

Accelerated Innovation Deployment (AID) Demonstration Project Narrative

[NOTE: Project narrative should not exceed five (5) pages.]

I. Project Abstract (5 sentences maximum)

1. *Project Abstract:* Describe work that would be completed under the project, whether the project is a complete project or part of a larger project with prior investment, and the aspect of highway transportation and the TIDP goals that the innovation would address (maximum five sentences). The project abstract should succinctly describe how this specific request for AID Demonstration funding would be included in the project. Show citation box

Title: Automated Taxi (**aTaxi**) shuttles in Greenville, SC, and their Business Potential, are the focus of this Accelerated Innovation Deployment (AID) Demonstration project.

Innovation Deployed: **aTaxi** shuttles, similar to Google cars, are automated electric vehicles (**AEV**) that are driverless and shared by passengers from an origin (home or office) to a selected nearby destination (shop, dine, learn, heal, play, etc.) and have potential to create great visibility and excitement for automated vehicles.

Greenville's dedicated **AEV** routeway is part of a multi-modal transportation corridor/ greenway along a former railroad that will also provide for walkers and bicyclists, and is labelled the "Swamp Rabbit Trail" which closely parallels Laurens Road, a major connector highway with 25,000 cars and buses operating between downtown Greenville and Mauldin (map attached).

The innovative business opportunity is for **aTaxi shuttles** on the Swamp Rabbit Trail to provide improved connectivity and mobility for local residents, especially people who cannot drive or choose not to drive for physical, medical or personal reasons, while reducing congestion and pollution on Laurens Road, and developing/ deploying new vehicles, techniques, and practices to accelerate the adoption of AEV as an innovative aspect of surface transportation.

The challenges in creating a business case for AEV innovations include the current high costs of the **aTaxi** vehicles, the availability and costs of dedicated AEV routeways, the rate of acceptance/ usage of AEV by current automobile drivers, and the funding of AEV capital and operational expenses.

II. Project Description

2. *Project Description:* Brief description of the project and project objective(s), the innovation and related documented benefits, the performance goals and measures for the innovation, current organizational/institutional experience with the innovation, and the significant improvement to conventional practice expected.

Greenville's goal is to demonstrate successful operational performance of a "fleet" of at least six various electric, autonomous (**aTaxi**) shuttle shared vehicles. Autonomous vehicles represent a breakthrough in transportation, with profound benefits for safety, economic productivity, social mobility, and the environment. But, as yet no clear roadmap exists for how to integration these

technologies into the current transportation network. This project will provide the first step in a practical link between today's limited number of specialized field tests and a system that integrates autonomous vehicles into everyday applications while also providing hands-on experience that will help state and local agencies in general to plan for implementation of autonomous and connected vehicles. As such, it offers a way for citizens and businesses to become more familiar with this new means of travel, opening the door to broader utilization. It also will help state DOTs and other public agencies learn how to take full advantage of the potential that this new technology offers.

There are many broad transportation benefits to our project – improved mobility/accessibility; reduced environmental impacts, reduced congestion, and improved livability. Specific benefits of the aTaxi innovation include the personal, private nature of the small vehicle, the on-demand and origin-destination direct travel, and the driverless or automated features are attractive to people tempted by electronics to drive distracted.

The performance goals include short or zero wait time, relatively rapid travel, and lower overall travel cost savings because shared vehicles cost less than personal vehicles that sit idle for a large percentage of each day. While Google cars have brought recent media attention to self-driving cars, the lack of aTaxi availability for most people, the high costs, the lack of charging stations, etc. means very few people have actually ridden in an AEV. And the big question remains: “Will people actually get out of their personal vehicles, and use shared aTaxi shuttles for first and last mile travel?”

Greenville can be a leader in demonstrating a successful aTaxi business case. We have worked with Corey Clothier and ARIBO for about two years, and are partners in the ARIBO Global Cities Team Challenge project. We participated in GCTC conferences at NIST in September 2014 and February 2015, and in Podcar Washington 2013 meeting and in Kirkland WA in 2014. In February, 2014, GCEDC hosted a one day demonstration of the Navia shuttle between a rehab facility and the main hospital in Greer. In December 2014, a group of university students demonstrated Bruin1 - an automated electric vehicle on the public library campus. We have two groups of university students working to automate and demo EVs this spring.

On 1/30/15, the GC Economic Development Corporation issued an RFP inviting automated transport network (ATN) system companies to bring their technology and investors to Greenville to build an ATN system of 20 or more miles around Greenville. On 2/12/15, the County applied for an IBM Smarter Cities Challenge grant, a pro bono collaboration that will explore potential for multi-modal transportation, including automated EVs, to help create GreenVillages development around mobility hubs.

