

Practitioner's Guide

Oak Ridge National Laboratory: Environmental Emissions Non-energy Benefits: Working Paper

September 2014
ORNL/TM-2015/126

This report explains the results of the nonenergy benefits study conducted as part of the WAP evaluation. It focuses on measuring the emissions reductions resulting from energy usage reductions after the WAP and estimates the societal value of those emission reductions.

The guide that follows is not an executive summary. Each volume of the Weatherization evaluation by ORNL has its own excellent summary. It is meant to be a tool that guides Weatherization Assistance Program practitioners seeking to locate and apply the results of sophisticated outcome evaluations included within this evaluation report volume. It highlights findings that can be important for those who design and deliver WAP services similar to those found in this volume of the retrospective evaluation of the 2008 Program and offers page references that help readers locate specific topics, statistics, and tables.

Evaluation by:

David Carroll Carolyn Miller
Jacqueline Berger, Ph.D. Colleen Driscoll

Guide Created by:

Community Action Partnership
Economic Opportunity Studies



Weatherization Leveraged Partnerships Project

ORNL Environmental Emissions Non-energy Benefits: Working Paper

Why is estimating environmental emissions' non-energy benefits important?

This analysis showed that the 2008 Weatherization Assistance Program (WAP) created significant non-energy benefits as a result of reducing residential greenhouse gas [GHG] emissions by decreasing fuel use in the homes that were served. Program leaders may wish to use the data on the social costs of specific pollutants and the benefits from WAP to target their services, especially if funding is related to emissions reduction policies.

What can you find in the report?

- All greenhouse gases avoided emissions estimates and values (pg. 5-11)
- Sulfur dioxide (SO₂) avoided emissions estimates and values (pg. 13-20)
- Nitrogen oxide (NO_x) avoided emissions estimates and values (pg. 21-28)
- Particulate matter (PM 2.5) avoided emissions estimates and values (pg. 29-36)
- Volatile organic compound (VOC) avoided emissions estimates and values (pg. 37-44)

This report is titled a 'working paper' because it was an early application of a model methodology¹ created by the National Research Council (NRC). The valuation of the 'social costs' and 'social benefits' did not rely on the projected or past market value as set in the trading markets for greenhouse gases. Instead, using the NRC methodology, the authors of this study identified negative societal impacts from pollutant emissions, especially health benefits, and assigned costs in various contexts. This report's methodology generated higher estimates of the social cost per ton of emissions compared to the trading market value approach.

This original approach is described on page 3. For a summary of the aggregate value of avoided emissions for all fuels and the value per housing unit, see Table 8.1, p. 45

Comparisons of the value of avoided emissions across air pollutants and fuel types used are available through Table 8.2, p. 46. The fuel mix of weatherized homes affected the result because each household fuel has a different mix of pollutants and each pollutant has different social costs from the others.

What are the key findings?

- National values of avoided emissions for the 2008 WAP program:
 - \$250 million over the life of the measures installed by the 2008 WAP
 - \$2932 average value per home over the same period
- There is great variation among homes as result of the different mixes of fuels they use and the climate at their location, so the average is a weak predictor of any one home's emission reduction.

¹ *Hidden Costs of Energy: The Unpriced Consequences of Energy Production and Use* (National Academy Press, 2010)

Fuel Oil and SO₂

- Fuel oil's users' emissions savings resulted in 49% of the total social value of avoided emission among all fuel types. Even though a small share of weatherized homes used fuel oil, its high SO₂ emissions have high social costs. Along with the other greenhouse gases emitted by these homes, the social cost of fuel oil heat emissions is particularly high.



Additional data:

Table 4.4 Social Cost of SO₂

Table 4.9 Quantity and Value of Avoided Emissions for SO₂ Per Housing Unit — National

Other Fuels

- Reduction in use of the other most common household energy sources, natural gas, propane and electricity generated by a mix of fuels whose costs were averaged together made up 34% of the program's benefits.



Additional data:

Table 3.4 Social Cost of CO₂

Table 3.9 Quantity and Value of Avoided Emissions for CO₂ Per Housing Unit — National

Other Air Pollutants – Beyond SO₂ and CO₂

- Reductions in three other air pollutants—NO_x, PM_{2.5}, VOCs—accounted for the remaining 10% of the total lifetime benefit of lower emissions.



Additional data:

Table 8.2 Value of Avoided Emissions by Type of Emissions and Fuel Type Aggregate Value — National

This document was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.