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Energuide: Evaluation of
Cost-Benefit Analysis and
Future Directions



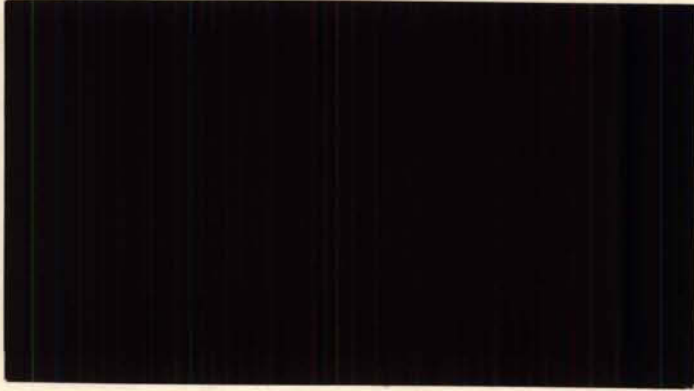
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Energuide: Evaluation of
Cost-Benefit Analysis and
Future Directions

Prepared by
Canadian Energy Research Institute

This report is one of several prepared by independent consultants as input for the evaluation of the Energuide Program, an element of the Traded Goods program component. All evidence, advice and recommendations represent the independent views of the consultant rather than the views of the Government of Canada or any of its departments or agencies.



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EXECUTIVE SUMMARY

- The goal of the Energuide program is to reduce energy consumption by providing information to consumers on the energy efficiency of appliances for use in comparison shopping.
- The data used in the cost-benefit analysis of the Energuide Program are very crude, and in some cases ranges have been estimated based on informed judgement. Consequently, the conclusions are very tentative.
- The social benefits of the existing Energuide program probably exceed the costs resulting in a net benefit.
- The existing Energuide program has likely generated net benefits for only two appliances: dishwashers and clothes washers.
- Continuing the Energuide program in its current form is not likely to generate substantial net benefits in the future, with dishwashers being the only appliance generating significant net benefits.
- Labelling appliances which use substantial quantities of energy (e.g., hot water heaters and furnaces) is more likely to generate net benefits than extending Energuide to appliances with low energy requirements.
- Alternatives to Energuide labelling include standards on energy efficiency, taxes on energy inefficient appliances, and subsidies to improve the energy efficiency of appliances.
- Consumers are encouraged to purchase energy inefficient appliances because residential energy prices are below the social cost of energy. Allowing oil and gas prices to be determined by markets and removing the implicit subsidies on electricity would remove these subsidies.
- Extending Energuide to manufacturing equipment is of questionable merit.

CHAPTER 1

INTRODUCTION

1.1 Background

In December of 1975, the Government of Canada directed the Department of Consumer and Corporate Affairs to develop an energy consumption labelling program for major household appliances. This directive resulted in the present Energuide program which covers six major household appliances (refrigerators, freezers, ranges, dishwashers, clothes washers and dryers). Energuide is an informational program designed to improve the effectiveness of consumers in the marketplace and thereby improve the market's efficiency and responsiveness to consumer demands. A second objective was to encourage manufacturers of major household appliances to produce energy efficient appliances.

The program was formally introduced in 1977 with the requirement that all major household appliances bear an Energuide label showing the monthly consumption of electricity, as tested by the Canadian Standards Association (CSA). The first Energuide labels were affixed to refrigerators manufactured after September 30, 1978. The CCAC action plan also suggested that consideration should be given to the inclusion of other products in the program.

The Strategic Policy Research Branch of Consumer and Corporate Affairs Canada has commissioned Peat Marwick to conduct a cost-benefit analysis of the Energuide program in its current form. The Program Evaluation Division of the Department has commissioned the Canadian Energy Research Institute (CERI) to review and assess the cost-benefit analysis. In addition, CERI has been asked to develop a plan of action for determining the future of Energuide. The study reports the results of our research.

1.2 Objectives

The purpose of this report is to review the status of Energuide and to propose a plan for determining the program's future direction. Specifically the objectives are to:

- °critically examine Peat Marwick's Cost Benefit analysis of the Energuide program, and assess which aspects of the analysis should be subjected to further detailed examination;
- °assess the implications for continuing the current Energuide Program;
- °present a plan of action for extending the Cost-Benefit analysis to cover the expected costs and benefits of expanding the Energuide program to cover a broader range of appliances and new fuels;
- °suggest alternatives to Energuide to achieve energy savings;
- °to provide advice and assistance to the Program Evaluation Division as the various stages of the Cost-Benefit analysis are completed.

The terms of reference for this report are reproduced in Appendix A.

1.3 Study Organization

Chapter 2 of this report provides an in-depth review of the Cost-Benefit Study conducted by Peat Marwick for Consumer and Corporate Affairs Canada, Strategic Policy Research Branch. Chapter 3 addresses the implications of continuing the Energuide program. An action plan for evaluating the extension of the Energuide program to new products or sectors is proposed in Chapter 4. Chapter 5 examines alternatives to Energuide to achieve energy savings. Appendices B, C, D and E document the advice on the cost benefit analysis provided to the Program Evaluation Division at the various stages of this project.

Peat, Marwick and Partners, A Cost-Benefit Study of the Energuide Program, May 1984.

Chapter 2

REVIEW OF COST-BENEFIT ANALYSIS

2.1 Introduction

Cost-Benefit analysis is a technique for comparing the merits of alternative projects or programs. It provides a logically consistent organization of information in order to facilitate decision making. The objective is to estimate private and social benefits and costs attributable to a project or program by comparison to a scenario without the project. If all government programs are evaluated on the same basis using a consistent set of assumptions, then cost-benefit analysis allows a comparison and hence a ranking of the various programs.

The results of cost-benefit analyses provide only one input to the decision making process; that is, they assess a program's economic consequences. Program evaluation will also often require an evaluation of social, political and distributional issues.

The Peat Marwick Cost-Benefit study had two major objectives:

- measure the energy saving attributable to Energuide;
- estimate costs and benefits incurred as a result of the Energuide program.

Costs and benefits were evaluated according to two time frames:

- the "past," which incorporates program activities from their commencement to 1985/86, and their past and future impacts;
- the "future," which incorporates additional impacts flowing from a program extension from 1985/86 to 1989/90.

The Peat Marwick study pursued several lines of inquiry in order to assess benefits and costs:

- a review of existing literature on actual and hypothetical energy consumption trends of household appliances;

- a review of the Canadian Appliance Manufacturers Association data;
- a comparison of U.S. and Canadian energy consumption trends of household appliances;
- an analysis of Consumer and Corporate Affairs Canada Energuide directories;
- interviews of manufacturers and experts to determine the impact of new and existing technologies on energy efficiencies of household appliances;
- case studies of all six appliances listed in Energuide to obtain information on hypothetical energy use, appliance sales and manufacturing costs conducted by interviewing industry experts; and
- interviews of appliance retailers.

Peat Marwick's conclusions are summarized as follows:

- The Energuide Program appears to have had a significant impact on gross energy savings in the past, and could be expected to have a significant impact in the future.
- The quantitative estimates of benefits and costs are very sensitive to assumptions on energy utilization and energy valuation.
- Base case estimates of net benefits attributable to Energuide are between minus \$33 million and plus \$669 million for the past program; and between minus \$20 million and plus \$101 million for the future program.

