

Appendix G: Electricity Cost Calculations

Battery-Electric CHE Annual Fuel Cost Calculation

Annual fuel costs for each battery-electric CHE type are calculated using the following equation:

$$\text{Fuel Price (\$ per year)} = \text{Electric charging demand (kW)} \times \text{charging hours per year (h)} \times \text{Electricity rate } \left(\frac{\$}{\text{kWh}}\right)$$

Where,

$$\text{Charging hours per year (h)} = \frac{\text{CHE annual activity (h)}}{\text{Electrical equipment durability (h)}} \times \text{Charging time (h)}$$

The electric charging demand (kW) is sourced from the Dynamic Energy Forecasting Tool (DEFT).¹ Charging hours per year (h) are calculated based on CHE annual activity and electrical equipment durability and charging time. CHE annual activity is derived from the CARB inventory.² Electrical equipment durability and charging time are sourced from DEFT. According to the 2024 CEC Integrated Energy Policy Report, the statewide average electricity rate will stabilize at around \$0.27/kWh from 2025 going forward for commercial uses.³ For this analysis, an electricity rate of \$0.27/kWh is applied.

Fuel costs for each diesel-powered CHE type are calculated using the following equation:

$$\text{Fuel price (\$ per year)} = \text{fuel efficiency } \left(\frac{\text{Gallon}}{\text{h}}\right) \times \text{operating hours per year (h)} \times \text{Diesel costs } \left(\frac{\$}{\text{Gallon}}\right)$$

¹ EPRI, "Zero-Emission Planning and Grid Assessment for the Port of Los Angeles," June 29, 2023. Accessed January 22, 2025. <https://www.epri.com/research/products/000000003002025783>.

² California Air Resources Board, "2022 Cargo Handling Equipment Emissions Inventory," December 2022. Accessed January 22, 2025. https://ww2.arb.ca.gov/sites/default/files/2023-04/2022%20CHE%20Emission%20Inventory%20Document_6April2023.pdf.

³ California Energy Commission, "2024 Integrated Energy Policy Report Update," n.d. <https://www.energy.ca.gov/data-reports/reports/integrated-energy-policy-report/2024-integrated-energy-policy-report-update>.

Operating hours per year are sourced from the CARB CHE inventory.⁴ Diesel costs are derived from the CEC IEPR and adjusted for red-dyed diesel pricing by excluding taxes applicable to on-road diesel, resulting in a cost of \$4.13 per gallon for the year 2025.⁵

Grid-Electric CHE Annual Fuel Cost Calculation

Annual fuel costs for each grid-electric CHE type are calculated using the following equation:

$$\text{Fuel Price (\$ per year)} = \text{Electric charging demand (kW)} \times \text{charging hours per year (h)} \times \text{Electricity rate } \left(\frac{\$}{\text{kWh}} \right)$$

Where,

$$\text{Charging hours per year (h)} = \text{CHE annual activity (h)}$$

The electric charging demand (kW) is sourced from DEFT.⁶ Since grid-electric CHE is plugged in during operation, charging hours per year (h) are the same as the annual activity. CHE annual activity is derived from the CARB inventory.⁷ For this analysis, the same electricity rate used in the battery-electric CHE cost calculations is applied. Fuel cost calculations for diesel-powered CHE are also the same as in the battery-electric CHE cost calculations.

⁴ California Air Resources Board, "2022 Cargo Handling Equipment Emissions Inventory," 2022. Accessed January 22, 2025. https://ww2.arb.ca.gov/sites/default/files/2023-04/2022%20CHE%20Emission%20Inventory%20Document_6April2023.pdf.

⁵ Integrated Energy Policy Report - IEPR," n.d. Accessed January 22, 2025. <https://www.energy.ca.gov/data-reports/reports/integrated-energy-policy-report-iepr>.

⁶ EPRI, "Zero-Emission Planning and Grid Assessment for the Port of Los Angeles," June 29, 2023. Accessed January 22, 2025. <https://www.epri.com/research/products/000000003002025783>.

⁷ California Air Resources Board, "2022 Cargo Handling Equipment Emissions Inventory," December 2022. Accessed January 22, 2025. https://ww2.arb.ca.gov/sites/default/files/2023-04/2022%20CHE%20Emission%20Inventory%20Document_6April2023.pdf.