

## Attachment 1: Description of Emissions Reduction Measure Form

**Title:** *Energy Efficiency Ratings and Standards for Buildings at Time-of-Sale*

**Type of Measure (check all that apply):**

- |   |  |
|---|--|
| <input checked="" type="checkbox"/> Direct regulation | <input type="checkbox"/> Market-based compliance:                    |
| <input type="checkbox"/> Monetary Incentive           | <input checked="" type="checkbox"/> Non-monetary incentive           |
| <input type="checkbox"/> Voluntary                    | <input checked="" type="checkbox"/> Alternative Compliance Mechanism |
| <input type="checkbox"/> Other Describe:              |  |

**Responsible Agency:** California Energy Commission, California Air Resources Board, and Department of Real Estate

**Sector:**

- |   |   |
|---|---|
| <input type="checkbox"/> Transportation   | <input checked="" type="checkbox"/> Electricity Generation      |
| <input type="checkbox"/> Other Industrial | <input type="checkbox"/> Refineries                             |
| <input type="checkbox"/> Agriculture      | <input type="checkbox"/> Cement                                 |
| <input type="checkbox"/> Sequestration    | <input checked="" type="checkbox"/> Other Describe: Natural gas |

**2020 Baseline Emissions Assumed (MMT CO<sub>2</sub>E):** 211 MMTCO<sub>2</sub>e

129 MMTCO<sub>2</sub>e from the electricity sector,<sup>1</sup> and 82 MMTCO<sub>2</sub>e from end-use consumption of natural gas.<sup>2</sup>

**Percent Reduction in 2020:** 1.4% (3.1 MMTCO<sub>2</sub>e)

**Cost-Effectiveness (\$/metric ton CO<sub>2</sub>E) in 2020:** \$0 per metric ton CO<sub>2</sub>e

---

**Description:**

The California Energy Commission (CEC) has stringent energy efficiency standards for new buildings, known as “Title 24.” However, more than two-thirds of California’s residential buildings were built before 1982, when the CEC’s building standards first began to include

---

<sup>1</sup> California Energy Commission, *Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2004*, CEC-600-2006-013-SF, December 2006, Table F-2.

<sup>2</sup> The California Energy Commission’s forecast for statewide consumption of natural gas in 2016 is 14,625 MM Therms, with a growth rate from 2008-2016 of 1.44% per year. Extrapolating to 2020 results in statewide consumption of 15,486 MM Therms in 2020. Using the conversion of 53.06 kg CO<sub>2</sub>e per MMBtu, from the Climate Action Team’s updated macroeconomic analysis, results in 82.17 MMTCO<sub>2</sub>e. (California Energy Commission, *California Energy Demand 2008-2018*, Staff Draft Report, CEC-200-2007-015SD, July 2007, p. 1-9; Climate Action Team Economics Subgroup, *Updated Macroeconomic Analysis of Climate Strategies Presented in the March 2006 Climate Action Team Report*, Public Review Draft, September 7, 2007.)

energy performance requirements,<sup>3</sup> and nearly half of the state's non-residential buildings were built before the CEC's first building standards in 1978.<sup>4</sup> And with continual upgrades in the standards, even compliant 1990 vintage buildings lack some of the most cost-effective efficiency measures. As a result, there are significant opportunities to improve the energy efficiency and reduce greenhouse gas (GHG) emissions from existing buildings.

The utilities' energy efficiency programs provide information, incentives, and technical assistance to encourage customers to improve the efficiency of their existing buildings. One of the key opportunities to make efficiency improvements in existing buildings is at the time the building is sold, since owners often have inspections of the property and make improvements associated with a sale. Energy efficiency inspections, ratings, and improvements at the time of sale represents a significant opportunity to improve the existing building stock, since over 600,000 existing homes are sold each year (triple the number of new homes built).<sup>5</sup>

The CEC and the Air Resources Board (ARB) should establish time-of-sale information disclosure requirements, followed by time-of-sale efficiency requirements, to ensure that this key opportunity to reduce GHG emissions is captured.

In a 2005 report, *Options for Energy Efficiency in Existing Buildings*, the CEC created a roadmap for capturing these savings. The initial components are in place: the CEC has a process for certifying Home Energy Rating System (HERS) raters, and the CEC has completed an informational booklet offering energy efficiency advice for home sellers and buyers.<sup>6</sup> In addition, San Diego Gas & Electric has contracted with GeoPraxis to offer the Energy Checkup time-of-sale home inspection program as part of its 2006-08 energy efficiency programs.<sup>7</sup> A few cities, including San Francisco and Berkeley, have ordinances that require energy efficiency improvements to buildings at the time of sale,<sup>8</sup> and the utilities are partnering with local governments to expand the use of these local energy conservation ordinances as part of the 2006-08 energy efficiency programs.

