University of Nevada, Reno

Nevada Center for Applied Research (NCAR)

A best-in-class, stand-alone, fully functional, applied research and development technology center that serves to enhance the global competitiveness of the Nevada industry, by leveraging the physical and intellectual assets of the University of Nevada, Reno (UNR).

"Matching Industry Needs with Academic Goals…"

Annual Progress Report

Reporting Period: May 1ST 2022 to September 30TH 2022

September 2022

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Section I: Project Purpose

VISION

The Nevada Center for Applied Research (NCAR) will be a best-in-class, 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 (UNR).

OVERARCHING MISSION

Expand and improve the already established, 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.

NCAR will continue to be 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. As a one-stop shop for applied research, NCAR's mission is to help industries:

- Establish collaborative relationships between industry and academia that promote open innovation research programs and scientific studies to address real-world problems.
- Facilitate industry access to cutting-edge, shared research laboratories and sophisticated instrumentation and equipment.
- Build an interdisciplinary team of faculty, scientists, postdoctoral students, and graduate students to work on ongoing or 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.

Along with the already existing UNR infrastructure (Shared Research Facilities and Core Lab), NCAR has leveraged new initiatives and associated infrastructure created between 2016-2022 that were designed to provide value to industry and to be closely aligned with strategic university programs.

GOALS

To enhance the development of programs that provide industry with a broad range of technical services, intellectual capital, testing and research capabilities, advanced tools and methodologies in Science and Engineering; helping to nurture the economic development of the State of Nevada.

Main foci are i) Robotics, ii) Life Sciences, and iii) Advanced Manufacturing, including the breadth of relevant fields and the convergence with other disciplines. The High-Performance Computing Facility (HPC) project initiated during 2016, will be used as a supporting infrastructure for all programs. NCAR will also provide fee-for-service access to the HPC for companies in need of this system. In addition, NCAR will continue to offer fast and effective access to more than 40 Shared Research Facilities and Core Labs to support these programs.

Section II: 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:

Section II. A) NCAR MANAGEMENT: Create a Stand-Alone, Research and Development Technology Center to Enhance the Global Competitiveness of Nevada Industry.

Accomplishments

NCAR continues experiencing a positive trend of services and activities during this reporting period, which has created a significant increase in the entrepreneurial, scientific, financial, and administrative activities of the center.

After completing all interlocal and Federal Aviation Administration (FAA) agreements, Nevada Autonomous is now fully operational under NCAR. Nevada Autonomous, is the new State of Nevada Test Site Operator for the FAA. Nevada Autonomous took these operations from the Nevada Institute for Autonomous Systems (NIAS), which is no longer in operations.

The shared sterilization room at the Applied Research Facilities (ARF) is fully operational now. We have also improved several other labs in ARF, which has made the building on campus a very active hub and central location for companies, entrepreneurs, faculty, and students to develop applied research with major focus on (but not limited to) life sciences and robotics.

NCAR has allocated $100K of its own revenue for a university-wide Request for Proposal for the repair of research equipment. The goal of this funding proposal is to enhance the research infrastructure at UNR and support basic and applied research, innovative efforts, and corporate-sponsored research.

In collaboration with agencies and industry partners, the development and submission of grants continues to be an integral part of NCAR operations. Relationships with UNR faculty, Shared Research Facilities and Core Labs is fluid. NCAR continuously nurtures these activities as they are one of the core components of the center, helping promote UNR resources for industry and entrepreneurs.

As a result of a collaborative agreement that was signed in October 2021 between UNR (through NCAR) and the Province of Misiones, Argentina (through Silicon Misiones), one of our affiliated companies, Macoma Environmental Technologies, LLC (a Nevada-based company), became the first photocatalytic industry to participate in this mutual exchange and the first NCAR company to operate internationally, in Argentina. Consequently, Macoma is now an international company. Besides its affiliation to NCAR, Macoma is also a member of the United Nations Environmental Program (UNEP), the Global Alliance for Buildings and Constructions (Global ABC), and the US Green Building Council.

Highlights of NCAR Accomplishments *During this Reporting Period*

Number of Companies Receiving Services	48
Number of Companies Using Facilities	36
Number of New Affiliated Companies Onboarded	5
Number of Jobs Created by Onboarded Companies	23
Invoice for Service and Facility Use Agreements	$354,241
Grants Awarded	$2,484,393
VC/Investments Received by Affiliated Companies	$61,816,157

Current summary of the Knowledge Fund investment can be found on Page 25, Section V: Knowledge Fund Investment - Summary

Commercialization and Partnering Activities

NCAR currently has 27 affiliated companies working on campus and more than 48 companies and entities that have performed one or more types of fee-for-service or facility use agreements with UNR labs, faculty members and students.

Programmatic and Project Changes

Since last reporting period, the NCAR Director is also working as the Executive Director, Corporate Partnerships for UNR. To that end, we developed a strategy to foster high-level partnerships with large industry with the objective of bringing financial, technological, and intellectual resources to UNR and contribute to the growth of research and innovation. Although this is an activity that NCAR has been performing since inception, with transactional activities with corporate partners, now we will also be seeking large and longer-term, corporate-sponsored research and development activities. To support these activities, we have developed a university-wide framework that was presented at the 2022 University Industry Innovation Network and was awarded a runner-up outstanding supporting mechanism, competing with several universities around the world.

