Factors Driving This Assessment

• Impending 2023 regional attainment deadlines
• Achieving zero emissions in the goods movement sector will be important
• No strategy yet to introduce sufficient zero-emission vehicles to meet 2023 goals (and beyond)

Zero-Emission vehicle technology may offer a solution to achieve regional air quality goals.
A Two Pronged Approach

1. An aggressive program to bring more clean fuel / hybrid trucks into service represents the best near-term strategy.

2. A regional freight corridor program represents an opportunity to commercialize Zero-Emission Technologies (ZET), and build incentives into an existing program (e.g. the RTP).

<table>
<thead>
<tr>
<th>Zero-Emission Technologies</th>
<th>100% Battery</th>
<th>100% Hydrogen Fuel Cell (or equal/better)</th>
<th>Both require recharging replacement/disposal infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td>On-Vehicle Energy Storage</td>
<td>Electric Motor</td>
<td>Electric Traction power ⇒ Propulsion / Battery Recharge (overhead catenary or embedded electromagnetic induction)</td>
<td>Both require: On-vehicle energy storage when off guideway and Power generation and transmission infrastructure</td>
</tr>
<tr>
<td>Wayside Energy Distribution on Guideway</td>
<td>Embedded Linear Synchronous Motor ⇒ Reactive Propulsion</td>
<td></td>
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</tbody>
</table>
Early Indicators Favor Wayside Power Generation

Fixed guideway systems (i.e. rail, maglev)
- Consume inordinate real estate
- Inflexible - do not serve dispersed origins / destinations
- Inappropriate to serve diverse markets

Current battery technologies
- Restrained by energy storage capability – limits operating range

Wayside Power
- Extends the range of battery, may enable simultaneous battery charging
- May not be restricted to freight corridors
- Potentially less expensive

Markets favor independent ZET trucks (100% battery, 100% fuel cell, or hybrid with wayside-powered guideway)

Range Extended with Wayside Power

**SOA Electric Truck**
- Currently deployed at some Port of Los Angeles terminals
- Deliver loaded 40-foot container up to 30 miles
- Top speed is 40 MPH
- Performance should improve as technology matures
- Slow battery charge systems

**Range Extended**
- Overhead or embedded conductor on freeway dedicated truck lanes
- Can significantly extend ranges for electric trucks across region and increase vehicle availability through on-road charging
- May be transitional technology until longer range/quick charge battery systems
- Zero local emissions
Recommendations

- Develop a program around building a freight corridor with wayside power
- Assume that hybrid vehicles use wayside power – increase markets served by corridor
- Include wayside power into project costs of RTP
- Consider including purchase subsidy
- Develop a rapid development and commercialization program in parallel with pre-construction project development (CALSTART CARGO)

Early Commercialization Activities

**Short Term**
- Stakeholder surveys – needs, concerns, etc.
- Outline technical / market needs
- Continued assessment / comparison of technologies

**Mid-Term**
- Create RFP / Call for vendor submissions
- Develop key performance parameters
- Create group of potential collaborators / other regions interested in technologies

**Long-Term**
- Possible demonstration projects
- Study incentives / funding and regulatory issues
- Select technology and vendor
- Deploy on a limited basis
Corridor Timeline

Planning and Assessment

RTP

Early Commercialization Activities

Corridor Construction

2010 2012 2012 2020 2023

Continuing Assessment

• Develop an RTP assuming wayside power
  – Continue assessing other technologies for implementation
• Cost estimates for a Zero-Emission Technology
• Determine implementation responsibilities and milestones
• Assess possible funding sources
  – Investigate potential for private investment
• Address phase-in of technologies (including level of penetration by technology)
• Coordinate with other ongoing Zero-Emission efforts (I-710, CALSTART CARGO (e.g.), etc)