

Introduction

This Tech Hub Phase 1 Designation proposal, Supercharging Nevada's Lithium Batteries and other EV Materials Loop, demonstrates that the region has loosely coordinated economic and innovation activities that are ripe for EDA investment to ensure systematic formation of a highly competitive ecosystem. This proposal is for a Phase 1 designation only. Nevada is poised to build a self-sustaining and globally competitive advanced energy cluster representing a key component of the U.S.' transition to clean energy. This will be achieved through the diffusion of technologies in the Key Technology Focus Area of advanced energy and industrial efficiency technologies, such as batteries (from vehicle to grid-scale applications). The proposed Tech Hub sits at the forefront of the national push toward clean, advanced energy; new materials; and energy efficient technologies. Nevada has assets, resources, and capabilities to make the U.S. a world leader in the lithium lifecycle. EDA's investment will lead to robust regional alignment in this sector. The proposed region for the Tech Hub includes all of Nevada except Clark County and includes two MSAs (Carson City and Reno-Sparks). Building the hub will not only help secure the nation's clean energy future, but also transform communities across the state, integrating underserved geographies and populations into the 21st century economy.

This region contains the highest concentration of assets, capital, R&D, labor market, and infrastructure relevant to the selected KTFA. The National Science Foundation (NSF) has invested \$1 million in the University of Nevada, Reno (UNR) for an NSF Engines Type-1 development award, Advancing the circular economy for Li batteries. Additional EDA funds would accelerate the maturity of the requisite economic environment in which the innovations developed under an eventual NSF Engines Type-2 award will thrive. UNR recognizes the synergistic opportunities presented by aligning these two funding mechanisms to advance a technology that is vitally critical to national security, regional prosperity, and environmental justice. The EDA funded University Center for Economic Development (Nevada UCED) is the Tech Hub consortium lead, is part of UNR and is a partner in Nevada's NSF Engines project. Nevada UCED is at the heart of a network of industry, government, and non-profit partnerships that provide the foundation for a self-sustaining and globally competitive regional economy based on the lithium lifecycle. The Tech Hub consortia includes: a) all seven of the area's regional economic development authorities (RDA's); b) both of Nevada's US EDA Economic Development Districts (EDD's); c) private businesses involved in the mining, extraction and processing of lithium and other EV materials; d) firms engaged in manufacturing batteries and energy control systems; e) businesses involved in battery and related materials recycling; f) NV Energy, Nevada's largest utility provider, g) private sector venture development entities; h) other institutions across the Nevada System of Higher Education covering a spectrum of activities from technical workforce training to two and four-year degrees to world-class research; i) labor unions; j) local governments; k) industry associations; l) Native American and underrepresented group representation; and m) a variety of NGO's. Consortia membership will continue to grow over time.

Funds secured through a Phase 2 EDA Tech Hub application would be used to rapidly and significantly expand the ongoing efforts of consortium partners to commercialize research. The Tech Hub will be designed to fill gaps in the industry's value network and supply chain through business creation, attraction, and expansion. These efforts are largely administered by the two existing EDDs and the seven RDAs. Funds from a Phase 2 EDA Tech Hub would also be used to expand existing training programs and create new training programs, internships, and apprenticeships across the proposed region. Intentional efforts will continue to be made to directly support the community and economic development efforts of the UNR Office of Indigenous

Relations, the Nevada Indian Commission, the Inter-Tribal Council of Nevada, and the federally recognized Tribes within the region.

