# ENERGY CONSERVATION IN SCHOOL BUILDINGS IN NEWFOUNDLAND AND LABRADOR



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# ENERGY CONSERVATION IN SCHOOL BUILDINGS IN NEWFOUNDLAND AND LABRADOR

An Internship Report

Presented to

the Department of Educational Administration

Memorial University of Newfoundland

In Partial Fulfillment

of the Requirements for the Degree

Master of Education

by

Rick Harlin Canning, B.A.(Ed.), B.A.

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## ABSTRACT

This internship was conducted at the Energy Branch of the Department of Mines and Energy of Newfoundland and Labrador. It focused primarily on energy conservation activities in the schools of the province as they relate to the physical and mechanical structure of school buildings.

Information was obtained by sending a questionnaire to each of the 35 school boards of the province, by interviewing several of the business managers of school boards, by researching literature at the Department of Mines and Energy and at the library of Memorial University, and by corresponding with the departments of Education and Mines and Energy across Canada.

At present there is little co-ordinated effort to conserve energy in the school buildings of Newfoundland and Labrador. Most school buildings are in desperate need of renovations for the purpose of conserving energy. To assist boards the Department of Education introduced an Energy Conservation Grant on a 50/50 basis with school boards up to a maximum of $1.50 per student. However, many boards are unable to avail of the grant due to the lack of funding at the board level or because of a lack of information about appropriate activities to conserve

energy. The main thrust to conserve energy is left to the individual school boards.

Most school boards are aware of the need to conserve energy, particularly from an economic point of view. The business managers saw the main obstacles to energy conservation as the lack of proper funding, insufficient time for board administrators to deal with the issue, lack of precise information on energy conservation, and the lack of leadership at the provincial level. However, many worthwhile activities have been carried out by individual school boards that demonstrate to some degree the advantages of conserving energy. This is also supported by work done in the four provinces studied: Alberta, British Columbia, New Brunswick and Ontario.

If the schools of Newfoundland and Labrador are going to make progress in the area of energy conservation, then there must be a joint effort by all agencies involved in school buildings, including oil companies, power companies, the Department of Education and the Department of Mines and Energy. Furthermore, this effort must be coordinated at the provincial level by one agency or person so that all school boards can benefit from an energy management program. The program must be comprehensive but at the same time flexible enough to accommodate the individual characteristics of each board, such as, climatic conditions, age of buildings, and any other physical features.

## ACKNOWLEDGEMENTS

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The writer is also indebted to all the school board business managers who took the time to complete the questionnaire and to meet with the intern. The support of this group was most appreciated.

Finally a special "thank-you" to my wife Robina for her time, financial support and secretarial skills. Her dedication to the project, particularly in the typing of the report, was over and above that of a concerned wife. My son Trevor must also be thanked for his understanding of the time that mom and dad had to spend at the internship.

CONTENTS


| | Page |
|---|---|
| ABSTRACT | ii |
| ACKNOWLEDGEMENTS | iv |
| LIST OF TABLES | viii |
| Chapter | |
| 1. INTRODUCTION | 1 |
| The Energy Crisis and Conservation | 1 |
| Energy Conservation in School Buildings in Canada and the U.S.A. | 4 |
| The Importance for Newfoundland and Labrador Schools to Conserve Energy | 9 |
| The Internship | 13 |
| 2. THE INTERNSHIP EXPERIENCE | 14 |
| Placement and Duration | 15 |
| Objectives | 16 |
| Methodology | 17 |
| Delimitations | 19 |
| Definitions | 20 |
| Abbreviations | 23 |
| Overview | 24 |
| 3. ACTIVITIES AT THE DEPARTMENT OF MINES AND ENERGY | 25 |
| The Questionnaire | 26 |

| Chapter | | Page |
|---|---|---|
| | Energy Awareness | 28 |
| | Attitudes and Opinions About Energy Conservation | 30 |
| | Sources of Information | 33 |
| | Summary | 34 |
| | Interviews With Business Managers | 35 |
| | Summary | 46 |
| | The Guidebook | 47 |
| | Role of the Intern | 47 |
| 4. | PROGRAMS IN OTHER PROVINCES | 51 |
| | Ontario | 51 |
| | Province-Wide Activities | 52 |
| | The Hamilton Board of Education | 53 |
| | British Columbia | 55 |
| | New Brunswick | 58 |
| | Fredericton Schools | 60 |
| | Alberta | 62 |
| | Summary | 67 |
| 5. | REFERENCE MATERIALS FOR SCHOOL BOARDS | 68 |
| | Books | 68 |
| | Reports | 69 |
| | Articles | 70 |
| | Magazines | 72 |
| | Summary | 72 |

Chapter Page

6. ENERGY PROGRAMS OF NEWFOUNDLAND EDUCATIONAL AGENCIES ..... 74

Department of Mines and Energy ..... 74

The Demonstration Program ..... 76

The Energy Bus Program ..... 77

Department of Education ..... 78

The Denominational Education Committees . 81

Federation of School Boards of Newfoundland ..... 83

School Boards ..... 84

The Terra Nova Integrated School Board ..... 85

Green Bay Integrated School Board .... 89

The St. John's Roman Catholic School Board ..... 90

Summary ..... 93

7. EVALUATION, CONCLUSIONS, AND RECOMMENDATIONS ..... 94

Evaluation of the Internship ..... 94

Conclusions ..... 96

Recommendations ..... 99

REFERENCES CITED ..... 103

APPENDICES

A. OUTLINE OF GUIDEBOOK ..... 107

B. THE QUESTIONNAIRE ..... 111

C. LETTER FROM SUPERVISOR OF SCHOOL GRANTS .. 124

D. CORRESPONDENCE ..... 126

E. MATERIALS FROM HAMILTON SCHOOL BOARD ..... 130

TABLES


| Table | | Page |
|---|---|---|
| 1. | The Importance of Energy Costs in School Board Operations | 10 |
| 2. | Distribution of Costs Incurred by School Boards, 1981-82 | 11 |
| 3. | Response Rate | 27 |
| 4. | Energy Awareness Among 27 School Boards | 28 |
| 5. | Energy Conservation Grant | 29 |
| 6. | Attitudes and Opinions toward Energy Conservation | 30 |
| 7. | Information | 33 |
| 8. | Sources of Information | 34 |
| 9. | Demonstration of Peak Load Control and Night Set Back - High School - All Electric | 38 |
| 10. | Energy Management Steps Taken by School Boards | 42 |
| 11. | Format of Guidebook | 48 |
| 12. | Information Needed in Guidebook | 49 |
| 13. | Comparison of Energy Consumption and Cost In School District No. 62 (Sooke) | 57 |
| 14. | Results of Retrofit Program in New Brunswick Schools | 58 |
| 15. | Money Spent on Energy Conservation via Grant as Compared to Potential Spending | 81 |
| 16. | Terra Nova Integrated School Board Calculation of Incentive - Furnace Oil November 1, 1978 to April 30, 1979 | 87 |

Table Page

17. Terra Nova Integrated School Board Incentive Report on Kilowatts 1978-79. November 1, 1978 to April 30, 1979 ..... 88

18. Terra Nova Integrated School Board Summary of Incentive by System 1978-79 ..... 89

19. Energy Conservation Activities for the St. John's Roman Catholic School Board ..... 92

# Chapter 1

## INTRODUCTION

This is a report of an internship that studied energy conservation, particularly with respect to school buildings in the Province of Newfoundland and Labrador. The underlying problem is both serious and of recent origin.

### The Energy Crisis and Conservation

Pre-industrial man depended on natural energy and on fuels that he could carry in his hands or with the help of animals. Man first lived in natural caves, and later on used stones for houses and other buildings. Then the mechanization of delivery systems and the discovery of the boiler and of electricity gave rise to the multi-storey building. Energy use has steadily increased because of easy and cheap access to energy resources. In 1977, it was estimated that the total world consumption of oil was about 20 billion barrels a year. To maintain that rate of consumption and keep reserves intact, another Kuwait or Iran would have to be discovered every three years or another Texas or Alaska every six months.[1]

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[1] Alexander McRae, Janice L. Dudes, and Howard Rowland, eds., The Energy Source Book (Maryland: Aspen Systems Corporations, 1977), p. 3.

Since the Arab embargo of 1973 the western world, and indeed the whole world, has come to the realization that conventional fuel resources are finite and that reserves are in short supply. This combined with the tremendous increase in oil prices has encouraged countries, such as Canada, to strive for self-sufficiency. The importance of this goal of self-sufficiency has been seen by every family in North America, since the rapid increase in fuel prices has hit every home.

A basic question facing Canadians is what we can do to lessen our dependence on the imported oil that is at present so necessary for our survival. One answer is to look to alternate sources. However, as pointed out by Jim Cross:

> We can harness the sun, the wind, gravity, the tides, the atoms, and the earth itself to provide our energy. There is just one problem: We cannot do it all now.[1]

The other solution or direction to follow is to conserve energy, while continuing to search for new oil resources within our own country. For years we have wasted unconscionable amounts of non-renewable resources and we therefore thought them to be cheap and reasonably available. This situation has finally led to the need for Canadians, as well as for people of all industrialized societies, to

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[1] Jim Cross, "Energy Design for New Buildings," CEEP Journal, XV (September - October, 1972), 10.

introduce measures to stop the waste of our natural resources.

Energy conservation may be considered a source of energy and no less an energy alternative than oil, gas, coal, or nuclear.[1] If the United States were to make a serious commitment to conservation, it might well consume 30 to 40 per cent less energy than it does now and still enjoy the same standard of living or even a higher one. Furthermore, conservation may be the cheapest, safest, and most productive energy alternative readily available in large amounts.

As also pointed out by Stobaugh and Yergin:

> The cost of conservation energy is very competitive with other energy sources. The possible energy savings would be equivalent to the elimination of all imported oil - and then some.[2]

The British Columbia Ministry of Education points out that "energy conservation should be given a priority equal to that accorded to stimulating additional supplies".[3]

The need to conserve energy was stressed by the Honorable Brian Peckford, Premier of Newfoundland and Labrador, in an address to the people of Clarenville in

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[1] Robert Stobaugh and Daniel Yergin, eds., Energy Future: Report of the Energy Project at the Harvard Business School (New York: Random House, 1979), p. 136.

[2] Ibid., p. 137.

[3] "Energy Conservation for Schools" (Victoria: The British Columbia Ministry of Education, 1979), p. 1.

1981. He stated:

> In the short term particularly, then, we must rely on energy conservation to reduce our demand for thermal electricity, oil and gasoline, and the reason is obvious: energy conservation gets the quickest results.
> .... the days of cheap energy are gone so there is little question that a barrel of conservation is the cheapest barrel of oil we can buy.[1]

Mr. Peckford went on to point out that:

> We must work vigorously in the months and years ahead to ensure that the day arrives when not a single barrel of oil is burned unnecessarily in this province.[2]

To achieve the goal of conserving energy, action must be taken collectively by all members of society beginning with such large users of energy as schools, offices and other buildings. Conservation is not easy to achieve since, particularly in recent years, Canadians have had an abundance of cheap fuels. Moreover, in Newfoundland many communities, hitherto without electricity or electrical appliances, have within a generation become significant consumers of electricity.

## Energy Conservation in School Buildings in Canada and the U.S.A.

Energy conservation has become a household term in North America. Different levels of government have taken measures to try to make Canada a nation self-sufficient in energy. However, it will take action by all sectors of

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[1] An excerpt from an address by the Honorable A. Brian Peckford in Clarenville, October, 1981. p. 5.

[2] Ibid., p. 8.

society if the goal of self-sufficiency is to be realized. Since society as a whole has to be taught why to conserve and how to conserve energy, the school is a logical place to start. Schools themselves are paying high energy bills and are under pressure to use less electricity, natural gas, heating oil and gasoline. It seems resonable that schools adopt a policy of energy conservation to save money, to conserve energy resources, and to set a good example.

Both in Canada and the United States studies of school buildings have been carried out to save energy and money for school boards. A 1979 summary of American and Canadian studies of energy conservation in schools revealed that:

> Canadian schools use approximately 11 per cent of the total energy used for heating, lighting, and transportation in Canada. This includes some 8 million barrels of oil and 24.6 million cu. ft. of gas....
>
> United States schools paid an energy bill of about $3.2 billion in 1977. Average energy consumption per unit of floor area is reasonably close to that of Canadian schools....
>
> There is potential for all schools to save energy. Alberta and British Columbia studies agree that savings of at least 20% are possible by improving operating procedures and by making minor alterations. Better designed schools can cut individual bills by at least 50%, according to an Alberta study.[1]

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[1] Energy Conservation in Schools: Review of Canadian and U.S. Studies, Surveys, Programs and Publications (London: Chorley & Bisset Ltd., 1979), pp. 5 - 9.

These facts reveal that the "lamp of learning burns oil (energy)" and that "the education enterprise can make a real contribution" in conserving energy.[1]

To help conserve energy, school boards can approach both the building envelope itself and the users. There is little doubt that most of today's school buildings were built at a time when the initial cost rather than life-cycle costing was the rule of the day. As a result, many schools are energy inefficient since heating and lighting were low-cost items at the time they were built. Thus one should consider what action can be taken to make existing buildings energy efficient, particularly since very few new schools are being presently constructed.

A study was completed in March 1976 by Whitworth[2] on possible ways of conserving energy in Canadian schools. The main concern of the report was to obtain suggestions for translating changing educational requirements and community needs into appropiate school facilities which are designed or changed to be cost beneficial, and to hoard energy.

Whitworth[3] presented the following information:

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[1] Fred E. Whitworth, The Conservation of Energy in Schools: A Feasibility Report (Ottawa: The Canadian School Trustees Association, 1976), p. 2.

[2] Ibid., p. 3.

[3] Ibid., p. 10.

| Some Changes to be Effected | Possible Savings in Energy Used |
|---|---|
| 1. Increase insulation in ceiling and walls, caulking windows, etc. | from 20% to 40% or even 50% |
| 2. Shut off exhaust fans 3 PM to 7 AM | 40% |
| 3. Hold maximum intake and shut-off fan | 50% |
| Reduce intake by 50% | 14.5% |
| 4. Reduce glass area 35 to 17% | 4% |
| 28 to 10% | 9.8% |
| 18 to 10% | 1% |
| 5. Cut lighting wattage 15% | 2.4% |
| 6. Heat recovery system (80% efficient) | 18% |
| 7. Double glazing | 12 to 13% |
| 8. Reduce temperature to 60° 3 PM to 7 AM (depends on heating system, insulation, etc.) | |
| 9. Close school for January | 2% to 24% (if heating system drained, etc.) |
| 10. Adopt a 4 day week in Jan. and Feb. | 0.7% |
| 11. Adopt 4 day week all year plus one extra hour school | 0.7% |
| 12. Start school at 10 AM | 2.4% |
| 13. Start school at 11 AM | 5.2% |
| 14. Reduce temperature 75° to 70°F | 17.1% or 3.4% per degree |
| 15. Reduce outdoor intake 25% to 12.5% | 3.4% (or more according to temperature) |

Furthermore, Whitworth suggested that costs can be cut by:

1. turning off lights when not in use;
2. using fluorescent lights rather than bulbs;
3. using a large bulb rather than 2 or 3 small ones;
4. installing fluorescent lights in panels or bands - use only what you need;
5. installing a photoelectric control so as to obtain more efficient photoelectric switching;
6. avoiding the mishandling of the ventilator so as to make sure it is doing the job for which it was installed. It can be used for cooling as well as recirculating the interior air;
7. using thermostatic control;
8. recaulking doors and windows when necessary;
9. checking insulation on steam, hot water and chilled water pipes;
10. keeping equipment clean. Dust can reduce efficiency by 25% or more. Lamps, reflectors and shades should be cleaned or replaced. Clean or replace air conditioning and other filters. Leaking faucets and radiators should be repaired;
11. considering air condiitoning as a possible economy in new buildings. This is particularly pertinent for schools used the year around, or with hot humid weather, or in a city centre;
12. assisting teachers to become energy conscious.[1]

The above list is not complete. It does suggest a number of worthwhile steps that can be taken to conserve energy. However, the steps should be taken only after considering each school building on its own merit. According

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[1]Ibid., pp. 11 - 12.

to Whitworth, preventive maintenance can provide savings of 25% to 30% of the total energy cost.[1]

## The Importance for Newfoundland and Labrador Schools to Conserve Energy

Although Newfoundland is a net exporter of energy, 76% of the province's total primary requirement is met through imported petroleum products. The remainder of the demand is met primarily by electrical energy, 43% of which is thermally generated in oil-fired power plants. By 1985, the demand for electrical energy on the Island is expected to be 320 million kilowatt hours greater than the supply from existing electric power plants and those under construction.[2] This deficit is forecast to reach 2,519 million kilowatt hours in 1990.[3] However, these forecasts and the resultant costs can be reduced significantly by adopting appropriate energy conservation policies, including those applicable to school buildings.

Up to now little has been done in this province to make school buildings energy efficient. Schools were built at the cheapest cost because of the lack of proper funding. They were built when the prices of electricity

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[1] Ibid., p. 11.