Looking Forward

The successful trend for the center is now being expanded as a university-wide operation that is now focusing on larger and longer-term corporate-sponsored research and the sustainment of the current programs and initiatives that brings intellectual and economic growth to the state of Nevada.

Section II. B) ROBOTICS: Create a state-wide "Institute of Service Science and Engineering"

Accomplishments

With the help of our key partners, the Regional Transportation Commission of Washoe County (RTC Washoe) and the City of Reno, the Intelligent Mobility (IM) initiative has completed the instrumentation of the Living Lab in the Virginia Street corridor in Reno. The focus of the project now is the communication infrastructure, data management and the Artificial Intelligent--based traffic applications.

The Digital Twins project, in collaboration with RTC Washoe and the Federal Transit Administration (FTA), is about 95% completed and we are moving into the final testing phase to demonstrate that the system will be beneficial to RTC Washoe, maintaining a digital twins of transit infrastructure with the objective of improving efficiency and reducing maintenance costs. The Digital Twins project was successfully presented to the FTA and, after the pilot program is completed, RTC Washoe is considering implementing the system on several electric buses from its fleet. The instrumentation of each bus with 3D laser scanners (lidar), GPS, and cameras, will allow RTC Washoe to cost-effectively monitor and improve facilities maintenance for the transit infrastructure in large areas of the city.

The development of Living Laboratories in Northern Nevada for real-life, urban testbeds for autonomous and connected vehicles and intelligent traffic control system offer real potentials for economic development, as this is attracting companies and agencies to the region.

Mass Transit Autonomous System Data

The NCAR IM team has been working with the City of Reno and RTC Washoe to develop a centralized data collection system for public transit and infrastructure systems. The cutting-edge research in this area has triggered the creation of a UNR-spinout company called LiDAR Matrix, Inc., which will provide services to transit agencies applying LiDAR (Laser-Light Detection and Ranging) data and patented AI-technologies. LiDAR Matrix. Inc. has four-related, pending patents that were submitted through UNR. The company is working on a new patent and also setting up software usage agreements with UNR.

Autonomous Vehicle Program

The IM team has been engaged in several research projects developing advanced technologies to improve autonomous vehicles. Our fully-instrumented, autonomous vehicle is currently "mapping" different areas of the city of Reno and the Lake Tahoe region to enhance our database.

After extensive communications with Khalifa University, researchers in Abu Dhabi, UAE, we are starting a collaboration based on Autonomous Vehicle data collection, annotation, and dissemination, and will be expanding to more projects in the future. As autonomous vehicles should handle all weather conditions and road topologies, our goal is to start the creation of richer and more diverse datasets collected from various regions and under different environmental conditions. Essentially, we would

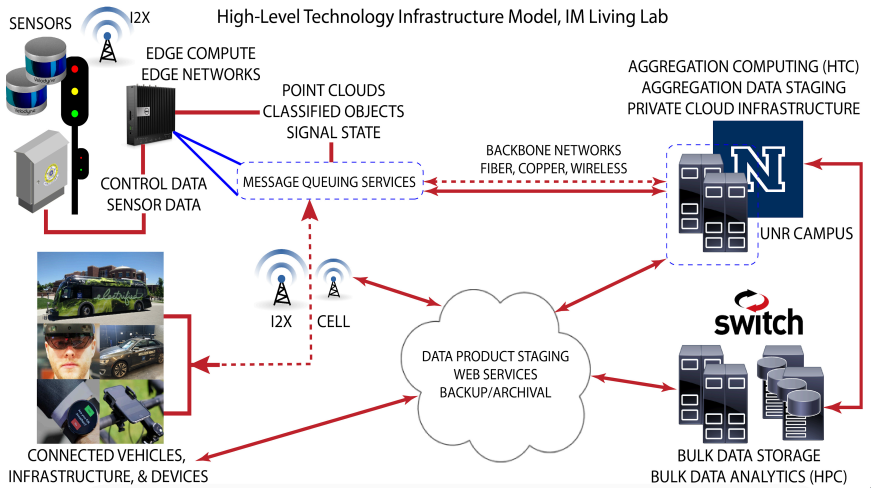
like to follow the same standard in dataset and annotation formats, sensor setup, and distribute datasets in a standardized web portal.

Connected Infrastructure

As stated in this section, all Living Lab sensors in Reno and Henderson are installed and the infrastructure is completed. We toured some of the intersections in Reno with RTC Washoe engineers and the Executive Director, to make sure that the direction of the project is in line with both, RTC Washoe's and the City of Reno's goals and needs. The Living Lab connected infrastructure is one of the largest of this type in the world right now.

Cyberinfrastructure and Cybersecurity

The Living Lab cyberinfrastructure includes a multi-modal fiber with a theoretical throughput of 1.2GB and we recently purchased new equipment to overcome the limited 100Mb port restrictions on the City of Reno. The new hardware allows our edge-network to be more efficient. A high-level map of the current infrastructure is shown below:



Socioeconomic Impact

As we complete the Living Lab infrastructure, we are also moving forward with different grant opportunities to assess the socioeconomic impact. The IM team is working on the SCC (PG), a critical assessment of bicyclist and pedestrian safety in Reno. For this, we will recruit about 500 bicyclists/pedestrians to complete a survey, identifying unsafe locations (interactive map or text entry). In addition, we will identify 4-5 locations to deploy mobile LiDAR sensors in safe & unsafe locations. We have engaged several community partners, including Alta Planning, Tahoe Transportation District and RTC Washoe.

