



University of Nevada, Reno

Nevada Center for Applied Research (NCAR)

Bioscience Entrepreneurial Laboratory

High Performance Computing Facility

Evolutionary Computing System Lab

Mick Hitchcock Nevada Proteomics Center

Intelligent Mobility

Nevada Terawatt Facility

Quarterly Progress Report

Reporting Period: October 1st to December 31st, 2016

January 2016

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Project Purpose

The Nevada Center for Applied Research is a stand-alone, fully-functional applied research and development technology center that serves to enhance the global competitiveness of Nevada industry by leveraging the physical and intellectual assets of the University of Nevada, Reno.

NCAR's mission is to create a professional, flexible, sustainable, market-responsive technology innovation center that serves to stimulate regional innovation-based economic development by aligning the needs of industry, startup companies, researchers and entrepreneurs with resources at University of Nevada, Reno. This is achieved by providing industries with a central and public access point to utilize the broad range of technical services, intellectual capital, testing and research capabilities, advanced tools and methodologies available at NCAR's Shared Research Facilities that otherwise would be cost-prohibitive for startups and not cost-effective for established companies. As a one-stop shop for applied research, NCAR mission is to help industries:

- Establish a collaborative relationship with academia promoting open innovation research programs and scientific studies to address real-world problems.
- Facilitate access to cutting-edge Shared Research Laboratories and sophisticated instrumentation and equipment.
- Build an interdisciplinary team of faculty, scientists, postdoctoral students and grad students to work on ongoing projects, stand-alone one-off projects, or new-complex developments.
- Provide access to an entrepreneurs' support network that includes incubation and business mentoring from experienced entrepreneurs and executives.
- Provide reduced cost co-working space available to the University community and local startups.

NCAR's specific goals are to foster industry growth and new jobs creation; strengthen existing companies in advanced manufacturing and other key sectors and support the creation of industry clusters that leverage the competitive advantages of Nevada.

NCAR is closely aligned with strategic university programs that are designed to provide value to industry. Some of these programs include: The Autonomous Car program, The Terawatt Facility, Material and Chemical Characterization Equipment, BioSciences Entrepreneurial Laboratory, High Performance Computing Facility, and The Nevada Advanced Autonomous System Innovation Center.

In an attempt to bridge the industrial community and the University, NCAR utilizes space both on campus (Research Centers, Cores and Applied Research Facility) and in the new state-of-the-art University of Nevada, Reno Innevation Center Powered by Switch in MidTown, close to the entrepreneurial epicenter of Reno.



Section I: Proposal Progress

During this reporting quarter, the Nevada Center for Applied Research (NCAR) has made progress toward meeting proposed metrics. Major accomplishments for the current reporting period include:

1. Accomplishment

Accomplishment 1 - NCAR Management

We have completed all tasks and procedures scheduled for 2016 to have NCAR's operation managed efficiently. We are now defining the financial approach to create a sustainable model for the center:

- During 2016, NCAR has executed 20 fee-for-service agreements with local, regional and out-of-state companies using UNR facilities, equipment and personnel (faculty members and students) totaling \$117,123 already paid and \$37,650 in outstanding invoices (work in progress). These fee for service activities are based on a previous memorandum created to characterize these services and associated F&A rates and do not include office and lab space revenues. In addition, we are under discussion with several companies regarding fee-for service, fee-for use of facilities and the possibility to operate in the Applied Research Facility and the Biosciences Entrepreneurial Lab (BEL).
- The implemented internal financial system to invoice industry partners and NSHE researchers is working as scheduled and we can generate invoices that accept credit card payments.
- Through internal discussions with UNR researchers and Shared Research Facilities/Core Labs personnel, we are now creating virtual industry friendly programs. These programs are based on a combination faculty expertise and existing equipment that are not necessarily located in one particular physical location. This approach, along with the creation of promotional material will be part of a new effort to attract industry to UNR resources.
- Our initial efforts meeting with faculty leads and professors to create "interdisciplinary clusters" of intellectual services (consulting groups) continue. However, no significant progress can be reported for this period. We will continue this approach that can provide specialized services to industries in the region.

Accomplishment 2 - NCAR Management - Bioscience Entrepreneurial Lab

The Biosciences Entrepreneurial Laboratory (BEL) is fully operational. It has generated since May 2016, revenues in the amount of \$10,800 through fee for use of facility agreements. BEL is currently in use by one spin-out company from UNR and one established company from Minden, NV that is also renting office space at the Applied Research Facility (ARF) and using fee-for-services through NCAR.

