

CLEAN FUELS PROGRAM ADVISORY GROUP

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Catenary Project Update

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Agenda

- Catenary Demonstration
- Project Status
- Phase II Study
- Questions & Discussion



Siemens Demonstration Project

- Designed to prove catenary truck concept in real-world drayage operations
- Catenary system
 - One mile length, both directions
 - Pole spacing similar to street lights (possibility of dual-use poles, but not existing poles)
 - DC power substation with remote monitoring
 - Test track for software & hardware adjustments
- Four demonstration trucks
 - Diesel hybrid, CNG hybrid, Battery-electric, and Future TBD platform



Catenary Truck Platforms

1. Volvo Diesel Hybrid
 - Major OEM partnering through existing DOE diesel hybrid development project
 - All-electric range capability (off catenary)
2. TransPower CNG Hybrid
 - Major OEM chassis
 - Project partners are OEM and local integrators
3. TransPower Battery-electric
 - Leveraging local integrator's current technology development
4. BAE Kenworth CNG Hybrid
 - Leveraging DOE project with catenary accessible hybrid

Project Status: Catenary Trucks

- The TransPower CNG Hybrid and Battery Electric truck is going through final assembly
- The vehicles will be tested on the off-the-road test track in Carson along Alameda Street this month



Project Status: Catenary Trucks

- The Volvo Diesel Hybrid truck is in Sweden where it is being outfitted with their hybrid system and the Siemens pantograph
- The vehicle will be ready for demonstration in March



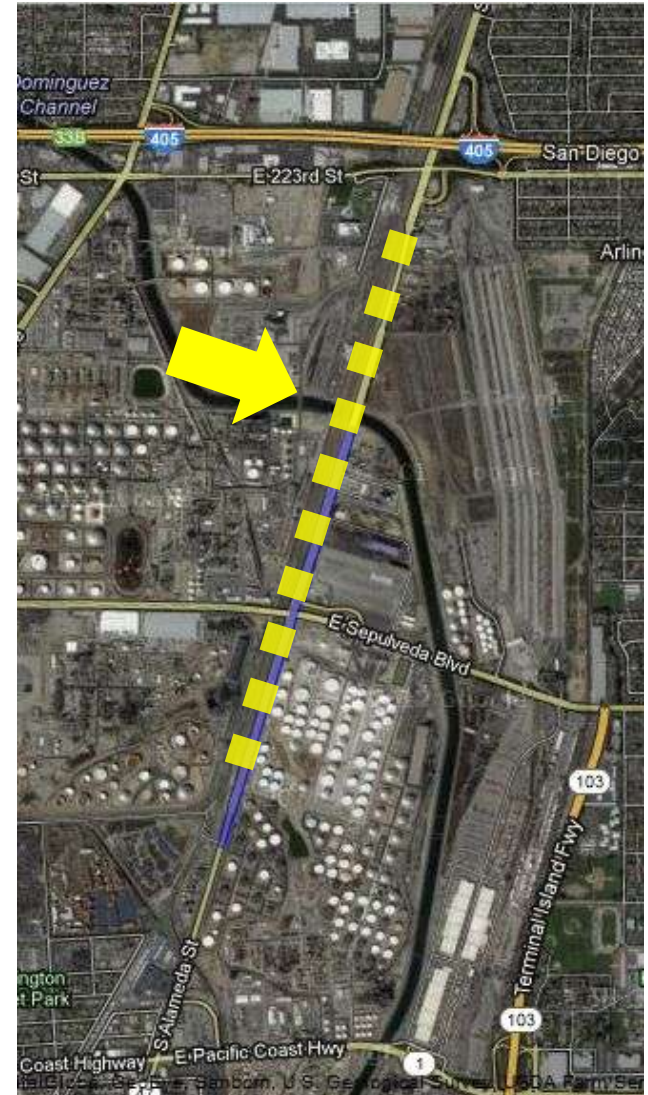
Infrastructure



- Infrastructure consists of:
 - Poles and supports for catenary lines in each direction
 - Lanes can be shared with other vehicle traffic
 - Sub Stations, approximately one per mile

Demonstration Location

- Approximately one mile along Alameda Street in the city of Carson
- Current route for north-bound trucks to warehouses and 405



