. Significant performance listed below.

- JSA emphasized contractor safety by continuous monitoring of work activities and weekly walk-thru inspections. There have been no subcontractor recordable injuries since November 2012.
- The Computer Center upgraded under the Utility Infrastructure Modernization (UIM) project is complete and the 2nd floor computer center is now consolidated in the renovated 1st floor space. The Power Utilization Efficiency (PUE) factor has been calculated at 1.2, well below the DOE sustainability goal of 1.4 for new computer centers. Installation of the CTF cold box and CHL C6 Warm Compressor is complete. UIM is 98.7% complete and very close to scheduled performance and cost

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**9/22/17 ★ Exceeds Performance Meets Performance ▼ Needs Attention ◆ Not Meeting Performance**

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index; SPI = 1.00 and CPI = 1.01. The Project continues to maintain a perfect safety record after 139,597 hours worked.

- Construction of the new ESH&Q building was completed July 2017, with a perfect safety record after 28,900 hours worked.
- Using Commonwealth of Virginia funds, JSA has completed the JLEIC Utility Distribution Study, draft Infrastructure Design Requirements document, Stormwater Management Plan, and Environmental Assessment documentation in preparation for the preliminary conceptual design report.
- Rusty Sprouse and Rick Korynta assisted the SLI program by participating in a short-notice "mini "IPR" which was of considerable value to the Office of Science Field Operations.

**NOTABLE OUTCOME STATUS:** None set for Goal 7
Goal 8: Sustain/Enhance Effectiveness of ISSM and Emergency Management Systems (20%)

- OBJ 8.1 – Provide Efficient/Effective Emergency Management System (25%)
- OBJ 8.2 – Provide Efficient/Effective Cyber Security System for the Protection of Classified/Unclassified Information (50%)
- OBJ 8.3 – Provide Efficient/Effective Physical Security Program for Protection of SNM, Classified Matter, Classified and Sensitive Information, and Property (25%)

NOTABLE PERFORMANCE ITEMS:

8.1 JSA maintained an efficient and effective emergency management system throughout FY17. Significant accomplishments are noted:


- JSA participated in the statewide Tornado Awareness Week, March 20-24, 2017, by charging supervisors to review shelter locations and the accountability procedure with staff. In addition, ESH&Q tested the accountability procedure by asking division staff to report to their supervisors as if it were a real-time situation. All division members were accounted for within 20 minutes. Further improvements to the procedure were defined and tested throughout the year as a continuous improvement effort.

- Jefferson Lab’s Emergency Management Team (EMT) conducted a tabletop exercise on January 27, 2017. The main objective was to discuss how the information flow process would work from an emergency scene to the Emergency Operation Center and vice versa. An after action report was developed and the issues are being tracked through the Lab’s Issues Management process.

- Security personnel conducted a test of the Active Threat Alert notification system on August 31 to demonstrate ability to quickly notify the lab population of an active threat on site. The test was successful and no issues were identified.

- On July 7, 2017, Jefferson Lab ESH&Q staff discovered a pipe emitting smoke and flames in a wooded area behind the Residence Facility on SURA property. The Fire Protection Engineer responding to the scene inspected the pipe, which had self-extinguished, decided to relocate the pipe to the Central Material Storage Area (CMSA), a secure gravel area. The pipe was isolated in an area that would not allow the flames to travel. The pipe subsequently re-ignited and self-extinguished. At that point the Newport News Fire Department was called. The team investigating this Notable Event, identified some general reluctance to call 911 on the part of JSA staff. A communication campaign of lessons learned was initiated. As a result, when a natural gas odor was identified, the employee quickly dialed 911, which brought the fire department to site in a very timely manner.

8.2 JSA demonstrated an effective Cyber Security Program evidenced by the number of Cyber Security Incidents (CSI), the effectiveness of configuration and patch management via vulnerability scanning, and the time required to investigate and remediate alerts identified by the laboratory’s Intrusion Detection Systems. Several enhancements to the cybersecurity program were implemented. JSA also continued to collaborate with DOE on cybersecurity initiatives. Significant accomplishments during FY17 are noted below.

