

# Pacific Gas and Electric Company Carbon Footprint Calculator Assumptions

## General Information

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### 1. Typical PG&E Residential Customer – Monthly Household Energy Use<sup>1</sup>

- Electricity Usage: 540 kilowatt-hours (kWh)
- Natural Gas Usage: 45 therms (winter 60 / summer 24)

### 2. ClimateSmart Rates<sup>1</sup>

- Electricity: \$0.00254 per kWh
- Natural Gas: \$0.06528 per therm

### 3. PG&E Carbon Dioxide (CO<sub>2</sub>) Emissions Rates<sup>2</sup>

- Electric: 0.524 lbs CO<sub>2</sub> per kWh
- Natural Gas: 13.446 lbs CO<sub>2</sub> per therm

## Minimizing Your Carbon Footprint – Estimated Avoided CO<sub>2</sub> Emissions

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### 1. Switch to Compact Fluorescent Light Bulbs

Avoid 34 lbs CO<sub>2</sub> per bulb per year

#### *Assumptions:*

- Compares a 100-watt incandescent bulb to a 23-watt compact fluorescent.
- Lighting used 2.34 hours per day.<sup>3</sup>
- PG&E emissions rate (electric): 0.524 lbs CO<sub>2</sub> per kWh.

### 2. Install an Energy-Efficient Clothes Washer

Avoid 260 lbs CO<sub>2</sub> per year

#### *Assumptions:*

- Avoid up to 15 therms per year and up to 128 kilowatt-hours per year.
- Based on California Energy Commission-rated Tier 3, 2.65 cubic feet clothes washer supplied by a gas water heater. Savings will vary greatly depending upon number of loads and size of washer, whether front- or top-loading, and whether electricity or natural gas is used for water heating.
- PG&E emissions rate (natural gas): 13.446 lbs CO<sub>2</sub> per therm.
- PG&E emissions rate (electric): 0.524 lbs CO<sub>2</sub> per kWh.

### 3. Purchase an Energy-Efficient Water Heater

Avoid 120 lbs CO<sub>2</sub> per year

#### *Assumptions:*

- Avoid up to 9 therms per year.
- 30 to 50 gallon 0.63 Energy Factor (EF) natural gas water heater. EF is a measure of energy efficiency.
- PG&E emissions rate (natural gas): 13.446 lbs CO<sub>2</sub> per therm.

### 4. Install High Efficiency Central Furnace

Avoid 1,000 lbs CO<sub>2</sub> per year

#### *Assumptions:*

- Avoid up to 74 therms per year.

- Based on installation of a more efficient furnace (94% AFUE) to replace a less efficient unit (70% AFUE) of the same size (67.611 kBtuh rating). AFUE stands for Annual Fuel Utilization Efficiency and is a measure of heating efficiency on an annual basis.
- PG&E emissions rate (natural gas): 13.446 lbs CO<sub>2</sub> per therm.

## 5. Install Solar Electric Panels

Avoid 3,300 lbs CO<sub>2</sub> per year

Assumptions:

- Typical residential system is 3-5 kW.
- 18% capacity factor.
- Operating 8,760 hours per year.
- PG&E emissions rate (electric): 0.524 lbs CO<sub>2</sub> per kWh.

## 6. Switch to Hybrid-Electric Vehicle

Avoid 2,900 lbs CO<sub>2</sub> per year

Assumptions:

- 12,000 miles per year for average automobile.<sup>4</sup>
- Compares hybrid-electric subcompact with comparable vehicle: 2007 Toyota Prius (46 miles per gallon average fuel efficiency) and (non-hybrid) 2007 Honda Civic (29 miles per gallon average fuel efficiency).<sup>5</sup>
- Burning 1 gallon of gasoline produces 19.4 lbs CO<sub>2</sub>.<sup>6</sup>

## Average Per Capita CO<sub>2</sub> Emissions (Energy and Vehicle Use)

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### 1. Average Californian

22,941 lbs CO<sub>2</sub> per person

Assumptions:

- 2005 California Per Capita Electricity Usage: 7,032 kWh.<sup>7</sup>
- 2005 California Per Capita Natural Gas Usage: 422 therms.<sup>7</sup>
- California Emissions Rate for Delivered Electricity: 0.879 lbs CO<sub>2</sub> per kWh.<sup>8</sup>
- Emissions Rate for Natural Gas: 13.446 lbs CO<sub>2</sub> per therm.<sup>9</sup>
- 12,000 miles per year and 21 miles per gallon for average passenger vehicle.<sup>10</sup>
- Burning 1 gallon of gasoline produces 19.4 lbs CO<sub>2</sub>.<sup>6</sup>

### 2. Average American

32,607 lbs CO<sub>2</sub> per person

Assumptions:

- 2005 United States Per Capita Electricity Usage: 12,347 kWh.<sup>7</sup>
- 2005 United States Per Capita Natural Gas Usage: 504 therms.<sup>7</sup>
- United States Emissions Rate for Delivered Electricity: 1,363 lbs CO<sub>2</sub> per kWh.<sup>8</sup>
- Emissions Rate for Natural Gas: 13.446 lbs CO<sub>2</sub> per therm.<sup>9</sup>
- 2004 United States Per Capita Vehicle Usage: 464 gallons per person.<sup>7</sup>
- Burning 1 gallon of gasoline produces 19.4 lbs CO<sub>2</sub>.<sup>6</sup>

### 3. Average Global Person

8,750 lbs CO<sub>2</sub> per person<sup>11</sup>

## Sources

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- <sup>1</sup> PG&E's ClimateSmart program, authorized by the California Public Utilities Commission in Decision 06-12-032.
- <sup>2</sup> PG&E's ClimateSmart program, authorized by the California Public Utilities Commission in Decision 06-12-032. The most accurate measure of emissions from power generation involves calculating the emissions from each plant operating in the portfolio of generating assets for each hour of the day and year, and this can vary considerably by time of day, year, and with seasonal variations in weather.
- To avoid this complex approach, it is common to approximate emissions from electric usage through the use of an average emissions rate such as the California Public Utilities Commission (CPUC)-approved ClimateSmart electric emissions rate of 0.524 lbs CO<sub>2</sub> per kWh. This reasonable approximation is based on the average emissions rate for PG&E's electric portfolio, consistent with the emissions rate that is independently certified and registered each year with the California Climate Action Registry (see [www.climateregistry.org](http://www.climateregistry.org)). The CPUC-approved ClimateSmart natural gas emissions rate is 13.446 lbs CO<sub>2</sub> per therm.
- <sup>3</sup> Database for Energy Efficient Resources, California Public Utilities Commission and California Energy Commission.
- <sup>4</sup> Emission Factors (EMFAC) Model 2007 Version 2.3, Average Annual Mileage from Air Basins in PG&E Service Territory.
- <sup>5</sup> U.S. Environmental Protection Agency, 2007 Miles-Per-Gallon Updates.
- <sup>6</sup> U.S. Environmental Protection Agency, Overview: Pollutants and Programs Average Carbon Dioxide Emissions Resulting from Gasoline.
- <sup>7</sup> California Energy Commission.
- <sup>8</sup> U.S. Environmental Protection Agency eGRID (Updated April 2007).
- <sup>9</sup> California Energy Commission (CEC): Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2002 Update, Page A-24, CEC-600-2005-025, June 2005. The average emissions rate for customer use of natural gas is 11.7 lbs CO<sub>2</sub> per therm. For comparability purposes for this calculator, we use the CPUC-approved ClimateSmart rate of 13.446 lbs CO<sub>2</sub> per therm, which includes both customer use and distribution of natural gas.
- <sup>10</sup> Emission Factors (EMFAC) Model 2007 Version 2.3.
- <sup>11</sup> World Resources Institute Climate Analysis Indicators Tool Version 3.0 (2002 Emissions Data), which is based on:
- U.S. Department of Energy, Energy Information Administration. 2004. International Energy Annual 2002.
  - International Energy Agency. 2004. CO<sub>2</sub> Emissions from Fuel Combustion (2004 Edition).
  - Marland, G., T.A. Boden, and R. J. Andres. 2005. Global, Regional, and National Fossil Fuel CO<sub>2</sub> Emissions. in Trends: A Compendium of Data on Global Change. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, Oak Ridge, Tenn., U.S.A.
  - Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, 2005. World Population Prospects: The 2004 Revision.