Oregon
Tina Kotek, Governor

Department of Transportation
Department of Environmental Quality
Salem, OR 97301

January 30, 2023

Senator Michael Dembrow, Co-Chair
Representative Khanh Pham, Co-Chair
Joint Committee on Ways and Means Subcommittee on Natural Resources

Dear Co-Chairs Dembrow and Pham, and members of the committee,

During the Wednesday, January 25th briefing on DEQ and ODOT's Medium and Heavy Duty Zero Emission Vehicle Incentives report, the committee asked DEQ and ODOT to provide additional information regarding medium and heavy duty charging and the Clean Fuels Program. Please find responses and further information below.

1. How long does it take a medium or heavy duty electric vehicle to charge?

Charging times for medium and heavy duty vehicles is largely dependent on two factors: charger power level and battery size. Level 2 chargers for MHD vehicles will range from 7-19 kW and existing DCFC range from 25 kW – 350 kW. Battery sizes range from 75 kWh for smaller class 3 vehicles to 500 (or higher) kWh for semi-trucks, class 8. This table shows the range of charging times:

	Class 3-5 (delivery van/box truck)	Class 6 (buses)	Class 8 (heavy trucks)
Battery size (reference)	75-100 kWh	200 kWh	500 kWh
Typical range (miles)	100-150	125-175	200-250
Charging Power	Typically Level 2, some DCFC at higher classes	DCFC	DCFC
Hours to Charge	6-8 hours at 11 kW (L2); 3-4 hours at 19 kW (L2)	4-6 hours at 75 kW (DCFC)	3-6 hours at 50-150 kW (DCFC)

2. How does temperature impact electric vehicle charging?

Li-ion batteries (EV batteries) perform best in moderate temperatures. Very cold or hot temperatures impact battery range and charging speed. Most vehicles incorporate temperature regulation into their battery management system to prevent damage. In cold temperatures (<40 degrees Fahrenheit), an EV's software will reduce its charging power to protect the battery. This system will preheat the battery and slow the rate of charging until it is safe to charge normally. An Idaho National Lab study found that at 32 degrees, an EV battery took in 36% less energy than when the battery charged for the same amount of time at 77 degrees. Conclusion: in very cold weather (below freezing), an EV battery needs more time to charge.

High temperatures also affect batteries and charging. All chemical reactions happen faster in high heat. Charging regularly at high temperatures can degrade batteries more quickly. As a battery approaches the point of overheating, the vehicle system decreases charging speeds to protect the battery. High temperatures will also impact the electronic components in charging stations. Conclusion: in very high temperatures (over 110 degrees), an EV battery needs more time to charge.

Internal combustion engine vehicles also lose efficiency in very cold or very high temperatures (15-25%), but not to the same degree as EVs (39%).

3. Do consumer owned utilities in rural areas have the grid capacity for electric vehicle charging?
Grid capacity depends on the site and is variable across the state. ODOT and DEQ do not have consumer owned utility information on specific grid capacity by utility territory, but we continue to coordinate with utilities and industry partners to plan ahead for 2 to 5 year lead times to provide higher power charging levels, especially for medium and heavy duty vehicles, needed to support vehicle transitions. All major Investor Owned Utilities in Oregon (Portland General Electric, Pacific Power, and Idaho Power) are in the process of submitting multi-year Transportation Electrification Plans to the PUC. Utility plans include developing market transformation strategies to promote electric vehicle adoption while planning to manage new load on their systems. The smaller consumer-owned utilities (local public utility districts, cooperatives, and municipal utilities) have similar processes with their boards or governing bodies.

4. Is the Clean Fuels Program impacting fuel consumption in Oregon?
Data has shown that the use of alternative fuels has been steadily increasing since the Clean Fuels Program (CFP) began in 2016. The carbon footprint of Oregon's transportation fuels has decreased by nearly 8 million tons, with very modest impacts to fuel prices and considerable benefits to our communities and air quality. Because of the CFP, Oregon is a national leader in the use of "blended fuels" where renewable fuels are mixed with fossil fuels. For example, the ODOT fleet uses renewable diesel for about 40% of its fuel use, up from 37% in 2021.

5. Is there additional support needed to support cleaner fuels in addition to the Clean Fuels Program?
The Clean Fuels Program is Oregon's signature program to reduce greenhouse gas emissions from transportation fuels in the state and stimulate the development of clean fuels for use in Oregon. The program sends a strong signal to the market to bring those fuels to Oregon and our market currently has the highest credit prices amongst the west coast states with a clean fuel standard.

In September 2022, the Environmental Quality Commission unanimously approved expanding the program an additional decade through 2035. This action nearly quadrupled the stringency of the program over that extended period which provides additional certainty to the market and ensures that our credit prices will remain robust.

6. Please provide a link to ODOT's Hydrogen Pathway Study.
ODOT's Hydrogen Pathway study was published in April 2022. Hydrogen and fuel cell vehicles are a promising tool to achieve a zero emissions future, and offer key operational advantages over battery-electric vehicles: longer driving range, shorter refueling times (on par with gasoline), several low and no-carbon production pathways and extended storage capabilities. Hydrogen may play a critical role in decarbonizing transportation, and the study summarizes the many steps Oregon can take to develop the market for hydrogen and fuel cell electric vehicles (FCEVs).

As always, please let me know if I can answer additional questions or provide more information.

Thank you,

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