Legal and Regulatory Implications

New work is being planned with the Social Psychology program at UNR and the National Judicial College. Focus could be on legal implications again, but also data usage and regulations.

Nevada Advanced Autonomous Systems Innovation Center (NAASIC)

The principles and goals of this program will remain the same. However, the NAASIC concept will now be integrated under the newly created Nevada Autonomous program presented below.

Nevada Autonomous

During the previous reporting period, UNR has launched Nevada Autonomous, a new program to manage and enhance Nevada's Unmanned Aircraft Systems (UAS) Test Site activities. The UAS Test Site service was created following Nevada's designation by the FAA as one of seven states to serve as a center for the development and testing of unmanned autonomous vehicles and systems.

During this reporting period, we completed the transition from NIAS to NCAR-Nevada Autonomous, with all interlocal agreements executed and a clear understanding from the FAA of what the role of Nevada Autonomous will be. Nevada Autonomous will be responsive to opportunities statewide and will collaborate with projects developed through the University of Nevada, Las Vegas, and Desert Research Institute. The new alignment better incorporates UAS Test Site activities with the aeronautical, autonomous vehicle and robotics research happening at the three research institutions of the Nevada System of Higher Education, while continuing to also facilitate testing opportunities with business, industry, and government agencies.

For this, we recently hired an experienced, ex-US Navy pilot to assist with the engagement of companies and agencies that would like to operate UAS in Nevada through Nevada Autonomous. Safety will remain a primary emphasis. Nevada Autonomous is part of NCAR and will be using all technical resources and business development expertise from NCAR to attract new companies and agencies to the state of Nevada. Since Nevada Autonomous officially started to operate in June 2022, it has already won a competitive grant from the FAA to work with ANRA Technologies and uAvionix in a project to incorporate broadcast-based, remote, ID (B-RID) into the USS network to achieve combined broadcast and network RID.

Autonomous Robots Arena

NCAR will continue to support and improve the general capabilities of the Autonomous Robot Arena in ARF. We have renovated the high-bay area at the ARF building to make a more efficient area for robotic development and add new features and capabilities to the Robot Arena making it appealing for local and regional drone companies. The Robotic Arena is a large high bay with tall ceilings that can be utilized to test drones and is a working area for autonomous systems being developed on campus.

Commercialization and Partnering Activities

Several partnerships were established for the development and submission of different grant applications for DOT, NSF and DOE. The grant proposal presented to the DOE was invited to submit a full proposal.

Programmatic and Project Changes

The addition of Nevada Autonomous and the integration of NAASIC in Nevada Autonomous, added a new dynamic to the way NCAR operates in the region.

Looking Forward

NCAR will continue the development and implementation of the IM Initiative, focusing on the full implementation and expansion of the Living Lab. NCAR is also developing a new strategic plan for corporate outreach to attract companies, agencies and talent to this program, the goal is to have this initiative fueled by industry-driven programs.

We will leverage the FAA Test Site Operation to make Nevada a key state for companies and agencies to test UAS. NCAR will continue exploring both commercial and academic opportunities for NSHE, and the State of Nevada.

Section II. C) LIFE SCIENCE: Create a self-supporting Bio-tech Hub in ARF

Accomplishments

NCAR continues to be a central access point for highly-innovative, fast-growing companies to work with the university and access the vast number of resources that UNR has to offer, including its intellectual capabilities.

In collaboration with the UNR Technology Transfer team, we started a new program where both NCAR-affiliated companies and companies that do business with NCAR will be approached, to determine whether any of the IP in the UNR IP portfolio may be of use/interest for these companies. This is a mutually beneficial program that may save companies new R&D expenses and add license revenue to the university.

During this reporting period, NCAR hired a Corporate and Entrepreneurial Coordinator to help in the day-to-day operations and the creation of new programs that will help our affiliated companies to thrive. For this, NCAR is providing businesses in the region with a safe zone, to foster their growth as well as offering innovation on demand. NCAR continues to have examples of companies that after using the Applied Research Facilities and other resources on campus, they have now emerged as viable companies in the region. The Autoclave and Research resources room was added as part of the resources provide to our companies adding one valuable resource to companies, faculty, and students. The addition of this sterilization room allows us to reduce the costs of biowaste management.

BioBUBBLE Containment Environment

A large study sponsored by the NIH continues to be executed by the College of Public Health in this space supported by NCAR.

Genomics

The Nevada Genomics Center (NGC) was reallocated to ARF in a more dynamic space for the center and it is fully operational. NGC is now closer, not only to NSHE users on campus, but also to all NCAR industry partners that may need to utilize its services.

Magnetic Resonance Imaging

Use of the functional Magnetic Resonance Imaging (fMRI) scanner at Renown continues to operate as a Core Lab and it was successfully incorporated as part of a larger imaging core using the iLab System.

Proteomics Center

The Mick Hitchcock, Ph.D. Nevada Proteomic Center will continue to provide cutting-edge, mass spectral approaches for proteomic researchers within NSHE. NCAR will continue a campaign to provide these services to industry working with the Proteomics Center team to improve industry access to the services.

Bioinformatics

The Nevada Center for Bioinformatics was successfully moved to ARF and is fully operational. We are working now on enhancing this core facility and the bioinformatics research resources, services and training in support of existing research programs, development of new programs and develop a more comprehensive portfolio of services for industry clients. We will also work on a system to incorporate these services with HPC resources.