Tech Hub Vision and Primary Efforts

This proposed Tech Hub envisions a region with a) innovation supported across the lithium batteries and EV materials supply chain, b) heightened efficiency, cooperation and competition, and c) mitigated economic distress of previously overlooked geographies and communities. To realize this vision, the proposed Tech Hub will center around three primary focus areas. (1) Support Growth, Innovation, Entrepreneurship and Sustainability. The Tech Hub will focus on “supercharging” the industry by supporting innovation and commercialization of R&D efforts (see Lab to Market section below), as well as innovation in the supply chain (upstream and downstream). (2) Enhance the Existing Value Network and Supply Chain. Nevada UCED will pursue opportunities for export enhancement, import substitution, and other opportunities to increase efficiencies, reduce costs, and improve resiliency. Manufacture Nevada and the Nevada Small Business Development Center will work with individual firms to make improvements to their internal processes that result in improved quality, efficiency, and competitiveness. Opportunities for value enhancement will be identified through a standing series of working groups and networking events that will elicit input from consortium members. Existing training and certificate programs in advanced manufacturing, pertaining directly to advanced energy and efficiency technologies, are currently administered by consortium members Great Basin College, Truckee Meadows Community College, and Western Nevada College. (3) Support Critical Community Ecosystem Development and Improvement. According to the U.S. Census Bureau American Community Survey Five-Year Estimates (2020-2021), the combined unemployment rate for the Tech Hub region was an estimated 6.0 percent (5.5 percent national average). The two-year regional per capita income level was an estimated \$31,547 (86.4 percent of the \$36,511 national average). This combined deficiency in unemployment and per capita income for the region indicates ongoing impact because of the COVID-19 global pandemic. Furthermore, the region meets another definition of economic distress: the region’s special need to enhance and protect the physical, cultural, and environmental characteristics of existing communities, especially the various Native American colonies, communities, and reservations located throughout the region.

Nevada UCED will expand its work with each of the RDA’s and EDD’s to address various community infrastructure issues. Consortium members and governmental entities will be encouraged to embrace net-zero carbon emission goals in their ongoing operations. Consortium member nZero has developed a SaaS business model to assist entities in this regard (see commitment letter).

Technology-Based Potential of the Region for Global Competitiveness

Significant sources of lithium and other EV materials are available across the state. Efficient extraction and characterization of these materials is supported by collaborative R&D efforts between industry, UNR and other consortium partners. Moving downstream from raw EV materials, dozens of companies that are part of this consortium engage in pioneering research, development and commercialization of lithium-related technologies. These companies represent the full spectrum of industry development, from nascent startups to international powerhouses. These companies have established partnerships with Nevada’s institutions of higher education to support cutting-edge research and have established collaborations with regional K-12 schools and community colleges to develop training programs, internships and apprenticeships for the next generation workforce in high-tech, high-wage jobs. These existing strengths in material assets, R&D expertise, and workforce development programming provide a strong competitive

advantage, and provide a solid starting point for “supercharging” the industry and infrastructure to support a regional, circular economy based on lithium and other EV materials.

The region has leading market-relevant scientific capacity in advanced energy and industrial efficiency technologies, such as batteries. The region has long pursued technology-based economic growth in efforts to diversify the economy. In 2011, the Knowledge Fund was created by the Nevada Legislature to invest in research and commercialization in both of the state’s research universities to support entrepreneurship and business development. Other initiatives, such as the Battle Born Growth funds, have partnered with accelerators and venture development entities, such as gener8tor and StartUpNV, to revolutionize the way Nevada aligns the universities’ work with private-sector startup and ecosystem building. The Nevada Governor’s Office of Economic Development (GOED), a consortium member, established Applied Research Centers at both UNR and the University of Nevada, Las Vegas to conduct applied research and create intellectual property that will be used to develop new technologies to spur widespread innovation across the lithium-related economy. The State incentivized 12 lithium-related companies with \$1.5 billion in state tax abatements that resulted in the creation of thousands of new permanent high-paying jobs. State strategic initiatives over the past decade have resulted in the relocation of Tesla, Panasonic, and other lithium-related businesses to the region. The state is now home to dozens of companies engaged in one or more aspects of the lithium lifecycle, many of which are consortium members of this proposed Tech Hub.

