International Research Journal of Applied Finance ISSN 2229 – 6891
November, 2012 Case Study Series

Energy Efficient Refrigerator – Buying Decision
An Environmental Accounting Case

Henry Schwarzbach
College of Business Administration
University of Rhode Island, USA
henryschwarzbach@gmail.com

Allan Graham
College of Business
Zayed University, UAE
allan.graham@gmail.com

Abstract

This case is designed to introduce students to the topic of environmental management accounting and provide experience in decision making with environmental costs and benefits.

I. Introduction to Environmental Management Accounting

This case is about a particular issue in "environmental management accounting." Environmental Management Accounting is practiced internationally, because environmental issues and impacts are global. A good definition of environmental management accounting can be found on the web site of Victoria, Australia's EPA (http://www.epa.vic.gov.au/bus/accounting/whatisema.asp).

"Environmental management accounting is a subset of environmental accounting. It is generally used to provide information for decision-making within an organization, although the information generated could be used for other purposes, such as for external reporting."

The view that environmental management accounting predominantly relates to providing information for internal decision-making is consistent with the definition provided by the US EPA (1995) which describes environmental management accounting as *"the process of identifying, collecting and analyzing information about environmental costs and performance to help an organization's decision-making."*

The United Nations Division for Sustainable Development (UNDSD) (2001) provides a slightly different definition of environmental management accounting**.** It emphasizes that environmental management accounting systems generate information for internal decision-making, where such information can be either physical or monetary in focus. As the UNDSD states:

"The general use of environmental management accounting information is for internal organizational calculations and decision-making. EMA (environmental management accounting) procedures for internal decision-making include both physical procedures for material and energy consumption, flows and final disposal, and monetized procedures for costs, savings and revenues related to activities with a potential environmental impact.
Environmental management accounting can therefore, depending on the system implemented, provide a broad range of information about financial and non-financial aspects of an organization's environmental performance."

"With the growing prevalence of environmental (and social) performance indicators being used as a basis for assessing an organization and its managers (for example, in management remuneration plans) there is a need to have a mix of both financial and non-financial indicators to assess an organization's environmental performance. For example, some managers might be rewarded in terms of dollar savings in waste costs (a financial measure), whereas other managers might be rewarded in terms of reduction in spillage rates (a non-financial measure)."

According to definitions, environmental management accounting systems have the dual purpose of managing and improving the financial and environmental performance of a business entity. It should be appreciated that environmental management accounting can generate information

Henry Schwarzbach, University of Rhode Island, henryschwarzbach@gmail.com
Allan Graham, Zayed University, allan.graham@gmail.com

about how the use of resources with environmentally-related impacts affects the financial position and performance of organizations. Environmental management accounting can also consider how organizational operations impact environmental systems.

This is in contrast to conventional management accounting systems typically in use within organizations. Such systems do not give separate recognition to environment-related costs or impacts, instead focus on particular issues on the basis of their economic or financial decision-making relevance.

II. The Problem

The U.S. EPA has a program called "Energy Star" which is designed to induce consumers and businesses to buy energy efficient products. A full description of the program can be found on the EPA website http://www.energystar.gov/index.cfm?c=about.ab_index. We provide a condensed description.

Energy Star is a joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy. It was started in 1992 as a voluntary program that labeled products with the amount of energy they use. The more efficient models receive a higher rating. The first products to receive the Energy Star label were computers and monitors and a few years later it was expanded to include additional office equipment as well as residential heating and cooling products. It has now expanded to most major appliances as well as lighting, home electronics, and even new residential and commercial buildings. The EPA web site (as of February 2010) claimed that

Modern Energy Star efficient refrigerators are much less energy intensive than those of older vintages. This technological advancement in energy efficiency can significantly reduce energy usage and greenhouse gas (GHG) emissions as households and businesses replace the old refrigerator with a new energy efficient model.

But is this reason enough to buy an Energy Star refrigerator? According to the EPA, Energy Star qualified refrigerators are required by the U.S. Department of Energy to use 20% less energy than non-ENERGY STAR brands. The U.S. EPA web page (http://www.energystar.gov/index.cfm?fuseaction=refrig.calculator) with an energy cost saver calculator where one can determine approximate annual cost savings of using an energy saving refrigerator over the cost of a conventional refrigerator.

The EPA estimates that replacing an old refrigerator with a new Energy Star model saves on average $165 per year. The EPA calculator provides more detail in that; it compares different types of refrigerators for different years as well as the differences between specific models. The question you must answer for this case is whether the savings are enough to justify replacing the old refrigerator with an Energy Star appliance.

III. Required

1. Assume that you have a 1998, 21 cubic feet, side by side refrigerator that you want to replace with a new similar Energy Star refrigerator, which can be purchased for $1050. Assume a 12

Henry Schwarzbach, University of Rhode Island, henryschwarzbach@gmail.com
Allan Graham, Zayed University, allan.graham@gmail.com

year life for the new refrigerator and the old one will be taken by your utility and you receive $50. Thus the net price of the refrigerator is $1,000 paid at the beginning of year 1, also called year 0. Assume that the new refrigerator will have no salvage value. Also assume that the old refrigerator would last 12 more years if you were to keep it.

a. Use the EPA calculator to calculate the annual cost savings for the situation described above, under each of the following assumptions.

