

Riverside Innovation District: A Green Cities Initiative Proposal to Volkswagen

I. Overview

We propose to Volkswagen that Riverside, California is the **best** choice for launching a Green City Initiative to pilot future concepts of sustainable mobility and launch transformational e-mobility throughout the nation.

Here is why:

Our People – *Our community is poised to enormously benefit from and embrace the reality of sustainable, shared, electric transportation.* Our demographic is young, environmentally conscious, tech-savvy and open to new concepts. Many freshmen living on our University of California – Riverside (UCR) campus do not have the luxury of parking spaces for private vehicles. Furthermore, our city is not compact and not bicycle friendly like many other California campuses and cities. Sustainable e-mobility solutions for these residents is urgently needed.

Our Momentum – *Riverside is undergoing unprecedented strategic growth over the next 5- 15 years.* In the next five years, our Innovation District will include a north campus expansion complete with 8,000 new beds for incoming freshmen, a regional event center and a transit hub, and a major new 18-acre facility for the California Air Resources Board (CARB). Citywide, growth at California Baptist University (CBU) and Riverside Community College (RCC) will continue to add additional student and faculty populations. Riverside itself has allocated additional space to expand with technology parks and industry innovation hubs over the next 15 years. We are also undergoing major inland port expansion with growing logistics centers; further, the Riverside County Transportation Commission (RCTC) is planning to pour billions of dollars of investment into local roadways, including funds allocated to mitigation techniques from the increased truck traffic. In summary, Riverside is a prime location for demonstrating e-mobility with the ultimate goal of impacting everything from personal transportation to world-wide logistics. *Volkswagen has the ability to leverage this growth at the ideal moment to create transformational change now by integrating and demonstrating significant connected and automated e-mobility into this planned growth strategy.*

Our Collaboration – *Our City, County, Utility, Regional Transportation Center, Regional Council of Governments, and UCR are committed to sustainable mobility solutions and can accomplish buildouts at unprecedented speed.* Riverside is unique in that our City, County, and municipal utility work hand-in-hand to provide turnkey projects in record time. We have a structure that bypasses conventional methods for typical construction projects, with streamlined permitting across boundaries, package solutions, and integrated publicly owned utilities. The team described above has accomplished many successes, from street reconstruction projects to major state and industrial facility buildouts that are proof of our aptitude, our superior economic model, and our commitment to green living in Riverside. *This type of successful partnership exists nowhere else in California.*

Our Need- *Our need for air quality improvements and congestion mitigation is rivaled by no other California city.* The broad area of Los Angeles-Long Beach-Riverside ranked as number 1 in the nation for

having the worst ozone pollution, according to the American Lung Association's 2016 report¹. In 2015, Riverside had over 140 reported days of high ozone. We qualify as a severely disadvantaged community under the SB 535 guidelines, and we have a large minority and low and moderate income population. While our residents and regulators are open to electric vehicles, Riverside has had difficulty with installations of charging stations due to the fact that we do not qualify for CEC EPIC funds, since we are not in an investor owned utility (IOU) territory. *Therefore, a Volkswagen investment will greatly support electrification in a complementary fashion with the State investments, and launch the currently 'left behind' Riverside into the ZEV community with transformational change.*

Our Knowledgebase—UCR is a leading applied institution for smart transportation, sustainable grid and vehicle integration. This knowledgebase, when coupled by funding for Riverside Innovation District and smart ZEV city, will create impact, information, and demonstrations of e-mobility concepts that are transformational.

Our Outreach – UCR's highly successful public awareness and education activities include numerous outreach and education programs such as the Healthy Communities Program and our STEM K-12 to college program, just to name a few. We also partner closely with UC Davis and other UCs in system wide outreach activities around transportation and sustainability.

Our Visibility—UCR is part of one of the most prestigious public university systems in the world, and the only system that has pledged to emit zero net greenhouse gases from its buildings and vehicle fleet by 2025. As part of the UC system, we speak to the world in research, development, education and sustainability. *Our commitment and momentum towards net zero through smart technology such as the Innovation District, as described below, will allow Volkswagen to make early, visible progress towards ZEV infrastructure and public awareness, and be cost leveraged with Riverside's current investment.*

¹ (<http://patch.com/california/temecula/riverside-countys-air-quality-among-worst-nation-report-finds-0>), Riverside County, the 10th largest county in the United States, received failing grades in smog -- or ozone - levels and in the average daily presence of particle pollution, which the U.S. Environmental Protection Agency defines as dirt, dust, soot and other "inhalable coarse particles" larger than 2.5 micrometers