2.2 Issues Relating to Data

Data sources for the Peat Marwick study are wide ranging and have varying degrees of reliability. It is unfortunate that sources for data and many of the calculations have not been adequately documented by PM. As a result, we can only guess at what PM have done or supply our own best estimates. In this section we provide comments on PM's data in three main areas--benefits, costs and valuation of energy savings.

2.2.1 Benefits

The range of expert opinion documented by PM as the source for many of their assumptions regarding scenarios with and without Energuide is vast. Consequently, almost any result can be substantiated by their evidence.

PM do not indicate how they estimated average ratings from the Energuide directories, although they were able to disaggregate some products into market subsectors (p. E-1). PM do indicate that detailed sales data for each model are required. We assume that PM took a simple average of all appliances for each market subsector to estimate average product ratings in each year. If they did so, then any switching by consumers to more energy efficient appliances within subsectors will not be captured. The Energuide products were designed to encourage precisely this behaviour.

2.2.2 Costs

PM attribute the increase in retail price attributable to Energuide as a resource cost. This includes the cost to manufacturers and a retail mark-up (p. VIII-9). If retailers incurred additional costs marketing appliances this would be legitimate. However PM states that most retailers "...incurred no additional costs as a result of the program" (p. H-2). Therefore the retail mark-up represents an income transfer from consumers to retailers. It is a real cost to consumers but not a cost to society.

There is a problem in the calculation of the impact on manufacturers' costs. The retail price increases, attributable to Energuide (p. VIII-a), have been applied to total domestic sales of appliances (exhibits 2, 5, 8 and 10) to yield total dollar impacts on manufacturers (exhibit 19). Imports represent up to 25 percent of sales of these products and costs to U.S. manufacturers of meeting Energuide requirements should not be included in a Canadian social costs-benefit analysis, hence the resource costs of Energuide are overstated. However, if U.S. manufacturers' costs are passed on to Canadian consumers, then they should be included as a foreign exchange impact.

PM indicate that for four appliances--clothes washers, dishwashers, ranges and dryers--the lower bound impact of Energuide on retail prices is zero (p. VIII-9). This situation is inconsistent with

evidence presented by PM (p. VIII-9). Moreover, if this is true, then benefits should be zero as well.

As PM point out, it is important to relate benefits to costs--the greater the efficiency improvement, the higher the resource cost. It would therefore have been useful to relate unit incremental costs of appliances to changes in efficiencies. This could have allowed for year-specific estimates of costs and cost-responsive sensitivity analysis.

2.2.3 Valuation of Energy Savings

We have compared PM's 1983 residential consumer prices for electricity, natural gas and heating oil to prices shown in the Energy Statistics Handbook published by Energy, Mines and Resources Canada. The comparison indicates substantial differences.

PM estimates of 1983 consumer rates for electricity prices appear low (exhibit 12). The source they cite has not yet been published for 1983. The most current source of these data is the EMR Handbook. The concepts are slightly different, however.

TABLE 2.1
RESIDENTIAL ELECTRICITY RATES - 1983
(¢/kW.h)

	PM ^a	EMR ^b
Canada Average	--	4.42
Atlantic Canada	4.5	5.78
Quebec	3.2	4.04
Ontario	3.7	4.27
Manitoba	2.5	3.51
Saskatchewan	3.4	4.46
Alberta	3.85	4.55
B.C.	3.75	4.76

SOURCE: Energy, Mines and Resources Canada, Energy Statistics Handbook, p. 7.23

^aLoads greater than 500 kW.h per month.

^bLoads of 1000 kW.h per month including taxes.

PM provides no source for their natural gas prices (exhibit 13). They compare to the EMR Handbook as follows:

TABLE 2.2
RESIDENTIAL NATURAL GAS PRICES - 1983
(¢/m³)

	PM	EMR
Canada Average	--	18.9
Quebec	21.6	24.4
Ontario	18.6	22.9
Manitoba	16.5	18.6
Saskatchewan	11.3	14.5
Alberta	10.5	13.6
B.C.	13.8	17.4

SOURCE: Energy, Mines and Resources Canada, Energy Statistics Handbook, p. 7.19.

PM assumes a 32¢/litre price of heating oil (p. VI-11), whereas the EMR Handbook (p. 7.9) lists the retail price of domestic heating oil as 30.4¢/litre in 1983.

PM states "...the cost of all forms of energy were assumed to be equal to the rates paid by the consumers in 1983." If prices used for the 1978-1982 period are the same as the 1983 prices, all prices used--electricity, natural gas, and heating oil--will exceed actual prices. This would likely result in a overestimation of benefits for the past program. Historical prices for these fuels from the EMR Handbook are shown in Table 2.3. The data are national averages and give an indication of real price changes since 1978.

TABLE 2.3
HISTORICAL RESIDENTIAL ENERGY PRICES - CANADA
(1983 dollars)

Year	Electricity (¢/kW.h)	Natural Gas (¢/m ³)	Heating Oil (¢/litre)
1978	4.36	13.5	19.8
1979	4.41	13.4	20.5
1980	4.38	14.6	22.3
1981	4.28	16.3	28.6
1982	4.34	17.3	31.8
1983	4.42	18.9	30.4

SOURCE: Energy, Mines and Resources Canada, Energy Statistics Handbook, pp. 7.9, 7.19, and 7.23.

PM states, "Electricity rates are certainly not expected to rise at a lower rate than general inflation (p. VI-12)." CERI analysis of electricity rates conducted over the past year indicates that it is possible that electricity prices may decline in real terms in several regions including Ontario and Quebec in the late 1980s. Real price decreases in hydro and nuclear based regions may occur in the 1990s. As a result, PM may be overstating the lower bound of estimated gross energy savings.

PM assumes that natural gas and fuel oil prices will increase at the rate of inflation. Analysis by CERI indicates that in the 1980s real fuel oil prices may rise due to refinery rationalization in central and eastern markets. Natural gas prices may also rise due to increasing distribution margins. The 1990s could see a return to steadily rising oil and gas prices. If fossil fuel prices do increase faster than inflation, the value of energy offsets will be higher. This could result in an overestimation of net energy savings.

2.2.4 Impact on Reliability of Cost-Benefit Results

All of the factors cited above impact on the reliability of the cost-benefit results. However, PM are very much aware of the softness of much of their data (p. 2, p. 4) and advise caution in the interpretation of results. Our analysis reinforces this warning. Future energy prices are inherently difficult to predict, and the CERI

view may or may not be superior. Our different view of the future would, however, result in lower estimates of energy savings due to Energuide.

2.3 Issues Relating to Methodology

All important costs and benefits have been identified and estimated in the PM cost-benefit study. Moreover, the scenarios examined therein have been properly defined. These are the two most important methodological issues arising in any cost-benefit study. However, there are some aspects of the PM approach to estimating benefits which we feel are too simplistic.

2.3.1 Opportunity Cost of Electricity

Electricity prices, estimated as the long-run incremental cost of electricity, are an appropriate measure for the upper bound scenario. However, this is difficult to estimate. The PM approach, as described below, is only a crude approximation and is poorly documented. A more legitimate approach is to examine utility expansion plans to determine the next units to be built and to use utility estimates of capital and operating costs for these units.

PM estimated the incremental cost of new generation based on additions to assets in 1979, 1980 and 1981. However, the additions to assets in 1979, for example, are equal to the as-spent dollars from the previous six or more years (depending on the construction profile of the plant). Thus, 1973, 1974...1979, dollars are aggregated without adjustment for inflation to equal the addition to assets in 1979. This was a period of extremely rapid price increases for utilities--10.6 percent p.a. for hydro generation and 11.8 percent p.a. for thermal generation. The PM approach is not accurate.

