APPENDIX B:

Analysis of the Default Emissions Factor for the Reporting of Unspecified Electricity by Electric Power Entities

Proposed Amendments to the Regulation for the Mandatory Reporting of Greenhouse Gas Emissions

State of California

AIR RESOURCES BOARD

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This document details the analysis conducted by California Air Resources Board (CARB) staff to evaluate the potential of updating the default emission factor for unspecified power in the Regulation for the Mandatory Reporting of Greenhouse Gas Emissions (MRR) at the behest of electricity market stakeholders in California, and in the Western Electricity Coordinating Council (WECC).

A default emission factor representing the emissions from a marginal resource is necessary for electric power entities to report GHG emissions associated with electricity from unspecified sources. The current default emission factor of 0.428 MT CO_2e/MWh was introduced in the 2010 MRR based on coordinated efforts by CARB, California Energy Commission (CEC), California Public Utilities Commission (CPUC), and Western Climate Initiative (WCI).

The current default emission factor was calculated as the total emissions divided by the total net generation of all marginal sources, defined below. Total emissions and net generation were calculated using data from the Energy Information Administration (EIA) reported by the electricity industry including generator types and capacities, quantities of fuel consumed, net generation, and whether the facility is a combined heat and power (CHP) unit. Using this EIA information, staff calculated the default emission factor by assigning facilities to either a marginal or non-marginal category. In cases where staff identified that a facility did not operate for the entirety of a year, the nameplate capacity was multiplied by the fraction of the year the facility operated. Electricity generating resources across the entire WECC were included, except for California and New Mexico, where emissions trading systems were anticipated to be implemented.

As described in the 2010 MRR Initial Statement of Reasons, to determine a marginal resource, “Staff used a capacity factor of 60 percent, consistent with Senate Bill 1368 (SB 1368, Stats. 2006, ch. 598), which prohibits any load-serving entity from entering into long-term contracts for baseload generation that exceeds a GHG emission performance standard established by the CPUC. SB 1368 defines a baseload facility as a facility with a capacity factor of ’at least 60 percent.’ Therefore, staff established a ‘marginal’ facility as a facility with a capacity factor less than 60 percent. In addition, facilities that are not dispatchable are excluded, such as facilities with must-take contracts such as CHP or facilities that provide energy as-available such as wind and solar. Hydroelectric power was also excluded since it can be claimed as a specified source of electricity under staff’s proposal.” (CARB PTSD/EID, October 2010, p. 168)

CARB staff based the default emission factor for reporting imported unspecified electricity on the average of 2006 through 2008, consistent with the methodology for setting the cap under the Cap-and-Invest Program.

In April 2024, CARB staff recalculated the original WCI default emission factor calculation using the same publicly available 2006-2008 data from the EIA and was able to achieve a result within ± 0.05 MT CO_2e/MWh of the original values. Staff performed that same analysis using EIA data from 2017-2022 data (5 years of data was used to average out the potential impacts from drought and the COVID-19 pandemic during those years), adding resources in New Mexico that were excluded in the original analysis, and excluding resources in Washington state, due to their Cap-and-Invest program. This analysis yielded a value of 0.440 MT CO_2e/MWh, within 3% of 0.428 MT/CO_2e. Due to the relatively small change in the value, CARB staff are not proposing to revise the default emission factor in this amendment process. This updated analysis aligns with CARB's prior review of the default emissions factor during the 2018 rulemaking process. It also echoes recent findings in the academic literature on marginal emissions rates nationwide (Holland et al., February 2022).

While conducting this assessment, CARB staff took the opportunity to review the original method and estimates under current electricity market conditions. The original assessment excluded all coal resources as not being load-following regardless of capacity factor. In the last 15 years, the energy generation mix in the WECC has changed substantially. Renewable generation has increased significantly across the WECC; however, as described in the original methodology, those resources generate based on meteorological conditions and cannot be described as "marginal". The total amount of hydro generation remains similar to the original assessment, and staff believe categorization of hydropower as non-marginal remains appropriate, given its role as a specified resource for many load-serving entities (inside and outside California), and due to the number of factors that dictate hydro-electric production, such as environmental and agricultural needs. In addition, coal power production has decreased in the WECC and CHP and other facilities that were excluded due to must take contracts may no longer have those contracts in place.

CARB staff conducted a scenario analysis by adding CHP and coal facilities that were below the 60% capacity factor from the original analysis and by looking at results from individual years. In all runs, the resulting default emissions factor was approximately 20 – 50% higher than the current 0.428 value.

Additionally, CARB staff undertook a sensitivity analysis to determine whether the UEF calculation is significantly impacted by the choice of capacity factor used to determine whether a resource was included as a marginal resource. In this analysis, the UEF calculation changed by about 5% and was 0.48 MTCO2e/MWh at a 40% capacity factor, and 0.424 at an 80% capacity factor, compared to 0.440 at 60% capacity factor under the existing methodology. These results lead staff to conclude that the UEF is not sensitive to the choice of a 60% capacity factor. Overall, staff found that the default emissions factor has not changed significantly since the original analysis in 2010 and that the current value continues to be an accurate representation of marginal resources in the WECC.

References

1. California Air Resources Board Planning and Technical Support Division Emission Inventory Branch (CARB PTSD/EIB). (2010, October 28). *Staff Report: Initial Statement of Reasons for Rulemaking; Revisions to the Regulation for Mandatory Reporting of Greenhouse Gas Emissions Pursuant to the California Global Warming Solutions Act of 2006 (Assembly Bill 32).* https://www.arb.ca.gov/regact/2010/ghg2010/ghgisor.pdf.

2. Holland, S., Kotchen, M., Mansur, E., Yates, A. (2022, February 14). Why marginal CO_2 emissions are not decreasing for US electricity: Estimates and implications for climate policy. *Proceedings of the National Academy of Sciences, 119(8).* https://www.pnas.org/doi/full/10.1073/pnas.2116632119.