

Sustainable Freight Pilot Project Idea

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2. Project Title: Zero-Emission Refuse Collection

3. **Location of project:** Urban refuse transfer stations across the state, such as:

- 8642 Elder Creek Rd, Sacramento, CA 95828;
- 3000 Power Inn Road, Sacramento, CA 95826;
- 5501 N Golden State Blvd, Fresno, CA 93722 and
- 14905 S San Pedro St, Gardena, CA 90247.

Vehicle operations within approximately a 30-mile radius of those facilities. Note that all facilities are in census tracts that score over 90% in the disadvantaged communities OEHA CalEnviroScreen 2.0.

4. Summary

Motiv proposes a program to field all-electric refuse trucks. The location of a refuse collection facilities may itself cause a census tract to be labeled as a Disadvantaged Community due to the impacts on air quality and other pollution which may be present. The local air pollution reduction from use of an electric refuse truck would be substantial considering the amount of truck use that occurs moving around the facility during normal operations. These trucks are ideal for electrification for four reasons: (1) their operations and routes are very predictable, (2) the nature of their work limits the distance most trucks cover in a day, (3) the trucks have high fuel usage, and (4) they serve communities and contribute to local PM pollution with significant immediate health impacts.

Motiv further proposes that the mechanism to achieve sustainable freight is a mechanism that CARB and the Air Districts have already put considerable resources into developing – the Hybrid and Electric Voucher Incentive Program (HVIP) – with some small additions to improve its effectiveness, detailed below.

5. Description of Advanced Technology

The City of Chicago put North America's first all-electric refuse vehicle (dubbed the ERV) into service a year and a half ago and it has been picking up trash ever since. One driver told Motiv that the truck "changed his life" because he spent all day sitting above the diesel truck engine, and the electric truck powertrain did not vibrate or emit diesel smell, heat or noise. Furthermore, his back was less sore due to reduced brake actuation associated with regenerative braking¹.

Zero-emission refuse collection is an ideal target for a sustainable freight pilot. Sustainable freight can only be accomplished with the involvement of Class 8 trucks, and refuse collection is one of the few applications where all-electric operation can be successfully demonstrated today with Class 8 trucks. Such a pilot would complement other class 8 technology pathways available today of hybrids and catenary lines. Unlike many long range applications, it also has more limited infrastructure needs that

¹ From discussion between Motiv representative and Sanitation Driver, City of Chicago.

can be serviced at a single site, enabling a pilot to be done with less funding required to test the technology.

The trucks will all be state-of-the-art battery electric. Trucks will include features like hill hold and adjustable regenerative braking. The trucks will also include an advanced remote telematics system, capable of the following secure remote features: data capture, vehicle calibration and vehicle firmware updating.

Refuse collection facilities in disadvantaged communities will receive important infrastructure upgrades to handle charging, where necessary. This infrastructure upgrades plus the worker training provided with the new all-electric trucks will be critical local economic development, enabling the state to dovetail economic and environmental investments to support communities.

This project is an improvement over past all-electric truck pilots for the following reasons:

1. The pilot truck being used by the City of Chicago is the basis of a grant Motiv has received from the CA Energy Commission. This grant will field three all-electric refuse trucks in CA, paving the way for inclusion and funding through HVIP.
2. Refuse trucks have a high purchase price and very high fuel usage – fuel usage that is very inefficient when used in a conventional fossil fuel engine due to accessory and idling loading. Data collected with the Chicago refuse truck indicates a net fuel savings of over \$70/day, maintenance savings of an additional \$15/day and emissions reduction of 68 tons CO_{2e} per year.

6. Estimated Cost for Implementation and Existing Funding Commitments

Motiv proposes that this pilot is funded by Hybrid and Electric Voucher Incentive Program (HVIP), with the CA Air Resources Board (and/or local air districts) adding one additional weight class and two additional “plus-ups” to the HVIP program as follows:

Class 8 Category for HVIP: HVIP currently does not provide any additional incentive for Class 8 trucks beyond what is available for Class 7 trucks, despite the increased fuel use, carbon footprint, emissions and cost of Class 8 trucks when compared to Class 7. Motiv proposes adding a new incentive class for trucks with a GVWR in excess of 33,000 lbs. Almost all refuse trucks fall within this Class 8 designation. Motiv proposes the following base vehicle incentive, which is proportional to HVIP in other segments²:

GVWR (lbs)	Base Vehicle Incentive		
	1 to 100 Vehicles		101 to 200 Vehicles
	Outside DC	Inside DC	
>33,000	\$150,000	\$180,000	\$75,000

² HVIP incentive dollars show a decreasing \$/pound GVWR as weight classes increase. Keeping with that trend, these numbers are based on a 42,000 lbs GVWR truck using the same ratio as exists in a 26,000 lbs GVWR electric truck. A more thorough analysis normalizing to ton of GHG or criteria pollutant offset may be more appropriate, but was outside of the scope of this initial proposal.