Moreover, the costs in 1979-1981 of new generation may not be good estimates of future costs. For example, in New Brunswick, during 1979-1981, the Pt. Lepreau I Nuclear plant was constructed, suffering massive cost overruns. The cost of Pt. Lepreau II is projected to be substantially less. In B.C., the Revelstoke Hydro Project was being built in 1979-1981. B.C.'s next facilities will be developed on rivers in the northern extremities of the province, and will be substantially more expensive.

As a result, PM's estimates (exhibit 12) are poor. Based on utility data, for example, incremental capital costs in Alberta for a coal plant are \$0.70-0.80/W, compared to PM's \$1.40/W. In Ontario, nuclear operating costs are less than 1¢/kW.h, compared to PM's 1.6¢/kW.h. In Quebec, hydro operating costs are only 0.1-0.2¢/kW.h, compared to PM's 1.2¢/kW.h.

PM use a factor of 1.25 to escalate 1980 and 1981 capital costs of capacity to 1983 dollars (p. VI-4). Statistics Canada reports that the cost of hydro and thermal generation escalated by 12.7 percent and 11.2 percent between 1981 and 1983, and by 27.8 percent and 24.4 percent between 1980 and 1983, respectively.

PM escalate operating costs from 1981 to 1983 dollars with a factor of 25 percent (p. VI-6). Average electricity prices increased in this period by 22 percent.

On p. VI-3 PM state, "...The price at which electricity is being sold to the lowest-rate customer can be regarded as the short-term marginal cost." Consumer rates are an average cost, not a marginal cost concept. In fact, the short-term marginal cost is the incremental cost (fuel plus operation and maintenance) from the typical unit which would be loaded to follow incremental electricity demand. This is especially true if a substantial surplus exists. There has been a substantial surplus in the three largest electricity consuming regions of the country--B.C., Ontario and Quebec--since 1980, and this surplus will persist for the rest of the decade and into the 1990s. We do not feel that the use of consumer rates represents a realistic lower bound, as PM states (p. VI-3).

2.3.2 Product Sales

PM indicate that manufacturing costs attributable to Energuide (p. VIII-9) add to the retail selling price of appliances, yet the sales forecast of appliances is the same for all scenarios. This implicitly assumes that the own price elasticity of demand for these products is zero. The price elasticity of household appliances as estimated by the Economic Council of Canada is -1.0. Omitting adjustments for this factor leads to an underestimation of sales for scenarios II and III (assuming scenario I sales were based on the Energuide program continuing). Hence, energy savings are underestimated although consumer welfare may actually be lower.

PM states "no adjustment for population shifts has been made" (p. C-1). CERI's latest forecast indicates that the provinces of B.C., Alberta, Ontario and Quebec will be the fastest growing provinces in the period to 2000. Ontario and Quebec have electricity prices lower than the national average. Thus, the shifting regional population structure will tend to lower the benefits PM attribute to Energuide.

2.3.3. Appliance Utilization

Increasing the energy efficiency of household appliances lowers the cost of running these appliances. If increased appliance utilization results, as suggested by Khazzoom (The Energy Journal, Vol. I, No. 4, pp. 21-40), then energy savings will be less than indicated. Khazzoom also indicates that increased utilization may actually result in increased energy consumption. In such a case, energy savings is not the appropriate valuation criterion. Clearly, the consumer is made better off even though the amount of energy consumed remains unchanged.

2.3.4 Discounting

PM values gross energy savings for the lower bound by using 10 percent real discount rates, "...which are considerably higher than the rates which are likely to be applied by individual consumers" (p. IX-2). This is contrary to all evidence on consumer discount rates for major appliance purchases--see, for example, Hausman's estimates of discount rates as high as 89 percent (Bell Journal of Economics, Vol. 10, No. 1, p.53) or Chernoff (Bell Journal of Economics, Vol. 4, No. 4, p. 82). Use of higher discount rates would greatly reduce the present value of consumer benefits.

The PM report provided sufficient data to check the present value calculations of manufacturing costs (Exhibit 19). Our calculations of net present value differ from those reported by PM. The results are shown in Table 2.4, with differences ranging from 2 to 31 percent.¹

¹When PM was informed of the discrepancy, they acknowledged that CERI's calculations were correct.

TABLE 2.4

PRESENT VALUES OF ENERGUIDE'S IMPACT ON
MANUFACTURING COSTS
(millions of 1983 dollars)

	Minimum			Maximum		
	PM	CERI	Percent Differ- ence	PM	CERI	Percent Differ- ence
<u>CASE A^a</u>						
5% discount rate	127.5	103.8	23	522.6	418.5	25
10% discount rate	101.1	81.1	25	412.1	323.5	27
15% discount rate	83.0	65.4	27	337.1	257.7	31
<u>CASE B^b</u>						
5% discount rate	45.7	37.5	22	139.7	116.2	20
10% discount rate	35.0	32.8	7	106.6	101.5	5
15% discount rate	28.3	28.9	-2	85.8	89.5	-4

SOURCE: Peat Marwick, Exhibit 19, CERI calculations.

^aEnerguid in place to 1984, then discontinued.

^bEnerguid continued.

2.3.5 Social Cost of Natural Gas

PM assume 5¢/m³ as the social cost premium for natural gas based on the difference in prices between export and domestic markets (p. VI-7). They appear to apply this premium for all years of the study. While this value may be appropriate for 1979, the resistance of U.S. buyers paying the Canadian export price since then indicates that this premium is perhaps too high. CERI analysis of the U.S. market suggests that Canada will face strong competitive pressure in U.S. markets until about 1987. Since the volume related incentive price is the marginal export price and is close to the Toronto city gate price of natural gas, a social cost premium of 1¢/m³ is more in order for 1980, but could trend up to the 5¢ premium by 1987.

2.3.6 Definition of Upper and Lower Bounds

In exhibit 5-3, upper and lower bounds for energy savings are documented. It seems perverse that the lower bound is higher than the upper bound for refrigerators and freezers in all cases.

2.4 Distribution of Benefits and Costs

Five groups within society are significantly affected by the Energuide program. However, there is insufficient information presented in the study to assess the magnitude of benefits and costs to each group.

Consumers receive the benefit of reduced energy consumption from more efficient appliances, and incur the cost of more expensive appliances. The selection of an appropriate consumer discount rate is required to ascertain whether this group is made better or worse off.

Appliance manufacturers incur costs of improving the efficiency of their appliances. If they are able to pass on higher costs to consumers, they do not lose. However, profits may be reduced if there is a decline in gross revenue due to lower product prices.

Retailers do not appear to have incurred any costs as a result of Energuide. If they apply a constant percentage mark-up to appliance cost, their profit per unit may increase.

The federal government incurs the program costs of Energuide. On the revenue side the impact is ambiguous. Revenues may be higher as a result of import duties, the manufacturers' sales tax, and the provincial government sales taxes. The impact on oil and gas production is unclear--less demand for hot water heating and increased demand in space heating. This will affect resource taxes and royalties for government, as well as the subsidy on imported oil.

Electric utilities forego the revenue resulting from lower electricity demand. In this time of excess capacity, the foregone revenue is greater than the operating costs which utilities would have incurred. In the long run, lower levels of electricity demand will allow utilities to delay construction of expensive new generating facilities.

