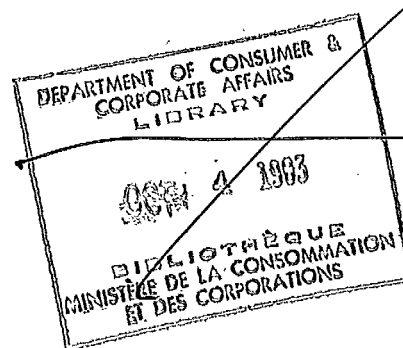


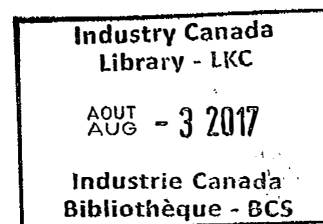
CONSUMER ENERGY RESEARCH



Ned Ellis  
Coordinator  
Consumer Energy Research  
P.R.A.L.

[1983]

The views presented in this paper are those of the authors and do not necessarily reflect the views or positions of the Department of C.C.A.



## CONSUMER ENERGY RESEARCH

### 1. Introduction

This paper will deal with CCAC consumer energy research in the residential sector. The purpose of the paper is to bring senior management up to date on:

- a) the consumer energy research plan in the residential sector
- b) current research initiatives
- c) future initiatives

### 2. Background

The energy research conducted by Consumer and Corporate Affairs is funded from the "Energy R & D Program" which, in turn, is funded from the Energy Envelope. The Panel on energy R & D, an ADM level committee is chaired by Energy Mines and Resources and administers the allocation of funds to individual Departments. Dr. Robinson is CCAC's representative on that Committee.

Both Policy Research Analysis and Liaison Directorate, and the Legal Metrology Branch, receive funds under the Energy R & D Program. This paper deals only with the research conducted by the Consumer Energy Research group within PRAL. Energy R & D Program funding was recently approved by Cabinet through 1985/86 and the Consumer Energy Research group will receive 690 thousand dollars and 3 person years, plus inflationary increases throughout this period.

### 3. Consumer Energy Research Plan

The main factors shaping CCAC consumer energy research strategy in the residential sector are the National Energy Program and the programs and policies introduced in the residential sector by Energy Mines and Resources and CCAC as a result of the NEP.

#### 3.1 National Energy Program

The main objective of the National Energy Program is Canadian self-sufficiency in oil by 1990, while another objective is increased Canadian ownership of the oil and natural gas industries. To a certain extent, the two

objectives conflict because increased Canadian ownership of the oil industry is being achieved by constraining the rate of return on foreign investment. We have recently seen an actual reduction in Canadian oil supplies at a time when we are trying to balance supply and demand. The postponement of certain mega projects, and the weakening of OPEC, have further reduced prospects for increased domestic oil supplies in future. Canadian self-sufficiency in oil, therefore, can only be achieved through the reduction of oil demand.

The crucial necessity of reducing oil demand was recognized by the authors of the NEP from the very beginning. The attached projections reproduced from the original NEP document in 1980 underscore the heavy reliance placed on oil demand management in meeting self-sufficiency goals.

#### Oil Demand and Supply Outlook<sup>1</sup>

	<u>1979</u>	<u>1985</u>	<u>1990</u>
	(Mb/d)		
Production	1,608	1,355	1,520
Demand	<u>1,823</u>	<u>1,615</u>	<u>1,475</u>
Net Imports (Exports)	215	260	(45)

The following table provides detail on the components of final demand for oil products in Canada.

#### Usage of Refined Petroleum Products (1981)<sup>2</sup>

<u>Use</u>	<u>%</u>
Retail gasoline	31.8
Other transportation	15.7
Industry	11.2
Non-energy use	9.7
Residential	8.8
Manufacturing	7.3
Producer consumption	6.4
Commercial	6.2
Agriculture	3.8
Electricity	2.5
Government	2.4
Mining	<u>2.1</u>
Total	100

1. National Energy Program 1980, Energy Mines and Resources Canada, Page 99.

2. Statistics Canada, #57-003, Table 1B, 1981.

This paper deals only with the consumer energy research plan for the residential sector exclusive of residential transportation. This sector accounted in 1981 for direct consumption of 8.8% or approximately 160,000 barrels of oil per day.<sup>3</sup> Within the residential sector, space heating and water heating account for virtually all direct oil use. The use of oil in the home, however, is not uniform across Canada as demonstrated by the following tables.

