

CALIFORNIA  
ENERGY  
COMMISSION

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

**STAFF FINAL REPORT**

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Arnold Schwarzenegger, *Governor*

# CALIFORNIA ENERGY COMMISSION

Gerry Bemis  
*Principal Author*

Gerry Bemis  
*Project Manager*

Pat Perez  
*Manager*  
**SPECIAL PROJECTS  
OFFICE**

Rosella Shapiro  
*Deputy Director*  
**FUELS AND  
TRANSPORTATION  
DIVISION**

B.B. Blevins  
*Executive Director*

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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

<b>EXECUTIVE SUMMARY .....</b>	<b>i</b>
<b>INTRODUCTION.....</b>	<b>1</b>
EARLY CALIFORNIA GHG INVENTORIES .....	2
LEGISLATIVE REQUIREMENTS FOR INVENTORY UPDATES .....	4
SUMMARY OF CALIFORNIA'S 2004 GHG EMISSIONS.....	5
<i>Composition of California's GHG Emissions</i> .....	5
<i>End-Use Sectors Contributing to California's GHG Emissions</i> .....	7
HISTORICAL GHG EMISSIONS TRENDS.....	8
<i>Trends in California GHG Composition</i> .....	9
<i>Trends in California's GHG Emissions End-Use Categories</i> .....	9
<i>GHG Emissions Intensity Trends</i> .....	12
<i>California's GHG Emissions In a World-Scale Context</i> .....	17
<i>Future GHG Emissions Trends</i> .....	22
CURRENT GHG EMISSIONS INVENTORY COMPARED TO CALIFORNIA CLIMATE ACTION TEAM REPORT VALUES .....	23
<b>GHG INVENTORY UPDATE .....</b>	<b>24</b>
<b>FUTURE GHG INVENTORY IMPROVEMENTS.....</b>	<b>27</b>
GWP WEIGHTING FACTORS FOR NON-CO <sub>2</sub> GASES .....	27
DATA IMPROVEMENTS OR REFINEMENTS .....	27
<b>APPENDIX A--DETAILED DOCUMENTATION OF CALIFORNIA GREENHOUSE GAS EMISSIONS .....</b>	<b>33</b>
<b>CALCULATION METHODOLOGY .....</b>	<b>35</b>
CO <sub>2</sub> EMISSIONS .....	35
<i>CO<sub>2</sub> Emissions from Fossil Fuel Combustion</i> .....	35
<i>CO<sub>2</sub> Emissions from Non-Fossil Fuel Emissions Sources</i> .....	42
METHANE EMISSIONS.....	48
NITROUS OXIDE EMISSIONS .....	54
HIGH GWP GAS EMISSIONS .....	57
<b>APPENDIX B--FUEL USED IN CALIFORNIA (TRILLION BTUS).....</b>	<b>69</b>
<b>APPENDIX C--DISCUSSION OF ALTERNATIVE METHODS OF ESTIMATING CO<sub>2</sub> EMISSIONS FROM ELECTRICITY IMPORTED TO CALIFORNIA .....</b>	<b>75</b>
INTRODUCTION .....	77
CURRENT GHG INVENTORY.....	77
JOSEPH LOYER METHOD .....	77
1990-1999 INVENTORY METHOD .....	78
SUMMARY OF OPTIONS TO ESTIMATE CO <sub>2</sub> EMISSIONS FROM ELECTRIC IMPORTS.....	78
<b>APPENDIX D--DIFFERENCES BETWEEN CURRENT INVENTORY AND JUNE 2005 INVENTORY .....</b>	<b>81</b>
INTRODUCTION .....	83
NATURAL GAS COMBUSTION CO <sub>2</sub> EMISSIONS.....	83
<i>Residential</i> .....	83
<i>Commercial</i> .....	83
<i>Industrial</i> .....	83
<i>Electricity Generation</i> .....	84

<i>Non-Sector Specific</i> .....	84
COAL COMBUSTION CO <sub>2</sub> EMISSIONS.....	84
<i>Electricity Generation</i> .....	84
NON-FOSSIL FUEL CO <sub>2</sub> EMISSIONS .....	84
<i>Agricultural Soils; Woody Crops</i> .....	84
METHANE EMISSIONS.....	85
<i>Petroleum &amp; Natural Gas Supply System</i> .....	85
<i>Natural Gas Supply System (Gas Transmission Subcategory)</i> .....	85
<i>Landfills</i> .....	85
<i>Enteric Fermentation</i> .....	85
<i>Manure Management</i> .....	85
N <sub>2</sub> O EMISSIONS.....	85
<i>Agricultural Soil Management (Direct Fertilizers and Indirect Fertilizers &amp; Crop Residues)</i> .....	85
HIGH GWP EMISSIONS .....	86