2.5 Issues Which Need Further Examination

Because imports represent a significant portion of domestic sales (except freezers), the "free ride" from the U.S. Energyguide Program is an important factor. PM do not document assumed import shares of sales, nor expected trends in U.S. appliance efficiency. The latter data should be obtainable from U.S. regulations. It is difficult, therefore, to assess what PM is stating about the change in energy efficiencies of Canadian-made appliances.

A discussion of one appliance--dishwashers--is fruitful. PM states that imports take a significant share of the market (pp. E-4 and G-9), and that there is a high degree of U.S. ownership of Canadian firms (p. E-4). Maytag is a market leader in terms of energy efficiency and quality of product in the dishwasher field (see Consumer Reports, various issues). Their top-of-the-line model (size and options) had a rating of 87 kW.h/month for 1981 through 1983. It has achieved this rating by reducing heat cycles and increasing the efficiency of the hot water flow. In some sense the Maytag rating represents an achievable industry standard.

PM predicts average ratings (which include smaller machines than the Maytag) in excess of 100 kW.h/month for every year (exhibit 5). They also indicate there is industry dissatisfaction with dishwasher performance (pp. G-7 and G-8). This is inconsistent with the Maytag standard.

PM states "without an Energuide Program in place, the manufacturers will have little incentive to do more research and development to improve energy performance..." This is also inconsistent with the fact that Maytag is a leader in minimizing energy and water consumption while maintaining a first-class product.

Maytag literature on its products indicates that the company competes on the basis of the quality of its product--reliability and cleaning performance--and energy efficiency. We feel that the strength of market forces to increase the efficiency of other company's products both with and without Energuide is understated in the case of dishwashers.

Since the Maytag costs several hundred dollars more than the less efficient appliances it competes with, the cost to the manufacturer of achieving energy efficiency may be understated in the

case of dishwashers if Maytag's premium price indicates, in part, their extra costs in achieving their level of efficiency.

One factor not addressed in the PM study relates to the existence of two classes of consumers--individual households and building contractors--and the treatment of differences in behaviour. While consumers may respond to energy consumption labels by purchasing more efficient appliances, it is not at all clear that building contractors who market homes with appliances already installed have an incentive to purchase energy-efficient products.

2.6 Evaluation

The success or failure of Energuide can be measured in two dimensions. The first relates to the generation of net benefits by the total program. However, even if the total program generates net benefits, complete success requires each product listed in the Energuide directory generate net benefits. The second relates to program design and whether or not Energuide results in consumers making more effective decisions. The PM cost-benefit study only addresses the issue of net benefits to the total program.

The results of the cost-benefit study may be summarized as follows:

- all important costs and benefits have been identified and estimated;
- the scenarios examined have been properly defined;
- the existing Energuide program has probably generated some net benefit;
- the existing Energuide program has likely generated net benefits for only two appliances: dishwashers and clothes washers;
- continuing the Energuide program is not likely to generate substantial net benefits;
- significant future net benefits are likely only from dishwashers;
- estimated benefits and costs have been based on limited and often conflicting information;

- the information base is very soft with the result that analysts with different prior biases would likely produce substantially different results; and
- there appear to be data problems in the valuation of benefits and costs.

PM did not attempt to summarize costs and benefits for each appliance. It is instructive to do so even though all components of costs cannot be attributed uniquely to individual appliances. Tables 2.5A and 2.5B shows the range of net benefits for each appliance using only manufacturers' costs on the cost side.

TABLE 2.5A
BENEFITS AND COSTS BY APPLIANCE
PAST PROGRAM^a

	Benefits	Costs	Net Benefit (Costs)	Benefit-Cost Ratio
Refrigerators	102.5-111.6	51.2-170.7	(68.2)- 60.4	0.60-2.18
Freezers	65.6- 68.2	30.0-100.1	(34.5)- 65.2	0.66-22.7
Dishwashers	52.8-175.2	0.0- 13.0	39.8 -175.2	4.06- ∞
Clothes washers	153.8-404.4	0.0- 23.1	130.7 -404.4	6.70- ∞
Ranges	6.4- 26.9	0.0- 9.8	(3.4)- 26.9	0.65- ∞
Dryers	4.3- 13.7	0.0- 6.9	(2.6)- 13.7	0.62- ∞

^aAssumptions follow Table 2.5B.

TABLE 2.5B
BENEFITS AND COSTS BY APPLIANCE
FUTURE PROGRAM^a

	Benefits	Costs	Net Benefit (Costs)	Benefit-Cost Ratio
Refrigerators	46.8-50.9	21.3-53.1	(6.3)-29.6	0.88-2.39
Freezers	16.6-17.2	11.6-17.3	(0.7)- 5.6	0.96-1.48
Dishwashers	17.1-56.7	0.0- 5.8	11.3 -56.7	2.95- ∞
Clothes washers	7.5-19.4	0.0- 9.7	(2.2)-19.4	0.77- ∞
Ranges	0.0- 0.0	0.0- 8.5	(8.5)- 0.0	0.00-0.00
Dryers	1.2- 3.7	0.0- 7.1	(6.9)- 3.7	0.17- ∞

SOURCE: Exhibit 5-3 and exhibit 19, CERI calculations.

^aAssumptions are as follows:
10% discount rate.
NPV in 1978.
NPV in 1984.

Note that the existence of net benefits for most products is not apparent. Only dishwashers and clothes washers have a benefit-cost ratio for the past program which always exceeds unity. For the future program the ratio for ranges is zero since no benefits have been identified and some costs have been incurred (e.g., labelling). The future program range of benefits relative to the range of costs for dryers and freezers are not very favourable and suggest that these products should be removed from the program.

The range of possible net benefits is large in most cases. This, of course, is the result of the poor information base on which the estimates stand. Our assessment of the PM report suggests that both the upper and lower bound estimates of net benefits may be high. This is particularly true of the lower bound estimate. In any event, the range of possible net benefits is already large and for most appliances covers a range of both positive and negative net benefits. The bottom line is that it is difficult to say anything definite about the success or failure of Energuide in generating net benefits to society.

Chapter 3

IMPLICATIONS FOR CONTINUING CURRENT ENERGUIDE PROGRAM

3.1 Cost-Benefit Analysis

Two main conclusions about the effectiveness of Energuide in the past can be drawn from Peat Marwick's cost-benefit study:

- the existing Energuide program has probably generated substantial net benefit; and
- the existing Energuide program has likely generated substantial net benefits for only two appliances--dishwashers and clothes washers.

Similarly, two major conclusions can be drawn from the analysis of continuing Energuide:

- continuing the Energuide program is not likely to generate substantial net benefits; and
- significant future net benefits are likely from only one appliance--dishwashers.

It is difficult to make definitive statements about Energuide's success or failure due to the quality of the information made available in the PM cost-benefit study. Estimated benefits and costs have been based on limited and often conflicting information.

The information base is very soft with the result that analysts with different prior biases would likely produce substantially different results. Estimating the opportunity cost of energy in order to reduce energy savings is difficult and requires a more sophisticated approach than that used by PM.

Social cost-benefit analysis is necessary to assess the economic dimension in program evaluation. It may also provide information on distributional issues, but is not useful for evaluating the social or political consequences of a program. While cost-benefit analysis is capable of assessing the most economic method of achieving

Energuide's goal (reduced energy consumption), the PM study did not address alternative delivery mechanisms. (See discussion in Chapter 5 concerning alternatives to Energuide.)