1.1 You live in Hawaii, where energy rates are the highest in the country. (Use the energy cost data provided by the EPA calculator web site).

1.2 You live in Hawaii but use the most recent monthly data on electricity prices from the Department of Energy. Enter the most recent Hawaiian residential rates from this schedule and compute the savings and discuss the differences.

http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_5_06_a

b. Open an Excel worksheet and use the PV function with the annual savings calculated in part 1.1, above, to determine the present value of the future cash savings discounted at 4%.

c. Use Excel again to calculate the Net Present Value (NPV) of the investment in the new refrigerator at discount rate of 4% and also the Internal Rate of Return. Explain whether or not, based on this financial return, one should buy the new refrigerator.

2. Several States have low energy costs around $.08 per kilowatt hour. These tend to be in the Northwest. According to the chart with the EPA calculator, at the time of this writing, Washington, Idaho and North Dakota had rates less than $.082 per kilowatt hour with Washington being the lowest. Let's assume you are a resident of Washington and your rate is $.08 per kilowatt hour. Calculate your cost savings under the same assumptions as in question 1.1 above. Then determine the NPV of purchasing a new refrigerator under the same conditions in question 1.2 above. Report your findings.

   Assume that in order to encourage energy conservation the federal government is going to offer a tax credit for the purchase of Energy Star products, how much would the credit need to motivate a citizen, under the conditions specified, assuming a 4% opportunity cost of capital, to buy the Energy Star refrigerator? If the government does not offer an incentive, what non monetary reasons might make one to buy the Energy Star product? How would the non monetary reasons for buying the refrigerator change if this was a corporation buying it for business use?

3. Refrigerators normally run on electricity. The amount of greenhouse gas caused by the fridge depends on what method is used to generate the electricity (coal, oil, gas, nuclear, etc.). For example in Rhode Island our electricity comes from a mix of all the above with no one being more than 40% of the total. Natural gas is the largest source, but Nuclear and oil are also significant.

   a. Look at the following web site http://www.eia.doe.gov/cneaf/electricity/epm/table5_6_a.html and go to table 1.2 to learn where the US derives its energy. Looking over the last several years what

Henry Schwarzbach, University of Rhode Island, henryschwarzbach@gmail.com
Allan Graham, Zayed University, allan.graham@gmail.com

energy sources it most important, what sources appear to be growing and shrinking in their importance?

b. Assume that a state currently obtains 5% of its electricity from wind at a cost of $.22 per kWh yet its overall average cost is $.10 per kilowatt hour. Suppose the governor has proposed a green initiative where the percentage of electricity from coal would decrease and be replaced with wind. Assume coal generated electricity cost $.08 and wind $.22 per kilowatt and that the reduction of coal is equal to 10% of the total. That is wind will increase by 10% of the total electricity generated and coal will decrease by the same amount. What will that average cost per kilowatt hour be if all costs remain the same and the governor's plan is enacted? What are the positive and negative implications of this change? Would you support the governor, why or why not?

c. Go to the web site http://www.eia.doe.gov/cneaf/electricity/epm/table5_6_a.html again. At the very bottom after Appendix C, you find "Electric Power Date by Month and State, 2001 to Present." The first Excel Workbook lists "Net Generation by State by Type of Producer by Energy Source." Individual US states produce some electricity in the state and can import electricity produced elsewhere. Many states also export electricity. For the most recent year (years are in tabs at the bottom of the workbook) and most recent month copy the section "Total Electric Power Industry." Paste it in a new worksheet. Then delete any rows with zero's or any subtotals. For most states there are several lines for each type of electricity generation. For example Illinois has the following:

2012	**7**	**IL**	Total Electric Power Industry	Petroleum	5,942
2012	**7**	**IL**	Total Electric Power Industry	Coal	8,103,715
2012	**7**	**IL**	Total Electric Power Industry	Natural Gas	2,407,647
2012	**7**	**IL**	Total Electric Power Industry	Solar Thermal and Photovoltaic	5,885
2012	**7**	**IL**	Total Electric Power Industry	Other Biomass	56,802
2012	**7**	**IL**	Total Electric Power Industry	Hydroelectric Conventional	6,384
2012	**7**	**IL**	Total Electric Power Industry	Nuclear	8,174,880
2012	**7**	**IL**	Total Electric Power Industry	Other Gases	10,708
2012	**7**	**IL**	Total Electric Power Industry	Wind	303,499

We chose Illinois because they produce power from a wide variety of sources. Many states do not have nearly as many types of electricity generation types. Prepare a report and discuss the significance.

4. Many utilities like the one in this example offer a rebate if you turn in your old refrigerator. Why would they do that? You can try to brainstorm reasons and write up your findings.

Henry Schwarzbach, University of Rhode Island, henryschwarzbach@gmail.com
Allan Graham, Zayed University, allan.graham@gmail.com