During this period, we signed agreements with a company formed by a Bay Area group in California. This group incorporated a new company (Bioelectronica, Inc.) in Nevada and signed a 2-year contract to run a Research & Development operation that include use of the BEL and an office space in ARF. The company also hired 1 part- and 1 full-time employees for the initial operation and is planning to hire more in the near future.

Discussions are also in place with a local entrepreneurial group that is interested in using both, BEL and office space in ARF to run their biotech businesses, and with a company from Illinois

that is moving their R&D operations in Reno (scheduled for March 1st 2017) and started hiring the first researchers (NCAR is helping in the hiring process). In addition, a local company, Nevada Nanotechnology is in the process of renting a lab space (a BEL extension) for a period of 4-6 month to use a system that will be dedicated to one of their R&D program. The additional lab space was already approved by the Office of the Vice President for Research and Innovation (VPRI)

Due to the high demand for the use of BEL and additional UNR resources and the fact that BEL is at full capacity, NCAR made a request to the office of VPRI for additional lab space within ARF and to discuss the necessary funding to expand the BEL operations with 700 to 1200sq. ft. of additional lab space. It is expected that additional space(s) will be occupied by industry and in full capacity within 12 months after coming on-line.

Accomplishment 3 - NCAR Management – Laboratory Information Management System (LIMS) implementation

The iLab system continue to operate in the Mick Hitchcock, Ph.D. Nevada Proteomic Center but the Innevation Center Powered by Switch may be moving to a different system more suitable to their activities. The Office of Animal Resources (former Lab Animal Services) is currently completing the iLab implementation and it is expected to be fully functional during Q1 2017. Also, we have scheduled for Q1 2017 the implementation of the iLab system in 1 INBRE-Bioinformatics and 3 COBRE Cores. These four additional cores were solely funded with an awarded administrative grant obtained in collaboration between NCAR and IDeA Network of Biomedical Research Excellence (INBRE); these cores will be sustainable for a period of 3 to 4 years.

Accomplishment 4 – High Performance Computing Facility (HPC) Facility

A survey of High Performance Computing (HPC) was completed among UNR researchers. Using the results of the survey and collaborating with a group of researchers, specifications for a HPC system were developed. A senior HPC engineer was hired to work on the project. Discussions with major vendors and with other institutions with HPC systems at the Super Computing 2016 conference also informed the development of the specifications. A Request for Proposals was released in December, 2016.

With the initial \$500 from the Knowledge Fund, additional funds were received in different categories: UNR/Research & Innovation \$400,000; UNR/IT \$200,000; Faculty Members \$200,000 and Mick Hitchcock – Philanthropy \$200,000, making a total of \$1,500,000 to setup the HPC facility. Additional funds also expected from faculty members in the form of grants, contracts, and start up packages.

Discussions are on-going with Switch Supernap to install the new UNR HPC system at the Switch facilities in Northern Nevada. Those facilities are now in operation.

Oversight on governance and the HPC business plan is under a newly formed UNR Cyber-Infrastructure Committee composed of a cross-section of researchers and technical experts

from UNR. Discussions have started with DRI and UNLV to collaborate on access to and use of all HPC resources.

Accomplishment 5 – Evolutionary Computing System Lab (ECSL) (Dr. Siming Liu, Professor Sushil Luis)

Major accomplishments for the current reporting period include:

- a) Won five courses teaching position in the next calendar year with the grant amount $\$7934 * 5 = \$39,670$.
 - CS105 Introduction of Computing in Spring 2017, Summer 2017, and Fall 2017.
 - CPE201 Digital Design in Spring 2017 and Fall 2017.
- b) Continuing working on the Traffic Signal Optimization project with Dr. Tian.
 - Implemented 12 new features. This will be one of the projects to be included in the Intelligent Mobility Initiative.

Accomplishment 6 – The Mick Hitchcock Nevada Proteomic Center (NPC) (Dr. David Quilici)

The NPC has implemented the iLABS core facility management software. This software allows for sample submission, tracking, as well as, billing and invoicing. NCAR installed iLabs in NPC as an effort to relieve an under staffed core of timely administrative tasks. NPC was the first core to go live with the software.

NPC provided proteomic services to 22 NSHE researchers and an additional 5 researchers from other academic institutions during the 2016 fiscal year.

