Zero-Emission Bus Information

fueling and maintenance costs, specifications of available bus models, emissions, and funding opportunities

Fueling costs[1]

Fuel type	Cost per gallon equivalent[3]
Diesel standard	$2.63
CNG standard	$2.12
Diesel-hybrid standard	$1.97-$2.37[4]
Full electric	$1.29

Maintenance costs[2]

Bus type	Average cost
Diesel standard	$9,075 / year
	$1.00 / mile
Full electric	$1,770 / year
	$0.20 / mile

GHG emissions comparison[5]

Fuel type	Emissions factor (g/mile)[6]
Diesel standard	~3,000
CNG standard	~2,800
Diesel-hybrid standard	~2,300
Fuel cell	~1,550
Full electric	~650

Financing options

Bus manufacturers may include financing options as part of their sales processes. Proterra and BYD, for example, have offered packages where agencies can purchase the bus platform as a capital expenditure and lease the battery as a general operating expenditure. Proterra has also offered 100% financing.

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[1] Fuel prices current as of July 2015, from Dept. of Energy's AFDC fuel price database: http://www.afdc.energy.gov/fuels/prices.html

[2] Source: http://www.udel.edu/V2G/resources/V2G-Cost-Benefit-Analysis-Noel-McCormack-Applied-Energy-As-Accepted.pdf

[3] To standardize fuel volumes for accurate comparison, each is converted to its equivalent in gallons of gasoline (GGE). For more information on these conversion factors: http://www1.eere.energy.gov/vehiclesandfuels/epact/fuel_conversion_factors.html

[4] The cost of fueling a hybrid depends on the average fuel economy of the model. The range used here assumes that average is somewhere between 10%-25% which is representative of buses tested in a variety of conditions as per these reports (source 1, source 2).

[5] Emission data from "Urban Bus GHG Emission Comparison," *Advanced Clean Transit,* California Air Resources Board, May 2015 http://www.arb.ca.gov/msprog/bus/workshoppresentation.pdf

[6] See the following report for more information on GHG emissions factors: http://www3.epa.gov/otaq/consumer/420f08024.pdf

SIERRA CLUB

Electric bus models comparison

Company	Model	Price	Range	Size	Charge time
BYD	All Electric Zero-Emission Transit Bus	~$800,000	~155 mi	40ft (40.19ft)	1.6 or 4 hours
BYD	Articulated All Electric Zero-Emission Transit Bus	~$1,200,000	~170 mi	60ft	2-3 hours
New Flyer	Xcelsior Bus with Lithium-Ion Battery Pack (XE40)	~$800,000	80-120 mi	40ft (41')	3-5 hours or 6 minutes
Phoenix	ZEUS 300 Shuttle Bus		100 mi	14-22 passengers	fast charging or 3 hours
Proterra	Catalyst Extended Range Transit Bus	~$800,000	~180 mi avg up to 258 mi	40ft (43' 6")	1hr or 5-10 min
Ebus	EBUS 22 Electric Bus	$395,000	~125 mi	22ft	"minutes" with fast charging
Complete Coach Works	Zeps Drive (retrofit)	~$500,000 (for 40ft bus)	85-150+ mi	40/35/30 ft	4 - 6 hours

Fuel cell buses

Several ZEB pilot programs run by transit agencies around the country have included hydrogen fuel cell buses. Although these buses are not generally available for immediate purchase, transit agencies have partnered with vendors to develop programs that work for them.

Vendor partners from fuel cell programs

	AC Transit Oakland, CA	**BC Transit** Whistler, BC	**Sunline Transit** Coachella Valley, CA	**CTTRANSIT** Hartford, CT
Bus platform	Van Hool	New Flyer	ElDorado	Van Hool
Fuel cell system	US Hybrid	Ballard	Ballard	UTC Power[7]
Lithium battery	EnerDel	Valence	BAE Systems	EnerDel

[7] Note that UTC is not longer in business.

Funding opportunities

Federal programs

Low or No Emission Vehicle Deployment Program (LoNo) offers funding to transit agencies for the acquisition and leasing of zero- and low-emission transit buses and related equipment with a budget of $22.5 million.

Congestion Mitigation and Air Quality Improvement Program (CMAQ) provides funding for projects that reduce transportation-related emissions.

State Energy Program (SEP) offers grants typically in the range of $300,000 – $800,000 to advance programs that create jobs and further climate and energy security.

TIGER Discretionary Grants are available to surface transportation infrastructure projects that will have a significant impact on the nation, a region, or metropolitan area, with grants ranging from $100,000 to $25,000,000.

Select state funding support programs

CALIFORNIA

Hybrid Truck and Bus Voucher Incentive Project (HVIP) provides vouchers to fleets of HEVs and ZEVs to reduce the cost of vehicles at the time of purchase. Vouchers range from $12,000 to $110,000.

Carl Moyer Memorial Air Quality Standards Attainment Program provides incentives to cover the cost of purchasing engines and equipment that are cleaner than required by law.

Motor Vehicle Registration Fee Program provides funding for projects that reduce air pollution from motor vehicles.

Public Benefit Grant Program provides funding for the purchase of new AFVs. The maximum grant amount per vehicle is $20,000, with a limit of $100,000 per agency per year.

Clean Air Fund provides grants for qualified air quality improvement projects located in Ventura County.

CONNECTICUT

Connecticut Clean Fuel Program provides funding to municipalities and public agencies that purchase, operate, and maintain AFVs.

FLORIDA

Renewable Energy and Energy-Efficient Technologies (REET) Grant Matching Program provides matching grants of $50,000 to $1 million for projects relating to innovative technologies that significantly increase energy efficiency for vehicles.

MASSACHUSETTS

Clean Vehicle Project offers grant funding for public and private fleets to purchase alternative fuel vehicles and infrastructure. Eligible vehicles include electric, hybrid electric, and solar electric vehicles.

OREGON

Oregon's ZEV Deployment Program offers tax credits up to 35% of an alternative fuel transit program's total cost.