[2] These figures were provided in a three page brief by the Department of Mines and Energy of Newfoundland. p. 1

[3] Ibid., p. 1.

were very low and energy conservation not a priority. Governments and boards were more interested in installing in schools the amenities of lights and hot water than in thinking about conserving energy. However, the days of low prices for fuel and electricity are gone. It is now important to become energy conscious with respect to school buildings, both in the constructing of new schools and the renovating of older ones. The school energy bill is a major one. The past four years, as indicated in Table 1, have seen the cost of heating and lighting sky-rocket to a point where schools might perhaps have been closed if the government had not intervened by increasing the operational grant.

Table 1

The Importance of Energy Costs
in School Board Operations

| Year | Provincial Operational Grant | Energy Costs $ | Percentage of total |
|---|---|---|---|
| 1981-82 | 29,900,000 | 13,000,000 | 43 |
| 1980-81 | 27,373,000 | 10,000,000 | 37 |
| 1979-80 | 25,376,000 | 8,000,000 | 32 |
| 1978-79 | 23,480,500. | 7,000,000 | 30 |

Sources: Column 1: Detailed Budget Estimates 1978-81.

Column 2: Provided by Allister W. Taylor, Department of Mines and Energy.

Table 2 indicates for 1981-82 the impact of heat and light as compared to other costs.

Table 2

Distribution of Costs Incurred by School Boards, 1981-82

| Item | Cost ($) | Percentage of total |
|---|---|---|
| Operational and Maintenance | 14,000,000 | 39.7 |
| Heat and Light | 10,000,000 | 28.3 |
| Instructional Materials and Interest Cost | 6,600,500 | 18.7 |
| Administration | 4,700,000 | 13.3 |
| Total | 35,300,500 | 100.0 |

Source: These figures were provided by the Department of Mines and Energy of Newfoundland.

This breakdown reveals that energy cost is the second highest item confronting school boards. The figures contained in these two tables illustrate the importance of controlling the cost of heating and lighting, since money saved in this area can be used to defray other costs of school boards in desperate need for extra money.

Studies of school board financing in Newfoundland have recognized the importance of heating and lighting to their budgets. A study in 1979 made the following recommendations:

> Recommendation #11
> That a supplementary grant be made to school boards whose light and heat costs exceed the provincial average. The grant to be 75% of the amount that actual light and heat costs exceed the average cost per square foot for light and heat for all schools in the province....
>
> Recommendation #12
> That the per pupil operating grant for schools in Labrador, excluding those in the nine communities designated under the Native Peoples Agreement, be 15% higher than for the remainder of the province.[1]

A recent study undertaken by the Federation of School Boards again recognized the importance of controlling the cost of heating and lighting for school boards and made the following recommendations:

> Recommendation #8
> That the budget for Operations and Maintenance be determined in all sectors - Janitorial salaries and benefits, maintenance, heat and lights, telephone, travel, snow clearing, etc., using recent costs and approved cost estimates for the next budget year....
>
> Recommendation #15
> That the government of Newfoundland and Labrador pay operational grants to school boards, based on the following formula for each board - 80% of net school tax potential.[2]

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[1] The Government Committee Established to Study Board Financing, Study of School Board Financing (St. John's: Government of Newfoundland and Labrador, 1979), pp. 27, 32.

[2] Federation of School Boards of Newfoundland, School Board Financing for the 80's (St. John's: Federation of School Boards of Newfoundland, 1981), pp. 42, 47.

These reports recognized the tremendous cost of heating and lighting to school boards. Energy conservation offers some assistance to this province. This is not to suggest that energy conservation is the panacea for all financial problems facing school boards. On the other hand, it is clear that energy consumption in this province is high and any reduction would ease the financial situation of school boards.

## The Internship

To become thoroughly acquainted with the application of energy conservation measures to school buildings, the writer became an intern with the Energy Branch of the Department of Mines and Energy, an agency that had been assigned by the Government of Newfoundland and Labrador to conserve energy in public buildings. From April 1, 1982 to August 31, 1982 the intern was completely immersed in those activities of the Department relating to school building energy conservation. The details of the internship, the specific objectives, and the means by which each was accomplished, are set forth in the next chapter.

## Chapter 2

## THE INTERNSHIP EXPERIENCE

An internship is intended to promote and develop professional administrative competence and skill by assigning the intern meaningful tasks to fulfill. This experience will enable the intern to apply his academic preparation to develop effective and meaningful administrative behavior.

To complete the Master of Education degree in Educational Administration, an internship may be undertaken. The Department of Educational Administration at Memorial University identifies three major types of acceptable internships:

1. The diversified internship emphasizes experiences in a variety of areas resulting in a broader scope or experience of educational administration.
2. The specific internship emphasizes experiences that are more finite, focusing on one particular area of administration.
3. The integrated combines both the diversified and the specific.[1]

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[1] "A Descriptive Statement of the Internship in Educational Administration" (St. John's: The Department of Educational Administration, Memorial University of Newfoundland, December 1974), p. 8.

This internship has made use of the integrated approach in that personal knowledge has been obtained as a result of close communication with school boards and other educational agencies within the province. As well, in-depth study has been carried out in the area of energy conservation specifically with respect to school buildings.

## Placement and Duration

The intern worked with the Energy Branch of the Newfoundland Department of Mines and Energy under the supervision of Mr. Allister Taylor, Internal Energy Conservation Co-ordinator. The internship lasted from April 1, 1982 to August 31, 1982. This agency was chosen because of the mandate it had been given by the provincial government with respect to energy conservation in public buildings including schools, because it had collected a number of resource materials in the area of energy conservation, and because no other agency at the provincial level had taken any direct leadership in this area. Furthermore, it was contemplating producing a guidebook for school boards in the province.

The internship focussed largely on this guidebook, with the intern assisting in its production. This involved researching the literature, collecting materials from across Canada, assisting with the development, distribution and returning of a questionaire to the

province's school boards, interviewing a number of school board business managers across the province as a follow-up to the questionnaire, interviewing officials of the Department of Education, the Denominational Educational Committees and the Federation of School Boards of Newfoundland. These activities brought the intern into direct contact with those responsible provincially and locally for the construction and operation of school buildings. Insight was provided into the total process of developing and implementing energy conservation programs for schools.

## Objectives

The objectives specified for the internship were as follows:

1. To help compile a questionnaire for school administrators to gauge the extent to which school boards are engaged in energy conservation. This would provide information for the proposed guidebook.
2. To collect and compile information on energy conservation in schools from other provinces. This information would be helpful for the proposed guidebook, and provide ideas about how to proceed with energy conservation in our schools. A tentative outline of the guidebook had already been considered by the Department. (See Appendix A).

3. To compile for the use of school board officials and others, a list of worthwhile reference materials related to energy conservation in schools, together with the addresses from which they might be obtained.
4. To report on specific energy conservation strategies which have been implemented in other Canadian provinces.
5. To identify and report the policies and programs of the following agencies:
   a. Government of Newfoundland and Labrador - Department of Mines and Energy.
   b. Government of Newfoundland and Labrador - Department of Education.
   c. Denominational Education Committees.
   d. Federation of School Boards of Newfoundland.
6. To identify and report on the programs of selected school boards in Newfoundland, in terms of their effectiveness in the area of energy conservation.
7. To make a series of recommendations for energy conservation in the schools of Newfoundland and Labrador.

## Methodology

To achieve the objectives listed above, the following were arranged as suitable major strategies:

1. The development of a questionnaire to be answered by school board administrators. The intern's involvement was one of assisting the department with the actual

wording of the questionnaire, with its distribution and return, and with the tabulation of results.

2. The collection of material for the proposed guidebook. Prior to this several discussions had taken place with Mr. Taylor in an attempt to define clearly the nature of the book and its purpose. Material was collected by:
   a. Sending letters to all provincial Departments of Education and Departments of Mines and Energy;
   b. Interviewing selected school board business managers in the province.
3. The compiling of a list of reference materials related to school boards. This was ongoing and was an outcome of the other activities.
4. The obtaining of information programs and strategies in other provinces. This was accomplished by reviewing materials in the Department's collection, by research carried out in the library at Memorial University, and, especially written correspondence with officials in Education and other departments of government in this and in other provinces.
5. The obtaining of information on the policies and programs of Newfoundland agencies. The intern interviewed either by telephone or in person a member of each of the following agencies:

a. Department of Education

b. Federation of School Boards of Newfoundland

c. Denominational Education Committees

d. Department of Mines and Energy.

6. The review of the energy conservation programs of individual school boards. Here, the main purpose was to quantify where possible what had been done in this province in the area of energy conservation. This was accomplished by the questionnaire, by personal interviews with school board business managers, and by telephone. The twenty-seven questionnaires returned provided the basis for the follow-up.

7. The formulation of recommendations for energy conservation. The recommendations are based on the information and the insights gained by the intern during the course of the internship.

## Delimitations

The internship was delimited to energy conservation in school buildings operated by school boards. It did not deal with energy conservation as it related to school busses in the province. Nor did it study the users of school buildings. Particular emphasis was placed on the production of a guidebook for school board personnel.

## Definitions

Several of the technical terms used in this report require definition.

### Building Envelope

All external surfaces of buildings that are subject to climatic impact; for example, walls, windows, roofs, and floors.

### Building Profile

A single file that gives detailed information on a school building including a photograph of the building, its square footage, its mechanical structure, its equipment related to energy, the age of the building, its structural material, and any other information relevant to energy consumption.

### Energy Audit

An energy audit is intended to identify areas of energy waste in the building and may take one of two forms- a mini-audit or a maxi-audit. The mini-audit is intended to provide the basis for the initial energy conservation program. The maxi-audit provides the basis for a more sophisticated and long term energy conservation program.[1]

### Energy Conservation

The eliminating of needless waste of energy and using what is needed as efficiently and practically as

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[1]Planning and Research Branch, Guidelines for Conserving Energy in Schools (Edmonton: Planning and Research Branch, Alberta Education, 1978), p. 9.

possible. The principal aim of energy conservation is the better utilization of energy to increase the efficiency of energy use and to reduce the rate of growth in consumption of conventional energy, while maintaining acceptable standards of living and of the environment.

Energy Guidebook

A consolidation of information related to energy conservation in schools in an attempt to systematically initiate conservation activities.

Life-Cycle Costing

The cost of a building over its entire life, including operating and maintenance costs, as well as the initial costs of construction.

Maxi-Audit

Usually a mini-audit will provide enough information to allow the design of the initial energy conservation program. After obvious building defects have been taken care of, a maxi-audit - a more thorough inspection of the building - should be completed by a mechanical engineer or someone experienced in energy audits.[1]

Micro-System W7000

An electronic load shedding device that is fitted into the existing electrical wiring within a building. It can be used to control: air conditioning units and exhaust fans, interior and exterior lighting, compressors and other

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[1]Ibid., p. 9.

refrigerator equipment, electronic heating equipment, electric water heating, disposals and compactors.

There are three load control functions available in the W7000 System which work to lower consumption and limit demand. These include: Time-of-Day Programming, Demand Limit Control, and Duty Cycling. Demand Limit Control reduces the peak rate of electrical energy usage. Duty Cycling reduces unnecessary operation of equipment and also increases equipment efficiency. The Time-of Day Programming allows one to individually program precise OFF and ON times for energy consuming devices with different programs for each day of the week.

Mini-Audit

A mini-audit amounts to a walk-through inspection of the building while taking notes of obvious building deficiencies.[1]

Night-Set Back

An electronic device attached to the furnace so as to program the reduction of the building's temperature automatically at night or when the building is not in use.

Peak Load Control

An electronic device used to control the peak kilowatt load in a building.

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[1]Ibid., p. 9.

Retrofit

A space-age term, describing the upgrading of a complex system through the insertion of improved components. In buildings, it generally means changes in equipment and structure to improve thermal and lighting efficiency,[1] in other words, the changing of the physical or mechanical structure of a building for the sole purpose of conserving energy.

School Planning Manual

A manual designed by the Department of Education to serve as a guide to school board personnel and their consultants in designing new school buildings.

True Payback

The time required for the accumulative net benefits derived from an investment to pay back the investment cost considering inflation and the true value of money, as opposed to Simple Payback, which is the length of time necessary for the cumulative benefits or savings resulting from an investment to recover the original cost of the investment, not considering inflation or the time value of money.[2]

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[1]Robert Stobaugh and Daniel Yergin, eds., Energy Future: Report of the Energy Project at the Harvard Business School (New York: Random House, 1979), p. 169.

[2]The Royal Architectural Institute of Canada, Energy Economics and Life Cycle Costing (Ottawa: Hanscomb Roy Associates, 1980), glossary.

## Abbreviations

ASHRAE - American Society of Heating, Refrigeration and Air-Conditioning Engineers.

ATA - Alberta Teachers' Association.

CEFP - Council of Educational Facility Planners.

SEEDS - Society, Environment and Energy Development Studies.

## Overview

The report thus far has dealt with the rationale for the study and its objectives. The remainder of the report will discuss the actual work of the intern as to the degree to which the objectives were achieved. Chapter 3 reports the intern's activities with the Department of Mines and Energy in connection with the questionnaire and its analysis, the interviews with school board business managers, and the guidebook. Chapter 4 describes school building energy conservation programs in other provinces. Chapter 5 sets forth a list of publications selected for possible use by school officials, while Chapter 6 describes the roles of various educational and governmental agencies in Newfoundland and Labrador with respect to school building energy conservation. Then in Chapter 7, the final chapter, the intern makes some recommendations about energy conservation in the province's schools. This chapter also includes an evaluation of the internship.

Chapter 3

## ACTIVITIES AT THE DEPARTMENT OF MINES AND ENERGY

The Department of Mines and Energy has been mandated an important role with respect to energy conservation in the schools of the province. This is verified by a Minute of a Meeting of the Committee of the Executive Council of Newfoundland dated 8th. March, 1976 which assigned to the Department the responsibility for the

> Review and amendment of housekeeping practices for all provincial buildings, including schools and rented accommodation, including the examination of areas ranging from cooling and heating levels, heating plant efficiency and the lighting of unoccupied space to wastage of paper (a particularly energy intensive product) and the possibilities for paper recycling.[1]

Although this does not establish control of energy conservation by the Department of Mines and Energy, it does establish a basis for possible leadership in conjunction with the Department of Education. The question still remains as to how the Department should get involved.

Prior to the internship it had been decided that the Department would explore the feasibility of preparing

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[1]A Copy of "A Minute of a Meeting of the Committee of the Executive Council of Newfoundland", March 8th., 1976, ME 9 - 76.

for school boards an energy conservation information package, or guidebook. As indicated previously the intern participated in the preparation of the guidebook by assisting with a preliminary questionnaire to school boards and by conducting follow-up interviews with a number of business managers. In this chapter are presented some of the findings from the questionnaire and from the interviews. Also reported from the questionnaire are the wishes expressed with respect to the format and context of the proposed guidebook.

## The Questionnaire

The questionnaire was designed to provide information that would assist the Department in developing the guidebook, which in turn would guide boards in introducing appropriate energy conservation measures. The questionnaire sought detailed and comprehensive information about such matters as the current energy situation of boards, their involvement in conservation, their attitudes, and their wishes with respect to the guidebook itself.

The questionnaire was sent to the superintendents and business managers of the province's 35 school boards, a total of some 70 persons. Responses were received from 27 boards. In almost all cases boards decided to return just one questionnaire, completed by the business managers. In

the case of one board the questionnaire was completed by the Director of School Planning and Maintenance. As indicated in Table 3, responses were distributed more or less evenly among boards classified according to the number of schools.

Table 3

Response Rate

| Classification of boards by number of schools | Boards receiving questionnaires | Boards returning questionnaires |
|---|---|---|
| 40 or over | 3 | 1 |
| 30 - 39 | 3 | 3 |
| 20 - 29 | 6 | 6 |
| 10 - 19 | 17 | 13 |
| 0 - 9 | 6 | 4 |
| Total | 35 | 27 |

It is not the intent of this report to give a detailed analysis of the questionnaire since that is the responsibility of the Department of Energy and not the role of the intern. However, certain findings of the questionnaire are valuable for this report since the intern wishes to establish information on energy conservation in our

schools. These findings deal with the energy awareness of boards including the extent to which they have taken advantage of the provinces's energy conservation grant, their opinions or attitudes about conservation, and their sources of information.

Energy Awareness

Table 4 indicates the extent to which boards are aware of energy conservation in their school buildings. The numbers and wording of the questions in this and subsequent tables are those of the questionnaire. As indicated, school boards are very much aware of the need to conserve energy in school buildings.

Table 4

Energy Awareness Among 27 School Boards

| Question # | | No. of Responses Yes | No |
|---|---|---|---|
| 16. | Is energy conservation considered when renovating? | 25 | 2 |
| 17. | Have any renovations been done to your school solely for the purpose of energy conservation improvements? | 17 | 10 |
| 19. | Are future energy costs and energy consumption considered by the board when plans are developed for new school construction? | 26 | 1 |
| 20. | Does your board require architects/ consultants to incorporate energy conservation features into their new building designs? | 24 | 3 |

Twenty-five of the 27 respondents considered energy conservation when renovating, 26 when considering new buildings, with 24 requiring architects to incorporate conservation features into new building designs. Seventeen had carried out renovations solely for the purpose of energy conservation. Furthermore, to verify this, the intern in interviewing school board managers reviewed specifications of plans of schools where energy conservation was included. However, one wonders how important "first cost" was in determining the importance of energy conservation to the boards.