The center continues to offer data analysis workshops and has also assisted the University of California, Davis proteomic center in a hands-on proteomic workshop.

NPC is currently working closely with Thermo Scientific in the implementation of a new targeted proteomic approach.

Dr. Quilici was the Key Note speaker at the Thermo Scientific Bay area users meeting September 2016.

Accomplishment 7 – Intelligent Mobility (Autonomous Car Project) - (Professors Kostas Alexis, Richard Kelley and Raul Rojas)

NCAR in collaboration with GOED has developed strategic partnerships to move forward in the implementation the Intelligent Mobility Initiative (A Use-Centered, Open-Innovation Living Lab Ecosystem for Automated- and Connected- Vehicles in Western Nevada). For this, an official coalition of stakeholders in Northern Nevada has been created, including the University of Nevada, Reno, the Regional Transportation Commission (RTC), Fraunhofer IVI, NV Department of Motor Vehicles, City of Reno, City of Sparks, Carson City and Proterra, Inc. Also, private sector organizations are discussing with NCAR partnering opportunities to create a “Living Lab” test bed in the Reno-Sparks community to test and refine synchronized sustainable mobility technologies. Due to the increased activities in this initiative, a full-time Technical Coordinator was hired in December, main role for this Technical Coordinator is to help with the Intelligent Mobility Initiative and some additional NCAR activities.

The proposal with Ford Motors Research and Innovation (in Palo Alto, CA) for a collaborative research and development still under, company expressed interest but is not formalizing the proposal.

The Center for Advanced Transportation Education and Research (CATER) at UNR will develop a V2I testing environment, and to set the two-way data communication between vehicles and infrastructures. The testing environment is with DSRC (Dedicated Short Range Communications) connected-vehicle communication devices. It will connect to traffic signal controllers for real-time traffic signal broadcasting and vehicle data collection. The testing environment will promote interdisciplinary research on connected/autonomous vehicles with the objective of improving traffic safety and mobility. CATER has completed the purchase of DSRC devices from LLEAR Corporation, and received these devices in November. Additional equipment will be shipped to UNR CATER during Q1 2017. The DSRC devices, including road-side units, on-board units and units for pedestrians/bicyclists, have been tested for communication functions. CATER has prepared traffic signal controllers at their lab for connection to the DSRC devices. The CATER team is working on the communication between the controller and the DSRC devices.

Additional accomplishments include the successful deployment of robotic technologies in relation with autonomous navigation, exploration and mapping. In particular, our team has demonstrated:

- The autonomous exploration and consistent mapping in degraded visual environments using aerial (full autonomy) and ground (partial autonomy) robots
- A multi-modal localization and mapping system (developed in-house) that fuses the data from multiple cameras (currently 2, designed to support up to 6), a LiDAR, inertial sensors, a thermal camera and GPS.
- The verification of the capability of the aforementioned system to provide GPS-denied localization for aerial robots navigating in challenging environments (darkness, reflective) and car vehicles navigating within the city of Reno at three different time slots (12pm, 5pm, 10pm)
- 4 papers were accepted in top conferences and Journals (including the Journal of Field Robotics, third largest impact factor in the field) and one workshop have been accepted within this period.

Also, in the previous quarter, there were a number of advances relevant to machine learning for intelligent mobility, falling into three major groups:

- RGB-Lidar Registration for Supervised Learning Data Collection. We have successfully calibrated a Point Grey camera and a Velodyne lidar, to obtain colored point clouds for an image of the camera-lidar rig). We will use this to collect data for training computer vision systems based on machine learning.
- Real-time tracking of pedestrians, vehicles, and traffic lights. We have adapted open source code using a deep neural network for object detection to handle the detection of pedestrians, street lights, and cars for daily driving tasks, demonstrating the operation of this network in the Reno area.
- HPC Infrastructure for Machine Learning. We have purchased two GPU “expander” boxes from Carson City-based Cubix. These will accelerate the training of our neural network models to support intelligent mobility.

Accomplishment 8 – Nevada Terawatt Facility (Dr. Aaron Covington)

NTF/NSTec Laser Plasma Diagnostics Development for the Dense Plasma Focus. Efforts continued to focus on laser and optical equipment acquisition and testing of optical diagnostic systems. During the reporting quarter, significant progress has been made toward meeting proposed metrics. Major accomplishments for the current reporting period include:

The Postdoctoral research fellow (Dr. Austin Anderson) continued working full time on this project. Dr. Anderson helped field higher resolution laser diagnostics similar to those that will be used at DPF on NTF campaigns during July-September, 2016. These experiments showed the operational feasibility of these laser diagnostic systems. A Mach-Zender interferometer was used to capture pinch images in conditions similar to those expected in DPF experiments. Data obtained from these measurements was analyzed and will be used to determine critical parameters such as the plume implosion velocity and density profile.