To capture the energy efficiency and greenhouse gas reduction opportunities available at the time buildings are sold, the state should pursue the following actions:<sup>9</sup>

- ◆ The CEC should complete its HERS rulemaking, to establish a rating scale for home energy ratings of existing buildings.

---

<sup>3</sup> California Energy Commission, *Options for Energy Efficiency in Existing Buildings*, CEC-400-2005-039-CMF, December 2005, p. 12.

<sup>4</sup> Ibid, p. 13.

<sup>5</sup> Ibid, p. 21.

<sup>6</sup> Information is available at [www.energy.ca.gov/HERS/](http://www.energy.ca.gov/HERS/).

<sup>7</sup> See <http://www.californiaenergyefficiency.com/sdge/3036.doc> and [www.energycheckup.com](http://www.energycheckup.com) for more information.

<sup>8</sup> For information about San Francisco's Residential Energy Conservation Ordinance (RECO) see [http://sfgov.org/site/uploadedfiles/dbi/downloads/aprog/90-RESIDENTIAL\\_CONSERV\\_ORD.pdf](http://sfgov.org/site/uploadedfiles/dbi/downloads/aprog/90-RESIDENTIAL_CONSERV_ORD.pdf). Information on Berkeley's RECO and CECO is at [www.ci.berkeley.ca.us/sustainable/residents/ResSidebar/RECO.html](http://www.ci.berkeley.ca.us/sustainable/residents/ResSidebar/RECO.html) and [www.ci.berkeley.ca.us/sustainable/buildings/ceco.html](http://www.ci.berkeley.ca.us/sustainable/buildings/ceco.html).

<sup>9</sup> The CEC's report provides more details on an action plan to establish time-of-sale efficiency requirements, and the state agencies that should collaborate to reach the goal. California Energy Commission, *Options for Energy Efficiency in Existing Buildings*, CEC-400-2005-039-CMF, December 2005, p. 25.

- ◆ The ARB should require that all existing homes sold in California receive a HERS rating. (Such a requirement has already been adopted in the European Union, and member states are developing rules for rating scales.)
- ◆ The Department of Real Estate should require that real estate agents demonstrate knowledge of the HERS rating rules as part of their licensing requirements.
- ◆ The CEC should conduct a rulemaking to determine and recommend to ARB a reasonable energy efficiency requirement for homes at time-of-sale and a reasonable phase-in period. For example, the CEC should explore whether every home after some date should be required to meet a certain HERS rating, a certain percent increase in HERS rating at the time of sale, or prescriptive requirements.
- ◆ The energy ratings should be made part of the real estate documents of the home. This will allow the markets to reflect the value of energy efficiency.
- ◆ The ARB should require that all existing homes sold in California meet the requirements recommended by the CEC. Note that this will also effectively require energy ratings on new homes, which is easy to implement because over 90% of new homes comply using computer based methods that generate a rating score automatically.

Alternatively, the Legislature could authorize the CEC to require that all existing homes sold in California receive a HERS rating, and meet a certain level of energy efficiency.

In addition, the CEC should explore a similar system to require energy efficiency improvements in non-residential buildings at the time of sale. Non-residential efficiency requirements have been included in some of the local ordinances discussed above.

### **Emission Reduction Calculations and Assumptions:**

The CEC estimates that the total cost-effective savings potential in existing buildings is 9 percent of electricity consumption (26,270 GWh), 11 percent of peak demand (5,937 MW), and 5 percent of natural gas consumption (799 MMTherms).<sup>10</sup> Once this entire potential is captured, it will provide about 12.5 MMTCO<sub>2</sub>e of emission reductions. However, these estimates appear to be extremely conservative about the full potential for time-of-sale energy efficiency requirements.

The policies described above will only capture part of that potential by 2020. We estimate that the policies can achieve about 3.1 MMTCO<sub>2</sub>e of reductions by 2020. This estimate is based on the following assumptions and conversion factors:

- ◆ The policies described above are implemented so that all homes sold beginning in 2010 receive a HERS rating, and that all homes sold beginning in 2012 meet a certain level of energy efficiency;
- ◆ 500,000 homes are sold each year;<sup>11</sup>
- ◆ The energy savings from each home that receives a HERS rating is 535 kWh/year, 0.15 kW, and 26 therms/yr;<sup>12</sup>

---

<sup>10</sup> Ibid, pp. 14-15.

<sup>11</sup> Ibid, p. 54.

<sup>12</sup> Ibid.