Commercialization and Partnering Activities

N/A

Programmatic and Project Changes

N/A

Looking Forward

NCAR will continue creating programs and resources to increase the presence of biotechnology companies in the region.

Section II. D) ADVANCED MANUFACTURING: Establish an NSF & industry-funded "Industry University Cooperative Research Center" (IUCRC); a consortium of partnering companies and universities with the objective of translating university research into industrial applications and patents.

Accomplishments

NCAR is now collaborating with Nevada Industry Excellence (NVIE) in the development of a strategy to: 1) connect NVIE customers seeking R&D to NCAR and 2) connecting NCAR customers moving from prototyping to production to NVIE. It is expected that this two-way collaboration will benefit local and regional companies and attract more out-of-state companies.

Although NCAR does not currently have enough resources to establish an IUCRC. The collaboration with NVIE and the collection of current UNR resources, form the basis for this future development. The following labs are the basis for advance manufacturing: Material Characterization Nevada, Advanced Manufacturing and Material Processing Laboratory, Mechanical Engineering Manufacturing Lab, Mechanical Engineering Multiphysics Laboratory, Center for Civil Engineering Earthquake Research, Mackay School of Earth Science, and Engineering Microbeam Laboratory. NCAR will eventually coordinate efforts and the pool of faculty necessary for advance manufacturing techniques and models.

Commercialization and Partnering Activities

N/A

Programmatic and Project Changes

N/A

Looking Forward

Once an internal framework for advanced manufacturing is defined, we will attempt to find a group of initial industry partners that can pilot this effort. Industry partners can be selected from NCAR-affiliated companies, as well as companies from NVIE portfolio.

Section II. E) HIGH PERFORMANCE COMPUTING (HPC) FACILITY

Accomplishments

The High-Throughput Computing modules we setup for IM is now being prepared for a wide-variety of computational research use on campus. The primary use continues to be for real-time applications for the IM Initiative. The HPC has the iLAB system implemented for faculty to use as a resource and we have a fee-for-service mechanism for companies to access it as well. NCAR is looking for financial options to update the HPC system for both academic and external usage.

Commercialization and Partnering Activities

N/A

Programmatic and Project Changes

N/A

Looking Forward

NCAR Associations are being promoted and access to the HPC resource is available for industry partners and initiatives.

Section II. F) OTHER PROPOSAL DEVELOPMENT

To increase multi-disciplinary activities with faculty members and industry partners, NCAR has been supporting/developing different grant applications. See Table 1 in the Performance Section.

Table 1. Awarded Grant – Supported by NCAR's Incubating Companies and/or Developed by NCAR			
Category	Recipient	Awarding Entity	Amount
**Health Science	UNR/NCAR	Strategic Progress, LLC	$50,000
**Cybersecurity	UNR/NCAR Innovative Res Analysis	Office of Homeland Security	$100,000
**Biosciences Administration	IDeA Network of Biomedical Research (INBRE)/NCAR	National Institute of General Medical Sciences	$300,000
**Bioscience	UNR-DxDiscovery	National Institute of Health	600,000
**Bioscience	UNR-DxDiscovery	National Institute of Health	589,866
**Bioscience	UNR-DxDiscovery	National Institute of Health	1,453,291
**Bioscience	UNR-DxDiscovery	US Department of Defense	200,000
**Bioscience	UNR-DxDiscovery	National Institute of Health	600,000
**Bioscience	UNR-DxDiscovery	US Department of Defense	999,899
**Bioscience	UNR-DxDiscovery	US Department of Defense	150,000
**Bioscience	UNR-DxDiscovery	National Institute of Health	420,640
**Bioscience	UNR-DxDiscovery	US Department of Defense	999,395
**Bioscience	UNR-DxDiscovery	National Institute of Health	25,000
**Battery Development	NexTech Batteries	Department of Defense	$250,000
**Bioscience	UNR-EscaZyme	National Institute of Health	$124,000
**Bioscience	UNR-EscaZyme	STTR	$225,000
**Bioscience	UNR-EscaZyme	STTR	$225,000
**Bioscience	UNR-EscaZyme	Private Partner	$530,000
**Bioscience	UNR-EscaZyme	STTR	$225,000
Traffic Management	UNR-Intelligent Mobility	Regional Transportation Commission (Washoe County)	$250,000
**Traffic Management	UNR-Intelligent Mobility	Nevada Department of Transportation	$313,397
**Traffic Management	UNR-Intelligent Mobility	Regional Transportation Commission (Southern Nevada)	$86,000
**Bioscience	UNR-DxDiscovery	National Institute of Health/ National Institute of Allergy and Infectious Diseases	$595,000
**Bioscience	UNR-DxDiscovery	National Institute of Health/National Institute of Biomedical Imaging and Bioengineering	1,490,000
**Robotics	Autonomous Robots Lab	Defense Advanced Research Projects Agency	$4,489,329
**Bioscience	UNR-Dx Discovery	Department of Defense	$398,927
**Bio-Bubble/Community Health	UNR-Sc. Of Community Health	National Institute of Health NIDA/FDA Center for Tobacco Product	$20,000
**Traffic Management	UNR-Intelligent Mobility	Regional Transportation Commission (Washoe County)	$450,000
**Road Feature Extraction	UNR-Intelligent Mobility	Department of Transportation	$328,819
**Autonomous Vehicles	UNR-Intelligent Mobility	Ozmen Center for Entrepreneurship	$2,690
**Mining - Autonomous	UNR	Nevada Gold Mine	$65,282
**Mining - Autonomous	UNR	Nevada Gold Mine	$46,615
** Mining - Autonomous	UNR	Nevada Gold Mine	$80,179
** Advanced Mobility	UNR-RTC	USDOT – Federal Transit Administration	$195,392
** Critical Material	American Battery Metal Corp.	USDOE Advanced Manufacturing Office	$4,500,000
** Batteries	American Battery Metal Corp.	US Advanced battery Consortium	$2,000,000