Table 5 indicates that 17 of the 27 boards responding have taken advantage of the energy conservation grant provided by the Department of Education.[1]

Table 5

Energy Conservation Grant

| Question # | No. of Responses | |
|---|---|---|
| | Yes | No |
| 21. Has your board taken advantage of the Department of Education's Energy Conservation Grant? | 17 | 10 |

[1] A personal letter to the intern from the Supervisor of Grants with the Department of Education indicated that 18 of the province's 35 boards had applied for and received assistance for energy conservation for the 1981-82 fiscal year, including 13 of those who completed the questionnaire. (See Appendix C).

Attitudes and Opinions About Energy Conservation

In Table 6 are displayed the responses by the twenty-seven school board officials to thirteen questions dealing with their opinions or attitudes about energy conservation.

Table 6

Attitudes and Opinions toward Energy Conservation

| Question # | | No. of Responses | |
|---|---|---|---|
| | | Agree | Disagree |
| 24. | The main energy problem confronting school boards is increasing prices. | 25 | 1 |
| 25. | Energy is a minor cost item in a school board budget. | 2 | 25 |
| 27. | Energy conservation is not pursued more vigorously at the school board level because administrators are tied up with more pressing problems. | 13 | 14 |
| 28. | Too much time is required to develop an energy management system for our school board. | 9 | 16 |
| 29. | There is not much potential dollar savings from higher energy efficiency. | 2 | 25 |
| 30. | The cost of energy conservation improvements is greater than the savings and is therefore not economically justified. | 4 | 22 |

| Question # | No. of Responses | |
|---|---|---|
| | Agree | Disagree |
| 31. There is no incentive to save energy dollars because if we reduce our energy consumption, energy suppliers will only increase their prices to us. | 7 | 18 |
| 32. Architects and Engineers are not providing school boards with energy efficient building designs. | 9 | 16 |
| 33. The lack of precise information is the major reason for not undertaking energy conservation projects. | 13 | 12 |
| 34. Energy conservation should be the concern of the government and not the school boards. | 1 | 26 |
| 35. The initial capital outlay necessary to build energy efficient school buildings is too high and therefore not cost effective. | 10 | 16 |
| 36. School boards do not have the capital necessary to undertake energy efficiency improvements to their buildings. | 27 | 0 |
| 37. Motivation and collaboration of the school population is not an important factor in the conservation of energy. | 2 | 24 |

From Table 6, these officials are generally highly concerned about the costs of energy. In responding to question 24, twenty-five of the 27 respondents agreed

that increasing prices was the main energy problem confronting school boards, while, from question 26 there were only two agreeing that energy was a minor cost item in the school board budget.

There was high agreement on the cost effectiveness of energy conservation measures. In question 29, twenty-five respondents indicated their belief in potential savings from higher energy efficiency, while in question 30, twenty-two disagreed with the proposition that the cost of energy conservation improvements are greater than the savings.

Twenty-six believed that energy should be the concern of both government and school boards, with 24 disagreeing with the proposition that motivation and collaboration of the school population is not an important factor in the conservation of energy.

Several obstacles to energy conservation were frequently checked. All 27 agreed there was a lack of capital to undertake energy efficient improvements. Thirteen indicated the involvement of administrators with more pressing problems, and the lack of precise information about conservation measures. Ten indicated the high initial cost of energy efficient buildings. Nine agreed that too much time was required to develop

an energy management system, and nine indicated that energy efficient building designs were not being provided by architects and engineers.

Sources of Information

If energy conservation is to be a priority, information has to be readily available. Table 7 indicates that 18 of the 27 respondents have in the past required information on energy conservation.

Table 7

Information

| Question # | No. of Responses Yes | No |
|---|---|---|
| 38. Have you required information on energy conservation in the past? | 18 | 9 |

Table 8 indicates that for the 18 respondents who required information, there was no single source of information. Although the Department of Education has an energy conservation grant, only 3 respondents would send there for information on energy conservation. Only eight would send to the Department of Mines and Energy. Most would get information from other school boards and from utility companies or oil suppliers. There seems to be a desire for information about energy conservation but no agency is recognized as exercising leadership in

providing it.

Table 8

Sources of Information
(N = 18)

| Question # | No. of Responses | |
|---|---|---|
| | Yes | No |
| 39. When you require information on energy conservation, where do you send for such information? | | |
| Other school boards? | 13 | 5 |
| Department of Education? | 3 | 15 |
| Department of Mines and Energy? | 8 | 8 |
| Utility companies, Oil Suppliers? | 12 | 6 |
| Others? | 2 | 16 |

Summary

The response to the questionnaire was reasonably good, although one would have hoped that on such a timely topic all boards would have responded. However, the interest displayed seems to warrant leadership from some government agency either in the Department of Mines and Energy or in the Department of Education. There seem to be four major problem areas - information, time, funding, and leadership.

## Interviews With Business Managers

As a follow-up to the questionnaire it was felt that direct contact through interviews should be made with as many school boards as possible, particularly those which had indicated some involvement in the area of energy conservation. The objectives of the interviews were three:

1. To obtain further information on projects and activities that school boards had undertaken in the area of energy conservation and, where possible, to document such information.
2. To obtain further information on the major obstacles to energy conservation projects and programs for schools.
3. To discuss in detail programs that could be undertaken to make our schools more energy efficient.

Boards were selected on the basis of information provided through the questionnaire, follow-up telephone conversations that indicated their willingness to provide details, their similarities to other school boards in the province with respect to the size of their boundaries and their number of schools. Their location was also a factor in easing travel and keeping

cost to a minimum.

Having been selected on these criteria, six boards were visited from July 12 - 16, namely, The Notre Dame Integrated School Board, The Terra Nova Integrated School Board, The Gander-Bonavista Roman Catholic School Board, The Green Bay Integrated School Board, The Deer Lake Integrated School Board, and The Humber-St. Barbe Roman Catholic School Board. The Avalon Consolidated Integrated School Board and the Seventh-Day Adventist School Board had been visited earlier. The Roman Catholic School Board for St. John's was visited after the trip. Because of the holiday period, the intern was unable to reach several other boards during the week of visitation.

The findings of the interviews will be discussed under the seven questions which were asked each business manager.

1. Would you describe briefly the history of your board's involvement in the area of energy conservation?

Every board indicated that it had been conscious of the need to conserve energy ever since the increase in fuel prices during the late seventies. However, the degree of involvement varied significantly from board to board with the Terra Nova Integrated School Board perhaps indicating the greatest amount of leadership in energy conservation activities. This was verified by the fact that most of

the other boards that were undertaking, or had undertaken, energy conservation activities did so from the example set by the Terra Nova Integrated School Board.

The major energy conservation activities of school boards included:

Insulation for walls and roofs
Windows (new and storm windows)
Caulking
Weatherstripping
Night-Set Back devices
Micro-System W7000.

The main emphasis was on the installation of micro-systems initially tried by the Terra Nova Integrated School Board under the direction of its former business manager, Mr. Sterling Norris. To date, at least seven W7000 systems have been installed in schools under the Avalon Consolidated Integrated School Board, the Green Bay Integrated School Board, the Terra Nova Integrated School Board, and the Gander-Bonavista Roman Catholic School Board. Other boards have been considering the system but have not been able to find the necessary funds.

Although boards had installed these micro-systems and initiated other projects, they were not able to document their effects on energy consumption without going back through their records. However, the intern was able to review documentation for one system, as indicated in Table 9.

Table 9

Demonstration of Peak Load Control and Night-Set Back
High School - All Electric

| | Actual KW H Demand | | Actual KW H | | Actual Cost | |
|---|---|---|---|---|---|---|
| Month | 1979-80 | 1980-81 | 1979-80 | 1980-81 | 1979-80 | 1980-81 |
| July | 122.9 | 245.9 | 18912 | 29786 | $ 1859 | $ 2438 |
| August | 94.6 | 75.6 | 11820 | 19898 | 1740 | 2249 |
| September | 132.4 | 104.0 | 18439 | 23640 | 1928 | 2231 |
| October | 255.3 | 302.6 | 39242 | 32623 | 2410 | 2571 |
| November | 293.1 | 288.7 (1) | 65719 | 52008 | 3183 | 2458 |
| December | -E | 293.1 | 66192E | 63829 | 3232 | 2830 |
| January | -E | 302.6 | 81600E | 101652 | 3481 | 3624 |
| February | 472.8 | 312.0 | 186,260 | 88800 | 5932 | 3354 |
| March | 472.8 | 325.0 | 120,091 | 76121 | 4318 | 3286 |
| April | 368.8 | 325.0 | 98342 | 76121E | 3799 | 3240 |
| May | 331.0 | 302.6 | 71393 | 69974 | 3313 | 2993 |
| June | 293.1 | 302.6 | 63828 | 39242 | 3084 | 2318 |
| | 472.8 Peak | 325.0 Peak | 841,838 | 673,694 | $38,279 | $33,592 |

Source: This Table was supplied by Mr. Sterling Norris of the BAE Group, 53 Bond Street, St. John's, Newfoundland.

The boards said that later, when more time was available, the necessary information could be obtained. The consensus was that in the case of the W7000 the pay-back of the initial cost would be between two to three years. The cost of a W7000 installed was between $14,000 and $16,000.

Table 9 is based on a W7000 micro-system installed in a high school in Newfoundland with an enrollment of about 500 students and about 47,000 square feet of space. The following information is derived from the table:

1. The actual KW H demand was reduced from 472.8 in 1979-80 to 325.0 in 1980-81. This was a reduction of about 147.0 KW H monthly at $3.50 per KW H or $514.50 per month.
2. Due to the installation of Night-Set Back Systems the KW H was reduced from 841,838 to 673,694 for a difference of 168,144 KW H annually.
3. The power bill for 1980-81 was actually $33,592. It would have been about $42,000 for a saving of $8,408.[1]

As a point of clarification one should point out that electricity billing for schools is based on peak demand and annual KW H consumption. The peak demand is decided by the highest KW H month for the year. Thus it is important that schools not allow the demand to rise abnormally for any particular month since the next year's

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[1]This information was supplied by Mr. Sterling Norris of the BAE Group, 53 Bond Street, St. John's, Nfld.

billing will be based on that particular month.

2. What energy conservation program does your board have in place at the present?

No board had a written policy or program for energy conservation for its school system. There was a general understanding among school board administrators that energy conservation was to be practised by the users of the buildings and also to be considered by the boards when renovating or when constructing new schools. The degree of action varied from board to board. However, most boards had issued guidelines to school principals and maintenance personnel. No monitoring had been done to determine the effect of this program on the total energy consumption, except in the case of a couple of boards which had introduced incentive programs whereby a percentage of the savings in dollars was returned to the individual schools which saved energy. The intern received documentation of those incentive programs which were discontinued after one year because of a lack of funds and because they were not equitable for all schools.

3. Do you have an accounting system for energy consumption for your school buildings as well as a separate building profile for each school building?

With the exception of one, every board interviewed had a separate accounting system for heating and lighting for <u>each school</u>, either on a monthly or a yearly basis. In fact most boards had an account on a

monthly basis showing consumption and dollars separately. Probably the board with the most detailed and efficient accounting system was the Roman Catholic School Board for St. John's. This was because it had a computer system that could give read-outs on a daily, weekly, monthly and yearly basis.

With respect to building profiles, most boards did not have a separate file for each school building. They did have information on individual buildings in one or more files for all schools. By a building profile is meant a single file that gives detailed information on a school building including a photograph of the building, its square footage, its mechanical structure, its equipment related to energy, the age of the building, its structural material, and any other information relevant to energy consumption. It should be kept in mind that this section of the report deals mainly with the nine boards interviewed, although the points made here were confirmed by those boards responding to the questionnaire, as indicated by Table 10.

4. What do you think about the idea of a guidebook for school administrators in the area of energy conservation?

The idea of a guidebook was most welcomed by all school boards. Some felt that it was long overdue and were

Table 10

Energy Management Steps Taken by School Boards

| Question # | | No. of Responses | |
|---|---|---|---|
| | | Yes | No |
| 7. | Has your board established a separate accounting system for energy consumption and energy cost for all school buildings? | 19 | 8 |
| 8. | Has your board designated a person or committee to develop and implement an Energy Management Program for your school board? | 8 | 19 |
| 9. | Has your board developed a file for each building under your jurisdiction which contains all vital building characteristics (e.g. square footage, classroom sizes, window area, construction materials, etc.) | 9 | 18 |
| 10. | Have energy conservation guidelines been drawn up by the board for maintenance and school personnel to follow? | 14 | 13 |

interested in seeing some agency at the provincial level getting involved in energy conservation. They felt that a lack of information is a major drawback to energy conservation in schools. To solve this problem, the business managers felt that some agency should take a leadership role in the area of energy conservation with one of the main objectives being to supply pertinent information to the schools.

The main concerns about the guidebook as expressed by business managers were:

a. It should be completed as soon as possible.

b. It must be practical, with actual samples of energy conservation projects.

c. It should be open-ended so it can be added to when necessary.

d. It must not be an end in itself but must be a part of a total energy program for schools.

e. Eventually funds must follow the guidebook.

5. What do you feel about the grant given for energy conservation to school boards by the Department of Education?

The consensus was that the grant was helpful and should not be taken away. However, they felt it had

a number of drawbacks:

a. It was an isolated thrust rather than part of a total energy management program.

b. Many boards could not afford to use the grant since it was on a 50/50 basis.

c. Some boards did not have the expertise to develop energy conservation activities on a cost effective-basis.

d. There should be a time limit for applications so that money budgeted for boards that did not apply might be awarded to those that did.

e. There was a need to establish guidelines for the use of the grant.

6. What are the major obstacles to energy conservation in the schools?

The business managers interviewed confirmed the major findings from the questionnaire as reported earlier in this chapter. They mentioned as major obstacles the lack of money, the lack of precise information, and the lack of leadership at the provincial level. They indicated that some boards did not have the expertise to take on energy conservation retrofitting activities. They also mentioned the difficulty of obtaining information applic-

able to the different climatic areas of the province. This is particularly true for the northern regions of the province.

7. Do you have any suggestions for an energy conservation program for schools across the province?

It was generally agreed that energy conservation in schools should be co-ordinated from the provincial level by the Department of Education or the Department of Mines and Energy, or by both. However, the provincial role should be one of providing leadership in the form of information, expertise, and funding. With respect to funding it was felt that the energy conservation grant was a step in the right direction, although, as was pointed out in question 6, changes need to be made in that grant.

Furthermore, they pointed out that energy auditing should be done for all boards in the province in order to establish a priority list for energy conservation activities. This service should be provided at the provincial level. However, they were quick to point out that action could be taken by individual school boards to conserve energy, without financial assistance by the government, particularly in the area of preventive maintenance.

Retrofit projects should be taken only after the users of the buildings had taken all possible steps to conserve energy. In any event, it was pointed out that if any energy conservation program is to be successful,

then total involvement by all groups associated with the schools must be forthcoming. These groups include the teachers, the students, the maintenance personnel, the school administrators, and any other group that may use school buildings.

Summary

While there was insufficient time to visit all school boards, the interviews that were conducted with the business managers yielded valuable information. From the interviews the following observations are possible:

1. School boards do not have total management programs for their districts.
2. The boards seem to be looking for leadership at the provincial level.
3. Boards believe that energy conservation can save money. Some indicated that it should be a top priority for boards since it is the only cost item that can be manipulated.
4. It was clear that activities in the area of energy conservation at the board level, were motivated more by dollars than by commitment to the conserving of energy.

5. There is a lack of evaluation of activities taken for the sole purpose of energy conservation. The business managers felt that if the success of a particular project were communicated to all boards, it would motivate other boards to take action.

## The Guidebook

The main objective of the Department of Mines and Energy with respect to energy conservation in school buildings, is to develop a guidebook for school board personnel to assist them in conserving energy. The tentative outline for such a guidebook had already been drawn up by Mr. Taylor, based on research across Canada and from his own involvement in energy conservation in this province.[1] The basic problems were to get information from school boards about what they wanted from such a guidebook and to include in it materials that would be relevant to this province.

## Role of the Intern

The intern's role with respect to the guidebook involved the collection of materials from library research, from the questionnaire, and from personal contact with school boards. It was not the intention of the intern to develop the guidebook since this would take much more

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[1] A copy of this outline is contained in Appendix A.

time than the internship would allow.

Tables 11 and 12 from the questionnaire, give some specific guidance for the guidebook.

