Oregon Department of Transportation

U.S. Department of Transportation
Federal Highway Administration

Making an All-American Public Fleet (Fuel Savings Guarantee Model)

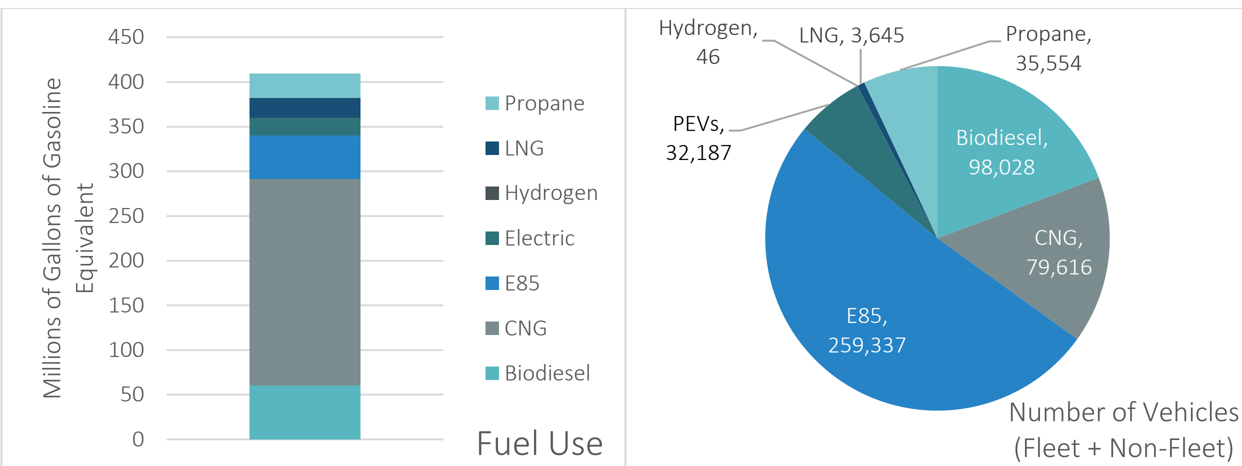
A Case Study for the "Accelerating Alternative Fuel Vehicle and Infrastructure Deployment with Innovative Finance Mechanisms" Workshop

An ambitious mayor from the Midwest announced that her city fleet will completely transition off oil by 2019, making it the first major American city to achieve this goal. Mayor Charlotte Wallace of St. Louis, Missouri tasked the city's fleet manager to identify the best alternative fuel for each vehicle type within the fleet, while minimizing the cost of the transition to the taxpayer through the use of innovative finance mechanisms.

Alternative Fuel Use in Fleets

The U.S. Department of Energy's Clean Cities program has helped public and private fleets reduce petroleum dependence for over 20 years. Alternative fuel fleets face two significant challenges. First, the fleet must identify a cost-effective alternative fuel vehicle that is comparable to the vehicle it is replacing. Second, the fleet must determine an adequate and cost-effective method to refuel or recharge the vehicle. Figure 1 shows the current distribution of alternative fuel vehicles and fuel use by state fleets and alternative fuel providers, as compiled by the U.S. Department of Energy Clean Cities Program.

FIGURE 1: PETROLEUM SAVINGS AND ALTERNATIVE FUEL VEHICLES FOR STATE FLEETS AND ALTERNATIVE FUEL PROVIDERS (2013)



Source: U.S. Department of Energy Alternative Fuel Data Center

Over time, advancements in vehicle technology and fuels have given fleet managers expanded choices for meeting their energy and environmental objectives. Compressed natural gas (CNG) and biodiesel have emerged as popular alternatives to diesel for medium- and heavy-duty vehicles, like tractor-trailers and refuse trucks. In the light-duty sector, automakers have dramatically increased the number of available plug-in and plug-in hybrid electric vehicles—up to 27 models were available in late 2015.

An All-American Fleet

Mayor Wallace wants her city's fleet to be powered only by non-petroleum, non-food crop based fuel. Being in the heartland, the city has easy access to 1) biodiesel made from animal fats, 2) natural gas and 3) electricity. The mayor also strongly believes the vehicles that the city acquires should be powered solely by alternative fuels in order to avoid sliding back to gasoline and diesel in the future.