More work also continued on the automated data analysis program that is being developed to help expedite the analysis of laser diagnostic images at NTF and DPF.

Dr. Ivanov has completed the design of all optical systems that will be used at the DPF. He has also worked closely with technical staff members at NSTec to ensure that the laser system is installed with proper infrastructure and safety systems. Drs. Ivanov and Covington have also worked with NSTec engineers to develop new viewports into the DPF that will allow for lasers and other probing optical diagnostics to be used in a much wider variety of experiments. We have also started writing a paper to describe the recent experiments performed at NTF.

The laser system has been delivered to the NSTec NLV site and preliminary tests of the system have been completed.

NTF Development of Spectroscopic Plasma Diagnostics for Measurement of Electromagnetic Fields. Mr. Eric Dutra fielded a two-week duration Zebra Z-pinch campaign for this project in Oct-Nov, 2016. This experimental campaign was fielded in collaboration with Drs. Radu Presura (NSTec-Sandia), Aaron Covington, Tim Darling, Piotr Wiewior and Austin Anderson. Eric's fellow graduate students Alex Angermeier and Jeremy Iratcabal also participated. Multi-axis spectroscopic data was collected from Al and Cu wire arrays. Elements were studied including aluminum and copper as well as deuterium that can be found in Dense Plasma Focus experiments in Las Vegas. The spectroscopic were analyzed for these experiments and next generation experiments are being planned for the Spring 2017 campaign cycle.

Computational efforts continued to be carried out in support of experiments and spectroscopic data collected analyzed. Plasma codes were used to help determine the contributions of various physical processes to the observed spectroscopy. Drs. Mancini and Darling helped with modeling efforts, Mr. Dutra also worked with Dr. Hafiz Rahman (MIFTI) to develop a more accurate Magneto Hydrodynamic (MHD) model of pinched wire arrays. These models will help us to more accurately interpret experimental results and guide future experiments at NTF and the DPF.

A journal article based on this work has been revised was published in SPIE proceedings and this work was reported in a contributed poster at the APS DPF meeting in San Jose in November.

Title: "Development of a spectroscopic technique for simultaneous magnetic field, electron density, and temperature measurements in ICF-relevant plasmas"

Authors: Eric Dutra¹, Jeffrey Koch¹, Aaron Covington², Radu Presura¹, Roberto Mancini², Timothy Darling², William Angermeier², and Showera Haque².

Author Affiliations: 1) National Securities Technologies, LLC; 2) Physics Department and Nevada Terawatt Facility, UNR.

Eric’s internal Site Directed Laboratory Development (SDRD) proposal was reviewed positively and given funding for another year. Eric also authored a report of all efforts during the past year for the NSTec SDRD committee.

The local team has continued development on new hybrid codes need to analyze data collected in experiments.

2. Other Proposal Development

In an effort to increase multi-disciplinary activities and collaboration with faculty members and start-ups/spin-outs and other companies, NCAR has been supporting/developing different grant applications. The table below shows a list of some of these activities. Grants below were already reported last quarter.

Grants Applications Supported/Developed by NCAR

Category	Collaboration With	Awarding Entity	Awarded Amount
Health Science	UNR/NCAR	Strategic Progress, LLC	\$50,000
Cybersecurity	Political Science / Innovative research Analysis	Office of Homeland Security	\$100,000
Administrative/Biosciences	IDeA Network of Biomedical Research Excellence (INBRE)	National Institute of General Medical Sciences	\$300,000
Bioscience	DxDiscovery	US Department of Defense	\$500,000
Bioscience	DxDiscovery	National Institute of Health	\$1,000,000
Public Transportation Safety	Regional Transportation Commission	Federal Transit Administration	\$2,000,000 (*)

(*) Proposal under development – not awarded



3. Additional Accomplishments

N/A for this reporting period.

4. Commercialization and Partnering Activities

UNR CATER has been discussing with the Nevada Department of Transportation (NDOT) for collaboration opportunities on traffic operation and safety with the V2I testing system.

