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June 6, 2023

Cory-Ann Wind
Oregon Clean Fuels Program Manager
Oregon Department of Environmental Quality
800 NE Oregon Street
Portland, OR 97232

Comment Submitted via email to OregonCleanFuels@deq.state.or.us

RE: Comments on Proposed Forklift Estimation Methodology

Dear Ms. Wind,

CleanFuture, Inc. ("CleanFuture) appreciates the opportunity to provide feedback on the proposed Forklift Estimation Methodology in response to implementation of the Clean Fuels Program Expansion 2022 Rulemaking. CleanFuture is a leading environmental company that has worked for over a decade to electrify and improve the efficiency of a wide range of vehicle fleets. CleanFuture, Inc. has built a strong platform connecting clean vehicle fleet customers with low carbon fuels (electricity and other fuels), particularly zero and sub-zero CI fuels, serving both on the supply and demand side in multiple programs and jurisdictions.

CleanFuture recognizes DEQ's objectives and requirements under the CFP regulation with an effective date of January 1, 2023; and CleanFuture is pleased to provide comments. CleanFuture's founder and president has 11 years' experience working at a forklift OEM relating to design and development of electric forklifts so I can provide industry insight. A key design parameter for electric forklifts is to design and tune the performance of the electric forklift truck such that the truck will typically operate for 8 hours on a single battery charge. Certain forklift rucks can be tuned for higher performance which results in range degradation as in any electric vehicle, and also certain high-performance operations can discharge forklift batteries faster in periods less than 8 hours, yet 8 hours is a reasonable and conservative assumption.

Most battery manufacturers specify 80% depth of discharge (DOD) for motive batteries in electric forklift trucks, which has been traditionally dictated by conventional battery chemistry and charging. With advanced battery chemistry and modern charging technology it is possible for higher energy throughput over that 8-hour shift by taking batteries to a lower DOD and/or with fast charging.

Comments on Oregon's Forklift Estimation Methodology (Discussion Draft for May 30th Workshop)

DEQ's focus and constraint on two parameters related to forklift operating profile are overly conservative for many operations. Yet we understand DEQ's need for accurate credit generation to align with actual ton of GHG reductions, and DEQ's intent to transition away from an estimation methodology to transition to metered data.

One such source of metered data is the hour meter on electric forklifts, which is a robust and reliable means of tracking forklift truck usage and is often used by leasing and rental companies as a financial record to bill operators for forklift truck usage.

CleanFuture requests for DEQ to accept metered hours of forklift use (i.e., hour meter hours) as a valid method of metering.

Electricity can be determined by the alternate method proposed by Smart Charging Technologies on May 15, 2023 as posted on by DEQ for the May 30th workshop.[1]

CleanFuture offers an alternate and simplified formula to determine Recharge kWh per 8-hour shift is shown below:

$$Recharge\ kWh\ = \frac{\left(\frac{Battery\ Volage\ \times\ AH\ capacity}{1000}\right)\ \times\ \%\ DOD\ \times CRF}{Charger\ Efficiency}$$

Where:

Battery Voltage:	Battery Nameplate Voltage Rating
Battery AH Capacity:	Battery Nameplate Amp-hour (AH) rating
% DOD:	% Depth of Discharge (default value of 80% per 8 hour shift)
Charger Efficiency:	Charger efficiency based on charging technology and age of charger[2]
CRF	Charge Return Factor, which accounts for overcharge for full charging[3]

The Recharge kWh per run hour is calculated by dividing the Recharge kWh by 8 hours, or

$$Recharge\ kWh\ per\ run\ hour\ = \frac{Recharge\ kWh}{8\ hour}$$

To determine kWh supplied to electric forklift trucks the actual metered run hours are multiplied by Recharge kWh per run hour, or:

[1] https://www.oregon.gov/deq/ghgp/Documents/SCTLetter-AltEstimationMethodologyforForkliftElectricity.pdf

[2] Charger efficiency based on typical values according to technology type, with silicon controlled rectified (SCR) at 78% to 82% efficiency range, Ferro-resonant charges typically between 82% and 86% range, and High Frequency at 90% to 96% efficiency range.

[3] Charge return factor adjustment at 15% overcharge or 115% total for Fero-resonant and High Frequency chargers, or 18% overcharge or 118% for SCR chargers.

$$kWh\ supplied\ to\ a\ given\ truck = Actual\ Truck\ Meter\ Hours \times Recharge\ kWh\ per\ run\ hour$$

Metered hours of hours of use (hour meter hours) provide a true and accurate metric of use and determination of energy supplied to electric forklifts.

CleanFuture requests for DEQ to clarify acceptability to use hour meter hours, which allows many forklift fleet owners to continue generating credits in electric forklifts under OAR 340-253-0330 (5).

Comments on Forklift Estimation Methodology Spreadsheet

CleanFuture provides comments on DEQ's discussion purposes only spreadsheet.

1. Each eligible electric forklift asset should be identified as a discrete row in the spreadsheet (this level of asset details is known by reporting parties and registered to DEQ).
2. Columns H to K are unnecessary and should be removed.
3. Model year for each registered serial number should be added as a new column
4. Hour meter hours should be added to the spreadsheet template.
5. Operating profile information (i.e., workdays per quarter and shifts per day) are included.
6. kWh supplied to electric forklift trucks can be calculated:
    a. at DEQ's prescribed parameters for the estimation methodology for the interim period.
    b. On metered truck hours with kWh calculated as outlined above on an ongoing basis.
7. The application code (i.e., "HDV/Off-Road - Electric Forklifts (Pre-2016)" and "HDV/Off-Road - Electric Forklifts (2016 and later)" can be assigned by the spreadsheet template and/or identified by reporting parties.
8. A pivot table summary can be created from the spreadsheet template.

A simple spreadsheet is submitted with this comment as an illustrative example, CleanFuture asks for DEQ staff to consider these ideas when developing the final spreadsheet template.

Equity considerations

Challenges and barriers exist for metering and data acquisition in the electric forklift sector, many other registered parties have identified challenges with to DEQ so CleanFuture will not further elaborate. Yet CleanFuture suggests to DEQ that many forklift fleets may find metering to be cost-prohibitive, especially in small fleets (and at small companies). So CleanFuture recommends that DEQ set a threshold level where small fleets below a certain credit threshold may generate credits using a conservative estimation methodology for electric forklifts. Metered hour meters and/or kWh can be required by DEQ after Q3 2023 reporting period for electric forklift fleets above that threshold.

Proportional allocation to Forklift Truck Model Year for Metered Data

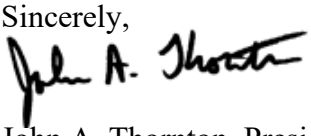
CleanFuture request to use a proportional allocation of metered data to determine kWh supplied to the two forklift application code categories (i.e., for HDV/Off-Road - Electric Forklifts (Pre-2016)" and "HDV/Off-Road - Electric Forklifts (2016 and later)").

By the very nature of individual hour meter data, this is easily solved as the kWh according to category is a known value.

For sub-meters or other kWh logging devices it is necessary to allocate kWh supplied to trucks by the application categories.

Thank you for this opportunity to submit these comments. Please advise if any further input on these issues would be constructive.

Sincerely,



John A. Thornton, President
CleanFuture, Inc.

Enclosure: Illustrative Spreadsheet Template Example