The city's fleet consists of three types of vehicles: passenger cars, medium-duty delivery trucks, and refuse trucks. The mayor would like to use funds already set aside for existing vehicle replacements combined with innovative financing to purchase an increasing number of alternative fuel vehicles each year until the fleet is completely powered by alternative fuels. In phase 1 of the transition, the city has decided to replace aging fleet vehicles with 50 new passenger cars, 25 new delivery trucks, and 15 new refuse trucks.

The city fleet manager solicited the assistance of the local Clean Cities Coordinator to guide the city through the decision-making process. The Coordinator began by conducting extensive research and stakeholder outreach to identify the most appropriate alternative fuel for each of the three vehicle types in the city's fleet.

The Coordinator concluded that CNG made most sense for the city's refuse trucks, because of its relatively low local air emissions. The trucks also have a fixed route and return to the same lot each day, so refueling overnight using lower cost, slow-fill CNG stations is feasible. The Coordinator identified biodiesel as the most promising fuel for the delivery trucks to meet vehicle duty cycle needs. These vehicles require a quick refill time, since their use is less predictable. Finally, the Coordinator concluded that the city should acquire battery electric cars, since those vehicles are readily available and the existing fleet cars travel less than 50 miles per day on average.

The Coordinator then identified a promising new and innovative finance mechanism to help the city attain alternative fuel vehicles. The mechanism is based on the approach energy service companies (ESCOs) use in the building sector. In the Fuel Savings Guarantee Model, a private sector entity like an ESCO provides a fuel cost savings guarantee to the city fleet based on an expected price differential between gasoline or diesel and the alternative fuel. The fleet can use the associated cost savings guarantee as leverage to attain low-cost financing that covers the higher upfront cost of the vehicles and fueling infrastructure. In return, the private partner receives a portion of the fuel cost savings in the form of an upfront fee.

The Challenge

The city fleet manager is excited about the prospects of using the **Fuel Savings Guarantee Model, since the approach encourages the private sector to take on the risk of the project yielding a net cost savings.** Given estimates on the total cost of the transition for each vehicle type (see Exhibit 1), the fleet manager must now determine which of the three vehicle types is best suited to be funded by this financing model.

Mayor Wallace wants St. Louis to be a leader on environment and energy security issues while demonstrating the prudent use of taxpayer funds. The city fleet manager must consider these potentially competing objectives in deciding whether CNG refuse trucks, bio-diesel delivery trucks, or EV passenger cars can be financed with the **Fuel Savings Guarantee Model**.

Discussion Questions

- What is the nature of the public-private partners in this business model?
- Which barriers does the model help address?
- What is the business case/finance case for fleet conversion? What is the net benefit to the city?
- What conditions make the model successful?
- How does the model impact the city's budget (i.e. is it off-balance sheet)?
- Is there a minimum fleet size or a specific vehicle type in which the model makes sense?

Exhibit 1: General Background

	Annual Vehicle Mileage	Vehicle Lifetime	Fuel Economy (MPGGE)	Purchase Price ($/Vehicle) (After Incentives)	Additional Infrastructure Costs ($/Vehicle)
Pass Car, BEV	12,400	15	90.78	$32,500*	$500
Pass Car, Gasoline	12,400	15	26.7	$20,000	
Delivery Truck, Biodiesel	16,500	15	6.2	$65,000	
Delivery Truck, Diesel	16,500	15	6.2	$65,000	
Refuse Truck, CNG	23,400	15	1.3	$260,000	$936
Refuse Truck, Diesel	23,400	15	1.5	$210,000	

Fuel	Fuel Unit	$/Fuel Unit (After Incentives)
Gasoline	gasoline gallon	3.00
Diesel	diesel gallon	3.00
Electricity	kilowatt-hour	0.075
B100	B100 gallon	3.15**
CNG	CNG GGE	2.00

Financial Assumptions	Units	Value
Loan Term	years	10
Interest Rate	%	4.1%
Percent Down Payment	%	0.0%
Discount Factor	%	4.0%

Notes:
*Vehicle cost does not include federal tax credits of $7,500 per vehicle
**Biodiesel costs includes federal tax credit of $1.00/gallon and average RFS RINs value of $0.50/gallon