We believe, as momentum builds, the public interest in automated vehicles will soar and that an AID grant for an aTaxi shuttle project in Greenville could be transformational. The project is scalable and replicable in other cities across America.

The proposed AID funded aTaxi demonstration project will utilize an innovative, dedicated routeway or “test bed” to demonstrate proof of concept, attract potential riders, and evaluate operational data. While SC-TAC's urban test bed at the International Transportation Innovation Center (ITIC) is a valuable asset for early vehicle performance assessments, the primary routeway for aTaxi shuttle service is GCEDC's former RR ROW corridor. The AID aTaxi shuttle demonstration will use the southern Swamp Rabbit Trail for dual aTaxi lanes and at least three Mobility Stations. Initial focus for connectivity is about two miles between three

GreenVillages mobility centers: the CU-ICAR campus, Verdae Village mixed use shops and restaurants, and the Verdae residential and mixed use community.

Greenville County will use Accelerated Innovation Deployment (AID) resources, coordinate with South Carolina DOT leaders, engage researchers at the International Transportation Innovation Center (ITIC), and involve developers along the Laurens Road multi-modal transportation corridor to develop and deploy improved automated electric vehicles (AEV) for the tenants on their properties, and to identify methods to accelerate the adoption of proven innovative AEV technologies as standard practices. Private funds could build and automate a Local Motors 3D vehicle for use on our SRT corridor.

Specific Greenville County goals for proposed AEV system reflect FHWA and AID goals:

- Significantly accelerate the adoption of innovative AEV technologies by the surface transportation community.
- Provide leadership to demonstrate and promote state-of-the-art AEV technologies, and increased acceptance and usage of AEV as a transport option that results in increased use of shared AEV and creates a new business model for urban transport as well as reduced highway congestion, and improved safety and rider satisfaction.
- Improve AEV routeway efficiency, safety, mobility, reliability, and sustainability.

III. Innovation Performance

3. Innovation Performance: Brief description of how the innovation will be monitored, assessed, and documented to determine if the performance goals and measures are achieved, including a timeline of demonstration, deployment, implementation, and/or adoption activities.

The AEV system performance will be managed and monitored by GC Recreation Department personnel. System assessment and documentation will be by CU-ICAR graduate students under the direction of CU faculty to determine if the performance goals and measures are achieved. We want to highlight the value of testing different vehicle types – six in total, so that we have opportunities to compare performance data from vehicles with different costs and strengths.

Proposed Schedule: Within three months of award, GCEDC, a unit of Greenville County, will complete a detailed work plan. This will describe specific tasks; responsibilities for each of the partners; and define performance goals for each task. These performance measures will cover operations, environmental, safety, mobility, and customer satisfaction objectives. It will also identify possible extensions once additional funds become available.

A key early task will be the lease of the four ALSEV vehicles. These include two Veeo vehicles with service, maintenance, and insurance packages, plus two additional electric vehicles donated by Clemson University, ICAR, which will be adapted with Veeo automation packages. In addition, two operational AEV provided by other universities and colleges will be added for fleet operations. These six pilot vehicles will allow sufficient resources for our start-up operations. The variety of vehicles allows us to collect data and compare performances in many ways.

Initial testing of the operation will take at least one month, but may extend longer to assure full integration of all vehicles. This task will calibrate the aTaxi shuttles to the roads and destinations in the two target areas – Verdae and CU-ICAR campuses. It will also provide information for expected customers regarding how to use the new system.

GCEDC will coordinate operation of the aTaxi shuttle system for at least one year after the AID grant is awarded. Since the intent of demonstrating commercial viability of the aTaxi shuttle operation is a goal, a private operator may be hired to continue the commercial autonomous vehicle system for one or more additional years. The longer evaluation period will allow for testing under multiple weather and pedestrian environments and provide the most robust safety, mobility and environmental data. This will avoid any short-term focus typically associated with field tests. This will also provide time to adjust operations as feedback and data is provided from the application.

The grant application calls for a final report that includes evaluation of the innovation, customer surveys, and guidance for how other state DOTs might benefit from the innovation. We will provide these reports, but in recognition of the strong interest in this new field, we will also provide updates and lessons learned after six months and twelve months of operation. These will include customer surveys every six months. These updates will be circulated widely among state DOTs and others in the US transportation community.

The project timeline begins within three months of the AID grant award, and includes demonstration, deployment, implementation, and adoption activities such as the following.