- ◆ The energy savings from each home that is required to improve its energy efficiency is double the savings achieved through only providing the HERS rating information; and
- ◆ The standardized emission factors for electricity and natural gas provided in the draft *Updated Macroeconomic Analysis of Climate Strategies Presented in the March 2006 Climate Action Team Report*: 313 kg CO<sub>2</sub>e per MWh of electricity avoided, and 53.06 kg CO<sub>2</sub>e per MMBtu avoided.<sup>13</sup>

The energy savings would reach 5,350 GWh, 1,500 MW, and 260 MMTherms per year by 2020. The electric savings will provide approximately 1.7 MMTCO<sub>2</sub>e reductions<sup>14</sup> and the natural gas savings will provide approximately 1.4 MMTCO<sub>2</sub>e reductions.<sup>15</sup> See the attached spreadsheet for further details on the calculations.

*These are conservative assumptions:* emission reductions could be increased substantially by expanding the policies to include non-residential buildings, water efficiency measures (which can provide significant “embedded” energy savings and GHG reductions, particularly in Southern California), and new opportunities for cost effective efficiency measures are likely to arise as the infrastructure of raters and retrofit contractors for existing homes grows more robust.

Since the utility programs offer incentives for residents of existing homes to make energy efficiency improvements, there may be some double counting of reductions from this proposed strategy and the utility energy efficiency programs strategy.

### **Cost-Effectiveness Calculation and Assumptions:**

The CEC’s report, *Options for Energy Efficiency in Existing Buildings*, estimates that the total resource costs and benefits for this strategy are approximately equivalent.<sup>16</sup> As a result, the measure would have no net costs, and achieve the GHG reductions for approximately \$0 per metric ton CO<sub>2</sub>e.

### **Implementation Barriers and Ways to Overcome Them:**

California will need to significantly expand the number of trained HERS raters and trained contractors that can implement the necessary energy efficiency upgrades. This is not difficult: the state built up an infrastructure of raters for new homes in order to enforce Title 24 requirements for tested leak-free ducts in only one year. The national home energy ratings certification organization RESNET has built up rater infrastructure to accommodate Energy Star new home programs in a number of metro areas in a matter of months. In addition, real estate professionals will need to become familiar with HERS ratings and energy efficiency contractors. The overall program should be designed to integrate seamlessly into the existing home inspection process so that it does not slow real estate transactions and instead provides

<sup>13</sup> Climate Action Team Economics Subgroup, *Updated Macroeconomic Analysis of Climate Strategies Presented in the March 2006 Climate Action Team Report*, Public Review Draft, September 7, 2007.

<sup>14</sup> (5,350 GWh) \* (1000 MWh / GWh) \* (0.313 ton CO<sub>2</sub>e/MWh) = 1.7 MMTCO<sub>2</sub>e.

<sup>15</sup> (260 MM Therms) \* (10<sup>6</sup> Therms /MMTherms) \* (10<sup>5</sup> Btu / therm) \* (MMBtu / 10<sup>6</sup> Btu) \* (0.053 ton CO<sub>2</sub>e / MMBtu) = 1.4 MMTCO<sub>2</sub>e.

<sup>16</sup> California Energy Commission, *Options for Energy Efficiency in Existing Buildings*, CEC-400-2005-039-CMF, December 2005, p. 55.

homeowners with a simple and easy way to make their home more comfortable and to lower their energy bills while cutting pollution at the same time. One way to do this is to encourage homeowners to get their homes rated and retrofit long in advance of sale, if they so desire.

### **Potential Impacts on Criteria and Toxic Pollutants:**

The draft *Updated Macroeconomic Analysis of Climate Strategies Presented in the March 2006 Climate Action Team Report* provides standardized emission factors for criteria pollutants from electricity, which are indicative of the magnitude of emissions avoided. The report provides factors of 0.018 kg NO<sub>x</sub> per MWh of electricity and 0.018 kg PM<sub>10</sub> per MWh of electricity.<sup>17</sup> The California Public Utilities Commission's 2004 avoided cost report provides NO<sub>x</sub> emission rates for various types of end-uses of natural gas. The average emission rate is approximately 0.1 lb/MMBtu.<sup>18</sup> PM<sub>10</sub> emissions were found to be so low for end-use consumption of natural gas that they were not included.

Using these emission rates, the 5,350 GWh of electricity savings and 260 MM Therms of natural gas savings in 2020 from this strategy would provide emission reductions of approximately 1,260 metric tons of NO<sub>x</sub> and approximately 96 metric tons of PM<sub>10</sub>. See the attached spreadsheet for further details on the calculations.

**Name:** Devra Wang

**Organization:** Natural Resources Defense Council

**Phone / email:** 415-875-6100; [dwang@nrdc.org](mailto:dwang@nrdc.org)

---

<sup>17</sup> Climate Action Team Economics Subgroup, *Updated Macroeconomic Analysis of Climate Strategies Presented in the March 2006 Climate Action Team Report*, Public Review Draft, September 7, 2007.

<sup>18</sup> Energy and Environmental Economics, *Methodology and Forecast of Long Term Avoided Costs for the Evaluation of California Energy Efficiency Programs*, for California Public Utilities Commission, October 25, 2004, p. 76.