Project Status: Infrastructure

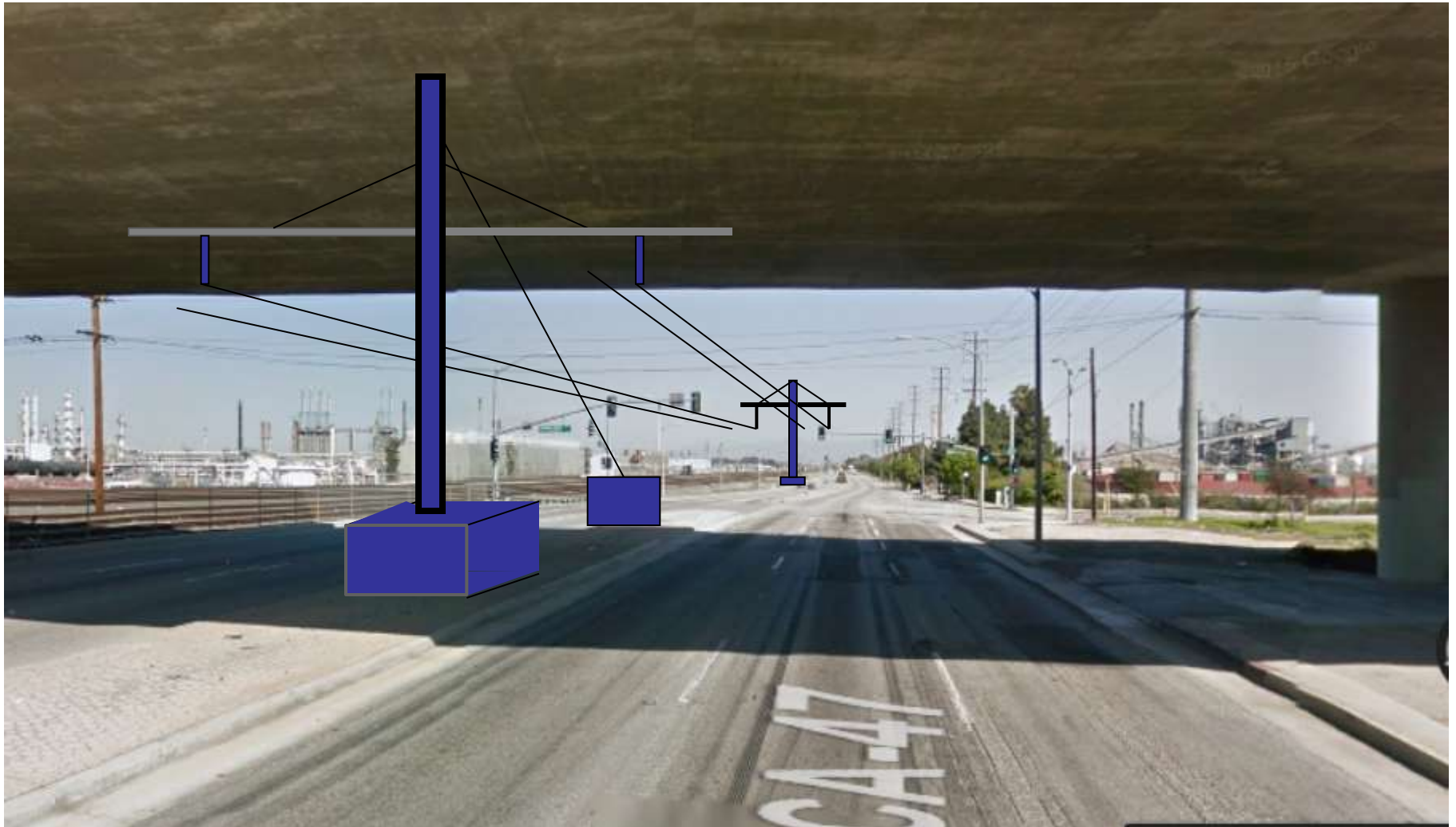
- Potholing along Alameda Street medium uncovered an unidentified pipeline
- Original design for underground foundations for the poles needed to be changed



Pole Footing Redesign

- Problem:
 - Unidentified pipeline and soil conditions prevent installing planned below ground foundation
- Approach:
 - Design and install a new foundation type that will sit entirely above ground
- Solution:
 - Two design concepts: poured-in-place concrete footings and precast concrete footings
 - Siemens determined that the precast concrete footing was the best solution based on impact to cost and schedule

Looking North Along Alameda

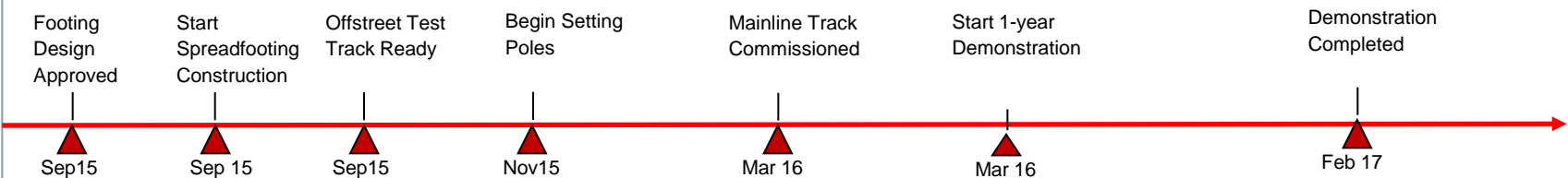


Schedule Impacts

Background

- Assumes that utility and City of Carson approval of spread footing design received by September 15, 2015
- Does not take into consideration any other requirements utilities or Carson may request or impose