- **Key Cyber Security Metrics:**

<table>
<thead>
<tr>
<th></th>
<th>FY17</th>
<th>FY16</th>
<th>FY15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyber Security Incidents</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Average Number of Systems Scanned with Critical Vulnerabilities Detected</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><em>New vulnerability scanning software changed the baseline at midyear FY16</em></td>
<td>4.9%</td>
<td>2.06%*</td>
<td>0.14%</td>
</tr>
<tr>
<td>The Q2 percent of scanned machines with important/critical vulnerabilities is much higher than previous quarters (8.9%) due to the MS12-036 (Remote Desktop Vulnerability) false positive test and the MS17-010 (Security Update for Microsoft Windows SMB Server) signature. The Q3 % is slightly elevated relative to historical data due to a low level of failed patches of SMBv1 vulnerabilities associated with the WannaCry virus.</td>
<td>4.9%</td>
<td>2.06%*</td>
<td>0.14%</td>
</tr>
<tr>
<td>Mean Time to RemEDIATE Intrusion Events</td>
<td>0.9 days</td>
<td>0.6 days</td>
<td>0.45 days</td>
</tr>
</tbody>
</table>

- **Cybersecurity Program Enhancements:**

9/22/17 ★Exceeds Performance ★Meets Performance ▼Needs Attention ●Not Meeting Performance
- Strengthened Intrusion Detection Systems (IDS) by decrypting web traffic and having the IDS systems process it to identify and block known malware and other nefarious activity.
- Added additional email monitoring capabilities of attachments to the IDS systems. Analysis is currently a manual process; provides additional data needed to conduct forensics on email attacks (phishing) and expands our scanning of attachments malware and other types of nefarious software.
- Nessus client agent deployed on endpoints to provide host side scanning to greatly expanding our vulnerability detection capabilities.
- JSA implemented PROOFPOINT, a new spam filter for our email servers. PROOFPOINT is performing well and trapping all varieties of malware making the TJNAF network much more secure and operationally responsive.
- There were no successful attacks within the TJNAF network by the WannaCry ransomware that impacted many commercial businesses in April 2017, in large part because the Microsoft patch was applied to TJNAF system promptly. The IT staff took action to update Windows patches to a small number of stand-alone machines. Additional controls were supplied by the IDS, with targeted signatures were applied promptly to filter out malware before reaching TJNAF systems.

**Collaborations with DOE on Cybersecurity Initiatives:**
- Participated in DOE data sharing and iJC3 initiatives for creation of an unclassified Security Operations Center (SOC)
- Responded to 31 data calls and JC3 investigation requests in a timely manner. Quarterly data calls include reporting on FISMA metrics, MFA, and data center inventory.

**DOE Multi-Factor Authentication (MFA) Project:** As part of DOE’s MFA project, JSA completed the deployment of MFA for privileged users in FY16 and completed the standard user deployment by February 15, 2017. Per SC’s guidance, a Plan of Action and Milestones (POA&M) was created for tracking progress. Key initiatives included:
  - Delivering tokens to 333 standard users
  - Configuring the authentication environment to support the initiative
  - Separating the central file server to enforce boundaries for out of scope open science user accounts
  - Adding MFA to IT managed configurations for LINUX and MACs
  - Upgrading JLab’s account and certificate management systems
  - Developing a pilot project for microsegmentation (private vlans), in preparation for future improvements to network security
  - This POA&M closed out in FY17 Q2.

**FISMA/CAP metrics:** Each Federal Agency reports Cyber Security metrics against FISMA/CAP goals. For the DOE labs, FISMA is implemented in a risk based approach. While not contractually required to comply with FISMA targets, CAP metric results are provided to DOE on a quarterly basis. During FY17 Q2, the Office of Science (SC) made efforts to rationalize the reporting definitions across the SC National Laboratories. Jefferson Lab has 21 of the 24 CAP metrics within target; the remaining 3 are shared by the majority of the SC Labs as they reflect the nature of computing at research labs, rather than computing strictly in an office environment.
  - SC Laboratories have exceptions for unprivileged users to use LOA 3, while the metric is for LOA 4.
  - Encryption of data at rest is handled through a risk based process. Encryption degrades performance and is most relevant for sensitive data. Open Science data is not sensitive and requires high performance access.
  - Anti-exploitation tools are deployed on JLab Windows platforms, but there is no tool available that runs on Linux platforms.