*Diagnostic	UNR-DxDiscovery	NIBIB SBIR Phase II	$433,825
*Diagnostic	UNR-DxDiscovery	NIAID SBIR Phase I	$150,779
*Diagnostic	UNR-DxDiscovery	Department of Defense	$39,906
*Defense	Goodman Technologies	NASA: Johnson Space Center	$749,996
*Defense	Goodman Technologies	US Navy - Office of Naval Research	$999,986
* UAS / Remote ID	NCAR-Nevada Autonomous	Federal Aviation Administration	$109,901
		TOTAL THIS REPORTING PERIOD	$2,484,393
		TOTAL SINCE INCEPTION	$25,863,144

** Reporting period*
*** Previous periods*

Section II. G) EXPANSION OF THE SBIR/STTI MENTORING PROGRAM

The Sierra Accelerator for Growth and Entrepreneurship (SAGE) program supports community and economic development by providing SBIR/STTR grant support services to Nevada businesses, innovators, and entrepreneurs.

Accomplishments

Program participation

During the program period, SAGE received 25 applications from 21 companies, of which 77% were from Northern Nevada, while 23% were from Southern Nevada. A complete list of program participants and their industries is shown in Table 3.

Application progress

A total of nine applications are in progress for the current project period. Two applications have been submitted to two federal agencies - the National Science Foundation and the Department of Defense. Companies that are not actively developing proposals are currently seeking relevant funding opportunities to apply.

Development of Wolfcorps

WolfCorps is designed to help move research beyond the university laboratory and guide the process of transferring research innovations into products and processes that benefit society. Based on the Lean Launchpad methodology developed by Steve Blank, WolfCorps offers researchers an immersive training experience where participants engage with industry leaders to identify challenges and develop targeted solutions.

Program participation

During the program period, WolfCorps received 15 applications from university teams and established Nevada businesses. Of these applications, four were invited to participate in the program. One company who participated in the program in a previous period was accepted into the National I-Corps program and will be receiving a $50,000 award for further company development. A complete list of program participants and their industries is shown in the Table 2 below.

Table 2: WolfCorps Program Applicants

Team Name	Industry or Technology Sector	General Location
Primas Systems	Software	Northern Nevada
ShapeShift Ciphers	Quantum Information Tech.	Northern Nevada
Disruptor Scientific	Chemical Technology	Northern Nevada
AWS Solutions LLC	Aerospace	Southern Nevada
Green Mining Solutions/Responsible Mining Solutions	Environmental Technology	Northern Nevada
Chameleon	Robotics	Northern Nevada
Solid-state Battery	Energy	Northern Nevada
Hippos	Marketing	Northern Nevada
Re-Li-cycle	Advanced Manufacturing	Northern Nevada
Cannabis Can Cure	Consumer Product	Northern Nevada
Novel Dishwasher Technology	Consumer Product	Northern Nevada
Revelis Bio	Biotechnology	California
Autonomous Inspection for Civil Infrastructure	Robotics	Northern Nevada
Arlen project polio	Healthcare	Northern Nevada
ECHO	Software	Northern Nevada

In compliance with requirements for the Nevada Knowledge Fund grant, the following semi-annual updates relate to annual goals.

a. ***A statement of the benefit to the public from the distribution of the Knowledge Account Grant funds, including documentation that supports the benefit:***

Nevada's strategic investment through the Knowledge Fund leverages the research, innovation, and entrepreneurial initiatives at the UNR, to support economic development in the state. One national indicator of economic growth is the number of Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) grants awarded for each state. These grants are a key tool to help accelerate innovations at our universities and bring technologies *from lab to market*.

The Sierra Accelerator for Growth and Entrepreneurship (SAGE) program provides tailored support to innovators and entrepreneurs, to improve their chances of receiving these grants. As a result of an entrepreneur securing a SBIR/STTR grant, the community may experience increased opportunities for employment, heightened business activity, and subsequent economic growth.

WolfCorps is designed to move research beyond the university laboratory and guide the process of transferring innovations to the marketplace that benefit society. Successful completion of this program strengthens a company's chance of successfully obtaining SBIR or STTR grants.

b. Information regarding the recruitment, hiring, operation and retention of research teams and faculty, to conduct research in science and technology, which has the potential to contribute to economic development in this state:

The objective of the program is to recruit faculty, students, small businesses, and community entrepreneurs to engage in technology-based innovation; both via the launch of new Nevada-based technology companies and to enhance technology innovation at the existing small-to-medium enterprises (SME) in Nevada. The SAGE and WolfCorps programs do not engage in personnel hiring and operations, but instead, support UNR faculty and members of the community to obtain grants and develop their business plans.

c. Information regarding research laboratories and related equipment located or to be located in this state:

Not applicable to SAGE or WolfCorps.

d. Information regarding the construction of research clinics, institutes and facilities, and related buildings located or to be located in this state;

Not applicable to SAGE or WolfCorps.