Table 11

Format of Guidebook

| Question # | | No. of "yes" |
|---|---|---|
| 41. | If an Energy Conservation Guidebook was developed for school officials would it be helpful and useful to have: | |
| | 1. All information contained in one volume? | 19 |
| | 2. The information divided into sections and sent to you over a time period? | 3 |
| | 3. The information contained in a series of booklets and each booklet sent out over a year period? | 3 |
| | 4. Other (no preference)? | 2 |
| | Total | 27 |

Table 12

Information Needed in Guidebook

| Question # | | No. of Responses | |
|---|---|---|---|
| | | Yes | No |
| 42. | Would the following information be helpful and useful to you in developing and implementing an effective energy conservation program into your operation? | | |
| | 1. Explanation of the energy situation in the Province and how it affects your operation. | 26 | 1 |
| | 2. Actual examples of other school board's energy conservation activities, both in Newfoundland and Canada. | 27 | 0 |
| | 3. Actual work sheets and step by step methods to fill out the sheets. | 25 | 2 |
| | 4. Technical terminology condensed into non-technical language. | 21 | 6 |
| | 5. Engineering formulae simplified and used in actual samples. | 20 | 7 |
| | 6. Non-technical explanation of various equipment and their functions. | 23 | 4 |
| | 7. How-To Procedures - which would enable school officials to take corrective actions on their own. | 25 | 2 |
| | 8. Other, please describe. - | 1 | |

Most respondents desired a one-volume guidebook rather than a series of pamphlets or sections. They wanted information about the energy situation and how it affects them. They wanted examples of conservation activities carried out by other boards both in Newfoundland and in the rest of Canada. They wanted detailed procedures, step-by-step methods, simplified engineering formulae and non-technical language.

The biggest problem with the guidebook was to obtain, for use as examples, documented information from the school boards about energy conservation projects actually carried out. A second problem was to make it general enough for the whole province but specific enough to be valuable. Boards must realize that the guidebook will be designed to be a tool and not a cookbook with answers to all their problems.

At the time of writing, the guidebook has still to be completed although the material has all been collected.

# Chapter 4

## PROGRAMS IN OTHER PROVINCES

In this chapter are described aspects of school building energy conservation programs operating in four provinces of Canada - Ontario, British Columbia, New Brunswick, and Alberta. Information was gathered through library research supplemented by correspondence. As will be apparent, the practice is not for overall responsibility for energy conservation in schools to be assigned to a particular agency, but rather for various agencies - departments of education, departments of mines and energy, power companies, and individual school boards - to deal with various aspects of the problem, sometimes as part of a co-ordinated provincial program.

### Ontario

In Ontario, there were province-wide energy conservation activities and individual efforts by school boards. In this section are described some of the province-wide activities and then some of the activities of one school board - that of the City of Hamilton.

Province-Wide Activities

The province first embarked on an Energy Conservation Management Project in 1976 as a joint effort between the Ministry of Education and the Ministry of Energy. Under this agreement funds were provided to undertake research and information projects in the public education sector under the supervision of The Ministry of Education. These projects included solar schools, insulation comparisons, and the preparation of films to increase public awareness:

> As a part of this program, demonstration projects have also been undertaken, such as the setting up of solar schools in St. Catherines and Etobicoke. Also, there have been studies done on insulation comparisons involving schools built alike but insulated differently. To increase public awareness of the success of the solar schools, two films have been made, one of a technical nature for engineers and design people, and one of a less technical nature for teachers and the general public.[1]

Ontario Hydro co-operated fully in these energy conservation awareness projects covering every school in the province. As pointed out by Mr. M. C. Wallis, Energy Conservation Supervisor:

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[1]A letter from Mr. Jack G. Davis of the Ministry of Education of Ontario to the intern dated August 3, 1982.

> In 1976 the Ministry of Education embarked on a series of Energy Conservation Seminars for school administrators and operating personnel. We co-operated in this program which covered every elementary and high school in the province, covering a variety of subjects on how to reduce energy waste in schools.[1]

Ontario Hydro also provided technical expertise, including assistance to school boards in carrying out energy audits.

The Ontario Ministry of Education also provided grants toward the cost of converting boilers from oil to gas where payback was less than one year.[2] Furthermore, it was indicated that the federal government also provided a grant of $800.00 per boiler installation.[3]

The Hamilton Board of Education

The Board of Education for the City of Hamilton embarked in 1973-74 on a program of energy conservation. This included retrofitting windows, installing computerized energy programmers in larger schools, converting from incandescent to fluorescent lighting, and modifying ventilation systems.

In October, 1978 a letter was sent by the Secretary-Treasurer and Business Administrator of the Board to all its foremen and caretaking staff, indicating

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[1] A letter from Mr. M. C. Wallis of Ontario Hydro to the intern, dated July 28, 1982.

[2] A letter to the intern from Mr. J. B. Singer of The Board of Education for the City of Hamilton, dated June 11, 1982.

[3] Ibid.

procedures to be followed in implementing the Board's Energy Conservation Policy:

1. Set thermostats at 68°- 70°F. during the heating season and 76°F. for the operation of air conditioning and maintain the above temperatures. (Thermostat settings in Gymnasia and Shops should be lower during the heating season).

2. Operate supply and exhaust fans during the maximum period of:
   (a) 9:00 a.m. - 11:30 a.m. and 1:30 p.m. to 3:00 p.m. for elementary schools
   (b) 9:00 a.m. - 3:00 p.m. for secondary schools
   The above periods should be further reduced during cold weather, particularly in the use of outside air intake.

3. Set back temperature control to 60°F. from 3:30 p.m. (unless the school is used in the evening) till 7 a.m. The setback temperature can be adjusted upwards during very cold windy weather.

4. Maintain minimum lighting during school hours. Turn off lights after school hours and when the room is not used. After school hours, lights should not be turned on, unless the classroom is used or the cleaning staff is working in a particular room.

5. Lower the temperature setting for domestic hot water to the lowest setting close to 110°F.

6. Submit to the Building Department any other suggestions which may save energy.[1]

As a result of these and other conservation measures, including conversion from oil to gas, the Board was able to report in 1982 that the reduction in energy consumption since 1973 had resulted in a saving of $1,169,489 just for the year 1981.[2]

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[1] Ibid. A copy of this letter was supplied by Mr. Singer. See Appendix E.

[2] Ibid. These and other figures were contained in a memorandum supplied by Mr. Singer.

An important point to note about the program is that it began by saving energy through maintenance and housekeeping, particularly for the years 1973-76. Later on it embarked on retrofitting.

## British Columbia

Energy conservation in the schools of British Columbia involves three agencies: The Ministry of Energy, Mines and Petroleum Resources, The Ministry of Education, and B. C. Hydro. The Province of British Columbia published a booklet entitled "Energy Conservation For Schools" which offered suggestions of how to save energy. It was published in 1979 and stated its reasons why schools should conserve energy:

> Saving energy makes economic sense. Oil and gas resources are diminishing while their cost is correspondingly increasing. Saving energy, then means saving money, a significant amount of money. Conserving energy makes sense in terms of protecting ourselves for the future. Conserving the energy we do have will buy time to find new oil and gas reserves and to seek sources of energy other than fossil fuels. Saving energy also makes moral sense in that it is better to use something prudently than to waste it.[1]

The energy conservation program outlined in the booklet would reduce energy consumption in most schools in British Columbia by at least 20%. The reduction would pay for itself in one to two years.[2]

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[1] Energy Conservation For Schools (Victoria: The B. C. Energy Commission and The Ministry of Education, Science and Technology, 1979), p. 1.

[2] Ibid., p. 2.

According to the Co-ordinator of the Internal and Municipal Conservation and Renewable Energy Branch, of the Ministry of Energy, Mines and Petroleum Resources, the Ministry of Education has spent over $1 million for capital retrofit. His department has worked with the Ministry of Education in a 500 school demonstration of the computerized energy audit program. However, the full impact and cost-effectiveness of this approach has not been evaluated.[1]

An example of success in energy conservation in British Columbia is the Sooke School District on Vancouver Island. A total savings of $65,251 was achieved for the first six months (January to June) in 1981 compared with the same period in 1978. This is illustrated by Table 13, which was provided in pamphlet form by B. C. Hydro.[2]

B. C. Hydro through its Energy Conservation Branch published several pamphlets to assist schools in energy conservation.

In summary, energy conservation in the schools of British Columbia has been a concern of several agencies within the province. It has been a joint effort and is meeting with some success. Unfortunately, the extent of its success has not yet been fully documented in a report available to us.

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[1]A letter to the intern from Mr. G. W. Bachmayer, Ministry of Energy, Mines and Petroleum Resources of the Province of British Columbia, dated June 10, 1982.

[2]Case History: Energy Conservation in Schools (Vancouver: The Energy Use Engineering Department, British Columbia, 1982), EC 1515.

## Table 13

### Comparison of Energy Consumption and Cost in School District No. 62 (Sooke)

| Fuel | 1981 Jan. to June | 1978 Jan. to June | *Savings Jan. to June 1981 Energy | **Dollars |
|---|---|---|---|---|
| Electricity (KW H) | 2,000,923 | 2,397,202 | 390,238 KW H(16.3%) | $16,787 |
| Oil (Gallons) | 112,721 | 162,479 | 46,625 gals(28.7%) | $48,464 |
| Total Savings | | | | $65,251 |

* Savings base period January to June 1981.
Adjusted for Degree Days difference (1981 to 1978) of 2.8%
(1978 Degree Days = 1,561 1981 Degree Days = 1,517).

**Based on an average cost of $0.043/KW H for electricity and $1.039/gallon for oil.

## New Brunswick

The province of New Brunswick has clearly demonstrated by its energy conservation program that school boards can save both energy and money.

Table 14 gives an indication of the results of the energy conservation retrofit program in New Brunswick schools.

Table 14

Results of Retrofit Program in New Brunswick Schools

| School | Period (months) | Savings | | Cost of Retrofit |
|---|---|---|---|---|
| | | KW H | Dollars | |
| Tantramar High Sackville | 6 | 885,200 | 18,815 | $5,943 |
| St. Stephen's Elementary | 6 | 523,000 | 11,596 | $7,805 |
| Matthew Martin Dieppe | 7 | 734,000 | 16,157 | $14,491 |
| W. A. Lasier High Tracadie | 2 | 1,614,000 | 35,508 | $9,740 |
| James M. Hill Chatham | 3 | 681,600 | 14,995 | $13,610 |
| Blackville Jr. High | 2 | 342,000 | 7,524 | $7,500 |
| A. J. Savoie St. Quentin | 2 | 294,300 | 6,475 | $8,772 |
| Villa des Amies Sheila | 5 | 508,400 | 11,185 | $7,819 |

Source: Electricity Today (Fredericton: New Brunswick Power, August, 1977), p. 3.

In seven of the eight schools listed the cost of the retrofit was recovered in from two to seven months with considerable additional savings for some schools.

The Department of Education's conservation program got under way early in 1976.[1] With input from New Brunswick Power, energy consumption data was collected on the all-electric schools in the province. Using this data as a guide, the Department launched a careful point-by-point analysis of twenty all-electric schools with histories of high energy consumption. A senior engineer with the Department's Building Branch was appointed to carry out the energy analysis and co-ordinate the program with the various school boards.[2]

The Department allocated $120,000 for the job. Therefore, it was decided that work would concentrate initially only on those schools where the cost of implementation could be recovered in one year. Of the twenty schools included in the study, twelve were subsequently selected for moderate "minor" retrofit work or minor modification. The second phase of the conservation program, which was to involve major re-design of existing building systems with cost of recovery of three to five years, went into effect in 1978-79.[2]

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[1] A Memorandum from the Department of Education of the province of New Brunswick. 1976-09-16.

[2] Electricity Today (Fredericton: New Brunswick Power, August, 1977), p. 2.

[3] Ibid., p. 2.

Fredericton Schools

As a result of this program a saving of $1 million was achieved by 31 Fredericton schools in a 5-year program.[1] The school districts 26 and 27 in Fredericton operate thirty-one buildings which include 28 schools, one district office, one bus garage and one learning centre. The total floor area of the buildings is 1,300,000 square feet and they are heated by either electricity or #2 fuel oil. The buildings date from 1873 to 1978 with the majority in the time period of 1920-50.[2]

The Director of Maintenance for the school districts indicated that the reason for the energy conservation was not so much for energy, but for the dollars associated with energy.[3]

He described the three phases of the program, starting September 1976:

Phase 1 - Energy conservation through housekeeping with little or no cost:

| | | | |
|---|---|---|---|
| (1) | Stickers for light switches | - | $80.00 |
| (2) | Candle power light meter | - | $20.00 |
| (3) | Established base year - 1975-76 | - | No Cost |
| (4) | Lower room temperature after school hours | - | No Cost |
| (5) | Lower temperature of hot water | - | No Cost |
| (6) | Turn off air handling units after hours | - | No Cost |
| (7) | Remove lighting in non-essential areas | - | No Cost |
| (8) | Create a newsletter | - | No Cost |

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[1] Energy Management Canada (Mississauga: Lakeview Publications Inc., 1982), p. 5.

[2] Ibid., p. 5.

[3] Ibid., p. 5.

This phase and parts of the second phase were started in the first year and after three months - $13,000 was saved; six months later - $26,000 saved; and after one complete year - $75,000 saved.

Phase II - Energy conservation with some cost and payback of six months to one year:

(1) Time clocks on lights, hot water, parking lots.
(2) Replacement of incandescent with fluorescent and mercury vapor lights.
(3) Installation of flush-O-meters rather than the automatic flushing.
(4) Meetings with principals, teachers, and custodial staff.
(5) Repairing of steam traps.
(6) Installation of storm windows and better types of windows.
(7) Insulating of attic spaces.
(8) Block bonding of deteriorating brick buildings.
(9) Advertising on postage machine.

After two years of savings we were up to $250,000 or 34.29%.

Phase III - Energy savings with major cost:

(1) Retrofit on mechanical equipment - dampers, fresh air intake, etc.
(2) Close in window space and installation of better type windows.
(3) Converting gasoline guzzlers (buses) to propane (to natural gas in 1983).
(4) Computerize plant operations by district.
(5) Installation of solar panels to preheat hot water.
(6) Hire energy conservation director.

In four years using parts of all three phases, we had saved (even with buildings added) since 1976:

(1) Electricity - $502,403.00
(2) Oil - $110,757.00
(3) Water - $ 17,372.00

These totals were achieved by July, 1981. As of March, 1982, the total savings had just broken the $1 million mark.[1]

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[1] "31 Fredericton Schools Reach $1 Million Oil, Electricity, Water Savings in 5-Year Program", Energy Management Canada, III (June, 1982), 5-6.

The Fredericton program is described in detail because it is an example of the comprehensiveness needed in any program. It is important for boards implementing energy conservation programs to put in place an evaluation mechanism to ensure their success. Furthermore, while all the activities of the Fredericton program may not necessarily be appropriate for a school board in Newfoundland, it does demonstrate that energy conservation can save money. Also, the program did not cost a large amount of money.

In summary, the success that New Brunswick has had with its school building energy conservation program, again indicates just what can be accomplished.

## Alberta

The province of Alberta has done extensive work in the area of energy conservation in schools. This is all the more significant since Alberta is sometimes considered the richest province in Canada, with the cheapest fuel prices and with much of its revenues coming from the sale of oil.

The Alberta program consists of three phases:

### Phase I

This phase involved the contracting of three independent studies by the Planning and Research Branch of Alberta Education:

1. Conservation measures for electrical, mechanical and structural systems in schools;
2. Motivation of staff and students to operate the building more efficiently using no-cost measures; and
3. Energy efficient new school design.[1]

The conclusions and recommendations arising from these studies caused phase II to be initiated.

Phase II

This phase was a pilot project involving the testing of the findings of phase I in selected schools in Grande Prairie, Calgary and Edmonton. It was designed on a budget of $910,000 and was implemented in 50 schools over a two-year period.[2]

The province was divided into 5 zones as indicated by the map[3] following. During the pilot project five engineers, one in each zone, implemented an energy conservation program which included energy audits of schools, recommendations and designs of technical improvements, cost estimates, installation procedures, and evaluation of the effect of these modifications on energy use. Staff motivation and student involvement were also addressed.