3.2 Alternative Approaches

There are alternative means available to evaluate Energuide, other than the "bottom line" approach of the cost-benefit analysis. Because the program was designed as an information program to facilitate informed consumer choice, a consumer survey can provide information on how the Energuide products--labels and directories--are used by consumers. Such an analysis can suggest means of improving program design in order to maximize benefits.

A survey of manufacturers to determine how Energuide affects them would also provide information to assess the program. A complete assessment of Energuide requires these survey results in addition to the cost-benefit analysis.

3.3 Recommendations About the Future of Energuide

There is not sufficient evidence to state definitively whether Energuide has been a success. However, it is possible to state that Energuide has not generated positive net benefits for all appliances. Based on evidence submitted in the cost-benefit study, products can be grouped into three categories:

- dishwashers have and will likely continue to generate significant net social benefits;
- ranges and dryers likely will not generate significant net social benefits; and
- refrigerators, freezers, and clothes washers may or may not generate some net social benefits in the future.

It must be noted that the costs and benefits estimated in the PM study were based on a very soft information base which results in a very wide range of net social benefits estimates. Nor is it clear that additional research would allow firmer estimates to be made.

It is also highly questionable whether Energuide is working as originally planned. Consumers do not make extensive use of the

Energide information when purchasing appliances. The increase in energy efficiency appears to have occurred without consumer pressure on manufacturers to produce energy efficient appliances.

For these reasons, we recommend that Energide not be continued in its present form.

Chapter 4

ACTION PLAN FOR EVALUATION OF EXPANDING ENERGUIDE PROGRAM

4.1 Introduction

In order to consider expanding the Energuide program, it is important to first ascertain that the need for the program still exists and whether the program fulfills the role for which it was created. Thus, if one is considering extending Energuide to new household appliances, one must first learn if consumers are purchasing appliance models which are not sufficiently energy efficient. Second, it must be determined if a labelling program will help consumers buy more energy efficient appliances. Third, costs and benefits must be evaluated.

If expanding Energuide to other sectors, e.g., manufacturing equipment, is to be considered, the question of inadequate information provided by the market is paramount. It is difficult to believe that corporations do not make efficient decisions. If they do, they will find it difficult to market their own products. Households do not sell the services provided by their appliances into competitive markets. Manufacturers do.

A long standing government policy has been to supply low cost energy to industry in order to give domestic producers a competitive edge in international and national markets. If this has led to the purchase of energy inefficient capital goods, then a problem exists. However, in this case industry is probably acting rationally and it is not likely that an information program such as Energuide will result in the purchase of more energy-efficient equipment. A tax/subsidy approach would likely prove more fruitful.

4.2 Potential New Appliances

The cost-benefit analysis of Energuide indicated the largest net benefits for clothes washers and dishwashers. A key factor in reducing energy consumption was the reduction in hot water usage. This suggests that improving the efficiency of hot water heaters may be worthwhile.

Within the house, the furnace is the appliance requiring the most energy. Therefore, extending Energuide to apply to space heating equipment offers the potential for savings.

It is not likely that appliances which receive limited use--by time of day or season--will offer a large potential for energy savings. Air conditioning equipment is subject to the Energyguide program in the U.S. However in Canada, this appliance is not widely used outside of Southern Ontario. Moreover, it is used only in the summer months, thus not affecting the winter peak load of Canada's electric utilities.

Chapter 5

ALTERNATIVES TO ENERGUIDE TO ACHIEVE ENERGY SAVINGS

It is implicit in the development of the Energuide program, that the market for household appliances is not providing adequate information to allow consumers to purchase energy efficient appliances. If the program improves market efficiency, benefits result. To assess alternatives to Energuide it is important to understand why market imperfections result in suboptimal or inefficient decisions by consumers. Once these market imperfections are understood, tools to improve efficiency can be assessed.

5.1 The Market for Household Appliances

Consumers have preferences for the services provided by various household appliances as well as other goods and services. Consumers choose whether or not to purchase an appliance's services as well as the level of service provided by the appliance.

The consumer has a budget constraint which depends on current and expected income, wealth and his ability to borrow funds. Appliance choice is based on life cycle costs. An optimal choice minimizes these costs which include the initial purchase price, installation costs and (discounted) annual operation and maintenance costs. A higher initial purchase price (for improved energy efficiency) may be offset by associated lower operating (energy) costs. The consumer therefore chooses an appliance which maximizes the flow of appliance services subject to the appliance purchase price, expected operating costs, his discount rate, income level and the prices of other goods and services.

Government intervention in the form of Energuide is based on the perception that consumers choose appliances which are too energy intensive because they lack the information to consider energy efficiency in their comparison shopping.

5.2 Market Imperfections

There are three types of market imperfections which result in the purchase of energy inefficient household appliances. First, there

may be inadequate information for consumers to make rational economic decisions. Given that fuel costs for operating appliances are a major life cycle cost, consumers need to know the efficiency of operating appliances. However, it is not always clear that this lack of information necessarily biases appliance choice towards those that are less energy intensive.

Second, the prices consumers pay for energy may be below the opportunity cost of energy due to government regulations. It is the policy of the federal government to constrain petroleum and natural gas price levels below free market levels and various subsidies and tax exemptions are granted to electric utilities. Furthermore, regulation of electricity prices force utilities to market power at average cost, which in today's environment, is below the long run marginal cost.

Finally, consumers typically demand short payback periods for investments, which implies high consumer discount rates. If these high discount rates exceed the social opportunity cost of capital, consumer choice will be biased to cheaper and, hence, possibly to less energy efficient appliances. An important cause of high discount rates is the inefficiency of capital markets. Poor access to investment funds, especially by low income earners retards socially optimal investment by consumers in energy efficient appliances.

5.3 Methods for Increasing the Energy Efficiency of Purchased Appliances

Governments have an array of tools to correct market imperfections including various types of regulations, taxes and subsidies, and participation in the supply of goods and services.

Perhaps the most important step the government could take would be the removal of consumer subsidies on energy in Canada. This would increase the operating cost of energy-inefficient appliances and provide an incentive to consumers to acquire more energy-efficient appliances.

Using taxes and subsidies, a government could raise the selling price of energy inefficient appliances or lower the price of efficient appliances. Alternatively, funds at low interest rates could be made available to consumers for appliance purchases. Eligibility for funds could depend on the efficiency of the appliance and perhaps an income test.

Regulations can take the place of mandated appliance efficiency standards such as those required by the U.S. Energyguide program. An alternative is Canada's Energuide program which only requires that appliances be labelled.

Regulations such as mandated efficiency standards can be criticized for a number of reasons:

- uniform national standards are not well suited to a country with substantial differences in energy prices and weather patterns;
- uniform national standards do not allow consumer's preferences to determine appliance choice (for example, a consumer requiring a low utilization rate of an appliance may not need an energy efficient appliance); and
- standards have a regressive impact on income distribution.

If the fundamental market problem is that consumer's make poor economic decisions due to inadequate information then it follows that government intervention should take the form of providing information to consumers. If the problem is that the energy prices consumers face are below their social opportunity cost then applying a tax based on appliance energy consumption would be more efficient, although raising energy prices would be a preferable solution.

Consumer information magazines such as Consumer Reports regularly evaluate household appliances. Where energy consumption is an important variable in the operating costs of appliances, these magazines document energy consumption. Thus, consumers who are concerned about energy efficiency do have an alternative to Energuide. Moreover, manufacturers do present data on energy usage--Maytag for example. It is possible, therefore, that market forces are acting efficiently to supply required consumer data on energy efficiency and that Energuide is not needed.

