

## ENERGY EFFICIENCY IS A NO-BRAINER by Willem Post, dated 3 September 2010

<http://www.coalitionforenergysolutions.org/>

### INTRODUCTION

The purpose of this study is to show that an energy efficiency measure consisting of insulating and sealing a 120-yr old house, of which Vermont has many, requires much less capital cost than using hybrid cars AND yields many times the CO2 reduction of hybrid cars.

A comparison of energy efficiency measures with short payback periods with various renewables, such as PV and thermal solar, biomass and biogas, wind, hydro, farm and landfill methane and geothermal, will produce similar results, as will be shown in future articles.

### METHOD OF ANALYSIS

Simple paybacks periods are used as a quick, first-cut to rank returns on investments for various projects. Operating and maintenance costs, financial and tax aspects, such as government incentives, the cost of capital, tax rates, etc., are ignored. More advanced analyses, such as a multiyear cashflow and internal rate of return analysis on a multi-year spreadsheet, would take them into account. Because resources are limited, private companies that require a defined minimum return on various classes of investments usually fund the highest ranked projects first to maximize income.

Simple payback period, for purposes of this analysis = Capital costs/(cost savings/yr)  
Assumed No. 2 fuel oil and gasoline cost = \$3/gal; assumed constant to simplify the analysis  
Assumed car usage = 15,000 miles/yr  
Assumed remaining useful service life of the 120-yr old house = 50 yrs  
Assumed useful service life of a hybrid car = 12.5 yrs  
The analysis of the alternatives is based on 50-years which means 4 hybrid cars are used in succession.

Combustion product = 22.4 lb CO2/gal of No. 2 fuel oil  
Combustion product = 19.6 lb CO2/gal of gasoline  
<http://www.eia.doe.gov/oiaf/1605/coefficients.html>

National CO2 intensity is used to calculate CO2 emissions; US CO2 intensity = 0.96 lb CO2/\$GDP; Japan CO2 intensity = 0.66 lb CO2/\$GDP  
[http://en.wikipedia.org/wiki/List\\_of\\_countries\\_by\\_carbon\\_dioxide\\_emissions](http://en.wikipedia.org/wiki/List_of_countries_by_carbon_dioxide_emissions)  
[http://en.wikipedia.org/wiki/List\\_of\\_countries\\_by\\_ratio\\_of\\_GDP\\_to\\_carbon\\_dioxide\\_emissions](http://en.wikipedia.org/wiki/List_of_countries_by_ratio_of_GDP_to_carbon_dioxide_emissions)

### SUMMARY

	50-yr Capital Cost; \$	50-yr Cost Saving; \$	50-yr CO2 Reduction; lb	Simple Payback Period; yrs
4 Hybrid Cars	20,000	21,150	149,397	11.8
120-yr old House	12,000	135,000	1,174,278	4.4

The energy efficiency measure yields about 6.4 times the dollar savings and about 7.9 times the CO2 reduction at about half the capital cost compared with the hybrids. Energy efficiency is a no-brainer.

It would harm the future well-being of Vermont households to provide subsidies to sway/hype them into spending their scarce resources on hybrids (and on expensive renewables) when much less costly energy efficiency measures with 1 to 5 year simple payback periods and much greater CO2 reductions are in abundance all over Vermont.

### ANALYSIS

#### HONDA CIVIC VS. HYBRID HONDA CIVIC

Cost of Honda Civic = \$20,000  
Mileage = 34 mpg  
CO2 emitted in Japan to produce a Honda Civic = \$20,000 x 0.66 CO2/\$GDP = 13,200 lb CO2  
Fuel use = 15,000 miles/yr/34 mpg = 441 gal/yr  
CO2 emitted by Honda Civic = 441 gal/yr x 19.6 lb CO2/gal x exploration, production, refining factor 1/0.85 = 10,169 CO2/yr

Cost of Hybrid Honda Civic = \$25,000  
Mileage = 50 mpg  
CO2 emitted in Japan to produce a Hybrid Honda Civic = \$25,000 x 0.66 CO2/\$GDP = 16,500 lb CO2  
Fuel use = 15,000 miles/yr/50 mpg = 300 gal/yr  
CO2 emitted by Hybrid Honda Civic = 300 gal/yr x 19.6 lb CO2/gal x 1/0.85 = 6,918 lb CO2/yr

Fuel cost saving due to hybrid use for one year = (441 - 300) gal/yr x \$3/gal = \$423/yr; \$21,150 for 50 yrs  
CO2 reduction due to hybrid use = 10,169 - 6,918 = 3,251 lb CO2/yr

CO2 emitted due to adding hybrid feature for 4 hybrids = 4 x (16,500 - 13,200) = 13,200 lb CO2  
CO2 offset period of adding hybrid feature for 4 hybrids = 13,200 lb CO2/(3,251 lb CO2/yr) = 4.06 yrs

Simple payback period of adding hybrid feature for 1 hybrid = \$5,000/(\$423/yr) = 11.8 yrs;  
Will car and batteries last that long? What is the cost of new batteries? What is the disposal cost of old batteries?  
The 50-yr net CO2 reduction = 3,252 lb CO2/yr x (12.5 x 4 yrs - 4.06 yrs) = 149,397 lb CO2.

#### ENERGY EFFICIENCY PROJECT: INSULATE AND SEAL GAYE SYMINGTON'S 120-YR OLD FARMHOUSE

Capital cost \$12,000; source Valley News  
Oil consumption: before 1,800 gal/yr, after 900 gal/yr; source Valley News

Fuel cost saving = (1,800 - 900) gal/yr x \$3/gal = \$2,700/yr; \$135,000 for 50 yrs  
CO2 reduction for one year = 900 gal/yr x 22.4 lb CO2/gal x exploration, production, refining factor 1/0.85 = 23,718 lb CO2/yr

CO2 emitted by the project = \$12,000 x 0.96 lb CO2/\$GDP = 11,520 lb CO2  
CO2 offset period of the project = 11,520 lb CO2/(23,718 lb CO2/yr) = 0.49 yrs; about 8 times shorter than the hybrid period.

Simple payback period = \$12,000/(\$2,700/yr) = 4.4 yrs; 2.7 times better than the hybrid  
The 50-yr net CO2 reduction = 23,718 lb CO2/yr x (50 yrs - 0.49 yrs) = 1,174,278 lb CO2.