II. Setting the Scene – Why Riverside

*Riverside, CA, with a population upwards of three hundred thousand, is one of the most vibrant, fastest growing cities in California. Our diverse vibrancy is demonstrated through activities such as the Long Nights of Arts and Innovation, numerous awards including the prestigious *Intelligent Community of the Year Award* in 2012², and our active sustainable grass roots community organizations³.*

Riverside County is a key player in the goods movement in the United States. With proximity to the ports of Los Angeles and Long Beach – the two busiest ports in America – Riverside is situated with excellent proximity to the intersection of three major arteries of Southern California’s freeway system: Interstate 10 from Los Angeles to Phoenix, Interstate 15 connecting San Diego to Las Vegas, and State Route 60. It also has access to major rail lines, including the Burlington Northern Santa Fe Railway and the Union Pacific Railway. Together the freeways and the railroads form critical arteries from the ports to large population centers for distribution across the United States.

Riverside is the home of three well-established higher education entities that are budding in development and growth⁴. The largest of these institutions is University of California, Riverside, which welcomed over 22,000 students to campus this year. As one of ten campuses in the UC system, UCR is part of one of the most prestigious public university systems in the world. In keeping with our reputation as a leader, in November 2013, UC President Janet Napolitano announced the Carbon Neutrality Initiative, which commits UC to emitting net zero greenhouse gases from its buildings and vehicle fleet by 2025, ***something no other major university system has done***. UCR is helping achieve this mission by using applied research and technology transfer to help bring new ZEV and sustainable energy technologies and infrastructure to our campus and to our state. Recognizing UCR for this leadership and innovation in advanced vehicle technology and our air quality research, the California Air Resources Board (ARB) has selected UCR to be the home of their new southern California facility. In less than five years, over 400 staff from the ARB will be working in Riverside at a new 18-acre state-of-the-art facility.

The influx of new residents to Riverside, from new ARB staff to UCR freshman, means Riverside is primed for rolling out popular transportation solutions such as shared ZEV transportation systems, public transit, and hydrogen fuel celled vehicles within the next five years. The availability of an innovative transportation options at their new location is very welcome by our existing and incoming demographic and will have major influence on personal transportation choices and purchases.

² <http://www.riversideca.gov/awards.asp>

³ Green awards include (need to look at still) <https://ucrtoday.ucr.edu/9701>; <http://www.pe.com/articles/building-612976-community-riverside.html>; <http://www.highlandernews.org/5075/ucr-honored-with-sustainability-awards/>; <http://www.highlandernews.org/1062/uc-benefits-from-green-technology/>

⁴ Cal Baptist University, growth statistics and new engineering building development https://calbaptist.edu/news/cbu_enrollment_tops_9000_continuing_growth_trend ; <http://schoolconstructionnews.com/2016/08/02/california-baptist-university-project-reaches-milestone/> . UCR growth statistics – 8000 students over the next 8 years, new developments, etc. New STEM high school, funding secured, in development. <http://www.pe.com/articles/research-780871-campus-student.html> ; <http://www.ucr.edu/about> ; http://ae.ucr.edu/business/958080_rfq_north_dist_alta_ssps_survey.pdf <https://www.universityofcalifornia.edu/news/chancellor-300-new-faculty-ramped-campus-growth>; <https://ucrtoday.ucr.edu/42662>; <https://ucrtoday.ucr.edu/31112>

III. Introducing the Proposed Innovation District

In recent years, the City of Riverside has developed a *Smart Cities Action Plan* that has a variety of forward-thinking elements including urban automation, connected vehicles, intelligent sensor-based infrastructure, user-focused shared mobility services, electric vehicle technology coupled with smart grids, and advanced urban analytics. As part of this action plan, the City of Riverside and the University of California-Riverside (UCR) have come together to design and develop an initial *Innovation Corridor* that will encompass many of these smart city elements. Ultimately, the corridor will be expanded to an *Innovation District* to include efforts with our Regional County Transportation Center (RCTC) to address congestion on freeways.

Below we describe in more detail why Riverside, and our planned Innovation District, make a compelling backdrop for Volkswagen to showcase the successful rollout of sustainable mobility solutions and provide significant quality of life benefit to Californians.

