WEST COAST COLLABORATIVE
A public-private partnership to reduce diesel emissions

Business Case for Battery-Electric Trucks in Portland, Oregon

Environmental Benefits of Battery-Electric vs. Diesel Trucks

Diesel-powered vehicles are the workhorses of our economy yet they produce emissions that pose a significant public health problem. Battery-electric vehicle (BEV) emissions do not come from the tailpipe, so BEVs are considered zero-emission vehicles, and thus benefit the health of people who would otherwise be exposed to emissions along fleet routes. BEV emissions are produced from electric power plants, but most categories of emissions are lower for vehicles running on electricity generated from power plants than from diesel-powered vehicles.[1] For example, the carbon dioxide equivalent (CO_2e) emissions from grid-based electricity in the Portland area would be 69.7% lower for BEVs versus comparable diesel internal combustion engine (ICE) vehicles based on relative fuel greenhouse gas (GHG) intensities and drivetrain efficiencies (i.e., reduction in GHG intensity by switching from diesel to Western Electricity Coordinating Council-WECC Northwest grid kilowatt hours-kWhs).[2,3,4,5] Furthermore, the emissions from grid-based electricity will decrease over time, while emissions from diesel combustion will remain relatively constant on a per gallon basis.[6]

Quantitative Business Case for Battery-Electric Trucks

Payback of BEV Incremental Cost from Operational Savings

Years to Simple Payback = $ Incremental Cost / $ Annual Operational Savings

Class 3-4 = 5.6 years

Class 5-6 = 4.9 years

Years to Payback with Annual Fuel Price Inflation (Diesel = 10% & Grid Electricity = 5%)

Class 3-4 = 4.7 years

Class 5-6 = 4.2 years

Qualitative Business Case for Battery-Electric Trucks

In addition to their short payback period, immediate operational savings, and significant emissions reductions, BEVs generate several ancillary benefits to the fleets that purchase them. The following is a list of some additional benefits associated with BEV ownership and operation:[7,8,9,10]

1) **Fuel Cost Certainty –** Electricity prices are significantly less volatile than petroleum prices;
2) **Consumer Preference –** Modern consumers prefer vendors who operate BEVs;
3) **Business Exposure –** Additional media and public attention for operating BEVs;
4) **Driving Performance –** Greater acceleration and torque at low power bands;
5) **Driver Recruitment & Retention –** Drivers prefer working for companies using latest technology;
6) **Energy Security –** Domestic electricity generation versus imported petroleum; and,
7) **Corporate Social Responsibility (CSR)** – BEVs reduce air and noise pollution along fleet routes, as well as vehicle vibration and emissions exposure for fleet operators.

Payback Analysis Data & Assumptions

This comparative payback analysis of electric trucks versus their traditional diesel ICE alternatives required several essential data. The following is a list of the data inputs that the United States Environmental Protection Agency (USEPA) West Coast Collaborative (WCC) staff used to conduct this Portland-specific BEV payback analysis:

	CLASS 3-4	CLASS 5-6
Costs[11,12,13]		
Diesel ICE	64,850	78,500
Diesel ICE Registration Fees & Taxes	570	778
BEV	140,000	155,000
BEV Registration Fees & Taxes	799	1,111
Electric Vehicle Supply Equipment (EVSE)	6,000	6,000
Incremental Cost (BEV + EVSE vs. ICE)	*81,379*	*82,833*
Incentives[14,15]		
BEV	750	750
EVSE	3,750	3,750
Fuel Economy[16,17,18]		
Diesel ICE Driving (mpg)	9.3	8.4
Diesel ICE Idling (gal/hr)	0.64	0.76
BEV Driving (kWh/mi)	0.7	1.0
BEV Idling (kWh/idle hr)	0.233	0.333
Driving Behavior[19,20]		
Vehicle Miles Traveled-VMT (mi/yr)	19,800	19,800
Idling (hrs/yr)	1,830	1,830
Fuel Costs & Savings[21,22]		
Diesel ($/gal)	4.131	4.131
Electricity ($/off-peak kWh)	0.07	0.07
Annual Savings ($/yr – BEV vs. ICE)	*12,633*	*14,879*
Maintenance Costs & Savings[23,24]		
Diesel ICE Maintenance ($/mi)	0.105	0.105
BEV Maintenance ($/mi)	0.0525	0.0525
Annual Savings ($/yr – BEV vs. ICE)	*1,040*	*1,040*
CO2e Emissions Reductions		
Diesel Fuel (lbs/gal)	22.2	22.2
California Grid Electricity (lbs/kWh)	0.859	0.859
Annual Reductions (lbs/yr – BEV vs. ICE)	*60,993*	*65,672*

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For more information about the West Coast Collaborative, please visit: www.westcoastcollaborative.org
For information on USEPA's National Clean Diesel Campaign, please visit: www.epa.gov/diesel/

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