California Energy Commission
Grant Agreement ARV-15-068

Port of San Diego Sustainable Freight Demonstration Project

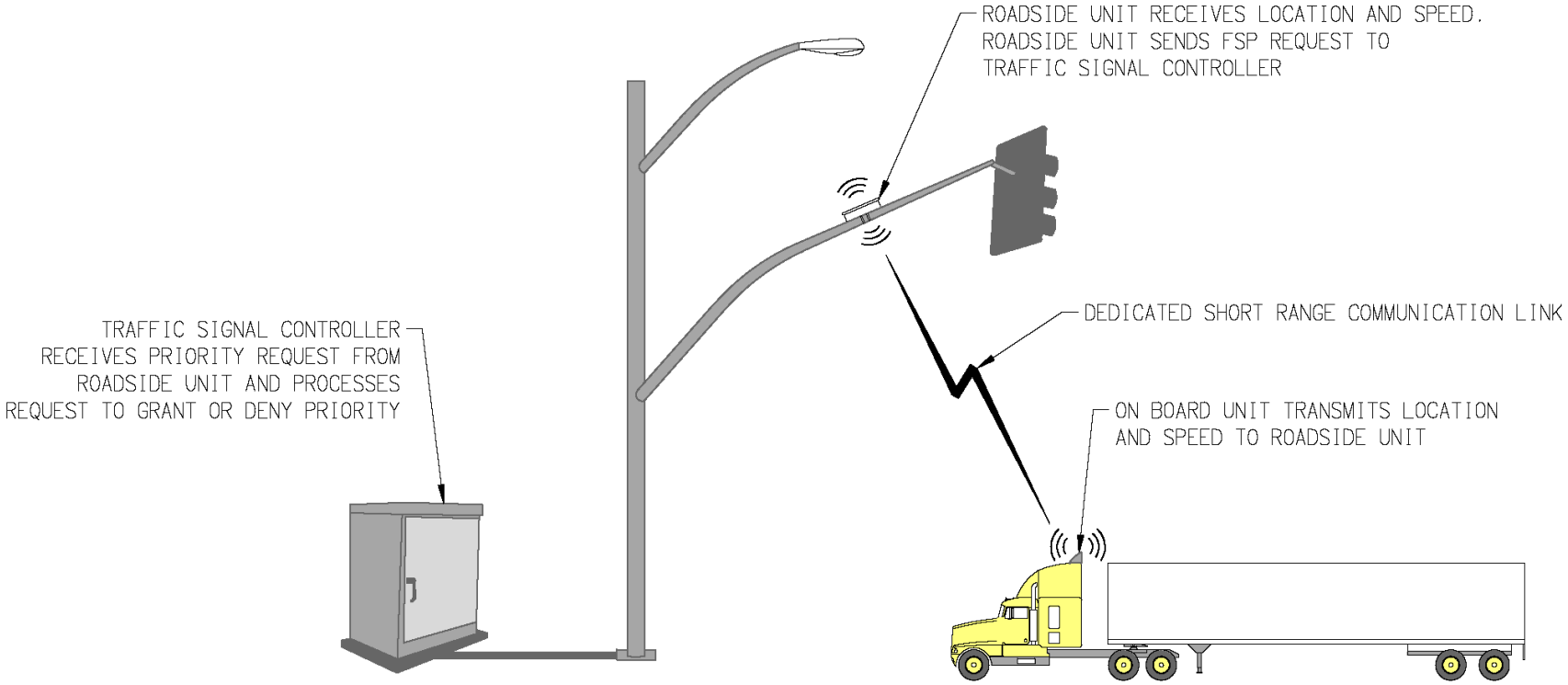
SAN DIEGO PORT TENANTS ASSOCIATION

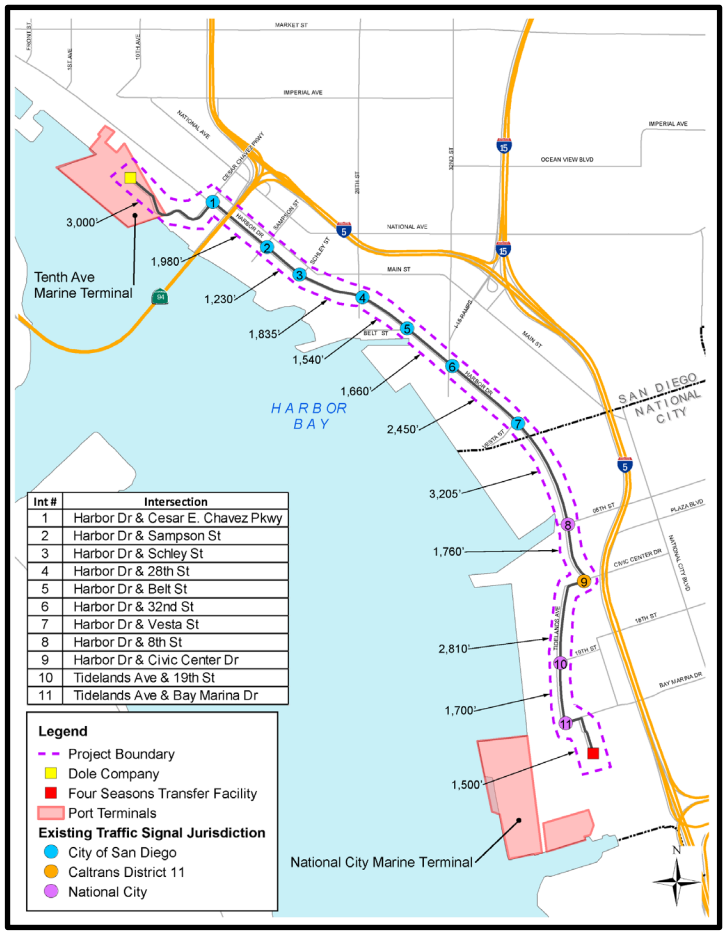
Overview of Project Deliverables

- Build 10 Advanced Technology Vehicles
- Build Intelligent Transportation System (ITS) for Integration into 10 Additional Vehicles for Fleet Partner
- Develop a DAC Program and Conduct Outreach