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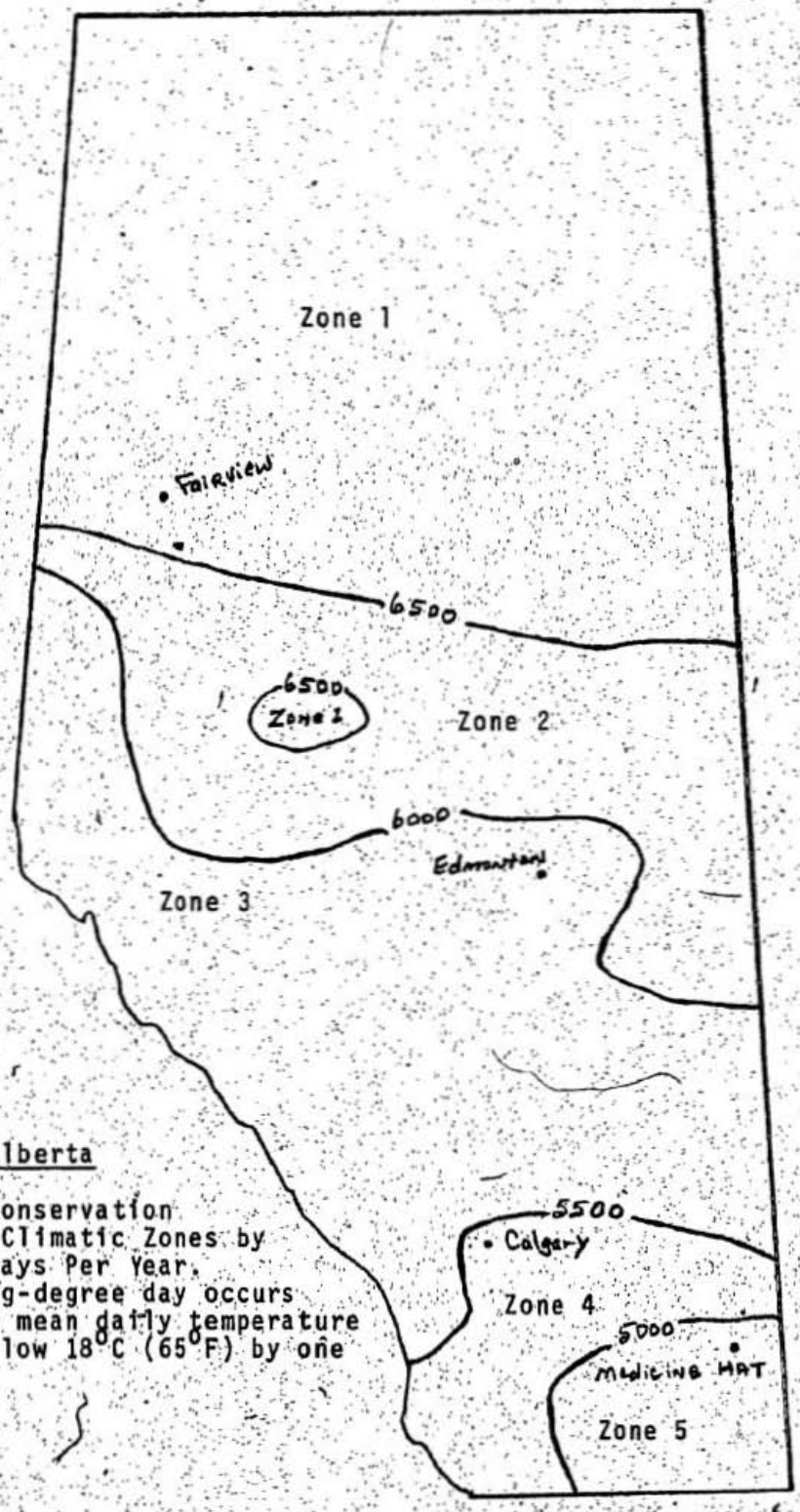
[1] "Province-Wide School Conservation Program", Energy Conservation Quarterly, II (June, 1982), 1.

[2] "Province-Wide School Conservation Program", Energy Conservation Quarterly, I (December, 1980), 1.

[3] "Schools Impact on Alberta Energy Scene", Energy Conservation Quarterly, I (December, 1980), 1.




Map of Alberta

Energy Conservation Project Climatic Zones by Degree-Days Per Year. A heating-degree day occurs when the mean daily temperature falls below 18°C (65°F) by one degree.

Phase III

Because of the success of the project, phase III was organized to provide energy consulting services for all school jurisdictions. Energy consultants were based in each of the Alberta Education Regional Offices - Lethbridge, Calgary, Red Deer, Edmonton, and Grande Prairie- to provide services for the areas.[1] The following steps are to be involved:

1. Data gathering to enable the engineer to provide an energy usage profile and calculations of an energy efficiency level for the buildings.
2. A detailed energy audit on each building to identify possible electrical, mechanical and structural modifications.
3. A list of retrofits with estimated saving paybacks.[2]

The significant part of this phase is its connection with the Building Quality Restoration Program.[3] The Alberta government feels that if work is not done to their schools now, then the cost will be even greater in the future, since the deterioration of present schools will mean many more new ones will have to be built. Thus, it embarked on a restoration program which commenced on January 1, 1979

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[1] "Province-Wide School Conservation Program", Energy Conservation Quarterly, II (June, 1982), 1.

[2] Ibid., p. 1.

[3] A letter to the intern from Mr. R. J. LaFleur, Planning Consultant for the Planning and Research Branch of Alberta Education, dated June 17, 1982.

and will terminate on December 31, 1983.[1] The budget for this program is $1.5 million per year to include energy conservation activities.[2]

The restoration program includes the following categories which qualify for provincial financial support: structural, mechanical, electrical, code requirements, upgrading of vocational and industrial education equipment, school modernization, vandalism (deterrents), site improvement and other approved Ministerial Programs. Energy conservation is incorporated into specific categories of the current program.[3]

The Building Quality Restoration Program provides substantial support for the cost of certain conservation measures, making it worthwhile to initiate modifications to heating, ventilation, and structural systems. It recognizes the importance of including energy conservation as a part of the total building program. Energy conservation projects are more economically carried out in conjunction with a building program whether new construction or renovations, rather than in isolation.

The Alberta program also stressed the importance

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[1] Building Quality Restoration Program 1979-1983. (Edmonton: Alberta Education, 1979), p. 1.

[2] "Province-Wide Program for Alberta School Buildings", Energy Conservation: Update, II (June, 1982), 1.

[3] Building Quality Restoration Program 1979-1983. (Edmonton: Alberta Education, 1979), p. 1.

of the operators and occupants of schools to the energy conservation project. The Energy Conservation Quarterly stated:

> A conservation program will be worthless unless people have incentive to continue operating systems with a minimum of energy waste.
> Any program that does not attack both the technical and motivational problems is doomed to failure, because one depends on the other for its success.[1]

Just being completed are two final reports on phase II which deal with the quantitative aspects of the program; and with the qualitative dimension, including motivational programs for students, teachers, administrators and maintenance staff.[2] These should be available in the fall. The third phase is still being evaluated since it is still in progress.

## Summary

The energy conservation programs of four provinces were examined in some detail. These demonstrated the considerable savings in energy and finances that can be achieved, sometimes with modest effort. They indicate also the value of a comprehensive, co-operative program that involves all concerned agencies under provincial guidance and leadership.

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[1] "Technical Changes to School Buildings", Energy Conservation Quarterly, II (December, 1981), 3.

[2] A letter to the intern from Mr. R.J. LaFleur, Planning Consultant for the Planning and Research Branch of Alberta Education, dated June 17, 1982.

## Chapter 5

## REFERENCE MATERIALS FOR SCHOOL BOARDS

This chapter of the report provides a short list of published materials relevant to school boards in the area of energy conservation. The list is not all inclusive. An annotated bibliography might be helpful as a future project by a graduate student or by a researcher for school boards.

### Books


An Energy Conservation Retrofit Process for Existing Public and Institutional Facilities. Washington, D.C. : Public Technology, Inc., 1977.

*Baron, Stephen Z., ed. Manual of Energy Savings in Existing Buildings and Plants Volume II: Facility Modifications. Englewood Cliffs: Prentice-Hall, Inc., 1978.

Castaldi, Basil. Creative Planning of Educational Facilities. Chicago: Rand McNally and Company, 1969.

*Dubin, Fred S. and Long, Chalmers Jr. Energy Conservation Standards. New York: Mc-Graw-Hill Book Company, 1978.

*Energy Conservation in Schools: Review of Canadian and U.S. Studies, Surveys, Programs and Publications. London: Chorley and Bisset Ltd., 1979.

Energy Conservation Opportunities and Guidelines for Existing Buildings. New York: Dubin-Mindell-Bloome Associates, P.C., 1975.


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*Indicates items most relevant to school boards.

*Energy Economics and Life-Cycle Costing. Ottawa: The Architectural Institute of Canada, 1980.

*Energy Update. Ottawa: The Department of Energy, Mines and Resources, 1979.

Gopal, R., ed. Energy Conservation in Building Heating and Air Conditioning Systems. New York: The American Society of Mechanical Engineers, 1978.

Guide For Planning Educational Facilities. Columbus: Council of Educational Facility Planners, International, 1976.

*McRae, Alexander, Dudes, Janice L. and Rowland, Howard, eds. The Energy Source Book. Maryland: Aspen Systems Corporations, 1977.

O'Callaghan, P.W. Building For Energy Conservation. Oxford: Pergamon Press, 1978.

*Payne, Gordon A. The Energy Managers Handbook. Michigan: Ann Arbor Science, 1980.

Sizemore, Michael M., Clark, Henry O. and Ostrander, William S. Energy Planning For Buildings. The American Institute of Architects, U.S.A., 1979.

Stobaugh, Robert and Yergin, Daniel, eds. Energy Future: Report of the Energy Project at the Harvard Business School. New York: Random House, 1980.

Wagner, Walter F. Jr., ed. Energy Efficient Buildings. New York: McGraw-Hill Book Company, 1980.

## Reports

*A Study In Energy Conservation For Existing Schools. Edmonton: The Calgary Board of Education for Alberta Education Planning and Research, 1979.

*An Energy Management Programme For Grande Prairie Public School District. Calgary: The University of Calgary, 1979.

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*Indicates items of most relevance for School Boards.

Design Guidelines for Schools in New Brunswick. Fredericton: The New Brunswick Ministry of Education, 1979.

EFL Report: The Economy of Energy Conservation in Educational Facilities. New York: Educational Facilities Laboratories, 1978.

*Energy Conservation For Schools. Toronto: The Ontario Ministry of Education, 1976.

*Energy Conservation For Schools. Vancouver: The B.C. Energy Commission and Ministry of Education, Science and Technology, 1979.

*Energy Conservation in the Schools: The Human Factor. Toronto: The Canadian Education Association, 252 Bloor Street West, Suite S850, M5S 1V5, 1980.

Energy Efficient School For Glenwood. St. John's: The Bond Architects and Engineers, Ltd., 1981.

*Guidelines for Conserving Energy in Schools. Edmonton: The Planning and Research Branch of Alberta Education, 1978.

Nova Scotia Attitudes Towards the Energy Issue. Halifax: BGI Management Consultants Ltd., P.O. Box 865. Avondale, Suite J12, 6080 Young Street, B3K 5L2, 1981.

*Whitworth, Fred E. The Conservation of Energy in Schools: A feasibility Report. Ottawa: The Canadian School Trustees Association, 30 Metcalfe Street, Suite 507, K1P 5L4, 1976.

## Articles

"A Lesson in Energy Conservation." American School and University, 52 (December, 1979), 28-29.

*Banks, Sally. "By Teachers, for Teachers: Calgary's Energy Curriculum." The ATA Magazine, 60 (January, 1980), 61-62.

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*Indicates items most relevant to School Boards.

Dorgan, Charles E. "Energy Management and Energy Audits For Schools." CEFP Journal, 16 (July - August, 1978), 4-5, 19.

"Energy Crisis." National Schools, 93 (January, 1974), 32-54.

"Energy Management Yields Results." American School and University, 52 (May, 1980), 32-35.

*Graves, Ben E. "Modernization: Everybody's Doing It." CEFP Journal, 15 (July - August, 1977), 4-5.

*Griffith, William J. and Probasco, Jack F. "Maintenance Help Set Priorities with a Facilities Audit: Part 2." American School and University, 53 (June, 1981), 14-16.

*Ingalls, R. J. "A Systematic Approach to Energy Conservation." CEFP Journal, 16 (July - August, 1978), 7-10.

McConaghy, T. W. "Energy Education: A Challenge For Teachers." The ATA Magazine, 60 (January, 1980), 4-5.

Rittleman, Richard P. "The Energy Crisis: How Schools Make It Worse and Why Boards Must Help Put A Stop to Fuel Waste." American School Board Journal, 162 (February, 1973), 49-52.

Shaw, C.Y. and Jones, L. "Air Tightness and Air Infiltration of School Buildings." ASHRAE Journal, 21 (April, 1979), 40-45.

*Stephen, Edward. "Energy Guidelines For Schools." American School and University, 48 (January, 1976), 43-49.

"The Fuel Schools Use." CEFP Journal, 15 (January - February, 1976), 4-6.

*Valaskakis, Kimon. "Three Routes to Conservation." The ATA Magazine, 60 (January, 1980), 6-11.

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*Indicates items most relevant to School Boards.

## Magazines

The ATA Magazine. Published by The Alberta Teachers' Association, 11010 - 142 Street, Edmonton, Alberta. T5N 2R1. $2.50 per issue.

Energy Management Canada. Published by LakeView Publications Inc., 1200 Aerowood Drive, Unit 28, Mississauga, Ontario. L4W 2S7. Free.

SEEDS Newsletter. Published by The SEEDS Foundation, #406, 10169 - 104 Street, Edmonton, Alberta. T5J 1A5. Free.

CEFP Journal. Published by The Council of Educational Facility Planners, 29 West Woodruff Avenue, Columbus, Ohio. 43210. U.S.A. $9 for 6 issues.

American School and University. Published by the Educational Division of North American Publishing Co., 401 N., Broad Street, Philadelphia, PA. 19108. U.S.A.

Energy Analects. Published by Corpus, 1450 Don Mills Road, Don Mills, Ontario. M3B 2X7. $397 for 50 weeks.

## Summary

It is important to point out that this list of reference materials is incomplete. It is intended to present materials that are available so that boards that require information will have some sources to contact. Rather than having all school boards in the province order materials separately from these sources, it would perhaps be better for one agency to collect appropiate materials and make them available to school boards.

Hopefully, materials and addresses listed will be of some assistance to boards or others interested in school building energy conservation.

## Chapter 6

## ENERGY PROGRAMS OF NEWFOUNDLAND EDUCATIONAL AGENCIES

One of the objectives of the internship was to report the policies and programs of all agencies in Newfoundland and Labrador with respect to energy conservation in schools. From the outset it was discovered that no one agency had taken exclusive leadership in this field. However, the following agencies were identified as closely related to the school situation:

1. The Department of Mines and Energy.
2. The Department of Education.
3. The Denominational Education Committees.
4. The Federation of School Boards of Newfoundland.
5. The School Boards.

Each agency was contacted by telephone, through personal interview, or by means of the questionnaire circulated by the Department of Mines and Energy.

### Department of Mines and Energy

As indicated in Chapter 3, a mandate to encourage energy conservation in all buildings in this province had

been assigned by the provincial cabinet to the Department of Mines and Energy. The Department's role with respect to school buildings, however, is complicated by the fact that education in the province is the joint responsibility of religious denominations and the Department of Education. This is particularly a problem with respect to the allocation of funds. It was important not to pursue any program or policy that might infringe upon the rights of the other agencies. However, the Department of Mines and Energy had been assigned responsibility for school building conservation. Thus Mr. Allister Taylor, the Internal Energy Conservation Co-ordinator of the Energy Branch of the Department, was given the responsibility for devising ways to assist schools in the area of energy conservation.

School buildings are significant users of energy and therefore a concern of government, particularly since in this province schools are largely government financed. The Department had been aware of some involvement in energy conservation activities by school boards, but it needed more information about these activities and about their attitudes towards conservation. This was one of the main reasons underlying this internship. Also, as a starting point the Department decided to develop a

guidebook on school building energy conservation that would be appropriate to the Newfoundland situation. This is ongoing at the time of the writing of this report.

In addition, there are two basic programs jointly sponsored by the provincial Department of Mines and Energy and its federal counterpart:

1. The Energy Conservation and Renewable Energy Development and Demonstration Program.
2. The Energy Bus Program.

The Demonstration Program

In June, 1979 there was signed a joint federal-provincial program -- the Energy Conservation and Renewable Energy Development and Demonstration Program -- which provides up to $11,250,000 over a five-year period for energy projects approved under the program. Canada's share of the cost will exceed $9 million with Newfoundland's share up to $2.25 million. Proposals for energy conservation and renewable energy demonstrations can come from industry, private individuals, associations, municipalities, colleges, and universities, as well as the Department of Mines and Energy and other provincial departments.[1] (Copies of this detailed information can be

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[1] Energy Conservation and Renewable Energy: Demonstration Program. (St. John's: Department of Mines and Energy, 1979).

obtained from the provincial Department of Mines and Energy, P.O. Box 4750, St. John's, Nfld. A1C 5T7).

The problem with this program as far as school buildings are concerned is that it must demonstrate a new technology. One board that did apply for this assistance was the Terra Nova School Board. It proposed an energy efficient school for Glenwood. However, although it proposed adding new energy savings features, it did not demonstrate new technology. The Department did not accept the proposal in total but agreed to finance those features that were added to the school for saving energy. Thus, the program is of limited value to school boards.

The Energy Bus Program

The second program - The Energy Bus Program - is also jointly funded by the two levels of government - the federal government on the one hand and the provincial Department of Mines and Energy on the other. Under this program a bus is equipped with two mini-computers, energy measuring instruments, demonstration equipment, video units. It is staffed by a team of professional engineers and highly trained technicians. The busses are owned by the Government of Canada and are operated by the provincial government under the terms of the cost-sharing agreement.

The main purpose of the bus is to travel around the province to identify ways for the owners of buildings to save energy. This service has been available to school boards

since the beginning of the school year 1982-83.

As the brochure published by the federal Department of Energy indicates:

> ... the Energy Bus Team makes on-site observations to obtain additional information for a computer analysis and discussion of energy use data. On the spot recommendations are given of steps to be taken to improve energy efficiency, plus an estimate of potential per annum dollar savings.[1]

There was some question, whether schools could be covered under the agreement, whether they could be considered public buildings since technically they are owned by the churches. Secondly, there was some question as to whether the federal government would want schools involved since education is a provincial responsibility. However, it was decided that schools would be included in the program.

