Catenary Drayage Truck for Zero-Emissions Goods Movement
Advisory Committee 1/29/15

Project Review & Status
Agenda

• Siemens OCS Project
• Project Status
• TransPower OCS Vehicle Project
• Project Overview and Status
Catenary 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
  – DC power substation with remote monitoring
  – Small test track and monitoring station

• Four demonstration trucks
  – Volvo Diesel hybrid, TransPower CNG hybrid and Battery-electric trucks
  – BAE/Kenworth CNG hybrid truck from ZECT II project
Progress – Traction Power Supply/Substation

- **Completed and in progress activity:**
  - Meeting in Germany in Aug. 2014 design review for the EHWY design
  - Ordered long lead major equipment: DC switchgear, AC switchgear, traction power transformer, prefabricated substation building shell
  - TPSS and major equipment designs completed and released for fabrication
  - Major equipment currently in the manufacturing process, with assembly of equipment over next several months
Progress – OCL

• Received pantograph data from Siemens AG in including operational dimensions and electrical parameters to incorporate OCL design
• Prepared preliminary OCL design for coordination with site civil design review
• Began procuring long lead OCL equipment
• OCL design finalized and procurement of OCL equipment continues
Progress – Pantograph

• Technical data packages for Volvo and TransPower Hybrid pantographs have been provided to the manufacturers
• Placed order for the first two pantograph frames
• PM visit to Germany to meet the pantograph team and to view the eHighway test track
• Meetings with Volvo to finalize schedule and to continue interface clarification work
• Interface clarifications with Volvo and TransPower completed in Oct. 2014
• Manufactured and assembled first pantograph in process
Progress – Civil Works/Permitting

- Developed preliminary site civil design and performed constructability and design review - Nov. 2014
- Completed site civil design in Dec. 2014
- Site civil design, permitting application, and supporting documentation submitted to the City of Carson for approval in Dec. 2014
- City of Carson permitting still under review
- Proceeding with preliminary procurement for roadworks installation, such as median improvements/modifications along Alameda Street and OCS foundation civil works
## Project Timeline

### 6/2013 - 5/2014
- **Infrastructure**: Design
- **Volvo Trucks**: Vehicle Pantograph Integration
- **TransPower Trucks**: Component & System Design

### 7/2014 - 7/2015
- **Infrastructure**: Permitting (CEQA)
- **Volvo Trucks**: Development & Testing
- **TransPower Trucks**: Vehicle Build

### 8/2015 - 8/2016
- **Infrastructure**: Construction
- **Volvo Trucks**: Demonstration
- **TransPower Trucks**: Testing

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- **Catenary system development**
  - Design - Completed
  - Permitting in Process & CEQA Completed
  - Construction Break Ground March 2015
  - Vehicles designed and modified in parallel with system construction
  - Total development time: 27-33 months (completed mid 2015)

- **One year demonstration and data collection** (completed in 2016)
Overview

• *TransPower and Siemens are collaborating to produce electric trucks capable of drawing power from an overhead catenary line*

• *TransPower is building one pure electric truck and one CNG hybrid electric truck*

• *Trucks are slated to be shipped to the test site in July*

• *Trucks will be demonstrated for one year on Alameda St. in Carson Ca.*

• *Data collected will help assess catenary functionality for future uses*
• **Base vehicle component layout easily accepts range extending technologies**

- Main Drive Motor(s)
- Electrically-Driven Accessories
- Automated Manual Transmission
- EV Control System
- Inverter-Charger Unit (ICU)
- Battery Energy Storage
- Empty Enclosure for high power DC-DC, high pressure air support
- Unneeded ESS enclosure removed – frees up space
The Catenary Trucks

**Electric Truck**
- Pantograph in retracted position

**CNG Hybrid Truck**
- Gen-set located behind cab

**System Based on the ElecTruck Platform**
- Flexible full speed, load, and grade capable class 8 tractor
- Catenary versions use half of the ESS
# Project Milestone Update

## E-Catenary

<table>
<thead>
<tr>
<th>Milestone</th>
<th>Status</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 - 1.5</td>
<td>Closed</td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>Closed</td>
<td></td>
</tr>
<tr>
<td>2.2</td>
<td></td>
<td>Vehicle Modification: In process, base vehicle complete mid February.</td>
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<tr>
<td>2.3</td>
<td></td>
<td>New Component Integration: Expected to begin in March / April. Pantographs to arrive mid May.</td>
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<tr>
<td>2.4</td>
<td></td>
<td>Initial System Verification: Expected to start late February</td>
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<tr>
<td>2.5</td>
<td></td>
<td>Field support and final catenary validation: Expected Start mid July.</td>
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## Hybrid-Catenary

<table>
<thead>
<tr>
<th>Milestone</th>
<th>Status</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1 - 3.3</td>
<td>Closed</td>
<td></td>
</tr>
<tr>
<td>3.4</td>
<td></td>
<td>Hybrid Truck Subsystem Integration: In Process. Base truck subsystems in build. CNG Genset work set to begin in April. Pantographs to arrive mid May.</td>
</tr>
<tr>
<td>3.5</td>
<td></td>
<td>CNG Hybrid Truck Integration: Base truck to be complete in March. CNG Genset and pantograph installation in May / June time frame.</td>
</tr>
<tr>
<td>3.6</td>
<td></td>
<td>Initial System Verification: Base truck commissioning to start late March. Additional CNG Genset and pantograph systems verified May / June time frame.</td>
</tr>
<tr>
<td>3.7</td>
<td></td>
<td>Field support and final catenary validation: Expected Start mid July.</td>
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Status and Schedule

Siemens is presently designing and assembling the test track catenary lines.

TransPower is nearly complete with the EV catenary truck, CNG Hybrid truck complete late March.

Siemens to visit TransPower in late February for a comprehensive site visit, project, technical, and control communication review.

January  
E-Cat  

April  
CNG Cat Truck  

July  
CNG Cat In Service  

E-Cat In Service  

CNG Hybrid Integration  

Pan Install  

CNG Genset Dev.  

Pan Install  

CNG-Cat In Service  

December