

# California's 2000-2018 Greenhouse Gas Emissions Inventory 2020 Edition

## Inventory Updates Since the 2019 Edition of the Inventory

Supplement to the Technical Support Document



Air Quality Planning and Science Division

October 2020

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## A. Introduction

Assembly Bill (AB) 1803 gave the California Air Resources Board (CARB) the responsibility of preparing and updating California's greenhouse gas (GHG) inventory to track the State's progress in reducing GHG emissions. The GHG inventory is one piece, in addition to data from various California Global Warming Solutions Act (AB 32) programs, in demonstrating the State's progress in achieving the statewide GHG targets established by AB 32 (reduce emissions to 1990 levels by 2020) and Senate Bill 32 (SB 32) (reduce emissions to at least 40 percent below 1990 levels by 2030). The 2020 edition of California's GHG inventory covers emissions for 2000 through 2018 and includes inventory improvements and accounting method updates.

The GHG inventory was developed according to the Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories ("IPCC Guidelines") (IPCC 2006), which is the internationally recognized standard for developing national GHG inventories. Since the 2019 edition of the inventory (2000-2017 emissions), CARB staff has made improvements to emissions estimation methods and incorporated new data sources. This document provides a description of the inventory updates since the previous edition of the inventory.

Each release of the California inventory incorporates the latest available data sources and emission quantification methodology. The IPCC guidance for GHG inventories states that it is good practice to recalculate historic emissions when methods are changed or refined, when new source categories are included in the inventory, or when errors in the estimates are identified and corrected. To maintain a consistent time-series of estimates within the inventory and consistent with the IPCC Guidelines, recalculations are made to incorporate new methods or to reflect changes in statistical data supplied by other agencies for all years from 2000 to 2018. Therefore, emission estimates for a given calendar year may be different between editions as methods are updated or if the data source agencies revise their data series.

The 2020 edition of the GHG Inventory has expanded the level of detail provided to the public for activity data underlying the GHG emissions. Beginning with this year's inventory, the quantities of heat contained in combusted fuels (in units of British Thermal Units (btu)) will be provided in spreadsheet format to allow for a common comparison between fuels, in addition to physical fuel quantities (e.g., gallons and standard cubic feet) that were already provided in the previous editions. In previous years, the Documentation Index website (CARB 2019a) has included data for imported electricity from GHG-emitting resources. Starting this year, the amount of imported hydro, solar, wind, and nuclear electricity (in Terawatt-hour (TWh) unit) will also be provided in the Documentation Index website.

In addition, CARB is releasing a report on upstream emissions of California's natural gas consumption pursuant to AB 2195. AB 2195 requires CARB "to quantify and publish annually the amount of greenhouse gas emissions resulting from the loss or release of uncombusted

natural gas to the atmosphere and emissions from natural gas flares during all processes associated with the production, processing, and transporting of natural gas imported into the state from out-of-state sources.” Most of the emissions quantified in the AB 2195 report occurred outside of California borders; and therefore, are not added to the GHG Inventory total.

In the sections to follow, background information on each updated category is presented followed by a description of the update. The inventory category code associated with the hierarchical structure of IPCC inventory categorization is shown in the sub-heading title of each section.

## B. Description of Inventory Updates

### B.1 Imported Electricity (IPCC 1A1ai): Adjust the Disaggregation of Facility-Reported CO<sub>2</sub>e Emissions into CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O

#### B.1.1 Background

Under AB 32, CARB must account for statewide GHG emissions, including all emissions resulting from the generation of electricity delivered to and consumed in California, whether that electricity is generated in-state or imported to California to serve California load. CARB's Regulation for the Mandatory Reporting of Greenhouse Gas Emissions (MRR) program collects data on the amount of electricity (in megawatt-hours (MWh)) imported from out-of-state power plants (CARB 2019b). To determine emissions for each out-of-state power plant, CARB's MRR program uses resource-specific emissions-per-MWh factors reported for each import from a specified source. Four cases exist in which the import is not from a single, specified source: unspecified imports, asset controlling suppliers (ACS), multi-jurisdictional retail providers (MJRP), and the California Independent System Operation (CAISO) Energy Imbalance Market (EIM) outstanding emissions. In each of these four cases, power is coming from a group or system of multiple power sources. MRR does not require the reporting of individual pollutant emission factors for these four cases; rather, a single emission factor is reported in units of carbon dioxide equivalent (CO<sub>2</sub>e) without individual GHGs. In accordance with the framework laid out in the IPCC Guidelines, the GHG Inventory needs to report each pollutant individually and disaggregate the emissions reported for these four cases. In this update, staff has modified the method for disaggregating the reported CO<sub>2</sub>e emissions into individual pollutants using assumptions and emission factors consistent with MRR for 2008 and later years.

#### B.1.2 Data and Method

For 2008 and later year data, the GHG inventory uses a single method to disaggregate CO<sub>2</sub>e emissions reported to the MRR program for the above mentioned four cases. The method uses the default emission factors for the combustion of natural gas as published in Table C-1 of Title 40 of the Code of Federal Regulation (CFR) Part 98 (40 CFR 98) (CARB 2019c) that is incorporated by reference in the MRR rule text (CARB 2019d). The default natural gas emission factors are used to determine the percentage of the total CO<sub>2</sub>e emissions attributed to each gas: methane (CH<sub>4</sub>), carbon dioxide (CO<sub>2</sub>), and nitrous oxide (N<sub>2</sub>O). These percentages are then applied to the reported CO<sub>2</sub>e emissions for each of the four cases to disaggregate their emissions from a single CO<sub>2</sub>e value into three individual values for CH<sub>4</sub>, CO<sub>2</sub>, and N<sub>2</sub>O.

No methodological change was made to data for years before MRR started to collect data. For 2007 and earlier year data, pollutants were estimated individually, and there was not a need to disaggregate CO<sub>2</sub>e into the three gases.

## **B.2 Transportation (IPCC 1A3): Use Biodiesel and Renewable Diesel Data from the Low Carbon Fuel Standard Program**

### ***B.2.1 Background***

In the previous edition of the GHG Inventory, staff used the statewide biodiesel and renewable diesel volume data from the California Energy Commission (CEC 2015). CEC estimates fuel volumes by conducting transportation energy balance analysis using a combination of diesel blend data from the California Department of Tax and Fee Administration (CDTFA), CEC's internal accounting of fuel imports and exports, and diesel production data from the Petroleum Industry Information Reporting Act (PIIRA). CEC started tracking, analyzing, and compiling data on these fuels before the Low Carbon Fuel Standard (LCFS) was implemented; and therefore, CEC has more years of data than LCFS. Starting this year, CEC is incorporating most of the LCFS data for 2011 and onward. With this CEC change, the GHG Inventory is now directly referencing LCFS data for 2011 and more recent years (LCFS 2020). For 2010 and prior years data, GHG Inventory continues to use data obtained from CEC (CEC 2015).

### ***B.2.2 Data and Method***

Starting with the 2020 edition of the GHG Inventory, the GHG Inventory is using biodiesel and renewable diesel volumes collected by the LCFS program for 2011 and later years (LCFS 2020), and continuing to use CEC data for 2010 and prior years (CEC 2015). Besides the change in activity data source, there is no change to methodology for calculating GHG emissions.

## **B.3 Industrial (IPCC 1B2a-iii): Add Sorbent CO<sub>2</sub> Emissions to the Manufacturing Sector and Commercial Cogeneration Facilities**

### ***B.3.1 Background***

Non-combustion CO<sub>2</sub> emissions result from the use of sorbent materials to scrub acid gases out of the exhaust of various industrial and power producing processes. This process releases CO<sub>2</sub> as a product of the chemical reaction that removes the acid gases. The MRR program has been collecting sorbent CO<sub>2</sub> emissions since the 2011 data year. The previous editions of the GHG Inventory have already incorporated acid gas emissions for the following three categories of facilities that report emissions to MRR: merchant-owned in-state power plants, industrial Combined Heat & Power (CHP, or cogeneration) facilities, and refineries & hydrogen production facilities. For the 2020 edition, additional MRR sorbent CO<sub>2</sub> data for the manufacturing sector and commercial CHP facilities have been processed and provided for inclusion in the GHG Inventory.