**APPENDIX E--METHANE SPECIATION PROFILE PROVIDED BY CALIFORNIA AIR RESOURCES BOARD ..... 91**

**APPENDIX F--COMPARING THE CURRENT 1990 TO 2004 GHG EMISSIONS INVENTORY AND 2005 INTEGRATED ENERGY POLICY REPORT TO CORRESPONDING VALUES USED BY THE CALIFORNIA CLIMATE ACTION TEAM..... 95**

INTRODUCTION .....	97
PROJECTIONS BASED UPON 2003 IEPR .....	97
PROJECTIONS BASED UPON 2005 IEPR .....	98

**APPENDIX G--CHANGES AFTER THE NOVEMBER 30, 2006 WORKSHOP..... 105**

SUBMITTED COMMENTS AND REPLIES.....	107
<i>Steven Brink, California Forestry Association</i> .....	107
<i>Bud Hoekstra, BerryBlest Organic Farm</i> .....	107
<i>David Coale, Palo Alto/Stanford Green Ribbon Task Force</i> .....	107
<i>Randy S. Howard, Los Angeles Department of Water and Power</i> .....	108
ERRATA.....	108

**Endnotes number 10 & 55 were updated from a draft report on the California Energy Balance to the final report. The bibliography was also updated.BIBLIOGRAPHY ... 108**

**BIBLIOGRAPHY ..... 109**

**ENDNOTES..... 111**

## 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.<sup>1</sup> 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,<sup>2</sup> the state contributes a significant quantity of GHGs to the atmosphere.

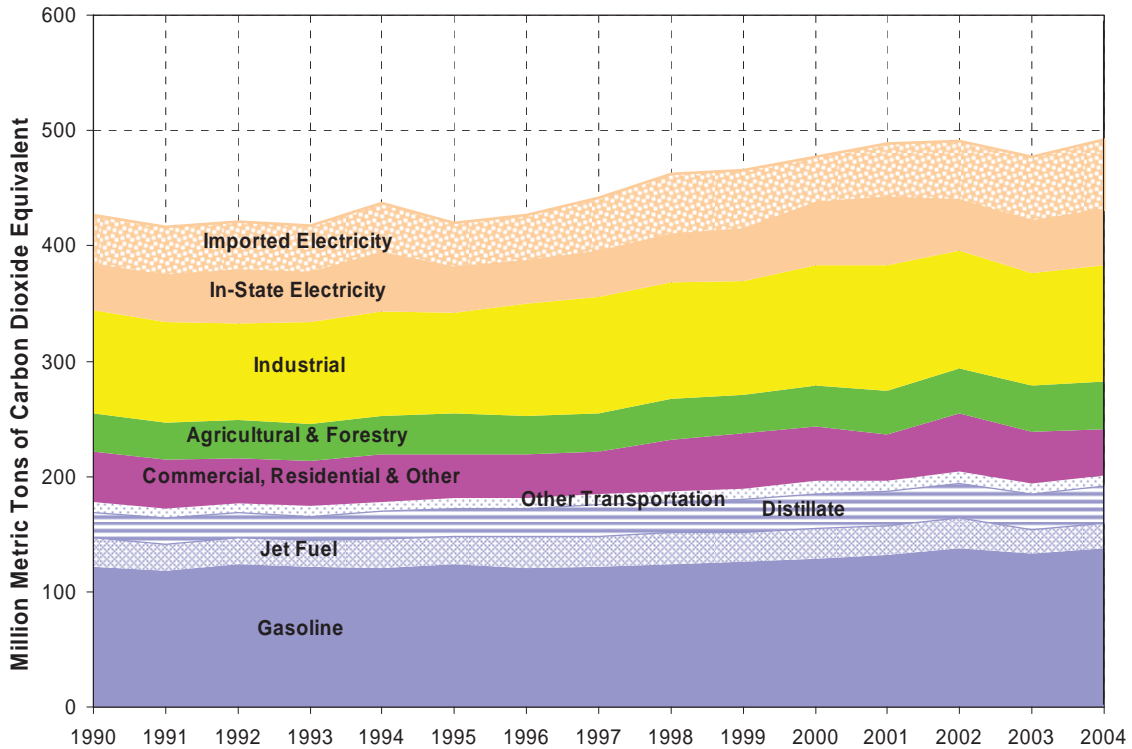
California's ability to slow the rate of growth of GHG emissions is largely due to the success of its energy efficiency and renewable energy programs and a commitment to clean air and clean energy. In fact, the state's programs and commitments lowered its GHG emissions rate of growth by more than half of what it would have been otherwise.<sup>3</sup> 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<sup>4</sup> 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.