This region is undergoing explosive growth and innovation across all aspects of the Tech Hub value chain. For perspective, there are a variety of chemistries and processes involved throughout the supply chain. Mining / Extraction: The region has a variety of sources of lithium ranging from clay deposits to lithium/boron deposits to brines. Firms developing these sources of raw materials use different processes (some proprietary). There is ongoing innovation throughout mining and processing. Batteries: The region has businesses manufacturing batteries for a variety of applications, each with different priority of battery characteristics (i.e. energy density vs. cycling resiliency). There is ongoing innovation in developing newer chemistries for enhanced capacity and cycling at non-ambient temperatures and solid-state batteries. The battery manufacturers employ different processes (some proprietary), with constant innovation. Recycling: There are at least four Nevada-based firms involved in battery recycling to ensure a reliable source of raw materials, each with different processes. Innovation is ongoing and as processes change, needed workforce skillsets evolve which leads consortium members to evolve their workforce training programs. Tech Hub resources will be key in responding to this evolution.

Impact on Economic and National Security of the U.S.

Lithium is a critical material that is indispensable for powering many of today’s technologies and is critical for many of the technological advances that will power a clean energy economy in the future. It is of paramount national security and economic importance to domesticate the supply and processing of lithium and other EV materials, the manufacturing of batteries of every kind, and the recycling of critical materials. Currently, the U.S. is dependent on foreign nations for its supply of raw and refined lithium. The geopolitical climate renders this part of the supply chain tenuous and unreliable. The strong, coordinated federal push toward domestication of the lithium supply chain to electrify the transportation sector is supported by billions of dollars of federal and private-sector investments into exploration, basic research, and technology innovation. This proposed EDA Tech Hub is poised to meet this national challenge that aims to secure our national economic prosperity, national security, and climate change goals.

Role of the Private Sector

Most regional firms in lithium-related resource extraction, technology development and commercialization have committed to consortium membership and active participation (see Letters of Commitment). These firms represent every aspect of the lithium lifecycle, from resource extraction to battery development to battery reuse and recycling. The two key industry associations representing the industry in this area are the Nevada Mining Association and the Nevada Battery Coalition. Both are ardently committed consortium members. To effectively develop the change models to be a self-sustaining and globally competitive regional economy, this proposed Tech Hub will schedule and facilitate regular meetings of working groups organized around the three foci outlined above. These working groups will be comprised of representatives from relevant firms, industry associations, public-sector and NGOs. These working groups will develop reports and recommendations that will inform robust processed-based solutions. These will be further defined and described in a Phase 2 application.

Regional Coordination & Partnerships

The proposed Tech Hub requires a strong governance structure and robust organizational apparatus to ensure regional alignment and coordinated movement toward achieving shared goals. UNR is fully committed to providing all necessary support to Nevada UCED to carry out this role (see letter of support). An interim RIO, Richard Bartholet, will use his extensive experience leading multi-stakeholder coalitions and knowledge of statewide economic development policies and practices to form a Strategic Advisory Committee (SAC) with members representing private-sector firms, public-sector institutions, and various NGO entities. In coordination with the NSF Engines Type-1 SAC, the Tech Hub SAC will formalize the process of integrating governance expertise into the Tech Hub through the following formal charges: Detail the competitive profile of a permanent RIO; Advise the Tech Hub leadership team in establishing working advisory and governance boards; Provide strategic oversight to ensure the highest level of leadership expertise is brought to bear to secure the success of the Tech Hub. The two SACs will complement each other to ensure that the region is deftly led through ecosystem maturity to be self-sustaining and internationally competitive. This Tech Hub consortium has leveraged and expanded upon the stakeholder partnerships and coordination of the NSF Engines Type-1 development award. Over the past year, most of the proposed Tech Hub's consortium members have already engaged in working groups, a stakeholder summit, and advisory committees to begin the ongoing process of coordinating and building an innovation ecosystem for a regional economy based on advanced energy and industrial efficiency technologies, such as lithium batteries. The existing partnerships among consortium members are deep and extensive and span workforce development programs to use-inspired research collaborations to innovation networks. The existing regional ecosystem, while nascent, is energetic and engaged. A consistent and intentional communications strategy will be implemented to ensure that all members are given equal opportunity to participate in consortia planning efforts, new members are encouraged to join, and all voices are heard.