Percent of Homes Heated by Various Fuels<sup>4</sup> (1980)

	<u>Atlantic</u>	<u>Que.</u>	<u>Ont.</u>	<u>Prairies</u>	<u>B.C.</u>	<u>Canada</u>
Oil	68.9	52.9	35.7	10.6	27.2	37.6
Gas	0.8	6.3	48.2	82.0	53.9	39.7
Electricity	19.0	38.2	13.9	6.1	15.7	19.7
Others	11.3	2.7	2.2	1.3	3.3	3.1

Percent of Homes Using Various Fuels for Water Heating<sup>5</sup> (1980)

	<u>Oil</u>	<u>Gas</u>	<u>Electricity</u>	<u>Other</u>
Newfoundland	23.8	-	73.8	2.3
Prince Edward Island	66.6	-	24.2	-
Nova Scotia	52.3	-	40.2	7.5
New Brunswick	35.8	-	60.6	3.6
Quebec	15.7	5.6	77.9	-
Ontario	4.3	43.4	51.7	-
Manitoba	-	53.1	45.4	-
Saskatchewan	-	66.5	30.8	2.8
Alberta	-	92.1	5.0	2.9
British Columbia	7.8	48.8	42.0	1.2
Canada	10.0	36.2	52.5	1.3

3. Assuming an average price of 30\$ (U.S.) per barrel means that the residential sector consumes an average 6 million dollars per day of oil imports and domestic production.

4. Statistics Canada, "Household Facilities by Income and Other Characteristics", Catalogue 13567 (1980), Table 1.2

5. Statistics Canada, "Household Facilities and Equipment", Catalogue 64-202, May 1982, Table 1.2

Oil is also consumed indirectly in some homes in the form of electricity. In total it is estimated that the residential and farm sectors consumer about 12 thousand barrels of oil per day<sup>6</sup> as electrical power. This figure is small when compared with total residential direct oil demand of 160 thousand barrels per day but may be significant in some provinces. Oil fired generation of electricity was once commonplace but in recent years has been replaced by other forms of generation in most parts of the country. Oil fired generation is, however, still prevalent in some regions and electricity conservation or replacement in these regions would yield appreciable oil savings. In fact, the following table demonstrates that Newfoundland, New Brunswick and Nova Scotia consume 85% of that oil used for electrical generation.

Oil, Usage in Electricity Generation<sup>7</sup>

	<u>Oil Generation as % of Total Electricity Generation</u>	<u>% of the total Oil Used in Electricity Generation</u>
Newfoundland	3.18	13.7
Prince Edward Island	100.00	1.9
Nova Scotia	46.6	25.7
New Brunswick	61.46	47.8
Quebec	.15	4.2
Ontario	.12	2.1
Manitoba	.25	.58
Saskatchewan	.18	.42
Alberta	.04	.11
British Columbia	.31	1.0
Yukon/NWT	27.50	2.4
Canada	13.81	100

The discussion of NEP objectives, and the data on oil use, suggest that CCAC residential energy research should focus on reducing oil demand in particular rather than energy demand in general. In the residential sector, reducing oil consumption largely means reducing the demand for oil as a space heating fuel and the distribution of research should reflect that fact. The data on regional distribution suggests that this research should focus on eastern Canada, including Ontario, because other fuels are primary heating

6. Calculated from data published in Statistics Canada 57.202 Vol. II and 57.003 (1981).

7. Statistics Canada, 57.202 Vol. II.

fuels in Western Canada. Similar conclusions can be drawn about use of oil in residential water heating, although Ontario can be excluded and the total amount of oil used is not as large. Finally, some attention should also be placed on research which conserves or replaces electricity where it is generated from oil. Although the amount of oil consumed is again not large, the potential for oil savings may be great because programs can be concentrated in three of the Atlantic provinces.