It is hard to imagine a situation where coercive action such as standards or the threat of standards is the best solution. If government intervention is required, then a policy which still allows freedom of choice for both consumers and manufacturers is superior to one which constrains their behaviour. Market forces can be strong but are subverted by standards. A properly applied tax/subsidy program can complement market forces to achieve more efficient results.

APPENDIX A
STATEMENT OF WORK

Statement of Work (Energuide Evaluation - Part I)

1. Background:

- 1.1 In December of 1975, the government directed the Department of Consumer and Corporate Affairs to develop an energy consumption labelling program for major household appliances. This directive resulted in the present Energuide program which covers six major household appliances (refrigerators, freezers, ranges, dishwashers, clothes washers and dryers). The program is essentially informational and is designed to improve the effectiveness of consumers in the marketplace and, thereby, improve the market's efficiency and responsiveness to consumer demands. The first Energuide labels were affixed to refrigerators manufactured after September 30th, 1978.
- 1.2 The Strategic Policy Research Directorate (SPRD) in the Bureau of Policy Coordination of Consumer and Corporate Affairs Canada is presently undertaking a cost-benefit analysis of the Energuide program in its current form. The results of this analysis are of interest to the Program Evaluation Division and will be incorporated, as one input among others, into a broader evaluation of Energuide.

2. Objective:

The cost-benefit analysis described above will be contracted out by SPRD. The work specified by this statement is to offer expert advice to the Program Evaluation Division with respect to the design, execution, results, and conclusions of that cost-benefit analysis.

The Contractor will offer advice with respect to:

- (a) critically examining the C/B analysis and assessing which aspects of the analysis should be subjected to further detailed examination; and
- (b) presenting a plan of action for extending the C/B analysis to cover the expected costs and benefits of expanding the Energuide program to cover a broader range of appliances and equipment and new fuels.

3. Scope of the Tasks:

- 3.1 Review and comment upon the statement of work for the cost-benefit analysis. (Verbal advice to be provided within five days after receipt by contractor).
- 3.2 Review the successful proposal and provide comments (verbal advice, to be provided within five days after receipt by contractor).

- 3.3 Attend a meeting in Ottawa at which the C/B analysis contractor will present an interim report to SPRD and provide both verbal and written comments on that report.
- 3.4 Review a program document discussing the expansion of the Energuide program to cover a broader range of appliances and equipment and new fuels and provide written advice and comment.
- 3.5 Conduct a meeting at your offices with entire project team in attendance to discuss;
 - i) progress to date;
 - ii) issues to be resolved; and
 - iii) format and outline of final report.

This meeting will occur on or about March 1, 1984.

- 3.6 Review the C/B contractor's draft report and provide comments in writing, (within 5 days of receipt by contractor).
- 3.7 Review C/B analysis contractor's final report and provide comments in writing, (within 10 days of receipt by contractor).
- 3.8 Provide a final report:
 - i) critically examining the C/B analysis assessing which aspects of the analysis should be subjected to further detailed examination; and
 - ii) presenting a plan of action for extending the C/B analysis to cover the expected costs and benefits of expanding the Energuide program to cover a broader range of appliances and equipment and new fuels.

4. Constraints:

- 4.1 From the description of the scope of the tasks, it can be seen that the Contractor will work on a very tight schedule and that the work will require the efforts of the four researchers agreed upon: Gordon Douglas, Walter Haessel, Jim McMillan, and Trisha Gibson.

5. Availability of Relevant Documents:

The Contractor will be provided with all necessary and relevant documents and kept properly informed by the Program Evaluation Division.

6. Presentation:

Reports must be presented in both written and oral form. Written reports are to be typed, double-spaced on standard size 213mm x 275mm paper in the usual manner. Ten (10) copies of each report will be provided.

7. Time Schedule:

7.1 By February 13, 1984

- Review Statement of Work for C/B analysis
- Review C/B Contractor's proposal and provide written comments
- Review program document and provide written comments

7.2 On or about February 16, 1984

- Attend a meeting in Ottawa of presentation of C/B Contractor's first written report
- Review interim report by February 24 and provide written comments

7.3 On or about March 1, 1984

- Meeting at Contractor's office with project team to discuss;
 - i) progress to date;
 - ii) issues to be resolved;
 - iii) format/outline of final report

7.4 By March 26, 1984

- Review C/B Contractor's draft report and provide written comments
- First payment \$4,100

7.5 By April 16, 1984

- Review final report of C/B Contractor and provide written comments

7.6 By May 7, 1984

- Provide final report
- Final payment \$4,100.

8. Financial Limitations:

The Contractor will receive an initial payment of \$4,100 after submitting a review of the C/B Contractor's draft report. The second and final payment of \$4,100 will be made upon timely receipt of a satisfactory final report. An allowance of \$1,800 will also be made for two return trips between Calgary and Ottawa.

9. Progress Report Requirements:

The submission and presentation of timely reports as described above in proper literary form will constitute the progress report requirements.

APPENDIX B

COMMENTS ON: "TERMS OF REFERENCE FOR PEAT MARWICK
AND PARTNERS" TO DETERMINE THE
FEASIBILITY OF A FUTURE BENEFIT-COST
ANALYSIS OF THE ENERGUIDE PROGRAM

Appendix B

COMMENTS ON: "TERMS OF REFERENCE FOR PEAT MARWICK AND PARTNERS" TO DETERMINE THE FEASIBILITY OF A FUTURE BENEFIT-COST ANALYSIS OF THE ENERGUIDE PROGRAM

The terms of reference are not sufficiently detailed. There are no references to the specifics of the Energuide program. It is our view that the terms of reference need to be made more explicit, identifying key issues which need to be addressed by the contractor. If these modifications are incorporated the feasibility study will be of higher quality and the probability of the contractor missing the deadline will be lessened. Comments on the objective, methodology and expected reports sections follow.

Objective

- The objective of the Energuide program should be stated: "The Energuide program was designed to facilitate informed consumer choice."
- The objective of the cost-benefit study should be stated in economic terms: "To evaluate the Energuide program we need to conduct a social cost-benefit analysis which calculates the present value of the net income benefit to Canadian appliance purchasers attributable to Energuide less the present value of associated costs incurred by consumers, governments, electric utilities, appliance manufacturers, electric utilities and consumer publications."

Methodology

- In estimating the benefits and costs it is necessary to calculate the value of these benefits and costs which would have occurred without the Energuide program.
- Not all manufacturers are located in Canada: efficiency improvements by these manufacturers cannot be attributed to a Canadian program.
- The perception of quality by the buying public may be at least as important as potential energy savings.

- To what extent would the Energuide function have been performed by other sources such as the manufacturers themselves or consumer information magazines?
- Benefits need to be identified by market area since the price of electricity varies by region: Ontario and Quebec are the largest markets but have relatively low electricity prices.

Expected Reports

- The interim report should contain a detailed description of the methodology proposed for conducting the cost-benefit analysis as well as a detailed draft of the final report outline.