In summary, the provincial government through the Department of Mines and Energy does intend to assist schools in the area of energy conservation. However, only the ground work has begun.

## Department of Education

Responsibility for the final approval of plans for new school buildings and extensions, involving government money, has been assigned by the Legislature to the Department of Education:

> Money shall not be paid for the construction or extension of any public school unless such construction

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[1] The Energy Bus Program (Ottawa: The Conservation and Renewable Energy Branch of the Department of Energy, Mines and Resources, 1982).

> or extension is planned in accordance with all applicable building standards and until the building plans and the site have been approved by an official of the Department designated for the purpose by the Minister.[1]

The Department has a School Building Manual which "is intended to serve as a guide to School Board Personnel and their Consultants in designing new facilities".[2] It indicates building codes, standards of lighting, ventilation and fire safety, standards for rooms and facilities, necessary provisions for the handicapped, procedures pertaining to site, and other matters. Through its engineer, the Department ensures that all regulations have been met.

Presently, there is no written governmental policy on energy conservation in school buildings, although the engineer advises boards on this matter. Moreover, guidelines are to be considered in revisions to the Manual currently under way.[3]

Clearly, in energy conservation there is for the Department of Education both an advisory role and, once guidelines are adopted, a legally imposed regulatory role.

Moreover, the Department does have a program to encourage school building energy conservation. This program

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[1]The Schools Act (R.S.N.) 1970, section 85, as amended by The School (Amendment) Act (R.S.N.) 1974, section 15.

[2]Government of Newfoundland and Labrador, School Planning Manual (St. John's: The Department of Education, 1976), foreword.

[3]Personal interview with the Director of School Services.

has been in existence for two years. Under it schools may receive a grant up to fifty per cent of expenditures on energy conservation, under certain conditions:

> One-half of the amount of money expended by the school board on measures taken to conserve the use of energy in any school under its jurisdiction; but an allocation under this paragraph shall not exceed the amount arrived at by multiplying $1.50 by the number of pupils enrolled at the school, and shall not be payable until satisfaction has been exhibited to the Minister or a person appointed by him for the purpose;[1]

This grant recognizes the importance of energy conservation in our schools. Boards are not required to submit an application in advance. Instead, they simply submit bills incurred for energy conservation. If boards are willing to put up half the money, then the Department feels reasonably confident that the money has been spent wisely. No attempt is being made by the Department to help boards spend in areas of priority. It was pointed out by the Supervisor of School Grants, that many schools are in somewhat poor conditions with respect to energy conservation and that any action taken is worthwhile.[2]

Table 15 indicates that for the fiscal year 1981-82 the grant amounted to $114,000. At $1.50 per pupil the maximum possible amount the Department was entitled

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[1]School Boards (Allocation of Moneys) Regulations, 1975 (Amendment) under The Schools Act dated at St. John's this 9th. day of September A.D., 1981.

[2]A personal interview with the Supervisor of School Grants with the Department of Education.

to award for the 147,000 pupils in the province would have been $221,000.

Table 15

Money Spent on Energy Conservation via Grant as Compared to Potential Spending

| Total Pupil Enrollment | *Amount Spent | Potential for Spending |
|---|---|---|
| 147,000 | $114,393.88 | $220,500.00 |

Source: *A letter from the Supervisor of School Grants with the Department of Education.

The grant was discussed previously, in Chapter 3, in dealing with the questionnaire. However, it is important to point out here that the grant in itself is not sufficient, that a more comprehensive program is required. It is significant to note that although the Department did supply the grant, boards did not see the Department as a source of information and direction with respect to energy conservation.

The Denominational Education Committees

In the province of Newfoundland and Labrador capital grants for school construction are allocated by

the provincial government to the three Denominational Education Committes on the basis of population, presently 55.65 per cent to the Integrated Education Committee, 5.51 per cent to the Pentecostal Assemblies Education Committee, and 36.58 per cent to the Roman Catholic Education Committee. A further .10 per cent is allocated to the Seventh Day Adventist Church, with the remaining 2.16 per cent divided among the churches according to the number of students from one denomination registered in a school of a different denomination.

Thus each Committee has the responsibility to monitor how monies are allocated. However, once capital grants have been awarded to a board by the appropriate Committee the policy is for the school board to carry out the construction, so that responsibility for energy conservation lies with the board. In the interviews conducted by the intern, the representatives of the Denominational Education Committees all indicated that they have no written policy on energy conservation, although all are aware of the need to conserve energy. There is an unwritten understanding about energy conservation but responsibility rests largely with each school board. The basic problem being money, it seems that energy conservation is viewed mainly as a problem that can be solved by money.

## Federation of School Boards of Newfoundland

In 1971 the Newfoundland and Labrador Federation of School Boards was formed as an association of all school boards of the province. The following objectives were adopted:

a. To represent all school boards in the formation of a provincial education policy and on matters of Legislation which do not infringe on established denominational rights, and to deal with matters of common interest to all Boards;

b. To provide a medium for the exchange of information among School Boards;

c. To improve the knowledge and appreciation of the aims and objectives of School Boards;

d. To provide professional help to School Boards needing direction in proper administrative methods;

e. To engage in educational research and to publish the results of such research;

f. To join with and assist other Federations or Associations of School Boards in Canada having the same or similar objectives as this Federation with the object of promoting mutual interest.[1]

It is not an external group but a creation of the boards themselves which alone can direct its aims and policies. In 1973 the Federation became a member of the Canadian School Trustees Association and so has both input into and assistance from educational policies developed at

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[1] The School Board (St. John's: The Denominational Education Committees, 1978), p. 49.

the national level.

With respect to school building energy conservation the Federation has no policy and has not been involved in any direct way. The intern was told by the Executive Secretary of the Federation that they are aware of the need to conserve energy but have left all involvement to the individual school boards at the district level. Furthermore, it was pointed out that the Federation was aware of some activities of boards in the area of energy conservation both provincially and nationally.

## School Boards

It is apparent that in this province school boards are the operators of the schools and thus are directly responsible for running energy efficient schools. Each board has a business manager who is in the position to evaluate the need to conserve energy, particularly from an economic point of view. Among the 35 school boards there exists quite a range of involvement in the area of energy conservation, for whatever reasons.

The questionnaire revealed that a number of boards were engaged in energy conservation activities. However, full details of their involvement were not obtained because

of their inaccessibility or because of the time needed to go back through their records. Most boards had not carried out cost-benefit analysis or other evaluations of their conservation activities. It must be pointed out, however, that several boards did not respond to the questionnaire, and of those who had, many could not be visited to obtain the necessary information.

For the purpose of this report three boards will be dealt with briefly: The Terra Nova Integrated School Board, The Green Bay Integrated and The St. John's Roman Catholic School Board. This is not to suggest that other boards are not involved in energy conservation activities. However, these three boards indicated their willingness to give information and they indicated also significant activity with respect to school building energy conservation.

The Terra Nova Integrated School Board

The Terra Nova Integrated School Board has taken a keen interest in energy conservation since 1975-76. It carried out a number of activities designed to save energy:

1. Memos were sent to all school principals suggesting ways to save energy.
2. A comprehensive set of records for energy consumption and conservation was set up for each building.

3. The board installed four W7000 systems at the cost of about $50,000. The payback for these systems was expected to be 2 to 3 years.
4. Several schools had thermography inspections carried out by energy consultants.
5. An incentive program was established to record all energy costs for each school building beginning in 1975. Details of the program's operation during 1978-79 are contained in Tables 16, 17 and 18. As indicated in Table 16, for the six-month period from November 1 to April 30 schools received 1¼¢ per gallon of furnace oil under budget, plus $13.88 for each percentage point under budget - a total furnace oil incentive of about $4,000. For electricity savings, as indicated in Table 17, the Board's incentive was $6,000, distributed at 1¢ per KW H under budget, plus $22.22 for each percentage point under budget. As indicated in Table 18, the Board during 1978-79 distributed some $10,000 back to its nine school systems with six receiving approximately $1,000 each, and one receiving almost $3,000. The board itself saved 14,000 gallons of fuel oil and 487,482 kilowatts of electricity. The program was later discontinued because of financial restraints and because it was considered unfair to some schools.

Table 16

Terra Nova Integrated School Board
Calculation of Incentive - Furnace Oil
November 1, 1978 to April 30, 1979

| Name of School | Gallons Budgeted | Actual Gallons Used | Gallons Savings (Deficit) | Incentive at 1¼¢ per gal | % Savings | Incentive at 13.88 Per % | Total Incentive | Gallons Savings for Full Year |
|---|---|---|---|---|---|---|---|---|
| 1. Gill Memorial, Musgrave Hr. | 8,400 | 6,450 | 1,950 | 24.38 | 23.2 | 322.01 | 346.38 | 3,635 |
| 2. Musgrave Hr. Elementary | 5,640 | 2,460 | 3,180 | 39.75 | 56.4 | 782.83 | 822.58 | 4,348 |
| 3. Musgrave Hr. Primary | 2,070 | 2,820 | (750) | Nil | Nil | Nil | Nil | (150) |
| 4. Rockwood High, Carmanville | 9,540 | 6,780 | 2,760 | 34.50 | 28.9 | 401.13 | 435.63 | 3,523 |
| 5. Aspen Cove | 1,830 | 1,650 | 180 | 2.25 | 9.8 | 136.02 | 138.27 | 774 |
| 6. Ladle Cove | 1,680 | 1,290 | 390 | 4.87 | 23.2 | 322.01 | 326.88 | 722 |
| 7. Moggin Cove | 1,500 | 1,470 | 30 | .37 | 2.0 | 27.76 | 28.13 | 573 |
| 8. Fredericton | 2,790 | 3,210 | (420) | Nil | Nil | Nil | Nil | 640 |
| 9. Fogo High School | 16,380 | 15,420 | 960 | 12.00 | 5.9 | 81.89 | 93.89 | (2,532) |
| 10. Joe Batts Arm | 3,900 | 3,030 | 870 | 10.87 | 22.3 | 309.52 | 320.39 | 883 |
| 11. Seldom | 1,740 | 1,890 | (150) | Nil | Nil | Nil | Nil | 414 |
| 12. Island Harbour | 1,920 | 1,800 | 120 | 1.50 | 6.3 | 87.44 | 88.94 | 759 |
| 13. Stag Harbour | 1,950 | 1,950 | 0 | Nil | Nil | Nil | Nil | 196 |
| 14. Deep Bay | 1,260 | 960 | 300 | 3.75 | 23.8 | 330.34 | 334.09 | 700 |
| 15. Fogo Primary | 4,050 | 4,110 | (60) | Nil | Nil | Nil | Nil | (496) |
| 16. Gander Junior High | 15,840 | 18,540 | (2,700) | Nil | Nil | Nil | Nil | (298) |
| 17. Gander Academy | 21,600 | 23,280 | (1,680) | Nil | Nil | Nil | Nil | (5,040) |
| 18. Glenwood Elementary | 8,130 | 5,220 | 2,910 | 36.37 | 35.8 | 496.90 | 533.27 | 2,952 |
| 19. Centennial High | 5,970 | 5,040 | 930 | 11.62 | 15.6 | 216.52 | 228.14 | 1,334 |
| 20. Norwood Elementary | 2,490 | 1,950 | 540 | 6.75 | 21.7 | 301.19 | 307.94 | 1,313 |
| 21. Norwood Primary | 3,390 | 3,660 | (270) | Nil | Nil | Nil | Nil | (181) |
| 22. Smallwood Academy | 5,370 | 5,550 | (180) | Nil | Nil | Nil | Nil | 344 |
| 23. Eastport High | 4,860 | 4,830 | 30 | .37 | .6 | 8.32 | 8.69 | (293) |
| 24. Dover High | 5,190 | 5,130 | 60 | .75 | 1.2 | 16.65 | 17.40 | 575 |
| 25. Eastport Elementary | 5,400 | 6,330 | (930) | Nil | Nil | Nil | Nil | (1,165) |
| 26. Hare Bay Junior High | 7,500 | 7,740 | (240) | Nil | Nil | Nil | Nil | (1,727) |
| 27. Glovertown High | 9,210 | 8,820 | 390 | 4.87 | 4.2 | 58.29 | 63.16 | 1,263 |
| 28. Terra Nova Primary | 1,590 | 1,770 | (180) | Nil | Nil | Nil | Nil | 508 |
| 29. Charlottetown | 2,190 | 2,040 | 150 | 1.87 | 6.8 | 94.38 | 96.25 | 407 |
| | 163,380 | 155,190 | 8,190 | $196.83 | | $3,993.20 | $4190.03 | 13,981 |

Source: The information in this table was supplied by the Business Manager of the Terra Nova Integrated School Board.

Table 17

Terra Nova Integrated School Board
Incentive Report on Kilowatts 1978-79
November 1, 1978 - April 30, 1979

| Name of School | KW H Budgeted | Actual KW H Used | KW H Savings (Deficit) | Incentive at 1¢ Per KW H | % Savings | Incentive at 122.22 Per % Saved | Total Incentive | Prorata Share of $6,000 Incentives | Savings for Full Year (KW H) |
|---|---|---|---|---|---|---|---|---|---|
| 1. Bayview Heights, Dark Cove | 580,000 | 303,840 | 276,160 | $2,761.60 | 47.6 | $1,045.67 | $3,807.27 | $2,933.40 | 346,960 |
| 2. Smallwood Academy, Dark Cove | 138,500 | 153,560 | (15,060) | Nil | Nil | Nil | Nil | Nil | (16,944) |
| 3. Dover High | 18,000 | 8,980 | 9,020 | 90.20 | 50.1 | 1,113.22 | 1,203.42 | 927.00 | 11,140 |
| 4. Nare Bay Junior High | 38,000 | 46,080 | (8,080) | Nil | Nil | Nil | Nil | Nil | (9,640) |
| 5. Jane Collins Academy, Nare Bay | 309,000 | 314,280 | (5,280) | Nil | Nil | Nil | Nil | Nil | (1,400) |
| 6. Gill Memorial, Musgrave Hr. | 15,300 | 17,840 | (2,540) | Nil | Nil | Nil | Nil | Nil | (1,920) |
| 7. Musgrave Harbour Elementary | 7,550 | 9,220 | (1,670) | Nil | Nil | Nil | Nil | Nil | (640) |
| 8. Musgrave Harbour Primary | 43,360 | 39,258 | 4,102 | 41.02 | 9.5 | 211.09 | 252.11 | 193.80 | 10,809 |
| 9. Gander Collegiate | 660,000 | 623,151 | 36,849 | 368.49 | 5.6 | 124.43 | 492.92 | 379.80 | 249,900 |
| 10. Gander Junior High | 45,000 | 40,528 | 4,472 | 44.72 | 9.9 | 219.97 | 264.69 | 203.40 | 9,836 |
| 11. Gander Academy | 117,000 | 139,200 | (22,200) | Nil | Nil | Nil | Nil | Nil | (30,720) |
| 12. Glenwood Elementary | 62,600 | 60,960 | 1,640 | 16.40 | 2.6 | 57.77 | 74.17 | 57.00 | 9,831 |
| 13. Hopkins Academy, Gander Bay | 235,500 | 259,501 | (24,001) | Nil | Nil | Nil | Nil | Nil | (17,452) |
| 14. Centennial High, Gander Bay | 26,900 | 27,960 | (1,060) | Nil | Nil | Nil | Nil | Nil | 1,340 |
| 15. Norwood Elementary | 2,100 | 2,040 | 60 | .60 | 2.9 | 64.43 | 65.03 | 49.80 | 228 |
| 16. Norwood Primary | 12,400 | 9,960 | 2,440 | 24.40 | 19.7 | 437.73 | 462.13 | 355.80 | 3,040 |
| 17. Port Albert | 28,500 | 31,320 | (2,820) | Nil | Nil | Nil | Nil | Nil | 80 |
| 18. Rockwood High, Carmanville | 130,700 | 128,330 | 2,370 | 23.90 | 1.8 | 39.99 | 63.89 | 49.20 | 19,950 |
| 19. Aspen Cove | 3,300 | 3,463 | (163) | Nil | Nil | Nil | Nil | Nil | (290) |
| 20. Ladle Cove | 2,600 | 2,546 | 54 | .54 | 2.1 | 46.66 | 47.20 | 36.00 | 110 |
| 21. Nuggin Cove | 2,750 | 2,346 | 404 | 4.04 | 14.7 | 326.63 | 330.67 | 254.40 | 557 |
| 22. Davidsville Elementary | 54,000 | 63,000 | (9,000) | Nil | Nil | Nil | Nil | Nil | (8,640) |
| 23. Glovertown High | 12,600 | 15,520 | (2,920) | Nil | Nil | Nil | Nil | Nil | (4,520) |
| 24. Fredericton Elementary | 16,900 | 20,826 | (3,776) | Nil | Nil | Nil | Nil | Nil | (4,575) |
| 25. Glovertown Elementary | 610,000 | 685,440 | (75,440) | Nil | Nil | Nil | Nil | Nil | (44,400) |
| 26. Terra Nova Primary | 1,700 | 1,647 | 53 | .53 | 3.1 | 68.88 | 69.41 | 53.40 | 249 |
| 27. Charlottetown | 2,800 | 2,122 | 678 | 6.78 | 24.2 | 537.72 | 544.50 | 419.40 | 1,137 |
| 28. Eastport High | 72,200 | 86,400 | (14,200) | Nil | Nil | Nil | Nil | Nil | (5,420) |
| 29. Eastport Elementary | 18,000 | 18,540 | (540) | Nil | Nil | Nil | Nil | Nil | 2,000 |
| 30. Fogo High | 49,900 | 69,462 | (19,562) | Nil | Nil | Nil | Nil | Nil | (34,108) |
| 31. Joe Batts Arm | 20,900 | 19,952 | 948 | 9.48 | 4.5 | 99.99 | 109.47 | 83.60 | 1,792 |
| 32. Seldom | 4,500 | 4,812 | (312) | Nil | Nil | Nil | Nil | Nil | (304) |
| 33. Island Harbour | 2,800 | 3,519 | (719) | Nil | Nil | Nil | Nil | Nil | (581) |
| 34. Stag Harbour | 2,600 | 3,743 | (643) | Nil | Nil | Nil | Nil | Nil | (748) |
| 35. Deep Bay | 3,300 | 4,581 | (1,281) | Nil | Nil | Nil | Nil | Nil | (1,603) |
| 36. Fogo Primary | 10,700 | 11,454 | (754) | Nil | Nil | Nil | Nil | Nil | (60) |
| | 3,361,940 | 3,234,661 | 127,299 | $ 6243.50 | | $ 4394.18 | $7796.88 | $6000.00 | 487,483 |