We are in contact with a company in Sweden for the potential collaboration in a project related with mine inspection. Their interest is related with our localization and mapping process.

Proterra, Inc. will work with our researchers in developments related to the Intelligent Mobility initiative.

We are completing agreements for HIL Applied Medical to open their North America Operation. HIL's R&D operation will be in UNR, in collaboration with UNR researchers, using UNR equipment.

5. Programmatic and Project Changes

Evolutionary Computing System Lab. CS105 Introduction to Computing teaching in the fall semester 2016 is completed. CPE201 Digital Design in the fall semester 2016 is completed.

Nevada Terawatt facility. NTF/NSTec Laser Plasma Diagnostics Development for the Dense Plasma Focus. The installation of the laser at the DPF is still on hold until all DOE laser safety requirements have been met. Hence, experimental operation of the laser on the DPF floor has been delayed until June 2017.

6. Looking Forward

NCAR Management. During Q1-2017, NCAR will continue working on its basic infrastructures. The BEL and spaces at the Applied Research Facility are at full capacity with Biotech companies of different types and from different regions in the USA.

The Nevada Cyber Statewide Capacity and Needs Assessment Plan is undergoing.

Bioscience Entrepreneurial Lab. Without any type of advertisement, BEL was very successful and in 8 months we have reached full capacity with 1 startup company, 1 UNR spin-out company, 1 company from Nevada expanding its operation, and 1 company from the Bay Area in California moving operations to Reno. Due to the number of inquiries from different groups, we are looking for additional space and funding to expand the BEL infrastructure.

Laboratory Information Management System. The implementation of the Lab Animal Medicine core is on-going and we have scheduled for Q1 2017 the implementation of the INBRE-Bioinformatic core and the three COBRE cores into the iLab system.

High Performance Computing Facility. Award of the successful bid to the RFP is expected in early spring of 2017 with installation of the system to follow. Completion of a partnership agreement with the Supernap should be in place in the first quarter of 2017. Governance and resulting procedures and a multi year sustainable business plan should be in place by the end of the first quarter. An additional staff member to act as a facilitator between those needing HPC resources and HPC operations will be hired to complete the needed support staff.

Evolutionary Computing System Lab. Goals are to a) continuing working on the Traffic Signal Optimization project. Dr. Tian still has a strong need on the research and development of the optimization platform; b) continuing teaching 5 courses at UNR for the next calendar year; c) Continuing working on the research of co-evolving micro behaviors for RTS games. Starting a new research project on building a Simulation Training and Control System for Bridge Inspection with Dr. Sushil Louis and Dr. Hung La.

The Mick Hitchcok Nevada Proteomic Center. Will continue to provide cutting edge mass spectral approaches for proteomic researcher within NSHE. The education through workshops and seminars of our researchers on proteomic approaches is a primary focus of the NPC. This education will not only generate more clientele for the center but it will enhance the proteomic research of the principal investigator making the center more competitive in garnering research funding. The center will continue to pursue funding opportunities through both private donors and government agencies to provide NSHE proteomic researchers cutting-edge instrumentation; and will continue collaborating with NCAR to create Industry programs that will increase the revenue for the center through fee-for-service agreements. Dr. Quilici has been asked to speak at the annual Association of Biomolecular Resource Facilities (ABRF) meeting in March 2017, which will bring further exposure of the center and the cutting-edge equipment and services.

Intelligent Mobility (Autonomous Car Program). NCAR will continue the development and implementation of the Intelligent Mobility Initiative and promoting the Living Lab program. Regular teleconferences continue between UNR/NCAR and Faunhofer IVI to coordinate developments in Reno/Sparks and Dresden, Germany. NCAR will also reach out to new companies that can benefit from testing in our Living Labs with the goal of including them as partners/stakeholders in the program.

UNR CATER will realize the real-time two-way data connection between the controllers equipped with DSRC roadside units and testing drivers/pedestrians with onboard/portable DSRC devices. UNR CATER will develop smartphone/tablet applications to bring real-time traffic signal data to help safer movement of drivers and pedestrians. The real-time information from vehicles and pedestrians will be used to improve traffic operation.