APPENDIX C

COMMENTS ON PEAT MARWICK'S COST-BENEFIT
FEASIBILITY STUDY

Appendix C

COMMENTS ON PEAT MARWICK'S COST-BENEFIT FEASIBILITY STUDY

- The final report requires an executive summary assessing the feasibility of conducting the cost-benefit study. The important costs and benefits must also be identified so that research effort can be concentrated in these areas.
- The report should have explicitly defined a framework for conducting the cost-benefit analysis. The information is provided in the report but is disorganized.
- The fundamental question of causality was not answered. There have been costs and there have been efficiency improvements, but there is no indication as to how to measure the improved efficiency due to Energuide. We suggest the following: compare the efficiency gains of U.S. made appliances to those of Canadian made appliances. The difference can be attributed to Energuide. Note that consumer switching to more energy efficient appliances due to Energuide must be evaluated as well.
- Issues omitted from the feasibility study include:
 - (i) effect on search effort: are consumer search costs lower for consumers interested in energy savings or are they higher due to the program's complexity?
 - (ii) effect on appliance sales: are sales less due to higher selling prices? If they are greater (due to better value), what happens to old appliances? What is the value of premature appliance scrappage? Are old appliances still used in the home for back-up or other purposes?
 - (iii) actual efficiency gains relative to laboratory testing.
 - (iv) the evaluation of consumer benefits (as opposed to social benefits) should use a discount rate greater than treasury board guidelines to reflect the consumer decision-making process which requires a short payback period.
 - (v) the sensitivity analysis should include alternative electricity price scenarios.
 - (vi) benefits should be examined regionally because of substantial differences in regional electricity prices.

APPENDIX D
COMMENTS ON PEAT MARWICKS'S COST BENEFIT STUDY
OF THE ENERGIDE PROGRAM

Appendix D

COMMENTS ON PEAT MARWICKS'S COST BENEFIT STUDY OF THE ENERGUIDE PROGRAM

1.0 SUMMARY

- 1.1 All important costs and benefits have been identified and estimated.
- 1.2 The scenarios examined have been properly defined.
- 1.3 The existing Energuide program has probably generated some net benefit.
- 1.4 The existing Energuide program has likely generated net costs for some appliances, i.e., ranges and dryers.
- 1.5 Continuing the Energuide program is not likely to generate substantial net benefits.
- 1.6 The calculation of net benefits for each appliance from continuing Energuide would be instructive. Significant future net benefits are likely from only refrigerators and dishwashers.
- 1.7 Estimated benefits and costs have been based on limited and often conflicting information.
- 1.8 The information base is very soft with the result that analysts with different prior biases would likely produce substantially different results.
- 1.9 There appear to be data problems in the valuation of benefits and costs.

2.0 ENERGY EFFICIENCY

- 2.1 The range of expert opinion documented by PM as the source for many of their assumptions regarding scenarios with and without Energuide is vast. Consequently, almost any result can be substantiated by their evidence.

- 2.2 Because imports represent a significant portion of domestic sales (except freezers), the "free ride" from the U.S. Energuide Program is an important factor. PM do not document assumed import shares of sales, nor expected trends in U.S. appliances. The latter data should be obtainable from U.S. regulations. It is difficult, therefore, to assess what PM is saying about the change in energy efficiencies of Canadian made appliances.
- 2.3 A discussion of one appliance--dishwashers--is fruitful. PM states that imports take a significant share of the market (pp. E-4 and G-9), and that there is a high degree of U.S. ownership of Canadian firms (p. E-4). Maytag is a market leader in terms of energy efficiency and quality of product in the dishwasher field (see Consumer Reports, various issues). Their top-of-the-line model (size and options) had a rating of 87 kWh/month for 1981 through 1983. It has achieved this rating by reducing heat cycles and increasing the efficiency of the hot water flow. In some sense the Maytag rating represents an achievable industry standard.

PM predicts average ratings (which include smaller machines than the Maytag) in excess of 100 kWh/month for every year (exhibit 5). They also indicate there is industry dissatisfaction with dishwasher performance (pp. G-7 and G-8). This is inconsistent with the Maytag standard.

PM states "without an Energuide Program in place, the manufacturers will have little incentive to do more research and development to improve energy performance" This is also inconsistent with the fact that Maytag is a leader in minimizing energy and water consumption while maintaining a first class product. The company is U.S. based.

Maytag literature on its products indicates that the company competes on the basis of the quality of its product--reliability and cleaning performance--and energy efficiency. We feel that the strength of market forces to increase the efficiency of other company's products both with and without Energuide is understated in the case of dishwashers.

Since the Maytag costs several hundred dollars more than the less efficient appliances it competes with, the cost to the manufacturer of achieving energy efficiency may be understated in

the case of dishwashers if Maytag's premium price indicates, in part, their extra costs in achieving their level of efficiency.

- 2.4 Increasing the energy efficiency of household appliances lowers the cost of running these appliances. If increased appliance utilization results, as suggested by Khazzoom (The Energy Journal, Vol. I, No. 4, pp. 21-40), then energy savings will be less than indicated. Khazzoom also indicates that increased utilization may actually result in increased energy consumption. In such a case, energy savings is not the appropriate valuation criterion. Clearly, the consumer is made better off even though the amount of energy consumed remains unchanged.

3.0 INCREMENTAL UTILITY COSTS

- 3.1 For electricity prices, estimating the long-run incremental cost of electricity is an appropriate measure for the upper bound scenario. This is however difficult to estimate. The PM approach is only a crude approximation and is poorly documented. A more appropriate approach is to examine utility expansion plans to determine the next unit to be built and to use utility estimates of capital and operating costs for these units.
- 3.2 PM estimated the incremental cost of new generation based on additions to assets in 1979, 1980 and 1981. However, the additions to assets in 1979, for example, is equal to the as-spent dollars from the previous six or so years (depending on the construction profile of the plant). Thus, 1973, 1974...1979, dollars are aggregated without adjustment for inflation to equal the addition to assets in 1979. This was a period of extremely rapid price increases for utilities--10.6 percent p.a. for hydro generation and 11.8 percent p.a. for thermal generation. The PM approach is not accurate and seriously underestimates costs.

However, the costs in 1979-1981 of new generation may not be good estimates of future costs. For example, in New Brunswick, during 1979-1981, the Pt. Lepreau I Nuclear plant was constructed, suffering massive cost overruns. The cost of Pt. Lepreau II is projected to be substantially less. In B.C. the Revelstoke Hydro Project was being built in 1979-1981. B.C.'s next facilities will be developed on rivers in the northern extremities of the province, and will be substantially more expensive.

- 3.3 As a result, PM's estimates (exhibit 12) are poor. Based on utility data, for example, incremental capital costs in Alberta for a coal plant are \$0.70-0.80/W, compared to PM's \$1.40/W. In Ontario nuclear operating costs are less than 1¢/kWh, compared to PM's 1.6¢/kWh. In Quebec, hydro operating costs are only .1-.2¢/kWh, compared to PM's 1.2¢/kWh.

4.0 ESCALATION TO 1983

- 4.1 PM use a factor of 1.25 to escalate 1980 and 1981 capital costs of capacity to 1983 dollars (p. VI-4). Statistics Canada reports that the cost of hydro and thermal generation escalated by 12.7 percent and 11.2 percent between 1981 and 1983, and by 27.8 percent and 24.4 percent between 1980 and 1983, respectively.
- 4.2 PM escalate operating costs from 1981 to 1983 dollars with a factor of 25 percent (p. VI-6). Average electricity prices increased in this period by 22 percent.

5.0 SOCIAL COST OF NATURAL GAS

- 5.1 PM assume 5¢/m³ as the social cost premium for natural gas based on the difference in prices between export and domestic markets (P. VI-7). They appear to apply this premium for all years of the study. While this value may be appropriate for 1979, the resistance of U.S. buyers to pay the Canadian export price since then indicates that this premium is perhaps too high. CERI analysis of the U.S. market suggests that Canada will face strong competitive pressure in U.S. markets until about 1987. Since the volume related incentive price is the marginal export price and is close to the Toronto city gate price of natural gas, a social cost premium of 1¢/m³ is more in order for 1980, and could trend up to the 5¢ premium by 1987.