- Order two Veeo vehicles with service, maintenance, and insurance packages;
- Order two Veeo automation packages for two additional electric vehicles donated by CU;
- Add two additional operational AEV to fleet as provided by other universities and colleges;
- Create a Local Motors vehicle and automate it (as a separate County or private funded option);
- Swamp Rabbit Trail Routeway completed and striped for walkers, bicyclists, and AE;
- Multi-modal stations w/ ticketing kiosks and solar panels installed;
- Service/storage area w/solar panels and wireless charging stations built;
- Each AEV logs 100 hours each of deployment within campus w/ monitor riders only;
- Each AEV is utilized for a full year and performance results are tracked individually;
- Benchmark data for speed, VMT, power usage, power costs, service costs, etc. collected;
- Various vehicles are compared for performance, individually, by type, and overall;
- Riders take pre-and post-ride surveys to assess attitudes and perceptions;
- Usage data for ridership and operational maintenance and service costs are evaluated;
- Summary report is prepared and presented to FHWA .

IV. Applicant Information and Coordination with Other Entities

4. Applicant information and coordination with other entities: Identification of applicant, and subrecipient if applicable; description of cooperation with other entities; and information regarding any other entities involved in the project.

Greenville County (GC), South Carolina is applying as a subrecipient through the State DOT. GC will lead and manage finances on the project, GCEDC owns the former railroad corridor parallel to Laurens Road, and the GC Recreation Department will manage the Swamp Rabbit Trail (SRT). However, other partner entities are crucial and will include:

- SCDOT – applicant and grantor of encroachments,
- City of Greenville – approval of bike and AEV lanes, financial support for the SRT.
- GCEDC – currently owns ROW, will manage aTaxi project on ROW for County
- ARIBO/ Comet LLC – Global Cities Team partner of GCEDC on aTaxi shuttle project.
- Veeo – supplier of a proven 100% electric, 100% automated vehicle and technology support,
- ITIC – coordinator of transportation innovation and coordinator of SCTAC test track access,
- CU-ICAR – assess automation technology, and evaluate project, donation of 2 EVs,
- GTC – service center and maintenance coordination and development of training components
- BJU – provision of an operational AEV, Bruin1, demonstrated in several venues this spring.
- Michelin – provision of mobility expertise and “tweels” for the vehicles
- Verdae Development – right of way transfer and land for a multi-modal station

V. Funding Request

5. *Funding Request:* Summary of the funding request including the basis for determining the cost of the innovation in the project. The applicant should also include the total project cost.

Item	Use	Unit Cost	Number	Total Cost	Innovation \$
Veeo- vehicle & service	aTaxi	\$150,000	2 yr-lease	\$300,000	“
EV + Veeo automation	aTaxi	\$75,000	2	\$150,000	“
EV + local automation	aTaxi	\$37,500	2	\$75,000	“
Lane paving & striping	aTaxi lanes	\$200,000	2 miles	\$200,000	
Mobility Hubs/Kiosks	Stations	\$50,000	4	\$200,000	‘
Service Center	O&M Ctr	\$75,000	1	\$75,000	‘
Manager & Technicians	Operations	\$80,000	2	\$160,000	‘
PT Intern/ Service Tech	Operations	\$40,000	4 FTE	\$160,000	‘
Evaluators	Evaluation	\$80,000	1 FTE	\$80,000	‘
Prof Services	Legal, etc.	\$80,000	0.5 FTE	\$40,000	‘
Fees and Travel	Misc	\$30,000		\$30,000	
Grading & Paving SRT	Routeway	\$300,000	2 miles	\$600,000	*Public match
Bridge over Laurel Crk	Footbridge	\$80,000		\$80,000	*Public match
Project Total Cost				\$2,150,000	Total
Cash & In-kind Gifts, ROW, Labor,* above				\$1,150,000	*Public match
Innovation Grant				\$1,000,000	AID Grant
Local Motors 3D model	3-DVehicle	\$100,000	1	\$100,000	Private funds

VI. Eligibility and Selection Criteria

6. *Eligibility and Selection Criteria*: Brief description of how the project meets the statutory eligibility criteria as described in Section III (*Eligibility*) and the selection criteria identified in Section IV (*Selection Criteria*).

- Project is eligible for Federal-aid highway assistance under Title 23, United States Code.
- The project includes transportation planning, financing, operation, structures, environment, and construction that address TIDP goals.
- The project will be initiated within 6 months of applying for AID Demonstration funding.
- The project includes an innovation that is:
 - proven in real-world application with documented, public benefits,
 - not routinely used by the applicant or the subrecipient, and
 - applicant or subrecipient intends to implement and adopt as a significant improvement from the applicant's or the subrecipient's conventional practice.

Additional Attachments No Yes (PDF files identified by Applicant and Project Title)