Source: The information in this Table was supplied by the Business Manager of The Terra Nova Integrated School Board

Table 18

Terra Nova Integrated School Board
Summary of Incentive by System
1978-79

| System | Electricity | Oil | Total |
|---|---|---|---|
| Musgrave Harbour | $ 193.80 | $1,168.96 | $1,362.76 |
| Carmanville | 339.60 | 928.91 | 1,268.51 |
| Fogo Island | 87.60 | 837.21 | 924.81 |
| Gander Bay | 405.60 | 536.18 | 941.78 |
| Gander | 640.20 | 533.27 | 1,173.47 |
| Dover | 927.00 | 17.40 | 944.40 |
| Dark Cove | 2,933.40 | - | 2,933.40 |
| Glovertown | 472.80 | 66.53 | 539.33 |
| Eastport | - | 8.69 | 8.69 |
| Total | $6,000.00 | $4,097.15 | $10,097.15 |

Source: Information supplied by the business manager of the Terra Nova Integrated School Board.

Green Bay Integrated School Board

According to its business manager the Green Bay Integrated School Board took the following steps to conserve energy in its schools:

1. Voluntary restraint was suggested in memos to all schools.

2. An incentive grant for schools was introduced for one year, whereby fifty per cent of all money saved would be returned to that school. This was cancelled due to a lack of funds and because of its inequity among schools.
3. A W7000 micro-system was installed at Grant Collegiate, Springdale for a cost of about $15,000 with an expected payback of 2 to 3 years. A second W7000 was installed at Beothuck Collegiate in Baie Verte in April, 1982. An evaluation of these systems was not available at the time of the internship.
4. The board has undertaken other energy conservation activities such as installing insulation and replacing windows.
5. An accurate record has been devised for each school so that the cost of heating and lighting can be monitored.

In all, the business manager indicated that the Board has a keen interest in energy conservation and feels that it is a significant means of saving money that is so greatly needed for other areas of education.

The St. John's Roman Catholic School Board

The Director of School Construction and Maintenance for the St. John's Roman Catholic School Board was very

co-operative in providing the information the intern needed with respect to the Board's involvement in energy conservation. The Board was involved in the following activities:

1. Memos were sent to the principals of all schools suggesting ways to conserve energy.
2. In 1980 an incentive grant was set up similar to those of other boards. Again, the grant was discontinued, and for the same reasons as the others.
3. Excellent building profiles have been established for each school building containing such information as the mechanical structure of the school.
4. A computer was installed for the school district which has great potential for energy conservation. It was not purchased solely to conserve energy but it does act as a great accounting and monitoring system for each of its schools.
5. An energy conservation committee was set up in 1981-82 with the purpose of pursuing and recommending ways to reduce energy consumption.
6. Other conservation activities included installing night-set back thermostats, caulking, and replacing inefficient burners. Details are contained in Table 19.

Table 19

Energy Conservation Activities for the St. John's Roman Catholic School Board

| School | Amount | Remarks |
|---|---|---|
| St. Pius X Boys | 3,074.00 | Replace inefficient burner |
| Gonzaga | 3,074.00 | Replace inefficient burner |
| Immac. Conception | 2,308.80 | Replace inefficient burner |
| Brother Rice | 24,953.90 | Increase thickness of roof insulation by two inches |
| Various Locations | 295.57 | Caulking Compound |
| Various Locations | 295.57 | Caulking Compound |
| Various Locations | 295.57 | Caulking Compound |
| Various Locations | 280.39 | Weather Stripping |
| Various Locations | 280.39 | Weather Stripping |
| Beaconfield Elem. (Portables) | 945.00 | Replace built-in thermostats with one low voltage thermostat for each classroom (Total - four units) |
| *Holy Heart of Mary | 57,533.00 | This amount is applicable to the fiscal period April 1/81 to March 31/82. |
| Total | $93,336.19 | |

*This was for the replacement of three oil fired hot water boilers with steam-to-hot-water converters. This change-over will result in improved efficiency in the operation of the two remaining boilers and eliminate the need to keep five boilers fired up.

## Summary

There is little doubt that at present the major impetus for energy conservation is the initiative of each individual school board with some assistance from the energy conservation grant of the Department of Education. However, the Department of Mines and Energy has given assistance with respect to information on energy conservation and is becoming more involved as is indicated by this internship. There would seem to be a need for joint effort on the part of all agencies involved. Perhaps the first step would be to open lines of communication between the agencies.

## Chapter 7

## EVALUATION, CONCLUSIONS, AND RECOMMENDATIONS

This chapter presents as evaluation of the internship by the intern and summarizes the conclusions gathered from the study of energy conservation in the schools of Newfoundland and Labrador. It outlines a number of recommendations for implementing a school building energy conservation program for the province.

### Evaluation of the Internship

Overall, the internship was worthwhile and self-satisfying personally and professionally. It brought the intern into closer contact with the people who operate the schools of Newfoundland and Labrador and gave him a better understanding of how schools are operated from a financial point of view.

Furthermore, it provided insight into the roles of government departments and educational agencies in the province with respect to schools, with a particular appreciation for the relationship between church and state. It occurred to the intern that at times there

seemed to be a lack of communication between the different agencies that participate in the running of our schools.

The major obstacle with the internship from the very outset was its large scope. The lack of co-ordinated energy conservation policy by the various educational agencies added to the problem. Although the Department of Mines and Energy had some information on the subject and had some contact with school boards in the province, it did not have an energy conservation policy in force. Thus the intern was faced with finding out what already existed in the province, as well as in other provinces, at the same time assisting the Department to find information that would give it some direction for future involvement with school boards in the province.

The interviews with the business managers were particularly enjoyable as it gave some appreciation for problems associated with the financial administrators of schools. It was unfortunate that time would not permit interviews with all business managers and all superintendents in the province.

The time of year was also a problem, particularly in mailing questionnaires at the end of May and visiting school board offices in July. It was a busy time for business managers and the time for annual vacations.

However, the intern felt that given the importance of the topic, more cooperation should have been forthcoming from some boards.

A further positive point was the cooperation received from the Department of Mines and Energy particularly from Mr. Taylor. It was his keen interest that motivated the intern to get more involved in the study. It meant that much more time was spent with the Department than the intern first envisaged.

With respect to the objectives, the intern feels that they were accomplished to satisfaction. The biggest disappointment was the lack of documentation or cost accounting of energy conservation activities. For the benefit of all school boards it is hoped that this will change. To further enhance energy conservation, it is important that data be recorded and ideas shared.

## Conclusions

Genuine interest exists among school board business managers and in the school system as a whole with respect to energy conservation. However, the degree of concern and action varies from board to board depending on the interest of the business managers, the financial situation of the board, and the information available

to them. Also, not everyone appreciates that substantial financial savings will result from energy conservation activities.

Whatever interest there is in energy conservation among school boards, it springs mainly from the boards themselves. Very little leadership is being given by any level of government. It is true that some financial assistance is available, if requested, but there is no overall concerted program to encourage boards to conserve energy. This is true even though the Department of Education has provided a grant, since the grant was the result of the initiative of boards. Furthermore, as was already pointed out, the grant is an isolated thrust and has not been developed as a component of a total comprehensive energy program. Moreover, according to the Director of School Services, while the revised School Planning Manual for school building construction encourages boards to incorporate energy conservation features, it does not list them as mandatory. The underlying problem seems to be that those who supply the money for building and operating schools are not the ones who spend it. This need not be a problem, but it can be unless co-operation is sought and encouraged.

A further point is that most schools were built when energy was cheap and not considered a significant factor in a board's budget. As a result many school buildings are not energy efficient. A first step would be to assess all schools as to their potential for energy savings and from this assessment to establish priorities. Some boards have endeavoured to do this but it is not adequate simply to embark on a haphazard retrofit program. Energy audits must be undertaken before large sums are spent.

The Department of Education grant is a beginning, but it is not as effective as it should be. It is more a token than a commitment to energy conservation. Furthermore, nobody seems to be adequately evaluating the effectiveness of the grant. A question should be why fifty percent of it is not being claimed.

In spite of the action taken by boards in energy conservation, it is apparent that if any program is to succeed, the following are essential:

1. There must be commitment by those in authority.
2. It must be applicable to its own unique situation.
3. There must be involvement and commitment by the users of the buildings.

Energy conservation programs cannot be forced upon the users of the buildings. It is true that mechanical devices and structural improvements can assist, but real success will occur only if teachers, caretakers, and students are included in the program. In fact energy conservation should be an integral part of the school curriculum to make sure that the students are a part of the energy conservation program.

## Recommendations

To introduce energy conservation in our schools is not just to provide funds to school boards. In fact a significant saving can be realized through housekeeping activities rather than in spending large sums of money. There must be good financial planning for the long term. It is necessary to have good liaison between all levels of government involved in school buildings. Based on this internship the following recommendations are offered for developing and implementing an energy management program for the schools of this province:

1. There should be a single government agency for boards to contact concerning energy conservation, whose terms of reference and lines of communication have been worked out jointly by the Department of Education and The Department of Mines and Energy.

2. The present Energy Conservation Grant should be incorporated into a comprehensive energy conservation program for the province, administered by the same agency that is co-ordinating the activities. Appropriate criteria should be established for awarding the grant and appropriate procedures established to evaluate the programs for which it was awarded.
3. Pilot retrofit projects should be undertaken with sample boards throughout the province to demonstrate visibly what can be done to conserve energy. The savings must be carefully documented for all boards to see.
4. Energy auditing should be done for all school boards on a priority basis. School boards in turn should have to demonstrate that appropriate energy accounting and monitoring procedures have been established throughout the district.
5. A newsletter should be published to communicate energy conservation activities to all schools. This may be a separate newsletter or part of the existing Department of Education Newsletter.
6. The proposed guidebook should be completed as soon as possible with the Business Managers' Association appropriately consulted to ensure that the guidebook will receive the proper support.

7. Energy conservation guidelines should be included in the Department of Education's School Planning Manual for school buildings.

8. Although an energy management program needs to be established at the provincial level, it is important also for each school district to establish its own polices and program taking into consideration its own circumstance including weather, building conditions, and school use.

9. The Business Managers' Association should offer guidance to government with respect to energy conservation in our schools. To do this it must be more vocal in support of energy conservation.

10. A study should be conducted into the operation of W7000's in schools where they have been installed. This would be helpful for other boards contemplating installing such equipment.

11. A provincial energy resource center should be set up to supply materials and information to all boards across the province. This would be particularly helpful for providing information on electronic equipment that is on the market. In other words, it would encourage consumer awareness for energy conservation.

12. Energy conservation should an integral part of the school curriculum.

13. Energy conservation activities or projects should not be be carried out in isolation from other building programs. When a school undergoes renovation, modernization, or expansion to accommodate grade twelve, energy conservation should be considered.

14. An energy audit service should be made available at the provincial level to provide school boards with professional information. Both the audits and the resulting conservation programs should be carried out on a priority basis.

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# APPENDIX A

# OUTLINE OF GUIDEBOOK

SCHOOL ENERGY GUIDE: A GUIDE FOR SCHOOL OFFICIALS

Tentative Table of Contents:

Booklet One: Introduction (pp. 1-6)

I Rationale for this Series

II History of Current Energy Problem

(i) Supply
(ii) Price

III The Effect on School Operations

IV What School Boards Can Do

(i) Examples from other Provinces and Newfoundland

V How Did They Do It

VI Purpose For Series and Approach Chosen

Booklet Two: Developing an Energy Management Program (7-10)

I Introduction

II What is an Energy Management Program

III Key Elements (defined)

(i) Examples of Programs Designs

Booklet Three: Energy Accounting (monitoring) element (11-15)

I Introduction

(i) Explanation

II The Steps in Designing the Accounting System

III Examples of Accounting Systems

IV Pull Out Tables

V Definitions and Formulae

Booklet Four: The Energy Audit (16-27)

I Mini Audit

II The Procedure

(i) Samples

III A Building Profile

(i) Samples
(ii) Forms

IV Quick Fix Activities

(i) Building Envelope
(ii) Heating and Cooling
(iii) Ventilation
(iv) Hot Water
(v) Lighting

Booklet Five: The Energy Audit Continues (28-33)

I Maxi-Audit

II The Procedure

(i) Samples

III Major Retrofit Activities

Booklet Six: Evaluation Techniques For Retrofit (34-40)

I Economic Considerations

(i) Life Cycle Costing
(ii) Simple Payback Method
(iii) Net Present Value

Booklet Seven: The Human Element (41-47)

I Introduction

II School Officials

III Energy Education

IV Maintenance

Booklet Eight: Energy Efficiency in New Construction (48-53)

I Introduction

II Energy Using Components

(i) Siting
(ii) Building Shell
(iii) Heating and Cooling
(iv) Lighting
(v) Hot Water
(vi) Other

III Techniques For Assessment (54-59)

(i) Life Cycle Costing
(ii) Computer Simulation

Booklet Nine: Formulae and Definitions (60-65)

(Follow each Booklet)

# APPENDIX B

## THE QUESTIONNAIRE

# QUESTIONNAIRE FOR SCHOOL BOARD ADMINISTRATORS

## A Survey of School Board Administrators Attitudes Toward Energy Conservation

Conducted By
Department of Mines And Energy
Energy Branch
Empire Avenue
St. John's, Newfoundland

Contact: Mr. Richard Canning (709) 737-2776
Or: Mr. Allister Taylor (709) 737-2776

GOVERNMENT OF NEWFOUNDLAND AND LABRADOR
DEPARTMENT OF MINES AND ENERGY

May 28, 1982

Dear Superintendent:

The Energy Branch of the Department of Mines and Energy is currently entertaining the idea of publishing an energy conservation information package for School Board Administrators, which we hope will assist you to implement energy conservation activities into your operations.

However, before we commence in to the development of this project we would like to know what your attitudes are toward this project as well as the general area of energy conservation. By knowing this information, the Energy Branch will be able to develop the information package you identify as being needed.

We would be grateful, therefore, if you took a few minutes to fill out this questionaire and return it to the undersigned by June 11, 1982. As soon as the responses to this survey have been compiled, the Energy Branch will commence work on the information package with great earnest so it can be available before a new school year commences.

Thank you.

Yours truly,
Allister Taylor.

Allister Taylor
Internal Energy
Conservation
Co-ordinator

AT/smg

Attachment

P.O. Box 4750, St. John's, Newfoundland, Canada A1C 5T7 • Telex: 016-4724 • Telephone: (709) 737-3159

PLEASE NOTE

This Questionaire has been separated into four sections. The first section should be answered by either the Superintendent or Business Manager but not by both. The latter three sections could be answered by both individuals on their separate questionaire.

INSTRUCTIONS

You are requested to answer all sections of this questionaire (with the exception of Section 1).

Your earliest reply is essential, if the Department of Mines and Energy is to prepare the Handbook/Manual series before the commencement of school operations this fall. Many of the questions that follow can be answered by checking. Please check (✓) in the space provided, where applicable.

N/A indicates that the question is not applicable to your situation.

In some instances a comment is requested - or you may desire to make a comment. Please be as lavish with comments as possible.

A pre-stamped return envelope is included for your convenience.

If you have any difficulties please call the number shown on the cover sheet.

Thank you for your co-operation.

Richard Canning

Allister Taylor

Name : _____

Position : _____

Name of School Board: _____

Part A

General Information

This section can be answered by either the school board superintendent or the business manager.

