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:

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

Where,

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

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:

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

[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:

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

Where,

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

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.

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[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*.