Schedule



Project Status: Off-the-road Test Track

- Test track is paved
- OCS foundations completed
- Power Supply is connected to SCE grid
- Commissioning of the power supply and test track will be completed by mid September
- TransPower will test their trucks on the track end of September



Future Project Milestones

A white Volvo truck is shown on a test track, viewed from a high angle. The truck is positioned on a track with lane markings. The background is a blurred, light-colored surface, possibly a concrete or asphalt track. The truck is facing towards the right of the frame.

- Test track completed in September, 2015
- TransPower trucks use test track for final development work
- Construction would be completed March, 2016 pending redesign approval
- Volvo truck completed and demonstration begins March 2016
- Demonstration complete February, 2017

OCS Phase II Study

- State agencies have requested cost estimates from Siemens for Phase II
- Siemens task in Phase I - to determine costs/mile
- An independent infrastructure cost analysis is being conducted
- An investigation of possible sites for Phase II has started

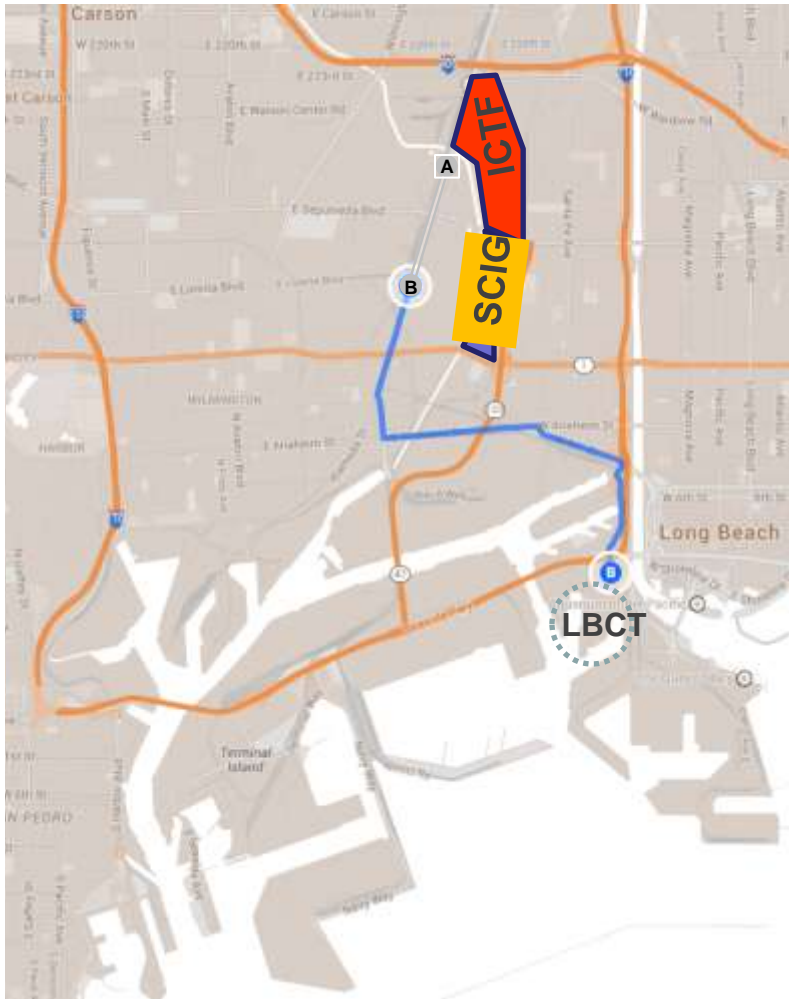


Siemens Project Costs Breakdown

Infrastructure	Vehicle & Pantographs	Demonstration	Project
\$7,450,000	\$4,280,000	\$2,450,000	\$600,000

- Infrastructure cost includes permitting, design, equipment and construction
- Vehicle cost includes one vehicle, four pantographs and engineering
- Demonstration includes test track and engineering
- Project cost includes project management and decommissioning
- **Note:** These costs include one time charges and may not be reflective of future costs