**External Audit:** JSA underwent an Inspector General (IG) Audit “Security over Infrastructure and Mission Systems at JLab”, March 27-30, 2017. Auditors from the IG office were onsite to review implementation of security controls and the standards and best practices for managing or measuring internet of things (IOT). The audit focused on the Core enclave and Accelerator controls system and included visual inspection of devices to ensure alignment of database records and physical devices. Follow up penetration testing is scheduled for late September.

**NIST 800-53.r4:** Investigated and purchased a commercial tool that will build documentation necessary for compliance with the updated Office of Science (SC) Program Cyber Security Plan (PCSP). NIST 800-53 (rev. 4), Security Controls and Assessment Procedures for Federal Information Systems and Organizations, became the SC standard when the updated plan was released in November 2016. This requires updated Cyber Security Plans for all 10 enclaves, which currently use NIST 800-53 (rev. 3), Recommended Security Controls for Federal Information Systems and Organizations. In anticipation of this new standard, JSA purchased the commercial tool to facilitate migrating from in-house software that is no longer maintainable. A Plan of Action and Milestones (POA&M) has been created, with a projected completion date of February 15, 2018. Milestones are currently delayed due to vendor issues. We anticipate completing on time.
**IT Infrastructure:** In addition to enhancing the cybersecurity program, JSA IT also enhances the general IT infrastructure. Significant improvements include:

- Integrating the two 'single sign-on' servers. This will improve the user experience by leading to more seamless interoperability, will reduce maintenance overhead and paves the way for federated authentication.
- In response to the 2016 IT Governance Audit, a user survey of IT was performed. There were 269 responses, with an overall favorable rating of 4.3/5. The comments have been analyzed to look for areas of improvement, including further improvements to video conferencing.

JSA activated EDUROAM on the TJNAF campus. EDUROAM is a federated access solution that enables members of affiliated institutions to sign into any EDUROAM WIFI network using their home credentials. This will make life easier for users visiting TJNAF as well as JSA staff visiting other DOE laboratories and affiliated academic institutions.

JSA migrated all systems into the new data center with minimal disruption in service, taking advantage of the redundant services, and completing the move for non-redundant systems on a weekend. The new data center meets or exceeds the PUE requirement of 1.4 or less.

JSA conducted an external assessment of the overall JLab records program, with reviewers from SURA universities. Overall, the review team considered the program to have an excellent foundation that meets regulatory and operational requirements, and found that individuals working in the records program to be highly capable to manage their areas. The team also reviewed future plans for electronic records management and endorsed the use of SharePoint and by benefit of their experience, made recommendations on best practices for SharePoint deployment.

The JSA IT Management and Information Systems group continues to provide excellent quality support across Jefferson Lab. Specific applications are referenced in other goals, including small business reporting, online travel expense reporting, and Notable Event reporting for ESH&Q. In addition for FY17, the group provided development or deployment of 10 major applications, including applications targeted towards supporting Technology Transfer, Engineering and Physics.

**8.3** JSA’s maintained an efficient and effective Physical Security Program for protection of sensitive nuclear material, classified material, classified and sensitive information, and government property. Significant accomplishments are noted:

- JSA increased the effectiveness of the site surveillance system by replacing the obsolete Video System, tripling the camera resolution, and allowing Lab security to control and limit down time to the program required 24-hours for 37 active cameras.
- Security planning and training through preparation of a Nuclear Materials Management Plan and Active Threat-Bomb detection training with FBI, Homeland Security, and regional police departments continued during this performance period.
- JSA upgraded all JLab portable hand-held radios with encryption and 911 alerting capabilities to the Newport News police department, fire department, and regional HAZMAT response. Improved emergency response communications equipment and hands-on training enables emergency responders to more effectively avoid road hazards and to position vehicles and people in a tactical manner.
- Foreign Ownership Control and Influence (FOCI) documentation was completed for JSA, SURA, and PAE. Separate facility clearance documents were issued for Thomas Jefferson National Accelerator Facility, JSA, and its owners.

**NOTABLE OUTCOME STATUS:** None set for Goal 8: