CALIFORNIA
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INVENTORY OF CALIFORNIA GREENHOUSE GAS EMISSIONS AND SINKS: 1990 TO 2004

STAFF FINAL REPORT

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Arnold Schwarzenegger, *Governor*

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ABSTRACT

This report provides estimates of California's greenhouse gas emissions over the 1990 to 2004 time period. Emissions estimates in the report are derived from data provided by the U.S. Energy Information Administration and additional data collected by the California Energy Commission. Analysis in the report uses protocols established for country-level greenhouse gas emissions inventory reporting as established by the Intergovernmental Panel on Climate Change and the U. S. Environmental Protection Agency. The report includes both in-state emissions and emissions from electricity imported into California. These emissions and emissions from international fuel uses are shown at the bottom of the inventory to allow the reader to decide whether to include them.

California's greenhouse gas emissions are large in a world-scale context and growing over time. If California was considered to be an independent country, its emissions would rank seventeenth largest.

This report also includes projections of California greenhouse gas emissions to 2020. These projections are based upon forecasts adopted by the Energy Commission in its *2005 Integrated Energy Policy Report*. This report also includes an estimate of reductions needed to meet 2010 and 2020 greenhouse gas emissions reduction targets established by California's Governor, Arnold Schwarzenegger.

KEYWORDS

Greenhouse gas emissions inventory, climate change, carbon dioxide, methane, nitrous oxide, high global-warming potential gases

TABLE OF CONTENTS

EXECUTIVE SUMMARY

This report updates California's statewide inventory of greenhouse gas (GHG) emissions to support evaluation of state policies that address climate change and climate variability or more commonly known as global warming. Information in this report extends the inventory period through 2004, which is the most recent year that data are available from the California Energy Commission (Energy Commission) or the United States Department of Energy's (DOE's) Energy Information Administration. This inventory reports GHG emissions from out-of-state electricity used in California along with in-state generation GHG emissions and estimates future emissions trends using fuel demand and other forecast data from the Energy Commission's *2005 Integrated Energy Policy Report*.

California's economy experienced the second largest percentage growth in terms of gross state product (in dollars, not adjusted for inflation) of any state in the country from 1990 to 2003.[1] During that period, California's GSP grew 83 percent while its GHG emissions grew more slowly at 12 percent. This demonstrates the potential for uncoupling economic trends from GHG emissions trends.

Nonetheless, California's GHG emissions are large and growing. As the second largest emitter of GHG emissions in the United States and twelfth to sixteenth largest in the world,[2] the state contributes a significant quantity of GHGs to the atmosphere.

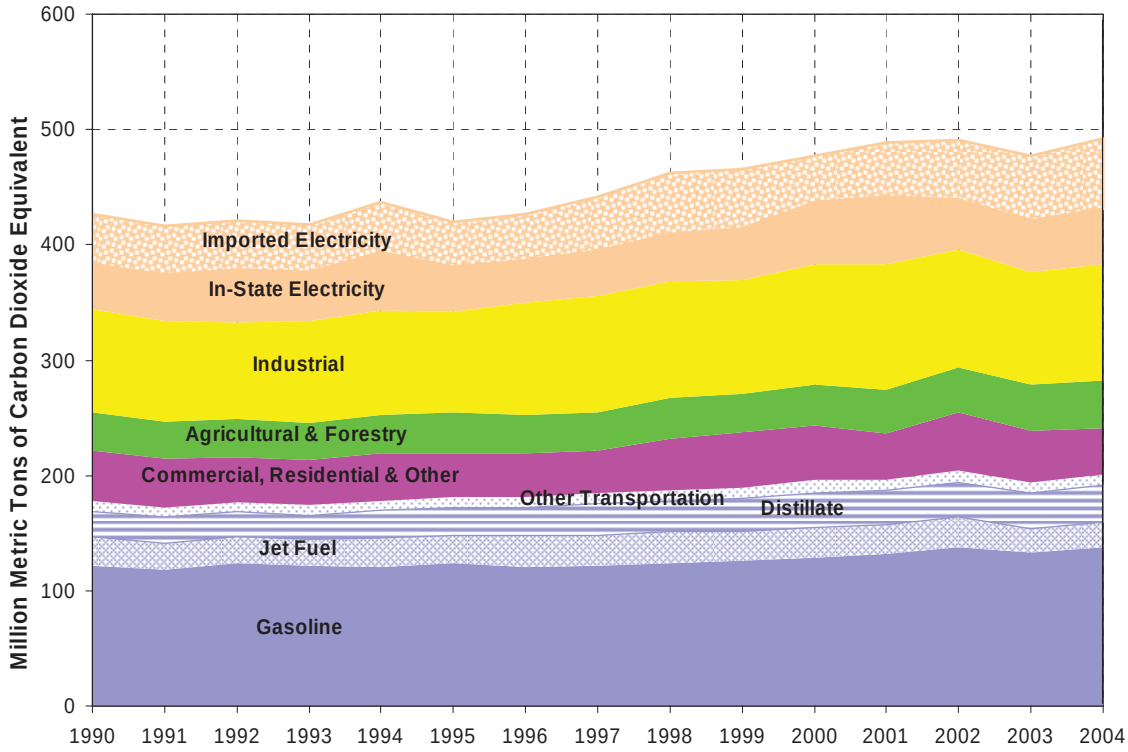
California's ability to slow the rate of growth of GHG emissions is largely due to the success of its energy efficiency and renewable energy programs and a commitment to clean air and clean energy. In fact, the state's programs and commitments lowered its GHG emissions rate of growth by more than half of what it would have been otherwise.[3] Moreover, California's energy programs and policies have had multiple benefits that include not only reducing GHG emissions, but reducing energy demand and improving air quality and public health.

Although California's total GHG emissions are larger than every state but Texas, California has relatively low carbon emission intensity. In 2001, California ranked fourth lowest of the 50 states in carbon dioxide emissions per capita from fossil fuel combustion and fifth lowest of the 50 states in carbon dioxide emissions from fossil fuel combustion per unit of gross state product. Emission trends per unit of gross state product are encouraging; most states have reduced their emissions per unit of gross state product over the 1990 to 2001 period.

In 2004, California produced 492 million gross metric tons of carbon dioxide - equivalent[4] GHG emissions, including imported electricity and excluding combustion of international fuels and carbon sinks or storage.

Figure 1 shows year-by-year trends in GHG emissions for the major energy sectors. Values differ yearly due to changes in fuel uses, meteorological variations, and other factors.

Figure 1 -- California's Gross GHG Emissions Trends



Source: California Energy Commission

The transportation sector is the single largest category of California's GHG emissions, producing 41 percent of the state's total emissions in 2004. Most of California's emissions, 81 percent, are carbon dioxide produced from fossil fuel combustion.

This California GHG emissions inventory excludes all international fuel uses, reporting them separately. Including these international emissions would increase total emissions by 27 to 40 million metric tons of carbon dioxide–equivalent GHG emissions, depending on the year.

Electricity generation is the second largest category of GHG emissions (behind transportation). In particular, out-of-state electricity generation has higher carbon intensity than in-state generation. While imported electricity is a relatively small

share of California's electricity mix (ranging from 22 to 32 percent of total electrical energy used), out-of-state electricity generation sources contribute 39 to 57 percent of the GHG emissions associated with electricity consumption in California. Electricity imported to California from the Southwest has a significant percentage that is coal-based generation, while imports from the Pacific Northwest have a significant portion that is hydroelectricity.

Because GHGs affect the entire planet, not just the location where they are emitted, policies developed to address climate change should include an evaluation of emissions from the entire fuel cycle whenever possible.

Staff recommends the following steps to further improve the accuracy and utility of the California GHG emissions inventory:

- Update fuel use and other emissions-related activity data.

- Perform a more detailed review of industrial uses of fossil fuels to classify when they are used as fuel versus when they are used as a process input and not released into the atmosphere at that step in their usage chain.

- Add industrial wastewater emissions. These occur from processing fruits and vegetables, red meat and poultry, and pulp and paper. Methane and nitrous oxide emissions from these activities are not yet included in this inventory and should be added since California is a major producer of these products.

- Study in more detail landfill methane emissions. Values in this inventory represent a facility-by-facility review of emissions by local air quality district staff; as of July 2006, local air quality districts are updating their data but have yet to finish this work. Also, landfill emissions are being studied by the Energy Commission's Public Interest Energy Research Program but results are not expected before 2008. Improved data for landfill emissions are expected to result from both of these efforts.

- Develop California-specific data for sulfur hexafluoride emissions from electric utilities for the 1990-to-present time period.

- Develop California-specific emission factors for methane and nitrous oxide from enteric fermentation and manure management.