e. *Information regarding the research being conducted by the research teams and faculty for which the Executive Director of GOED has provided funding pursuant to NRS 231.1597:*

SAGE companies that have applied or are applying for grants are working on research that falls under the following technology sectors or industries:

Aerospace	Cybersecurity
Agriculture	Defense
Biotechnology	EdTech/Training
Chemical Technology	Energy
Consumer Products	

WolfCorps teams that have participated in the program are working on projects that fall under the following technological areas emphasized by the National Science Foundation:

Environmental Technology	Quantum Information Technology
Robotic	Advanced Manufacturing

f. Information regarding the number of invention disclosures, provisional patent applications, and utility patent applications which have been filed, and the number of patents which have been granted or issued, because of the programs established pursuant to NRS 231.1591 to 231.1597, inclusively:

Since the start of the funding period, SAGE has received 23 applicants engaged in new inventions and WolfCorps has received 15. These are not invention disclosures tracked by the university. These are innovations for the launch of new businesses and/or new product lines for existing small businesses. Patents, if any, are considered company proprietary information and are not currently tracked under this program.

g. Information regarding the amount of research grants, gifts and donations awarded to the research teams and faculty recruited, hired, and retained pursuant to NRS 231.1597:

SAGE assists companies with accessing two types of grants: SBIR and STTR grants. The number of new SBIR/STTR awarded as a result of this program, will not be available until 2023.

Participation in the WolfCorps program can lead to participants receiving an NSF I-Corps National Teams award (Team). One company received this $50,000 grant for this project period.

h. Information regarding all grants, gifts, and donations to the Knowledge Account from public and private sources made through the research universities:

Not Applicable.

i. Information regarding matching funds for federal and private sector grants and contract opportunities that support economic development consistent with the State Plan for Economic Development developed by the Executive Director pursuant to subsection 2 of NRS 231.053:

Matching funds are not a metric applied to SBIR/STTR or NSF I-Corps grant programs.

j. Information regarding the number of businesses that have been created or expanded in this state, or relocated to this state, because of the programs established pursuant to NRS 231.1591 to NRS 231.1597, inclusively:

With SAGE and WolfCorps together, one new company was incorporated in the state during the program period.

k. Information regarding the number of jobs which have been created or saved as a result of the activities undertaken pursuant to this agreement:

Information not collected.

l. Information regarding activities related to workforce development and training such as certificate programs and degree programs:

The program has conducted two events in the current program period to provide information and SBIR/STTR training to Nevada businesses during the program period. However, SAGE is not a certificate or degree program.

m. For projects requiring a Financial Sustainability Plan, information regarding progress toward attainment of sustainability:

The Knowledge Fund has supported UNR as it builds competency and capacity toward a longer-term SBIR/STTR program. UNR plans to continue SAGE and WolfCorps services to faculty, university spinouts, and community entrepreneurs, beyond the initial funding period.

For the SAGE program, UNR will re-apply for the Small Business Administration's (SBA) Federal and State Technology (FAST) Program to continue SAGE activities beyond the GOED project period. Currently, 32 states are recipients of FAST funding and, if awarded, Nevada would join this innovation ecosystem receiving up to $125,000 per year.

For WolfCorps, UNR plans to re-apply for the National Science Foundation's (NSF) I-Corps Hubs Program in 2023, to continue WolfCorps activities beyond the GOED project period. If awarded, UNR would be part of the NSF's National Innovation Network and receive up to $300,000 per year for five years.

n. All Commercialization Revenue, as defined in Section IV, received and the allocation of such Revenue to the inventor and the research university as a result of the funded project:

Entrepreneurs and startup companies applying for SBIR/STTR and WolfCorps are early stage. It's unlikely that there will be significant commercialization revenue by the end of the one-year program period as a result of an SBIR/STTR grant. Additionally, revenue generated from products and services sold by private companies is considered corporate proprietary financial information. We do not track this private information.

Table 3: SAGE Program Applicants

Company Name	Industry or Technology Sector	General Location
Applied Tungstenite	Aerospace	Northern Nevada
Awareity	EdTech/Training	Southern Nevada
Carolina Cannabinoids	Biotechnology	Northern Nevada
Dave McCallen	Sensor Technology	Northern Nevada
Disruptor Scientific	Chemical Technology	Northern Nevada
Docker	Aerospace	Southern Nevada
Dynepic	Defense	Northern Nevada
Goodman Technologies	Defense	Northern Nevada
Incite Insight LLC	Defense	Northern Nevada
Coram	EdTech/Training	Northern Nevada
Melinda Yerka	Agriculture	Northern Nevada
MetalWave	Advanced Manufacturing	Northern Nevada
Micro Sheets	Consumer Products	Southern Nevada
Micronutrient Soil Amendment	Agriculture	Northern Nevada
Safeflight	Aerospace	Southern Nevada

OG Biotech	Biotechnology	Northern Nevada
Scalable, High-Efficiency, Dual-Axis Solar Tracker with Energy Storage	Energy	Southern Nevada
ShapeShift Cyphers	Cyber Security	Northern Nevada
Truckee Applied Genomics	Biotechnology	Northern Nevada
Valkyrie Systems Aerospace Inc.	Aerospace	Northern Nevada
Zorya/Saatvik Advisors	Cyber Security	Northern Nevada

Commercialization and Partnering Activities

N/A

Programmatic and Project Changes

N/A

Looking Forward

To continue the program with the current successful outcomes.