- Field Demonstrations of 20 Vehicles (Advanced Vehicles and ITS)

Freight Signal Priority System Overview

Vehicle and Roadside on Harbor Drive

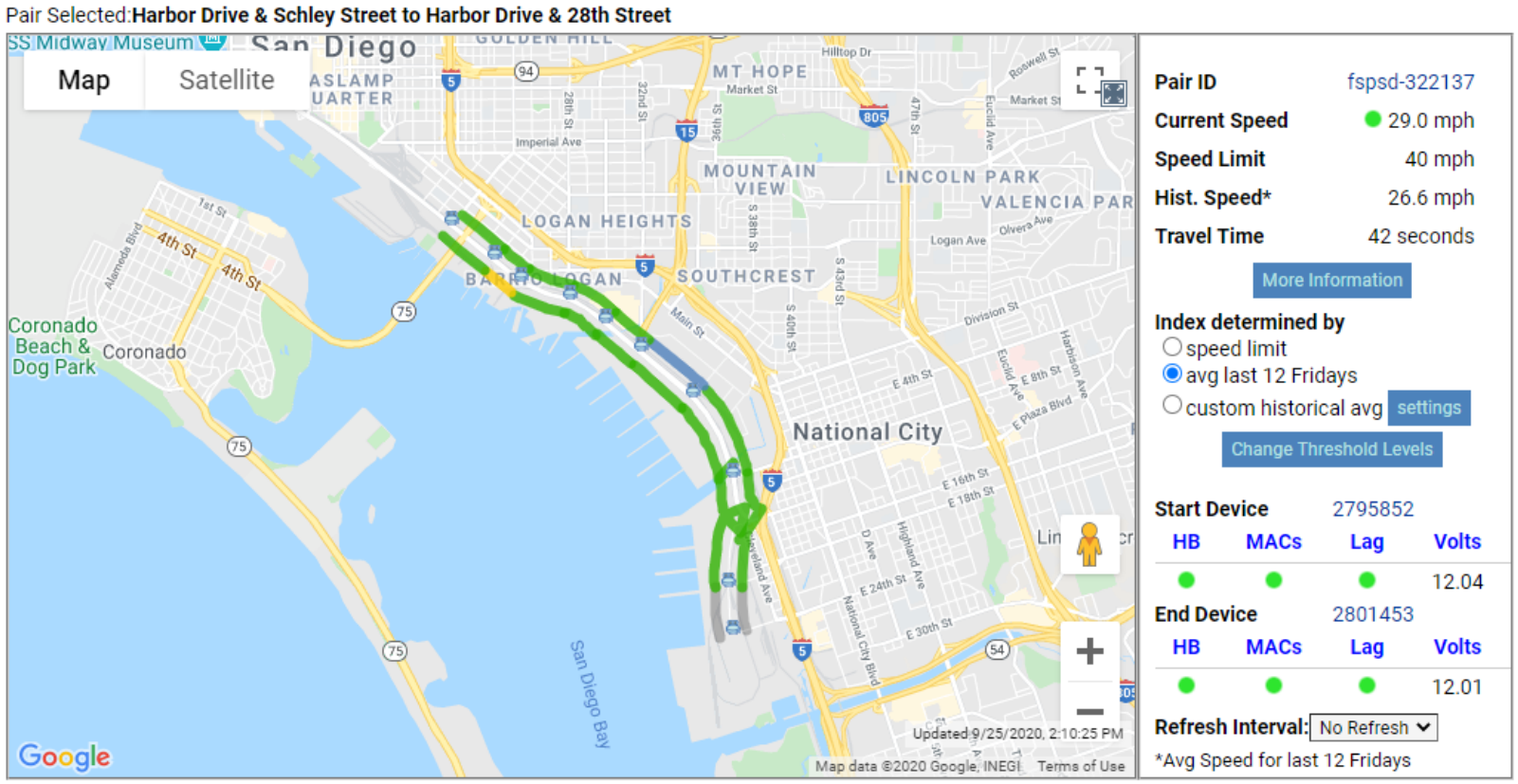




Reporting System

Performance Measures

- Travel Time Improvements
- Reduced Idle Times/reduced stops
- Fuel Efficiency
- Emission Reduction (EMFAC Model)
  - Oxides of Nitrogen
  - Non-methane Hydrocarbons
  - Particulate Matter