The objectives of the NEP in the residential sector are implemented through programs and policies principally at EMR and CCAC. Research which impacts positively on these programs will contribute to the NEP.

Energy, Mines and Resources Canada is the major client for CCAC consumer energy research and, through the Office of Energy R & D, allocates the funds which CCAC receives from the National Energy Program. The objectives of EMR, therefore, are an important consideration in setting our consumer energy research strategy.

It should be noted that this is a very good time to be impacting on EMR programs and policies. EMR is presently at a stage where new policies and programs are being introduced and old programs are being scrapped or substantially modified. Examples are numerous. The entire CHIP and COSP programs are under review and may be combined in a joint program in the near future. The Enersave computer audit is under review and may be replaced by a professional personalized home energy audit, possibly combined with the CHIP/COSP program noted above. Major new initiatives are planned or underway in the areas of fuel substitution away from oil based products. Considerable funds have been expended, for example, on the expansion of the natural gas distribution system to Quebec with further expansion projected for the Maritime provinces. Similarly, an EMR program will soon be announced which will provide a subsidy to consumers willing to convert their automobiles to liquid natural gas.

The main operational program at CCAC<sup>8</sup> which impacts on residential energy consumption is Energuide. The Energuide appliance labelling program was introduced in 1978 and currently requires that standardized energy consumption labels be prominently displayed at point of sale, on all electrical refrigerators and, dishwashers. This program is also in a state of flux because no funds have been allocated for its operation beyond 1985/86.

---

8. Excluding Competition Policy.

Another area of concern to this Department is that energy efficiency as a government priority may have added indirectly to a range of consumer hazards such as UFFI and inadequate ventilation of household air pollutants. The technology that can alleviate the apparent trade-off between energy efficiency and air quality exists, and it is important that our research take into account the need for a balanced approach to achieve given objectives.

This discussion of programs suggests that residential energy research should focus heavily on oil substitution and, in particular on the major initiative underway to expand natural gas use in Quebec and the Atlantic provinces. Research should also address the issue of home energy audits and potential oil payoffs. The main issues affecting CCAC directly would appear to be the future of Energuide and the issue of air quality.

#### 4. Current Research Initiatives

In December of 1982, requests for proposals (RFPs) in 10 large subject areas were sent to 250 private firms, individual researchers, and university departments across the country. The subjects of these requests were identified after discussions with various government officials, and wherever possible, they reflect the programs of CCAC and EMR in meeting the goals of NEP. The main objective of this first wave of requests was to operationalize the research plan for the residential sector outlined above. At the same time, however, the wave addressed two other needs:

- a) EMR is about to introduce a program to encourage the conversion of vehicles to new gaseous fuels. This research is being conducted for the program manager and will be used as input to its implementation and marketing strategy
- b) The Office of Energy R & D has suggested that CCAC should become involved in demand research in the commercial, small industrial, and agricultural sectors. Some small steps are taken in this direction in the first wave.

The subject areas covered by this first wave of research requests are outlined very briefly below.<sup>9</sup>

- 
9. Substantially more detail on each subject area and its relation to the residential research plan is provided in the detailed RFP's which are available on request.

a) The Determinants of Natural Gas Use in the Maritimes and Quebec

This subject coincides with the off-oil thrust of EMR and is extremely important for the objectives of the National Energy Plan. Focus is on residential and commercial users. This subject is also intertwined with the Canadian Oil Substitution Program.

b) Attitude Study on Gaseous Fuels

This research will be a major input into an EMR program which encourages commercial and agricultural users to switch from gasoline to liquid natural gas or propane in their transportation equipment. Attitudinal barriers will be the main focus.

c) Oil Conservation in the Commercial and Small Industry Sectors

Few EMR programs are currently targeted at this group which account for over 10% of oil consumption. This RFP is in response to EMR request to slightly widen mandate.

d) Small Landlords and Energy Conservation

Again in response to the request to widen mandate. Response of landlords to EMR programs has been very low.