The team is highly motivated to succeed into delivering the following basic milestones:

- Demonstrate the autonomous navigation of a car in real-life traffic conditions and in degraded visual environments
- Prior to that, demonstrate the ability of multi-modal vehicle and pedestrian detection as well as intent recognition
- Demonstrate the autonomous planning under localization and mapping uncertainty – as is always the case for robotic systems employing necessarily noisy sensors or inferring over partially observable processes. We plan to demonstrate this ability with aerial and ground robots operating in confined spaces

- Augment the multi-modal perception unit so as to support and fuse RADAR detections as well hyperspectral data.

NCAR at UNR will continue to provide industry and citizens with a central access point to participate in the Living Lab activities.

Nevada Terawatt facility. NTF/NSTec Laser Plasma Diagnostics Development for the Dense Plasma Focus. The next set of Laser Diagnostic experiments will take place at NTF in mid-February. These diagnostics will be used to study the evolution of plasma instabilities and turbulence at conditions anticipated at the DPF.

NSTec has issued task orders for the design, construction and installation of the laser system. We have also issued five new task orders with NSTec to work on other projects.

No patents were applied for this cycle on this project. It is anticipated that unpublished and newly developed portions of the laser diagnostics system will be patented in Year 2.

Nevada Terawatt Facility. Development of Spectroscopic Plasma Diagnostics for Measurement of Electromagnetic Fields. The next series of experiments are scheduled for November 2016 and will focus on the optical detection of fusion by-products.

Section II: Performance

1. Progress toward Metrics

Standard Knowledge Fund Metrics	Previous	Current	Target
	1/1/16 - 9/30/16	10/1/16 - 12/31/16	By 03/31/17
Companies relocating to Nevada	0	1	4
Startup companies	0	1	1
Jobs created	0	3.5	3
Intellectual Property Licenses/Options Executed	0	0	0
Intellectual Property Revenue	\$0	\$0	\$0
Grants Received	\$109,163	\$864,447	\$30,470
Sponsored Research	27	13	14
Patents	0	0	0
Students placed with Companies	0	0	2
Impact Faculty Hired	1	2	1
Gifts/Donations to KF Projects	\$0	\$200,000	\$0
Student Internships	0	0	3



2. Project Scorecard Narrative

1. Companies Relocating to Nevada

NCAR. Bioelectronica, Inc. A biotech company already moved to ARF/BEL and is currently in operation.

NCAR. LF Research, a company from Illinois is schedule to sign the agreement and start operations in Reno (at UNR School of Engineering) during Q1.

NCAR. Phigenics, LLC, a company from Illinois is schedule to sign the agreement and start operations in Reno (ARF/BEL) in March 1st 2017.

Intelligent Mobility (Autonomous Car). Once the project is fully implemented and Dr. Rojas is back in Reno, we will negotiate with Autonomous GmbH to open an office in Reno.

2. Start-up Companies

NCAR. Novo Veritas Immunotechnologies has incorporated in Nevada and this local group of researchers is actively seeking funds to start operations in ARF/BEL.

3. Jobs Created

High Performance Computing Facility. One HPCF Engineering position (IT) and One HPC Application Specialist (Research and Innovation).

NCAR. EscaZyme: 1new employee; Bioelectronica, Inc: 1.5 new employees.

4. Intellectual Property Licenses/Options Executed - Nothing to report at this time.

5. Intellectual Property Revenue – Nothing to report at this time.

6. Grants Received

High Performance Computing Facility

University of Nevada, Reno – Research & Innovation: \$400,000

University of Nevada, Reno – IT: \$200,000

Faculty members: \$200,000

Evolutionary Computing Systems Lab. a) coevolving Micro Behaves for RTS Games, Dr. Sushil Louis, Amount: \$4,398.41; b) traffic Optimization, Dr. Zong Tian, Amount: \$37,196.68; c) teaching CS219 in the CS department at UNR in Spring 2016, Amount: \$7,935.00; d) teaching CS105 in the CS department at UNR in Fall 2016 and Spring 2017, Amount: \$15,870.00; e) teaching CPE201 in the CS department at UNR in Fall 2016 and Spring 2017, Amount: \$15,870.00; f) simulation Training and Control System for Bridge Inspection, Amount: \$37,320

Proteomics Center. Federal and State funding in the amount of \$11,257 was used at the Nevada Proteomic center by NSHE researchers.

7. Sponsored Research

Evolutionary Computing Systems Lab. a) coevolving Micro Behaves for RTS Games, Dr. Sushil Louis; b) traffic Optimization, Dr. Zong Tian; simulation Training and Control System, Dr. Sushil Louis and Dr. Hung La.