Common Concerns with EV Technology in Port / Shipyard Operations

- **Sufficient Battery Capacity**
  - Operations require equipment to be able to operate for consecutive shifts without interruption
  - Down time for charging can cost time, money, and lost business
- **Power and Performance**
  - Steep grades are common in port and shipyard operations
  - Can affect speed, hauling capacity, and significant battery drain or lack of power to perform necessary tasks
- **Durability**
  - Port/shipyard equipment is exposed to the elements year-round
  - Heat and humidity can negatively impact battery life and longevity
- **Design**
  - Visibility, ground clearance, and maneuverability may be significantly different from conventional equipment
  - Consequences of design adaptations may not be realized until put into real world use
- **Lack of existing infrastructure**
  - Charging is not yet standardized across EV MDHD equipment
  - Adopting EVs often requires also developing the infrastructure
  - Can include considerable costs and time investment for permitting and construction

Case Study: BYD Drayage Electric Drayage Truck

1st Generation

VS

2nd Generation

One drayage shift at Pasha requires 4 to 5 non-stop, round trips between the Port and Otay-Mesa (approximately 36 miles per round trip)

- Requires charging after 1 round trip.
- Cannot maintain the minimum speed limit when going up hill on a sustained grade
- If incorporated into a shift would require detaching the trailer and transferring to a second vehicle (increasing downtime significantly)

- Significant improvement to the battery performance
- Easily maintains speed going up hill on a sustained grade with an empty trailer; some speed loss with full trailer but still within safety parameters
- Performs a full shift without opportunity charging
- Two 2nd Gen trucks are now also being demonstrated at Terminalift with great results

Case Study: BYD Electric Yard Tractor

Dole Demonstration

Design Function Issues

- Back window design smaller than preferred for good visibility with sliding rather than rolling design
- Driver chair positioned slightly too high for visibility
- Passenger side mirror too large and gets continuously bumped
- 5th wheel stopped lower than the height of the rails

Design Modifications

- Alternative windows, chairs, and mirrors were identified and replaced in the demonstration vehicles
- Stoppers and additional reinforcement were added to correct the 5th wheel issue

Result

- Yard tractors have been operating successfully as planned at Dole
- All identified issues were resolved in the 2nd Generation model design

Pasha Demonstration

Design Function Issues

- Driver seat and steering column not able to swivel (necessary safe operations during Pasha cargo movements on and off ship)
- 5th wheel not able to be lowered while in drive (must be in park)
    - Necessary for safe operation on ramps during ship loading/unloading

Design Modifications

- Design changes were fully investigated
- Deemed too expensive to re-design for one vehicle

Result

- Yard tractor was reassigned to yard movements only

Equity Plan and Findings

Port of San Diego Sustainable Freight Demonstration Project

San Diego Port Tenants Association
DAC Advisory Group Suggestions and Recommendations

- Create a Port of San Diego Disadvantaged Communities (DAC) Advisory Group to include goals of equity, environmental/social justice as part of the community outreach and engagement process. Promote community empowerment and inclusion.
- Improve local community leadership involvement in identified targeted DAC areas to ensure clear DAC goals as part of the Port's zero-emission efforts.
- Create more training and outreach opportunities for local diverse workforce; enhance contracting opportunities for underserved small businesses; and provide equitable opportunities to incentives and programs to smaller and disadvantaged tenants.

San Diego Port Tenants Association
DAC Advisory Group Suggested Objectives & Implementation

- Design an equity action plan, through facilitating dialog, on how to implement equity in SDPTA.
- Identify a led and/or key SDPTA community leaders to organize by bringing together a diverse group of people from the community, initiate structured dialog and identify measurable outcomes.
- Design port project applications and review processes that include equity.
- Increase contracting opportunities to veterans, disadvantage small businesses and minority-owned businesses.

San Diego Port Tenants Association
DAC Advisory Group Objectives & Implementation Cont.

- Increase employment opportunities and economic benefits for low-income and disadvantaged populations by the following:
  1) Collaboration with organizations and local government organizations
  2) Building sustainable relationships in the community
  3) Program design and implementation
- Identify grants that support equity, DAC program positive impact development and ongoing evaluation of the SDPTA DAC Advisory Group's measures for success.

San Diego Port Tenants Association
DAC Advisory Group Objectives & Implementation Cont.

- Identify the outcomes based on process, outreach and activities. Additionally, identify where ongoing improvement can be implemented and make necessary modifications for future success.
- Analyze whether outlined measures have positive health, environment, social and economic outcomes for the community.
- Evaluate impact by continuously gathering and documenting data, as a part of SDPTA goals.