EXECUTIVE SUMMARY

ENERGY AND GREENHOUSE GAS SAVINGS USING RIGID FOAM SHEATHING OR SPRAY FOAM APPLIED TO EXTERIOR WALLS OF SINGLE FAMILY RESIDENTIAL HOUSING IN THE U.S. AND CANADA

INTRODUCTION

This analysis is a case study that examines energy savings and subsequent greenhouse gas emission reductions resulting from the addition of rigid plastic foam or spray foam sheathing to the exterior walls of single family housing in the United States and Canada. The widespread use of rigid plastic foam sheathing and, more recently, spray foam sheathing on exterior walls has become common in new housing construction. Energy conservation awareness was first recognized in the energy crisis of the 1970's. However, in the past 5 years, energy conservation has again become a very high priority for most North Americans.

Foam insulation possesses excellent structural and insulating characteristics and is considered to be cost effective by most homebuilders today. Its use significantly increases the insulation R-value of walls and therefore saves energy and reduces greenhouse gas (GHG) emissions.

GOAL/SCOPE

Four foam insulations were considered in this analysis – Expanded Polystyrene (EPS) boardstock foam, Polyurethane (PUR) foam sprayed in place, Extruded Polystyrene (XPS) boardstock foam and Polyisocyanurate (PIR) boardstock foam. The goal of this analysis is not to focus on each insulation type individually, but to show that the use of these foam insulations in residential housing provides an offset to the energy use and greenhouse gas emissions associated with their production.

An average size U.S. new construction house in 2006 was just under 2,500 square feet, and had 2,006 square feet of wall area. Typical building practices were wood frame construction with fiberglass batt insulation and wood siding. Energy savings were modeled between this house and one with 1 inch of foam sheathing under the wood siding. Only savings due to thermal conduction were included. Additional savings due to the air and vapor barrier qualities of the foam insulations are not calculated; therefore the final results are likely lower than actual energy savings.

RESULTS

The range of total energy requirements for producing the foam insulations for use in the U.S. are shown in the following table, along with the payback time and total energy savings over 50 years. The foams do not all have the same production energy requirements or the same payback time. Averaged across the entire country, however, every foam pays back the energy required for production in one to two years; over the assumed 50 year lifespan, more than 320 million Btu's of energy are saved in an average home.

ENERGY SAVINGS FROM USING EXTERIOR FOAM SHEATHING ON A U.S. AVERAGE 2006 NEW CONSTRUCTION HOUSE*

	Energy (Million Btu)
Energy Savings	
Annual	6.5 - 9.0
50 years	323 - 451
Foam Production Energy	7.41 - 14.0
Energy Payback (years)	1.15 - 1.79

* National average of climate zones

The two main sources of greenhouse gases are fossil fuel combustion and the release of certain blowing agents. When the global warming potential of these blowing agents was not included, the greenhouse gas savings align with the energy savings. Payback times are slightly shorter for greenhouse gases than for energy – less than 1.5 years for a U.S. average. Although they make up only a small percentage of the weight of the foam insulation, the blowing agents will be entirely released to the atmosphere over the lifetime of the foam. Today, the effect of some blowing agents increases the greenhouse gas payback time significantly. In 2010, when the use of some blowing agents with high global warming potentials (GWP) will be restricted by Title IV of the Clean Air Act and as insulation producers shift to blowing agents that have lower global warming potential (GWP) than current blowing agents, the GHG payback time will decrease correspondingly.

Although Canadian results were included in the full report, they are not included in this Executive Summary. Results for Canadian homes do not differ significantly from those in the U.S. and show an energy payback of one to two years.