Equity and Diversity

The proposed Tech Hub has and will continue to intentionally implement tactics and policies that encourage diversity, equity, inclusion, and access (DEIA). The proposed Tech Hub aligns with the White House Justice40 initiative because the consortium includes communities that have been traditionally marginalized, underserved, and overburdened by pollution, and the KTFA of this proposed Tech Hub is the most reliable path to realizing a clean energy future. The proposed Tech Hub region contains 28 of the 32 federally recognized Native American colonies, communities, and reservations in Nevada, each of which has experienced poverty and

unemployment above statewide and national averages and measures of household income, family income, and per capita income below statewide and national averages. Nevada UCED, in partnership with the UNR Office of Indigenous Affairs, the Nevada Indian Commission, the Inter-Tribal Council of Nevada, and other consortium members will develop a series of workforce, business and community development programs designed to improve these circumstances.

Composition and Capacity of the Regional Workforce

The 2021 U.S. Census Bureau's American Community Survey 5-Year Estimates indicate that 48,307 individuals (12.3 percent) of the 393,366 individuals employed across this Tech Hub region, were employed in the Agriculture, Forestry, Fishing, and Hunting, and Mining sector and the Manufacturing sector, the two sectors most closely aligned with this proposal's selected KTFA. In the 14 rural counties of the Tech Hub region where most expansion of mining, extraction, processing, recycling and battery manufacturing will occur, the combined total workforce in all industries is only 121,666 individuals. These conditions help explain the partnerships and investment already made to support workforce and community development. The Tech Hub consortium will need to dramatically scale workforce and community development efforts to accommodate both the rates of growth and innovation in this industry.

Innovative "Lab to Market" Approaches

While the region is rich in technology development and innovation in all aspects of the battery lifecycle, it is relatively weak in new tech-based company formation. From university spin-offs to venture development, the region is limited in post-formation acceleration. All consortium members would benefit from a user facility geared towards cultivating and incubating ideas and inventions through laboratory testing that can spur commercialization. Startup businesses do not typically have the resources to acquire the necessary inputs of production (physical and human) to take an invention from Technology Readiness Level (TRL) 1 or 2 to TRL 6. Even larger firms often do not have the human infrastructure for analysis and characterization, because there is a significant shortage of professional scientists trained in advanced techniques in the proposed region. To address this gap, the Tech Hub plans to establish an innovation-centric lithium research facility called the Lithium Campus (LitCamp). Plans, specifications, and budget for LitCamp will be outlined in the Phase 2 application. LitCamp is envisioned as a complete facility for innovation in lithium from cradle to cradle. LitCamp will be a key resource for sustaining the region with newer innovations and serve as a replicable model across the U.S. This user facility will provide advanced characterization and testing tools, process optimization and pre-pilot scale testing facilities, and experts in lithium research and technologies. LitCamp will be established as a 'one-stop-shop' fee-for-use facility to help innovative startups with a testbed to develop and test their ideas with a focus on broad commercialization across the targeted industry sectors.

This project will build upon existing state-supported initiatives and programs, including the Nevada Knowledge Fund, which is administered by GOED. The Knowledge Fund spurs commercialization activities at each of the state's three research institutions and supports the Nevada Center for Applied Research, located on the UNR campus. In addition, the Knowledge Fund will augment this investment with a \$1 million Gap Fund program to support acceleration of battery and renewable energy technologies through TRL 4 and 5. GOED also oversees the federal State Small Business Credit Initiative (SSBCI), which includes a state-sponsored venture capital program (Battle Born Growth Venture) with \$36 million – the largest venture capital program in Nevada. All of these resources are aligned behind and support the proposed Tech Hub's key technology focus area.