



TRI DELTA TRANSIT

Eastern Contra Costa Transit Authority
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APPENDIX B

Agenda Item 7d Autonomous Vehicle Demonstration Project

Board of Directors Meeting

Wednesday December 16, 2020



AV Star for Tri Delta

First Transit

**PERRONE
ROBOTICS**

GreenPower
MOTOR COMPANY

December 2020

Partnership Overview



First Transit

- Operations
- Project Management
- Staffing



GreenPower

- GreenPower EV Star electrical vehicle
- OEM maintenance support



Perrone Robotics

- MAX/TONY AV stack solution and Engineering



GreenPower Motor Company

Vision: Advancing the adoption of electric vehicles by making battery-electric buses and trucks affordable, durable, and easy for customers to deploy

- **Founded in 2010**
- **Purpose-built commercial electric vehicles for a broad range of service types**
- **Vehicles capable of autonomous operation and wireless charging**
- **Manufacturing located in Porterville, CA**
- **Sales Admin office located in Rancho Cucamonga, CA**



Perrone Robotics, Inc.

*Vision: One
Software
Platform, Any
Autonomous
Application*

35,000 automated
miles traveled



17 years of autonomy
experience



150 man-years
of team AV experience



More than 30
vehicles automated



Two US patents with
others pending



First Transit

***Vision:** We provide easy and convenient mobility, improving quality of life by connecting people and communities*



10 AV deployments



20,000 employees



65 years in business



35,000 vehicles maintained



US, Canada,
and Puerto Rico



300+ contracts



318m passengers per year

Project Plan

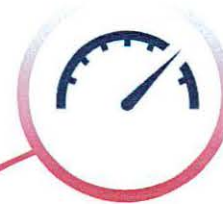
Deploy an Automated Vehicle in public transit operation

- **Level 4 automated vehicle within existing service**
- **Within micro-mobility 'MyRide' service**
 - On-demand, rideshare service
 - Service area around Pittsburg or Antioch BART stations
 - Monday-Friday, 5a-9p service
- **AV Star to supplement existing fleet**

Operational Design Domain

General Public Zone

Level 4
Automation
(operator
present
onboard)



Operates at top
speeds ranging from
25-35 mph



Operates in mixed
traffic

- Pedestrians
- Cyclists
- vehicles



Operates within
cities or suburbs



Interacts with
intersections, yield
turns, stop lights,
parking scenarios

Typical PRI sensor setup



FMVSS capable vehicle, Altoona-Tested and verified

Cameras used for lane-keeping, traffic signal detection and analysis

Multiple 3D lidars view front and sides and overlap for safety/reliability

RADAR provides longer-range inputs and better fusion results when following traffic

Hardware Functionality

Sensor Type	Location	Purpose
GPS/INS/IMU	Top of vehicle	Aid in localization of shuttle. GPS corrections provide < 10cm accuracy, typically 2-4 cm.
Lidar	2 front corners, 1 center rear, others as required by ODD	Detailed views of road and surroundings of shuttle during operations. Effective to 100 meters but can see reflective objects farther out.
Long-range Radar	Front	Identify objects at greater distance to enable higher speed operations. Also provide object speed estimation.
Medium-range Radar	Front and rear, left and right sides	Enable view of vehicles approaching intersections from the side to allow merging at intersections. Also useful for merging.
Cameras	2, front	Traffic light location and state detection. Also lane edge detection used for navigation when GPS quality is poor.
Ultrasonics	Front/Rear as needed	Used for close-in maneuvering where obstacles are within about 3 meters or less.

Partnership Roles



First Transit

- Onboard operator staffing and supervision
 - Training
- Risk assessment and site analysis
- Community engagement
 - Public outreach
 - First responder training
- Data collection and reporting
- Vehicle maintenance support



GreenPower Motors

- **EV Star**
 - Purpose-built electric medium-duty vehicle
- **Up to 150-mile range**
- **Vehicle Capacity**
 - 19 forward-facing passenger seats
 - 12 passenger seats + 2 wheelchairs
- **118 kWh Battery**
 - Capacity Standard J1772 Plug-in Charger
 - Optional DC Fast Charging up to 50kW



Perrone Robotics

- **Autonomy Kit**
 - Hardware
 - Software
 - Engineering
- **Route setup and tuning**
- **Training assistance**
- **Technical Support**



Tri Delta – Eastern Contra Costa Transit Authority

- **Vehicle storage location**
 - Vehicle charging
- **Staff and supervision**
- **Service operation and route input**
- **Testing and validation oversight**
- **Marketing and communication**



Tri Delta – Eastern Contra Costa Transit Authority



Deployment

- **January 2021 (at earliest)**
 - Route setup and tuning
- **Operation**
 - **Within existing micro-mobility 'MyRide' service**
 - On-demand, rideshare service
 - Service area around Pittsburg and Antioch BART stations
 - Monday-Friday, 5a-9p service