Section III: Performance

Table 4: COMPANIES CURRENTLY AFFILIATED WITH NCAR: Start-ups/Spinouts/Established in ARF					
1	*Company Name*	*Core Specialty*	*Original Location*	*Jobs Created*	*Type*
2	*Adaract	Robotic Artificial Muscles	Reno, NV	4	Start-up
3	American Battery Technology Company	Lithium Batteries	Cambridge, MA	15	Established, moved R&D operations to Reno.
4	Atlas Magnetics	Spark Testing/	Reno, NV	5	Start-up
5	Avanus Corporation	Electronic Devices	Berkley, CA	1	Start-up
6	Bio-Med Scientific, LLC	Biomedical	Reno, NV	4	UNR Spin Out
7	Carolina Cannabinoids	Hemp derived from Cannabinoids	Charlotte, NC	1	Start-up
8	Disruptor Scientific, LLC	Nanomaterial	Reno, NV	2	Start-up
9	DRW Consulting, LLC	Consulting/R&D	Carson City, NV	1	Start-up
10	DxDiscovery, Inc.	Biomedical	Reno, NV	8	UNR Spin Out
11	*Ecoatoms	Biological/Aerospace	Reno, NV	1	UNR Spin Out
12	EpiSwitch Rx, Inc. **Now known as: Renogenyx, Inc.**	Biomedical	Reno, NV	4	Spin Out
13	Ethox Chemicals	Chemical Materials	South Carolina	2	Established
14	Eye Sight Quest, LLC	Optometry	Reno, NV	4	Spin Out
15	*Goodman Technologies, LLC			4	Start-up
16	*LiDAR Matrix, Inc.	Lidar Sensors and Devices	Reno, NV	3	Spin Out
17	LF Research	Electromagnetic Tests	Poplar Grove, IL	2	Established, moved operations to Reno.
18	Macoma Environmental Technologies, LLC	Environmental Products	Las Vegas, NV	5	Start-up
19	NV LED Optics, Inc.	LED manufacturing	Reno, NV	2	Start-up
20	Phigenics, LLC	Biomedical	Warrenville, IL	10	Expanding R&D Operations
21	RosVivo Therapeutics	Biotechnologies	Reno, NV	3	Spin Out
22	Theralytix, LLC	Biomedical	Danville, CA	2	Start-up
23	TLS Supply Chain Solutions, Inc.	Warehousing/ Land, Air, Sea Freight	Turkey Reno, NV	10	Start-up
24	Truckee Applied Genomics, LLC	Biotechnologies	Reno, NV	5	Spin Out
25	TuBiomics, Inc.	Biomedical	Reno, NV	3	Start-Up
26	UVC Science, Inc.	UV Lights Development	Reno, NV	7	Start-up
27	*Zhittya Genesis Medicine, Inc.	Biomedical	Reno, NV	1	Start-up
Total Jobs Created by Current NCAR Affiliated Companies				**109**	

NCAR GRADUATED COMPANIES					
	**Alert Wildfire System	IOT	Reno, NV	1	UNR Spin Out – No longer with NCAR
	**Bioelectronica, Inc.	Biomedical	Palo Alto, CA	10	Alumni Company
	**Lana Sheta DBA FloCheck	Biotech	Reno, Nevada	1	Alumni Company
	**GenNext Materials & Technologies, LLC	NanoChemistry	Reno, Nevada	2	Alumni Company
	**Khepra, Inc.	Biotechnologies	San Diego, CA	4	Alumni Company
	**Kremenak Nanotech	Biomedical	Columbia, MO	3	Alumni Company
	**Prothelia, Inc.	Biotechnologies	Boston, MA	9	Alumni Company
			Total Jobs Created by ALL NCAR Affiliated Companies	**139**	

- All companies did or will use additional Shared Research Facilities through NCAR's Fee for Service Agreements.
- All companies are collaborating or planning to collaborate with UNR faculty members on their developments.
- All companies hired or are planning to hire students or local experts to enhance their operations.
- All companies were encouraged to apply for grants in collaboration with NCAR and UNR faculty members
- After the BEL expansion, we are expecting 3-6 new companies initiating/moving operations in Reno through a NCAR affiliation.

* Added during this reporting period
** Graduated out of NCAR. The term "Graduation" is used to define companies growing/expanding beyond NCAR/ARF physical capabilities, going into mass production and/or needing larger space.

Section IV: Metrics

Based upon achievements in the past two years, NCAR projects that the following targets will be met (it is expected that several targets will be exceeded):

Table 6. NCAR: KNOWLEDGE FUND SUMMARY ROLLUP PROJECT: Income/Funds directly and indirectly related to NCAR activities

	This Period May 1, 2022 to Sep 30, 2022	Inception to Date Jan 1, 2016 to Apr 30, 2022
Fee for Service Agreements	$105,314	$1,950,127
Facility Use Agreements (including BEL / EL System)	$239,926	$1,128,283
Evolutionary Computing System Lab	-	$140,510
Gifts / Donations (*)	-	$4,965,572
Other Contributions (**)	-	$1,200,000
Grants (***)	2,484,393	$25,863,144
Total	**$2,829,633**	**$35,247,636**

(*) Mick Hitchcock (Proteomics): $1,200,000 / Mick Hitchcock (HPCF): $200,000 / Switch (in-kind) in technology infrastructure support (space, power & security for 5 years): $3,400,000 / Mick Hitchcock (Sterilization Room & Equipment in ARF): $165,572
(**) Nevada Terawatt Facilities/NSTec: $400,000 / UNR/VPRI (HPCF): $800,000
(***) See Table 1 above for details