6.0 LOWER BOUND ELECTRICITY PRICES

- 6.1 On p. VI-3 PM state, " . . . The price at which electricity is being sold to the lowest-rate consumer can be regarded as the short-term marginal cost." In fact, the short-term marginal cost is the incremental cost (fuel plus operation and maintenance) from the typical unit which would be loaded to follow incremental electricity demand. This is especially true if a substantial surplus exists. There has been a substantial surplus in the three largest electricity consuming regions of the country--B.C., Ontario and Quebec--since 1980, and this surplus will persist for the rest of the decade and into the 1990s.

We do not feel that the use of consumer rates represents a realistic lower bound, as PM states (p. VI-3).

7.0 FUEL PRICES

- 7.1 PM estimates of 1983 consumer rates for electricity prices appear low (exhibit 12). The source they cite has not yet been published for 1983. The most current source of these data is the EMR Statistical Handbook (p. 7.23). The concepts are slightly different, however.

	Residential Electricity Rate (¢/kWh)	
	<u>PM^a</u>	<u>EMR</u>
Canada Average	--	4.42
Atl.	4.5	5.78
Que.	3.2	4.04
Ont.	3.7	4.27
Man.	2.5	3.51
Sask.	3.4	4.46
Alta.	3.85	4.55
B.C.	3.75	4.76

^aLoads greater than 500 kWh per month

^bLoads of 1000 kWh per month including taxes

7.2 PM assume a 32¢/l. price of heating oil (p. VI-II), whereas the EMR Statistical Handbook (p. 7.9) lists the retail price of domestic heating oil as 30.4¢/l. in 1983.

7.3 PM provides no source for their natural gas prices (exhibit 13). They compare to the EMR Statistical Handbook as follows:

	Residential Natural Gas Prices (¢/m ³)	
	PM	EMR
Canada Average	--	18.9
Que.	21.6	24.4
Ont.	18.6	22.9
Man.	16.5	18.6
Sask.	11.3	14.5
Alta.	10.5	13.6
B.C.	13.8	17.4

7.4 PM states ". . . the cost of all forms of energy were assumed to be equal to the rates paid by the consumers in 1983." If prices used for the 1978-1982 period are the same as the 1983 prices, all prices used--electricity, natural gas, and heating oil--will greatly exceed actual prices. This would likely result in a substantial overestimation of benefits for the past program.

7.5 PM states, "Electricity rates are certainly not expected to rise at a lower rate than general inflation (p. VI-12)." CERI analysis of electricity rates conducted over the past year indicates that it is possible that electricity prices may decline in real terms in several regions including Ontario and Quebec in the 1980s. Real declines in virtually all hydro and nuclear based regions are expected to occur in the 1990s.

7.6 PM assume that natural gas and fuel oil prices will increase at the rate of inflation. Analysis by CERI indicates that in the 1980s real fuel oil prices may rise due to refinery rationalization in central and eastern markets. Natural gas prices may also rise due to increasing distribution margins. The 1990s should see a return to steadily rising oil and gas prices.

7.7 Fuel oil and natural gas prices include substantial taxes and royalties. PM given no indication of how these are treated.

8.0 MANUFACTURERS' COST

- 8.1 The impact on manufacturers' costs appears to have been calculated incorrectly. The retail price increases, attributable to Energuide (p. VIII-a), have been applied to total domestic sales of appliances (exhibits 2, 5, 8, and 10) to yield total dollar impacts on manufacturers (exhibit 19). Given that imports represent up to 25 percent of sales of these products and that costs to U.S. manufacturers of meeting Energuide requirements should not be included in a Canadian social cost benefit analysis, the resource costs of Energuide are overstated.

9.0 PRODUCT SALES

- 9.1 PM indicate that manufacturing costs attributable to Energuide (p. VIII-9) add to the retail selling price of appliances, yet the sales forecast of appliances is the same for all scenarios. This implicitly assumes that the own price elasticity of demand for these products is zero. The price elasticity of household appliances as estimated by the Economic Council of Canada is -1.0. Omitting adjustments for this factor leads to an underestimation of sales for scenarios II and III (assuming scenario I was based on the Energuide program continuing). Hence, energy savings are underestimated although consumer welfare may actually be lower.
- 9.2 PM states "no adjustment for population shifts has been made" (p. C-1). CERI's latest forecast indicates that the provinces of B.C., Alberta, Ontario and Quebec will be the fastest growing provinces in the period to 2000. Ontario and Quebec have electricity prices lower than the national average. Thus, the shifting regional population structure will tend to lower the benefits PM attribute to Energuide.

10.0 DISCOUNT RATES

- 10.1 PM values gross energy savings for the lower bound by using 10 percent real discount rates, ". . . which are considerably higher than the rates which are likely to be applied by individual consumers (p. IX-2)." This is contrary to all evidence on consumer discount rates for major appliance purchases. See, for example, Hausman's estimates of discount rates as high as 89 percent (Bell Journal of Economics, Vol. 10, No. 1, p. 53) or

Chernoff (Bell Journal of Economics, Vol. 4, No. 4, p. 82). Use of higher discount rates would greatly reduce the present value of consumer benefits.

APPENDIX E
COMMENTS ON "THE FUTURE OF ENERGUIDE"

Appendix E

COMMENTS ON "THE FUTURE OF ENERGUIDE"

The benefit-cost calculations for Options I and II incorporate a number of fallacious assumptions and methodological errors. These errors tend to overstate the benefits and understate the costs. Moreover, the errors are sufficiently serious that the validity of the conclusions is questionable and that the inferences drawn from these conclusions are therefore untenable. The case for a causal relationship between Energuide and appliance efficiency improvements has not been made.

Option 1

The program document assumes all efficiency gains are due to Energuide. There are in fact two effects on consumer benefits. First is the average gain in efficiency of appliances. Energuide could have caused none all or part of the gain in efficiency of Canadian made appliances which exceeds the efficiency gain of U.S. made appliances. Second is the switch to more energy efficient appliances. The switch from less to more efficient appliances may or may not be attributable to the labelling program.

Manufacturers cost for R&D, retooling and labelling are assumed to be negligible. Data for the ISPI's for manufacturing and household appliances are cited to back this assumption. These data are wholly irrelevant. In fact, costs to manufacturers do occur and must be accounted for.

Costs and benefits are in as spent (or saved) dollars. Results need to be presented in constant dollars and discounted.

Factors omitted include:

- space heating offsets
- effect on search costs
- regional sales and electricity prices
- early appliance scrappage
- costs and benefits of "second" appliances
- laboratory versus actual energy consumption.

Option II

Extension of Energuide to new products is predicated on success with the current program and products. This has not yet been demonstrated. It is a necessary, but not a sufficient condition that the program yield net social benefits in order to justify extension of the program.

Hot water heaters for new homes are typically purchased by home builders who are indifferent to energy efficiencies. Thus any benefit will occur only indirectly, if manufacturers increase efficiencies. Early replacement of existing hot water heaters will be slow¹ (depending on consumer's required pay back periods) so that these potential savings will be small when discounted. Savings should be based on the number of hot water heaters sold, not the number manufactured.

¹The hot water heater cost of about \$400 (installed) compared to the average energy savings of about \$20 (see "the Future of Energuide, p. 11).

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