Nevada Terawatt Facility. NSTec has issued another task order to cover this experiment at NTF. Another six task orders have been issued for other projects (1-continuing and 5-new).

Proteomics Center. Eleven NSHE researchers and one commercial lab utilized \$11,257 sponsored project dollars for Q4 at the center.

8. Patents

Nevada Terawatt Facility. During the course of this research program- we have developed a new technique to activate medical isotopes used in positron tomography emission (PET) scans. We are applying for provisional patents for these potentially transformative technologies.

9. Students placed with Companies

Nevada Terawatt Facility. NTF/NSTec Laser Plasma Diagnostics Development for the Dense Plasma Focus. One NTF graduate (PhD) student and one post doc have had full interviews with NSTec during the reporting period and both have been extended job offers as Senior Scientists with the company.

Nevada Terawatt Facility. Development of Spectroscopic Plasma Diagnostics for Measurement of Electromagnetic Fields. One NTF graduate (PhD) student and one post doc have had full interviews with NSTec during the reporting period. One was extended job offer and one is pending as Senior Scientists with the company. Other NTF graduate students are in the process of setting up site visits for interviews with the company.

10. Faculty Hired

Evolutionary Computing Systems Lab. Research Assistant Professor: Dr. Siming Liu

Autonomous Car. Technical Coordinator (Research Faculty) for NCAR/Intelligent Mobility.

Nevada Terawatt Facility. Research Professor (.25 FTE- Year 1), Postdoctoral Research Scholar (0.5 FTE). Note: The Physics Departments is currently creating a long-term plan as part of our external academic accreditation/review process. This document includes requests for hiring several new impact faculty members that will leverage off of NTF/NSTec capabilities.

11. Gifts/Donations to KF Projects

High Performance Computing Facility. Mick Hitchcock donated \$200,000.

Nevada Terawatt Facility. NSTec has purchased a new state-of-the-art laser system for the project and will also be providing laser tables and other support equipment at the N. Las Vegas site. NSTec has given NTF students and researchers access to state-of-the-art plasma diagnostics systems during the reporting period. These diagnostics include two white light streak cameras and a 16 channel digital framing camera.

12. Student Internships

Autonomous Car. Three student's interns are in the process of being hired for the living lab project. An additional intern might be hired if the project with Ford Motors Research and Innovation is accepted.

Nevada Terawatt Facility. Two more UNR Physics undergraduate students are planning on spending the summer working at NSTec Livermore Operations. In addition, NSTec has made their facilities available to our graduate students who have used these to calibrate equipment needed for experiments at NTF. We also have students travelling to Livermore to use NSTec's advanced/additive manufacturing facilities to fabricate custom x-ray bolometers and other diagnostics.

Section III: Budget

NCAR: KNOWLEDGE FUND SUMMARY ROLLUP - PROJECT: Expenditures			
For Reporting Period - July 1 – September 30, 2016			
	Estimate (Year 1)	Expenditures Inception to Date Jul 1, 2015 – Dec 31, 2016	Expenditures Current Period Oct 1 - Dec 31, 2016
Total Salary & Benefits	\$1,307,506	\$601,559	\$140,361
Equipment	\$901,068	\$146,727	\$18,585
Travel	\$23,023	\$16,299	\$5,770
Other Direct Costs	\$862,601	\$70,327	\$12,216
Graduate Tuition	\$14,302	\$6,846	\$-
Total	\$3,108,500	\$841,758	\$176,933

NCAR: KNOWLEDGE FUND SUMMARY ROLLUP - PROJECT: Funds		
For Reporting Period - July 1 – September 30, 2016		
	Estimate (Year 1)	Funds Inception to Date Jul 1, 2015 - Jun 30, 2016
Grants / Contracts (*)	\$0.00	\$330,957
Gifts(**)	\$0.00	\$1,575,000
Cont. ED/ Outreach	\$ -	\$ -
Other Contributions (***)	\$ -	\$3,150,000
Knowledge Fund	\$3,108,500	\$502,484
Total	\$ 3,108,500	\$5,056,477

(*)	(**)	(***)
NCAR Agreements \$117,123	Mick Hitchcock (HPCF) \$200,000	NTF \$400,000
BEL \$10,800		Grants (please see table in page 7) \$1,950,000
Proteomics \$64,157		UNR/VPRI (for HPCF) \$800,000
ECSL \$138,877		
Total \$330,957	\$200,000	\$3,150,000

