I-710 Freight Corridor & Zero-Emission Trucks: Technologies, Opportunities, & Barriers

Clean Transportation Technologies and Solutions

Bill Van Amburg
Senior Vice President

Michael Ippoliti
Director, Clean Transportation Solutions

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Question

• Can Zero Emission Trucks be commercially available if a Zero Emission Freight Corridor is built?
Approach

- Research
- Confidential Delphi Interviews
- CALSTART Expertise
- Examination of Technology Options
- Identification of Barriers
- Define Opportunities
Findings

Trucks CAN Deliver Zero Emissions Goods Movement in the I-710 Corridor, within the time frame of the project

• Several Options for Zero Emissions
  – Hybrid with Dual-Mode Operation (ZEV Mode)
  – Range Extender EV (Fuel Cell or Turbine w/ZEV mode)
  – Full EV (with fast charging or infrastructure power)
  – Road-Connected Power

• Additional Options for Near-Zero Emissions
  – Alt Fuel Hybrids
  – Zero NOx dedicated fuel engines (CNG, RNG, H2 ICE)
  – Range Extender EV (turbine)
Examples: Dual-Mode Hybrids (w/ Zero Emissions Mode)

Meritor – Navistar
• Electric drive at lower speeds (up to 48 mph), blended mode at higher speeds
• Can greatly reduce fuel use, cut idle emissions, provide partial zero emissions

Eaton
• Electric drive for short range, low speeds (prototype)

Transit (buses)
• Long Beach Transit
• King County Metro
Examples: Series Electric/Hybrid – Range Extender

Artisan–Parker
• Electric drive system with turbine range extender (with ZEV mode)
• Much development in turbines, focus on NG

Vision Industries
• Electric with fuel cell range extender (zero-emissions)
Examples: Full Battery Electric

Balqon
- Drayage trucks

Proterra
- All-electric bus operating with Foothill transit
- Reduced battery pack size augmented with fast charge
Examples: Road-Connected Power

- Well known in transit industry (electric trolley-bus)
- Used widely in mining with extremely heavy equipment
- Now beginning testing in Europe (Siemens) for heavy-haul trucks
- Other tests looking at in-road power alternative

Siemens eHighways Concept
Opportunities

• Multiple technologies available
• Variations in feasibility
  – Dual Mode Hybrid Vehicles have “multiple” uses (not just corridor)
  – Fuel Cells and Full-EV require Infrastructure
• Pathway Trucks (near zero emissions)
  – Can test and validate a production “pathway” to reach zero in succeeding model generations
Barriers

- **Design Factors**
  - Durability
  - Weight/Volume
  - User Needs
  - Development Resources

- **Infrastructure**
  - Fuels
  - Corridor Design
  - Costs

- **Costs**
  - Development Cost
  - Materials/Component Cost
  - Vehicle Cost

- **Business Case**
  - Corridor Economics
  - Market Demand & Volume Potential
  - Regulations & Legislation
  - Fuel (Oil) Prices
Conclusions

• Zero Emission Trucks are Technically feasible within the timeframe of the project

• Barriers need to be addressed (Esp. Business Case)

• Pathway Trucks (Near-Zero emission) can help validate zero emission technology
Clean Transportation Solutions℠
Advanced Transportation Technologies℠

www.calstart.org

For info contact:

Bill Van Amburg
Michael Ippoliti
(626) 744-5600
bvananamburg@calstart.org
mippoliti@calstart.org