e) Home Energy Audits

This is one subject area which satisfies several objectives. As noted, professional home energy audits will probably form part of a new EMR program this year. At the same time, home energy audits coincide with CCAC philosophy because the audit provides only information to the consumer who in turn makes the consumption decision. This research is important in order to ensure that the audit system chosen by EMR maximizes benefits to consumers.

f) Profile of Oil Using Householders

This research is expected to provide direct input into the COSP program and the program to expand natural gas use.



g) Heat Pumps

The heat pump was recently introduced in the field of home heating as one means of reducing consumption of other fuels; most notably oil. Acceptance of this device by oil users will reduce demand, thus contributing to the objectives of the NEP.

h) Air to Air Heat Exchanges

The UFFI crisis has highlighted the fact that a trade-off frequently exists between energy conservation and air quality in the home. Air quality is a critical issue in several government departments including CCAC, and heat exchanges offer one technological solution to this seeming impasse.

i) Energy Consumption Labelling

The proposals asks researchers to focus on possible benefits arising from extension of Energuide to:

- 1) hot water heaters
- 2) heat pumps
- 3) oil, natural gas and electric furnaces
- 4) wood burning stoves, inserts and furnaces
- 5) plenum heaters
- 6) light bulbs.

j) Low Income Homeowners and Energy Conservation

This group has been shown as the most willing but least able to convert. To date they have not been adequately targeted by NEP programs.

In addition to this first wave of RFP's, two other activities are underway which should be reported under current research initiatives.

The first is the construction of oil usage tables for the residential and transportation sectors. This work is now underway and provided valuable input to the research plan for the residential sector. Other sectors, such as agriculture and commerce may be profiled at a later date.

The second initiative is the creation of a permanent consumer panel for the collection of data. The current lack of data is an impediment to the formulation of research plans and, further, leads to a situation where a substantial number of studies require independent surveys. The survey panel will consist of approximately 2,000 respondents who will provide semi-annual data over four years on detailed

energy consumption, appliance ownership, car ownership and usage, insulation levels, conservation action, attitudes, lifestyles and perception. The sample will be nationally and regionally representative and will be drawn from a census data. A pilot study will be underway shortly and is scheduled for completion in the Fall of the year. One other data collection initiative will see the addition of CCAC questions to the annual Labour Force Survey.

#### 5. Future Initiatives

This paper has dealt exclusively with the research plan in the residential sector excluding transportation, and the first wave of RFP's was predicated on that plan.

The table on oil usage on page 2 of this paper shows that transportation, in general, consumes 47% of petroleum products and that retail gasoline sales make up about 60% of this transportation consumption. As McDougall and Ritchie pointed out in their presentation, this sector is so large that even small improvements in conservation will have a large effect on total oil demand in Canada.

These two sectors, residential and transportation have always been the mainstay of CCAC consumer energy research and are likely to maintain that position for the immediate future. The research plan for the residential sector was developed first because of the number of crucial policy decisions which are now being made at EMR in this sector.

The next research plan produced will be for the transportation sector and some steps have already been taken in this direction. It is anticipated that this research plan will be complete in late spring and that a new wave of RFP's, focussing mainly on transportation, will be sent out soon after.

The mandate which CCAC receives from the Office of Energy R & D is fairly open at the present time. The next briefing book for the Panel on Energy R & D, for example, will note that the Demand Committee, which is chaired by CCAC, includes within its mandate, oil demand in the commercial, small industrial, and agricultural sectors. All of these sectors offer large potential oil savings but these are new areas and the extent of CCAC involvement will depend largely on the results of the first studies and person year availability. There is, however, a real need for research here which apparently is not covered from the consumer/user viewpoint, by any other department.

One other issue, of major concern, is the future of Energuide. With the concurrence of the Consumer Bureau, it is suggested that a policy paper on Energuide and its possible future should be prepared by Policy Coordination Bureau with the assistance of Consumer Bureau for presentation to Policy Committee before the next Multi-Year Operational Plan is completed. Research conducted for CCAC in the past, and research requested in the current RFP's, would form the basis for such an assessment.