Exhibit 2: BEV/Gasoline Passenger Car Assumptions

Costs of One BEV Versus Gasoline Passenger Car																
Cost Component	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10	Yr 11	Yr 12	Yr 13	Yr 14	Yr 15	NPV (4% DR)
Acquisition Cost Premium	-$1,614	-$1,614	-$1,614	-$1,614	-$1,614	-$1,614	-$1,614	-$1,614	-$1,614	-$1,614	$0	$0	$0	$0	$0	-$13,614
Operating + Maintenance Savings	$1,266	$1,276	$1,286	$1,297	$1,307	$1,318	$1,329	$1,340	$1,351	$1,362	$1,373	$1,385	$1,397	$1,408	$1,420	$15,414
Total Savings from Switching to BEVs	-$348	-$338	-$328	-$317	-$307	-$296	-$285	-$274	-$263	-$252	$1,373	$1,385	$1,397	$1,408	$1,420	$1,799

NPV of Total Savings with $7,500 Federal Tax Credit Per Vehicle: $9,654

Petroleum and Emissions - Per Lifetime Vehicle				
	Unit	Pass Car, Gas Lifetime Qty.	Pass Car, BEV Lifetime Qty.	Savings Lifetime Qty.
Petroleum Use	barrels	145	2	144
GHG	metric tons	84	44	40

Breakeven cost of CO_2 in $/metric ton (i.e. cost of carbon needed to recover losses)
N/A – no carbon cost needed

Exhibit 3: Biodiesel/Diesel Delivery Truck Assumptions

Costs of One Biodiesel Delivery Truck Versus Diesel Truck																
Cost Component	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10	Yr 11	Yr 12	Yr 13	Yr 14	Yr 15	NPV (4% DR)
Acquisition Cost Premium	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Operating + Maintenance Savings	-$950	-$958	-$967	-$975	-$984	-$993	-$1,002	-$1,010	-$1,019	-$1,028	-$1,038	-$1,047	-$1,056	-$1,066	-$1,075	-$11,617
Total Savings from Switching to Delivery Trucks	-$950	-$958	-$967	-$975	-$984	-$993	-$1,002	-$1,010	-$1,019	-$1,028	-$1,038	-$1,047	-$1,056	-$1,066	-$1,075	-$11,617

Petroleum and Emissions - Per Lifetime Vehicle				
	Unit	Truck, Diesel Lifetime Qty	Truck, Biodiesel Lifetime Qty	Savings Lifetime Qty
Petroleum Use	barrels	887	89	798
GHG	metric tons	502	312	190

Breakeven cost of CO2 in $/metric ton (i.e. cost of carbon needed to recover losses)
$80

Exhibit 4: CNG/Diesel Refuse Truck Assumptions

Cost Savings from 1 CNG Refuse Trucks Versus Diesel Refuse Trucks																
Cost Component	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10	Yr 11	Yr 12	Yr 13	Yr 14	Yr 15	NPV (4% DR)
Acquisition Cost Premium	-$6,208	-$6,208	-$6,208	-$6,208	-$6,208	-$6,208	-$6,208	-$6,208	-$6,208	-$6,208	$0	$0	$0	$0	$0	-$52,363
Operating + Maintenance Savings	$4,366	$4,411	$4,456	$4,502	$4,548	$4,595	$4,641	$4,689	$4,736	$4,784	$4,833	$4,882	$4,931	$4,981	$5,031	$53,860
Total Savings from Switching to Refuse Trucks	-$1,841	-$1,797	-$1,751	-$1,706	-$1,660	-$1,613	-$1,566	-$1,519	-$1,471	-$1,423	$4,833	$4,882	$4,931	$4,981	$5,031	$1,497

Petroleum and Emissions - Per Lifetime Vehicle			
	Refuse Truck, Diesel Lifetime Qty	Refuse Truck, CNG Lifetime Qty	Savings Lifetime Qty
Petroleum Use	5,202	29	5,173
GHG	2,940	2,710	230

Breakeven cost of CO2 in $/metric ton (i.e. cost of carbon needed to recover losses)
N/A – no carbon cost needed