### ***B.3.2 Data and Method***

In addition to the sorbent CO<sub>2</sub> emissions already included in the previous inventory editions, MRR sorbent CO<sub>2</sub> data for the manufacturing sector and commercial CHP facilities are now also included (CARB 2019b). The additional emissions are small, representing only 0.005 MMTCO<sub>2</sub>e of emissions (in 2017 value) that were not previously quantified in prior editions of the GHG Inventory. The additional data are incorporated in the GHG Inventory in the same manner as other MRR sorbent CO<sub>2</sub> data in previous inventory editions. No new or modified methods are used.

However, the IPCC Guidelines (IPCC 2006) recommends that corresponding updates be applied to the entire time series to ensure data consistency over time. Therefore, staff employs an estimation technique to extend these additional emissions back in time. For years before MRR started to collect data (2000-2010), the GHG Inventory uses the three-year average of 2011-2013 emissions for each sector for which these emissions are reported. This three-year average is then used to estimate the sector-specific emissions from this source for years 2000-2010.

## **B.4 Agriculture (IPCC 3A1ai & 3A2ai): Revise Estimation of Dairy Cattle Population**

### **B.4.1 Background**

Methane emissions from dairies are calculated using dairy population by cattle type and emission factors that are embedded in models used in the U.S. Environmental Protection Agency's (USEPA) Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2012 (USEPA 2014). CARB uses the U.S. Department of Agriculture's (USDA) Census of Agriculture (USDA 2020) for California's milk cow population in Census years: 2007, 2012, and 2017, or every 5 years. In the previous inventory editions, for intervening years between the 5-year Census, staff estimated dairy population by proportionally scaling the dairy population data from the California Department of Food and Agriculture's (CDFA) Dairy Statistics Annual (CDFA 2019) to match the 5-year Census numbers. However, CDFA is no longer publishing the Dairy Statistics Annual after the 2017 version was released in 2019. Therefore, staff must find an alternate method of estimating annual dairy population.

### **B.4.2 Data and Method**

Without California-specific dairy cattle population data for 2018, staff uses the long-term trend in existing USDA 5-year Census data (USDA 2020) to extrapolate dairy population for 2018. The USDA 5-year Census data shows a long-term average annual statewide decline of approximately 0.5 percent in milk cow populations. Staff applies this long-term average decline rate to 2017 data to estimate the 2018 milk cow population. The GHG inventory plans to use this estimation method for future years until a more reliable dataset becomes available.

## B.5 Miscellaneous Data Updates (IPCC 1A1ai, 1A2f, 2A1)

In the 2020 edition of the inventory, CARB staff made minor updates to several parts of the inventory. These updates include:

- Merge “Pacific Northwest” and “Pacific Southwest” into one unspecified electricity imports category to be consistent with MRR.
- Use the version of the 40 CFR 98 Table C-1 (CARB 2019c) that is currently incorporated by reference in the MRR rule text (instead of the most current version used by the USEPA) to be consistent with MRR.
- For cement industry fuel calculations, scale fuel combustion CO<sub>2</sub> by fuel type at the facility-level, instead of the sector-level as was done for the 2019 edition.
- Recategorize some custom fuels based on additional supplemental information about the heat content of the custom fuels.
- Use Useful Thermal Output (UTO) data from the U.S. Energy Information Administration (EIA) (EIA 2020) to attribute total emissions from cogeneration units to electricity and UTO for 2011-2018.
- Minor data corrections are also made to amount of electricity for EIM, landfill waste decay rates, and ocean-going vessel data.

As a result of these minor updates and data corrections, some emissions and fuel data for the same calendar year may be slightly different between the 2020 edition and 2019 edition of the inventory.



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