Phase II - Possible Sites



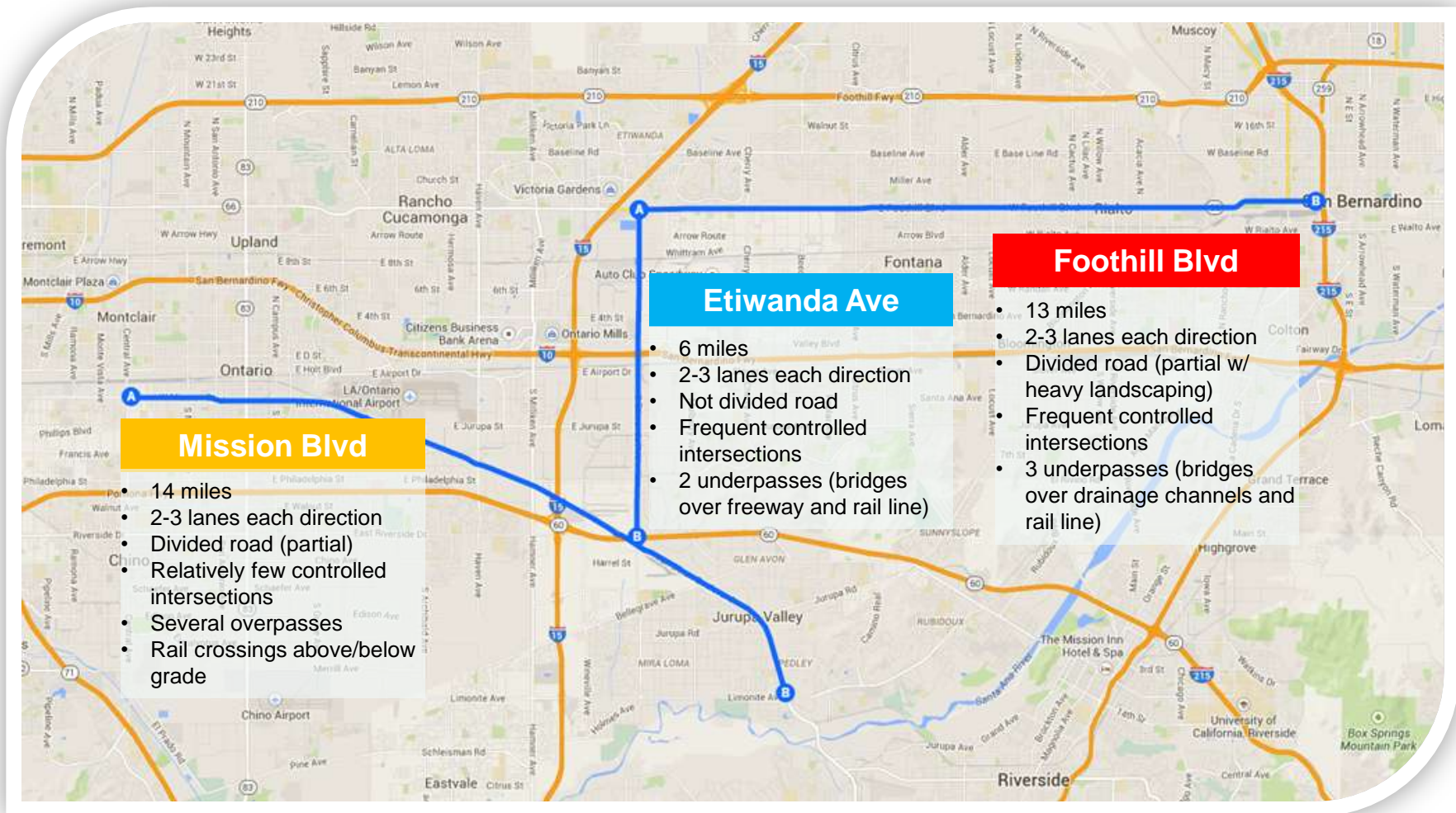
Continue existing one mile to connect the ports to rail Terminals...

Or

Find new location around the ports and Inland Empire

- Existing 1-mile OCS demonstration segment
- Proposed extension to OCS

Inland Empire Possible Sites



Route Characteristics

- **Mission Blvd**
- –ID'd as a key route by SCAG/SANBAG
- –Includes both Riverside and San Bernardino counties
- –Much of the route is relatively “industrial”
- –Passes by/through major warehousing areas
- **Etiwanda Ave**
- ID'd as a key route by SCAG/SANBAG
- Adjacent to major warehousing locations
- Route has more commercial developments than Mission Blvd
- **Foothill Blvd / SR-66**
- –Could connect warehousing locations with BNSF intermodal yard
- –Likely requires CalTrans approval
- –Most of route is commercial developments

Phase II - Considerations

- Infrastructure
 - Construction costs are site dependant
 - Permitting and CEQA can impact schedule
 - Longer lengths of system are needed to show regional viability
- Vehicle
 - Pantograph cost and weight need to be reduced
 - Supporting components – converters, sensors and vehicle interface add complexity and cost and need to be integrated into system



QUESTIONS - DISCUSSION