Physically, Riverside's Innovation District consists of the downtown district, expanded out to the UC Riverside campus. Riverside's downtown and UCR are connected by University Avenue, a 6-mile busy arterial roadway, with the planned transit hub at UCR on one end and downtown Riverside on the other (Figure 1). Additionally, there are two Metrolink stations bordering either edge of the corridor. There are many state-of-the-art elements to this Innovation District that not only address transportation, but also energy and air quality. These elements include:

- Autonomous ZEV demonstrations & testing corridor;
- ZEV Transit (electric bus) System and associated infrastructure;
- Vehicle grid integration through microgrid energy storage to support a fleet of electric vehicles (e.g., both cars and buses);
- Car sharing demonstrations;
- Dedicated Short Range Communication (DSRC) transceivers installed at traffic lights;
- School bus charging infrastructure and system; and
- Freight Transport Projects – In conjunction with RCTC, a roll out innovative freight mitigation strategies to minimize congestion from growing goods movement on the 215/91/60 freeways and associated arterials.

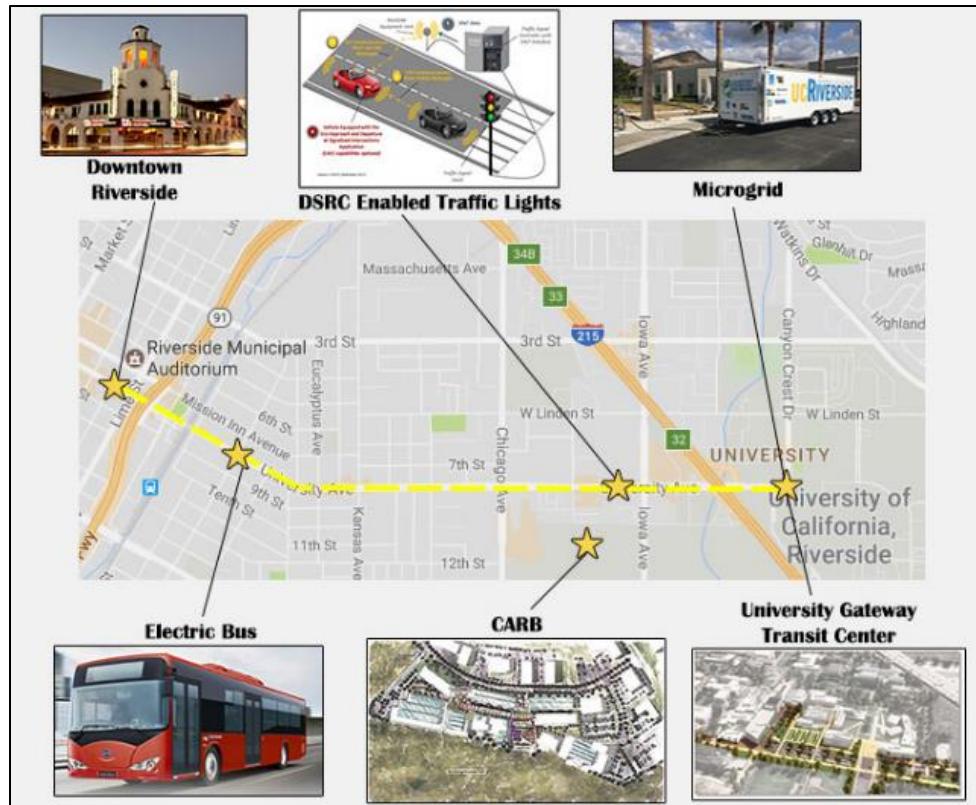


Figure 1. The Riverside Innovation Corridor

Non-Investor Owned Utility Region and Disadvantaged Community Status

The Riverside Innovation Corridor is located in a non-Investor Owned Utility (IOU) region, supported instead by the City of Riverside’s Public Utility which provides electricity and water to the greater Riverside region. As such, Riverside hasn’t been able to take advantage of California Energy Commission funding to develop its electric vehicle charging vehicle infrastructure as quickly as other parts of Southern California. With support from the Green Cities effort, Riverside, with emphasis on the Riverside Innovation Corridor and surrounding Metrolink stations and downtown, will be able to fully develop and utilize clean vehicle technology, improving the livelihood of its residents.