Section V: Knowledge Fund Investment – Summary

University of Nevada, Reno

Knowledge Fund Investment

Funded by Nevada Governor's Office of ECONOMIC DEVELOPMENT

$8.7M Knowledge Fund investment over 8 years

$198M in venture capital raised by affiliated startups

375+ companies, agencies, orgs engaged through memberships or agreements

710+ jobs created by affiliated companies

47 companies with University-based operations

$35M+ in grants, contracts, gifts, agreements

Programs Supported: Serving Nevada's Economic Growth

Nevada Center for Applied Research

Providing industry, entrepreneurs and agencies access to the University's labs, equipment and expertise by:

- Offering **access to more than 55 leading-edge labs and services.**
- Offering **affordable co-working and laboratory space on campus.**
- Facilitating **large-scale research initiatives** involving coalitions of public and private stakeholders.
- Supporting **incubation of early-stage businesses, predominantly biotech,** with resources and mentoring.
- Supporting **workforce development** and experiential learning for students.

Innevation Center

A hub of entrepreneurialism and innovation in downtown Reno, facilitating access to mentorship, investors, makerspace, interns and more. Supported in part by the Knowledge Fund and open to the community through a membership model:

- Members represent 57 companies and organizations.
- Members created 500+ jobs, raised $88.5M in capital.

Nevada Advanced Autonomous Systems Innovation Center

Developing robotics, artificial intelligence and autonomous systems, with current research that includes:

- **Drone and unmanned aerial operations, driverless cars, advanced manufacturing systems, underground and underwater robots.**
- **Nevada Gold/Barrick partnership** testing underground robotics applications for exploration and safety.
- Development of **large high-bay area to conduct University or industry drone tests** with accuracy of position and orientation.
- Established testing **safety procedures that have been validated** through field trials since 2015.

Knowledge Fund-supported efforts – Further RESULTS since 2013

- **$35.2M** total grants and donations received
  - Includes **$25.7M** in sponsored-research contracts (grants and fee-for-service)
- **16** spin-off companies
- **22** companies relocating to Nevada
- **8** faculty hired full-time by Knowledge Fund
- **10** faculty receiving some portion of support
- **88** student interns engaged with projects (hired by affiliated companies)
- **12** student employees (hired by University)
- Patents filed by University – none, work in progress
- **73** patents filed by companies incubated in NCAR
- **710** Jobs created
- Commercialization revenue to University – none, work in progress
- **$198.8M** Venture Capital raised by affiliated companies

Intelligent Mobility

Developing solutions for safe, clean and efficient transportation. This statewide effort coordinated through NCAR involves:

- **Public and private stakeholders** including the Regional Transportation Commissions of Washoe County and Southern Nevada, cities of Reno and Henderson, Nevada Department of Transportation, The National Judicial College and Fraunhofer IVI, as well as businesses such as Switch, Proterra, Dell EMC and Velodyne Lidar.
- **Researchers with expertise** in synchronized transportation, advanced autonomous systems, computer sciences and robotics, geography, social psychology and judicial studies.
- **"Living Laboratory" real-world test sites in Northern and Southern Nevada**, with "lidar-enhanced" roads able to communicate data to connected vehicles.

Water Innovation Campus

Addressing water problems in Nevada through collaborations with the cities of Reno and Sparks, Truckee Meadows Water Authority, Western Regional Water Commission and Nevada Department of Transportation. Research includes water reclamation and reuse applications, stormwater management, industrial water and waste management and more.

Sierra Accelerator for Growth and Entrepreneurship (SAGE)

Initially launched in 2019, the statewide SAGE program expanded with Knowledge Fund support in 2020. SAGE is designed to put Nevada's qualified small, technology-based businesses on the path to earn federal grant funding through the competitive SBIR and STTR programs.

Making a Difference for Nevada

"**NCAR was an attractive place for us to incubate and then scale.** Most of our hires have been from the University. The proximity made it easy and they are talented employees. We want to be part of putting Reno on the map for biotech."

– *Jonathan Hull, co-founder of Bioelectronica which grew from 2 employees to 12 while based in NCAR*

"The **collaboration with the University is an important step** in Flirtey's growth by allowing us to use their facilities and test Flirteys on campus. … With its close proximity to Silicon Valley, budding tech scene and the state's strong aeronautical history, Reno is positioned to become the biggest little city in the world of UAV space."

– *Matt Sweeny, Flirtey, which grew from 2 to 30 employees, completed first-ever commercial drone delivery in U.S.*

"**(The Innevation Center) did more** than help provide a location to meet people; it gave me like-minded people who are as crazy as I am to leave what you know **to do something you believe in.**"

– *Mark Ferguson, founder Lulius Innovation, which grew from 1 to 8 employees and plans to double in 2021*

"The **Nevada Center for Applied Research is charting a path to create the smart cities of the future** by enabling multimodal communication between infrastructure, vehicles and people."

– *Jon Barad, Vice President of Business Development, Velodyne Lidar, an Intelligent Mobility partner*

"The **University is so important to the economy** and the future of our region that the business community has to be closely connected to it."

– *Mike Kazmierski, CEO, Economic Development Authority of Western Nevada (EDAWN)*

For more information

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(R&I, 6/16/2022)

Section VI: Budget

Please see budget documents prepared by UNR Office of Sponsored Projects Administration.