Extra Battery “plus-up”: As HVIP is currently structured, fleets can only afford electric trucks equipped with the fewest possible batteries. Adding an Extra Battery plus-up would open the applicability of HVIP funding to electric trucks that are designed with more range. Extra range and energy storage is critical to the refuse collection market and other markets in order to bring electric beyond the lowest-range vehicles and into applicability for vehicles that do more mileage (and use more fuel) each day.

Infrastructure “plus-up”: Currently, HVIP for all-electric vehicles is more attractive for vehicles which will be housed in new facilities. New facilities typically have more available power, which reduces the cost of charge station installation. Beyond the above two suggestions, the lack of infrastructure funding may be another reason that fleets such as refuse collection have not moved to electric – most of their facilities are in disadvantaged communities and may have lower installed power, increasing the cost of installing charge stations. Note that not all facilities in disadvantaged communities are older and/or have less installed electrical power, but poorer/disadvantaged areas may have older building stock.

Motiv proposes that the amount for both of the above “plus-ups” be market driven. This would mean the dollar amounts would be set and adjusted over time to meet the truck deployment targets, provided the basic performance metric of dollar per ton CO₂ or dollar per ton criteria air pollutant does not fall unacceptably low. Plus-up funding may also be contingent on truck operation and charge installation in a disadvantaged community, respectively

Motiv proposes a starting value of:

- \$850/kWhr for the Extra Battery “plus-up”
- 80% of an electrician’s quote (2 competitive quotes required) for Infrastructure “plus-up”.

These amounts would change asymmetrically after 3-6 months depending on the number of vehicles ordered. If many vehicles are ordered, the amounts should go down. If no/few vehicles are ordered, the funders should solicit input from target fleets.

Finally, Motiv proposes that a small marketing budget be allocated for reaching out to refuse collection fleets in particular, possibly through refuse collector trade associations and events. A non-profit industry consortium could run such a program.

7. Timeline

Motiv proposes implementation of the new HVIP weight class and two “plus-ups” as soon as practical, contingent on funding availability among the agencies. If possible, the market outreach to refuse collection companies could begin even before announcement of the “plus-ups”. There should be a vehicle deployment target set which includes the number of total vehicles ordered under this program within the first 3 to 6 months of the commencement of the “plus-ups”.

There should be a time limit between order and delivery of vehicles, such as 9 months, after which the incentive amount per vehicle and station may be reduced to an updated amount based on changes in incentive amount due to market demand (see section (6) above).

Based on conversations with fleets, Motiv makes a rough prediction of a deployment schedule:

Months From “Plus-ups” Announcement	Number of Refuse Collection Fleets	Number of Refuse Vehicles Ordered	Number of Refuse Vehicles Deployed³
12	2	6	5
24	3	34	18
36	3	110	60

Note, in addition to these orders, Motiv anticipates other, non-refuse-collection fleets in the class 8 segment will place orders after the new proposed weight class and “plus-ups” are announced, enabling other freight applications to benefit from the program.

8. Progress Measurement

The proposal would rely on the existing infrastructure used by HVIP for tracking progress, but with a carve-out for tracking numbers for vehicle application separately (in addition to including them in the total). Both vehicle order metrics and vehicle use metrics from HVIP would continue to be tracked. This would allow the tracking of refuse vehicles to be differentiated from transit, delivery and other segments. This data would also be a key signal in where market traction is being achieved and which segments need specific outreach and incentives to catch up with growth.

Motiv proposes one additional element of tracking – with public recognition and awards from CARB, the Governor’s office or other appropriate agency for the fleets that offset the most greenhouse gasses and criteria air pollution using all-electric miles. By recognizing the fleets within each segment doing the most, fleets who are participating but less actively, will have an incentive to step up their performance and compete for recognition.

9. Partner Roles

The program would leverage the partnerships already established with HVIP – an industry non-profit for administration and progress tracking and partnership among the air districts and CARB for funding.

³ Includes the deployment of 3 all-electric refuse vehicles whose manufacture is already underway under CEC award ARV-14-050 to Motiv.