Further, Riverside and the Riverside Innovation Corridor falls squarely within a disadvantaged community region as defined by California’s Senate Bill 535, as shown in Figure 5. A green cities investment in the Innovation Corridor will allow Riverside to greatly improve conditions for its local community.⁵

⁵ <https://ucrtoday.ucr.edu/36007>

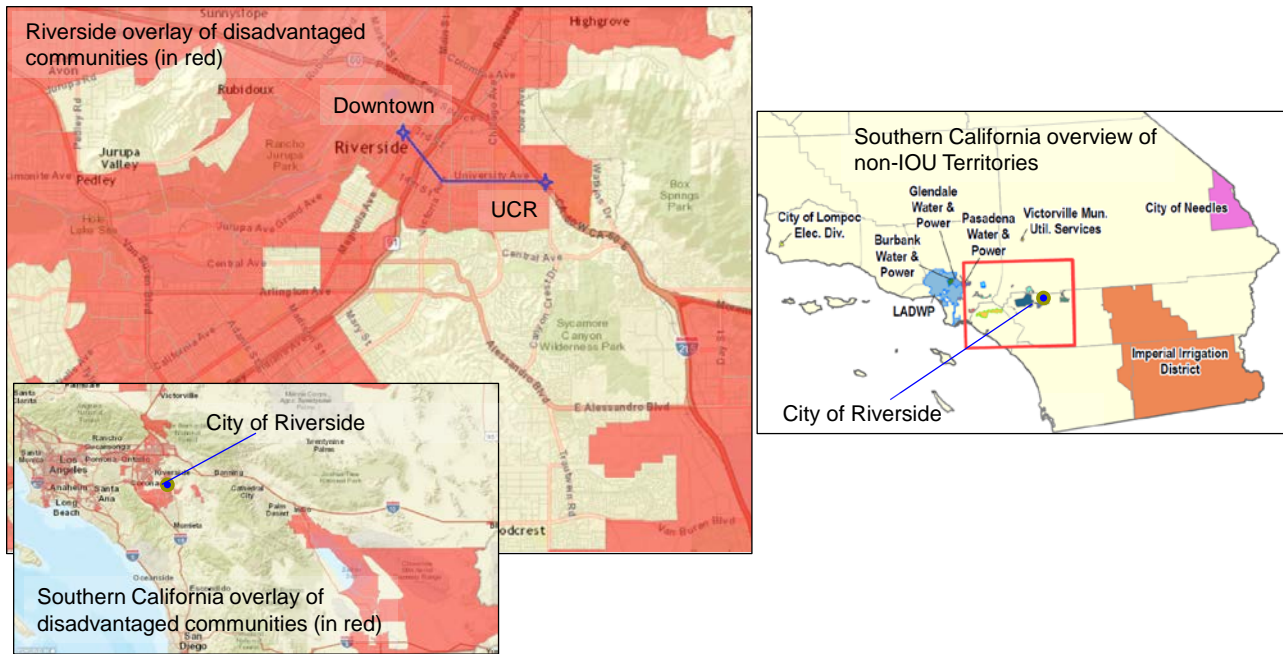


Figure 5. The Riverside Innovation Corridor falls within an area designated as a disadvantaged community and also is in a non-Investor Owned Utility (IOU) region.

Adjacency to The California Air Resources Board’s new Southern California Facility

In March 2016, the California Air Resources Board voted to consolidate many of its Southern California facilities and establish a new facility on the UC Riverside campus. This 18-acre site will be the home of a \$400M state-of-the-art facility that will employ over 400 employees. The new CARB facility is scheduled to open in 2020 and it will be tightly integrated into the UCR campus, with opportunities for student internships, cooperative faculty positions for its staff, and joint seminar series between the two organizations. The Riverside Innovation Corridor will directly benefit this new CARB facility due to its direct adjacency, as shown in Figure 6. The transportation elements of the corridor will provide clean mobility to the CARB employees. Further, UCR’s 2025 carbon neutrality initiative and CARB’s zero net energy goals will synergistically be served by the Riverside Innovation Corridor.



Figure 6. Location of the new California Air Resources Board’s new Southern California \$400M Facility along the Riverside Innovation Corridor

Research Elements of the Innovation Corridor Testbed

Researchers at UC Riverside have been very active in the last two decades, developing Connected and Automated Vehicle (CAV) applications to improve safety, mobility, and to place less burden on the environment. In addition, UCR is at the forefront in air quality and climate change research, particularly on the linkages with transportation and energy systems. As part of our deployment strategy of CAVs, the City and UCR have recently installed advanced traffic signal controllers that are enabled with Dedicated Short Range Communication (DSRC) transceivers. This allows for the traffic lights to broadcast their signal phase and timing information to connected vehicles to improve safety, traffic throughput, and to reduce emissions. As an example application, UC Riverside has developed “eco-approach and departure” algorithms that are being implemented now at several locations across the country (see Figure 2). These CAV applications are being deployed in the Riverside Innovation District, in order to improve local mobility while collecting valuable performance data.

In addition to these CAV applications, UCR is also deploying advanced vehicles in the Innovation District, such as an energy-efficient hybrid electric bus that can anticipate traffic conditions and passenger pickups in order to maximize efficiency along the bus route. This research is sponsored by the Department of Energy’s ARPA-E NEXTCAR program (see <https://arpa-e.energy.gov/?q=arpa-e-programs/nextcar>).

In terms of air quality research, UCR is also proposing to build a network of “citizen-scientists for air-quality” at the community level in the Riverside Innovation District. The goal of this NSF proposal is to advance science, increase community engagement, and improve the quality of life in a diverse, populous, and fast-growing region. As part of the Innovation Corridor, this project will also tie-in elements of our smart grid research that integrates solar and other renewable electricity into the local grid. The project will also enhance the Innovation Corridor by designing and implementing a suite of

environmental monitoring sensors, data analytics, modeling, and communications tools to produce new scientific knowledge about air quality at an unprecedented granularity (i.e., down to street level) and will educate residents about the implications of their decisions on local travel and energy use on their health and economic well-being.

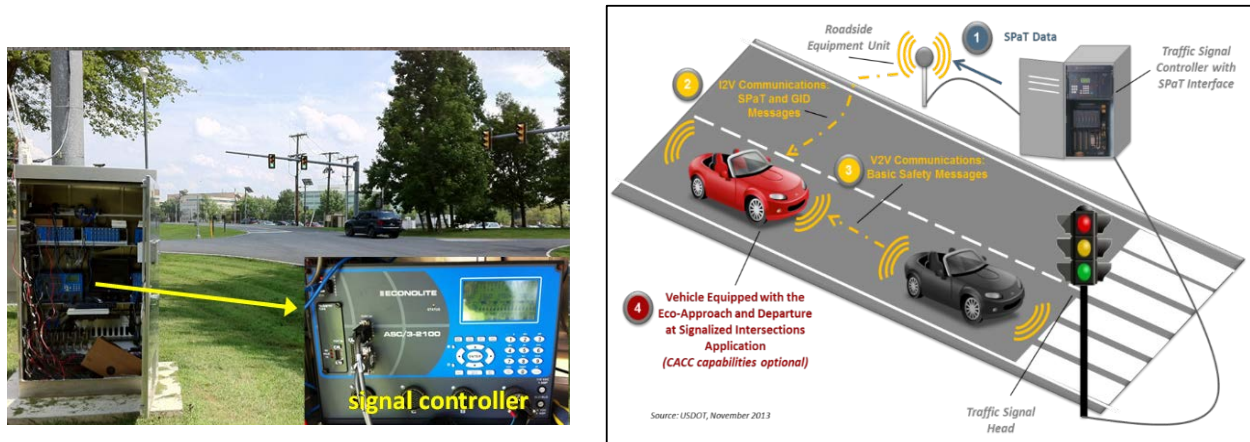


Figure 2. Traffic Signal Controllers that are enabled with Dedicated Short Range Communication and Connected and Automated Vehicle Applications that can improve safety, mobility, and the environment.

Advanced Transit Hub

Together with the City and the Riverside Transit Agency, UCR is planning an innovative transit hub on its campus located at the terminus of the University Avenue in the Innovation District (see Figure 3). This transit hub will be unique in that it will have microgrid energy storage to support a fleet of electric vehicles (e.g., both cars and buses). This transit hub will have significant electric vehicle charging infrastructure, allowing for fast charging (level-3) for several vehicles simultaneously. This charging infrastructure will not only support a fleet of electric buses but also a fleet of shared electric vehicles. In 1999, UCR researchers pioneered electric vehicle carsharing on its campus; UCR plans to greatly expand its electric vehicle carsharing system to support clean convenient transportation across its campus. This advanced carsharing system will connect with other transportation modes at the innovative transit hub, helping solve the common first-mile last-mile problem often associated with transit.



Figure 3. Riverside's newest transit hub will have significant electric vehicle charging infrastructure that will not only support electric buses but also an innovative electric vehicle carsharing system.

Electric Bus System and Associated Infrastructure

The Riverside Transit Agency together with the City is exploring the development of an all-electric bus system operating in the Innovation District, as illustrated in Figure 4. There have been great advances in all-electric bus technology, providing the range and comfort as today's buses, but with no emissions. In addition to the buses, innovative bus stop infrastructure is also being contemplated, where dedicated bus lanes could be developed, transit signal priority systems put in to place, and intelligent transportation system technology deployed at the bus stops.



Figure 4. All Electric Bus System and Associated Infrastructure