1. The number of schools under your Board's jurisdiction: _____

2. The number of schools by building type:

   K-11 #_____ K-8 #_____ 4-11#_____ K-6 #_____

   4-8 #_____ 7-11 #_____ K-3 #_____ 4-6 #_____

   7-8 #_____ 9-11 #_____ Other _____

3. The number of maintenance personnel employed by your board (full time staff). _____

4. Amount of funds that your school board spent on energy in the last fiscal year for fuel and electricity:

   Fuel: _____ Electricity: _____

5. If total consumption figures are known, could you indicate the total amounts of fuel and electricity consumed within your school buildings:

   Fuel: _____ gallons/litres

   Electricity: _____ KW H

6. What is the percentage of your budget spent on energy in the last fiscal school year? _____%

Part B

Energy Management

History of your board's involvement in the area of energy conservation. This section can be answered by either the superintendent or the business manager.

| | Yes | No |
|---|---|---|
| 7. Has your board established a separate accounting system for energy consumption and energy cost for all school buildings? | ___ | ___ |

| | | Yes | No |
|---|---|---|---|
| 8. | Has your board designated a person or committee to develop and implement an Energy Management Program for your school board? | ___ | ___ |
| 9. | Has your board developed a file for each building under your jurisdiction which contains all vital building characteristics (e.g. square footage, classroom sizes, window area, construction materials, etc.)? | ___ | ___ |
| 10. | Have energy conservation guidelines been drawn up by the board for maintenance and school personnel to follow? | ___ | ___ |

Maintenance

| | | | |
|---|---|---|---|
| 11. | Has your board established a maintenance procedure which requires maintenance staff to regularly check on major energy using components? | ___ | ___ |
| 12. | Has your board conducted any training courses for maintenance personnel in the area of energy conservation? | ___ | ___ |
| 13. | Does your board rely on service contracts to maintain major energy using equipment (e.g. furnace, air-conditioning system etc.) | ___ | ___ |
| 14. | Has your maintenance staff been trained to handle minor repair work? (e.g. furnace, replacing belts on HVAC system, etc.)? | ___ | ___ |
| 15. | Has your board sent representatives to any conferences/seminars or workshops dealing with energy conservation? | ___ | ___ |

Renovations and New Construction

| | | | |
|---|---|---|---|
| 16. | When general renovations are necessary does the board require a review of the renovation to see if energy conservation action can be done at the same time? (e.g. having to replace roof - include additional insulation) | ___ | ___ |
| 17. | Have any renovations been done to your school solely for the purpose of energy conservation improvements?<br>If yes, please indicate type of activity and number of times this type of activity has been applied to various school buildings. | ___ | ___ |

| | Yes | No |
|---|---|---|
| 18. Has your board conducted studies into the potential for energy improvements in school buildings? | ___ | ___ |
| If yes, have these studies been conducted by | | |
| (i) school board staff? | ___ | ___ |
| (ii) Engineering Consultant Firms? | ___ | ___ |
| (iii) Equipment Suppliers? | ___ | ___ |
| (iv) Other: Please indicate | ___ | ___ |
| 19. Are future energy costs and energy consumption considered by the board when plans are developed for new school construction? | ___ | ___ |
| 20. Does your board require architects or consultants to incorporate energy conservation features into their new building designs? | ___ | ___ |

Grants

| | | |
|---|---|---|
| 21. Has your board taken advantage of the Department of Education's Energy Conservation Grant? | ___ | ___ |
| If yes, could you please indicate how the grant was used: | | |
| (i) insulation (wall or roof) | ___ | ___ |
| (ii) Energy Management Control Systems | ___ | ___ |
| (iii) Windows (double or triple glaze) | ___ | ___ |
| (iv) Other: Please indicate: | ___ | ___ |

| | Yes | No |
|---|---|---|
| 22. Has your board submitted any energy projects for possible funding under the Canada/ Newfoundland Energy Conservation and Renewable Energy Demonstration Agreement administered by the Department of Mines and Energy? | ___ | ___ |

If yes, please indicate the type of project submitted for assessment:

_____

_____

If no, please indicate reason for not applying:

_____

Part C

Attitudinal Comments

This section could be completed separately by both the Superintendent and the Business Manager.

| | Yes | No |
|---|---|---|
| 23. If various Government programs become available in the next few years, would your board be interested in utilizing this program to assist you in your energy conservation work? | ___ | ___ |
| Could you please indicate which of the following programs your board would be interested in: | | |
| (i) Inspection on buildings for quick energy conservation corrective action? | ___ | ___ |
| (ii) A computerized energy accounting system where all boards would send their energy bills and have them analysed on a quarterly basis? | ___ | ___ |
| (iii) A retrofit demonstration project where funds would be provided to a sample of school boards to undertake minor renovations to some school buildings? | ___ | ___ |
| (iv) Other? Please indicate: | ___ | ___ |

_____

_____

| | | Agree | Disagree |
|---|---|---|---|
| 24. | The main energy problem confronting school boards is increasing energy prices. | ___ | ___ |
| 25. | Newfoundland does not have an energy shortage but an energy pricing problem. | ___ | ___ |
| 26. | Energy is a minor cost item in a school board budget. | ___ | ___ |
| 27. | Energy conservation is not pursued more vigorously at the school board level because administrators are tied up with more pressing problems. | ___ | ___ |
| 28. | Too much time is required to develop an energy management system for our school board. | ___ | ___ |
| 29. | There is not much potential dollar savings from higher energy efficiency. | ___ | ___ |
| 30. | The costs of energy conservation improvements are greater than the savings and are therefore not economically justified. | ___ | ___ |
| 31. | There is no incentive to save energy dollars because if we reduce our energy consumption, energy suppliers will only increase their prices to us. | ___ | ___ |
| 32. | Architects and Engineers are not providing school boards with energy efficient building designs. | ___ | ___ |
| 33. | The lack of precise information is the major reason for not undertaking energy conservation projects. | ___ | ___ |
| 34. | Energy conservation should be the concern of the government and not school boards. | ___ | ___ |
| 35. | The initial capital outlay necessary to build energy efficient school buildings is too high and therefore not cost effective. | ___ | ___ |
| 36. | School boards do not have the capital necessary to undertake energy efficiency improvements to their buildings. | ___ | ___ |

| | Agree | Disagree |
|---|---|---|
| 37. Motivation and collaboration of the school population is not an important factor in the conservation of energy. | ____ | ____ |

Part D

| Information | Yes | No |
|---|---|---|
| 38. Have you required information on energy conservation in the past? If yes, please indicate type of information required: | ____ | ____ |
| (i) technical | ____ | ____ |
| (ii) equipment and products | ____ | ____ |
| (iii) building designs for possible new school construction | ____ | ____ |
| (iv) other, please describe _____ _____ _____ | | |
| 39. When you require information on energy conservation where do you send for such information? | ____ | ____ |
| (i) other school boards | ____ | ____ |
| (ii) Department of Education | ____ | ____ |
| (iii) Department of Mines & Energy | ____ | ____ |
| (iv) utility companies/oil suppliers | ____ | ____ |
| (v) other, please identify _____ _____ _____ | | |

| | Yes | No |
|---|---|---|
| 40. Is the information received easily readable and helpful? | ___ | ___ |
| If no, would you say that the information has not been readable or helpful because: | | |
| (i) It is too highly technical | ___ | ___ |
| (ii) contained no demonstration or working examples to assist you | ___ | ___ |
| (iii) too detailed | ___ | ___ |
| (iv) too much reading material (too voluminous) | ___ | ___ |
| (v) not dealing with specific subjects | ___ | ___ |
| (vi) Other, please explain | ___ | ___ |

_____

_____

_____

_____

| | | |
|---|---|---|
| 41. If an Energy Conservation Guidebook was developed for school officials, would it be helpful and useful to have: | | |
| (i) all information contained in one volume | ___ | ___ |
| (ii) the information divided into sections and sent to you over a time period | ___ | ___ |
| (iii) the information contained in a series of booklets and each booklet sent out over a year period | ___ | ___ |
| (iv) other, please describe | ___ | ___ |

_____

_____

_____

| | | Yes | No |
|---|---|---|---|
| 42. | Would the following information be helpful and useful to you in developing and implementing an effective energy conservation program into your operation? | | |
| | (i) Explanation of the energy situation in the Province and how it effects your operation | ___ | ___ |
| | (ii) Actual examples of other school boards' energy conservation activities, both in Newfoundland and Canada | ___ | ___ |
| | (iii) Actual work sheets and step by step methods to fill out the sheets | ___ | ___ |
| | (iv) Technical terminology condensed into non-technical language | ___ | ___ |
| | (v) Engineering formulae simplified and used in actual samples | ___ | ___ |
| | (vi) Non-technical explanation of various equipment and their functions | ___ | ___ |
| | (vii) How-to-Procedures which would enable school officials to take corrective actions on their own | ___ | ___ |
| | (viii) other, please describe | | |

_____

_____

_____

Part E

School Involvement

43. Are there any schools under your board that have implemented (or in the process of implementing) any notable project/activity in energy conservation? If so, list on the next page.

(1) Name of School: _____

Brief description of project/activity:

_____

_____

_____

(2) Name of School: _____

Brief description of project/activity:

_____

_____

_____

(3) Name of School: _____

Brief description of project/activity:

_____

_____

_____

44. May we contact you for further information on the schools you have listed?

Yes _____ No _____

45. Have you any other comments to make concerning either the proposed Guidebook or energy conservation in general?

_____

_____

_____

_____

Thank-you again for replying to this questionnaire.

# APPENDIX C

## LETTER FROM SUPERVISOR OF SCHOOL GRANTS

GOVERNMENT OF NEWFOUNDLAND AND LABRADOR
DEPARTMENT OF EDUCATION

P.O. BOX 2017
ST. JOHN'S, NFLD.
A1C 5R9

1982 06 02

Mr. Rick Canning
P. O. Box 11, Site 51
Thorburn Road
St. John's, NF
A1C 5H3

Dear Mr. Canning:

Pursuant to your request, herewith a listing of the Boards who applied for and received assistance for energy conservation for the 1981-82 fiscal year.

| Integrated Boards | R. C. Boards |
|---|---|
| Vinland | Placentia-St. Mary's |
| Deer Lake | Labrador |
| Green Bay | Exploit's-White Bay |
| Exploits' Valley | Gander-Bonavista |
| Terra Nova | St. John's |
| Notre Dame | |
| Cape Freels | Pentecostal Board |
| Avalon North | |
| Avalon Consolidated | |
| Labrador East | |
| Port aux Basques | |
| St. Barbe South | |

The total expenditure under this heading for the 1981-82 fiscal year was $114,393.88.

Yours truly,

R. Beaufield
Supervisor of Grants

RB/kb

# APPENDIX D

# CORRESPONDENCE

Box 11, Site 51
Thorburn Road
St. John's, Nfld.
A1C 5H3
April 8, 1982

Mr. Allistor Taylor
Internal Energy Conservation Co-ordinator
Department of Mines and Energy
P.O. Box 4750
St. John's, Nfld.
A1C 5T7

Dear Mr. Taylor:

As of June 1981 I have been enrolled as a full-time graduate student in Educational Administration at Memorial University. To date I have completed the courses required for my program and would like to do an internship in the area of energy conservation for schools in Newfoundland. This internship would meet the necessary requirements for the completion of my degree.

Specifically, I would like to work with your department as an intern since your department is concerned with energy conservation for the province as a whole. From previous conversations with your department I learned that much of the necessary information I need can be obtained through your department. Furthermore, I understand that you are considering developing a guidebook on energy conservation for the province, specifically for schools. I would certainly like to assist you in this endeavour, which I feel would be very valuable to our schools.

There is no doubt that the need for energy conservation in our Newfoundland schools does exist in the light of the large amounts of money that school boards have to pay for heating and lighting. I am not suggesting that this internship will provide all the answers to the economic problems facing the school boards but that I may be able to gain some insight into the problem which might benefit our schools. Furthermore, I believe that energy conservation can offer a means of significant savings to our boards both now and for the future.

..... 2

I have already discussed this proposed internship with Dr. H. Kitchen and he is willing to assist me with it. Furthermore, I have also discussed it with Dr. B. T. Fradsham, Director of School Services at the Department of Education who is also interested in the idea and is willing to assist me in any way possible.

Please advise as soon as possible whether this internship can be realized with your department.

Thank you for your interest in this matter.

Yours truly,

Rick H. Canning

Rick. H. Canning

c.c. Dr. H. Kitchen
Department of Educational Administration

GOVERNMENT OF NEWFOUNDLAND AND LABRADOR
DEPARTMENT OF MINES AND ENERGY

April 12, 1982

Mr. Richard Canning
Box 11, Site 51
Thorburn Road
St. John's, Nfld
A1C 5H3

Dear Mr. Canning,

Re: Internship in the Area of
Energy Conservation for Schools

Having perused your letter of April 8, 1982 concerning your desire to intern with this Department, I must say that I'm indeed delighted that you have choosen to do your internship in the area of conservation and that you have selected this Department to assist you in this endeavour.

As you know from our previous discussions, the Energy Branch has been contemplating what we could do to assist schools in this province to become involved in energy conservation activities. However, given our mandate, which requires us to investigate and develop energy conservation activities for all sectors in this Province, we have not had the time to deal with each sector individually. Maybe your presence could accelerate the Energy Branch movement into the educational sector.

Therefore, this Department endorses your intended internship and that we will provide you with all the assistance you may require to ensure that your objectives will be accomplished.

Yours truly,

Allister Taylor

Allister Taylor
Internal Energy
Conservation
Co-ordinator

AT/smg

# APPENDIX E

# MATERIALS FROM HAMILTON SCHOOL BOARD

The Board of Education for the City of Hamilton

131

OFFICE OF THE
SECRETARY-TREASURER
AND BUSINESS ADMINISTRATOR

MAILING ADDRESS
P.O. BOX 938
HAMILTON, ONT.
L8N 3L1

100 MAIN STREET WEST
HAMILTON, ONT.

TELEPHONE (416) 527-5092

June 11, 1982

Mr. Rick Canning
Department of Mines and Energy
Government of Newfoundland and Labrador
P. O. Box 4750
St. John's, Newfoundland
A1C 5T7

Re: Energy Management

Dear Sir:

In reply to your letter dated June 2, 1982, I enclose reports on energy conservation and procedures on implementation.

We have also embarked on a three-year programme of boiler conversion from oil to gas in most of our schools. The Ontario Ministry of Education provides grants for conversions, where payback is less than one year. The federal government provides grants of $800 per installation.

In addition, we have a program of (1) retrofitting windows, (2) installation of computerized energy programmers in larger schools, (3) conversion from incandescent to fluorescent lighting, and (4) modification to ventilation systems. The Ministry of Education has provided grants for items (2) to (4) in the last two years.

Yours truly,

J. B. Singer
Deputy Administrator (Buildings)

JBS/bl
Encl.

## SAVINGS IN ENERGY CONSUMPTION

## (LINE 4)

Estimated savings due to conservation measures, using 1973 consumption (when conservation program was started):

### C O N S U M P T I O N

| | Hydro | Fuel Oil | Gas |
|---|---|---|---|
| 1973 (Actual) | 51,025,000 KWH | 13,320,889 L | 5,599,777 CM |
| 1981 (Actual) | 42,178,000 KWH | 8,075,000 L | 7,647,380 CM |

### S A V I N G S

1981 (1973 - 1981 consumption difference)*

Hydro — 8,847,000 KWH x $0.03575 = $316,280 + 2,142,100 KWH x $0.03575 = $ 392,863

Fuel Oil — 5,245,889 L. x $0.198 = 1,038,686 + 644,950 L. x $0.198 = 910,986

Gas — (2,047,603 CM) x $0.1248 = ($255,540) + 981,000 CM x $0.1248 = (134,360)

Total Saving in 1981 — $1,099,426 + $70,063 = $1,169,489

* Actual consumption with adjustments for new schools and addition since 1973; also, school closings and demolition.

Cost savings increase every year due to (a) rise in the cost of energy and (b) additional conservation measures.

1982 02 08

The Board of Education for the City of Hamilton

OFFICE OF THE SECRETARY-TREASURER AND BUSINESS ADMINISTRATOR

100 MAIN STREET WEST
HAMILTON, ONT.
TELEPHONE (416) 527-5092

MAILING ADDRESS P.O. BOX 910 HAMILTON, ONT. L8N 3L1

November 1st, 1976.

TO THE CHAIRMAN AND MEMBERS,
Business Management Committee,
Board of Education,
Hamilton, Ontario.

Ladies and Gentlemen:

During the winter of 1973/74, the Board, through budget deliberations embarked on a programme of energy conservation. In order to conserve electrical energy, lighting levels in our schools were surveyed and fluorescent lamps were removed where lighting levels were above required standards. Instructions were issued to schools to turn off lights when rooms were not in use and in order to conserve fuel, schools were requested to turn down thermostats at night and shut off exhaust fans when schools were not occupied.

Other measures were also taken including weather stripping of doors and windows in older schools, caulking, improving efficiency of boilers, etc.

As a result of these measures, we estimate savings of ten per cent in our energy consumption.

In 1977, we estimate energy consumption will cost in excess of $3,000,000. Hydro rate increase in February, 1976 of 24% meant an additional $200,000 and a further increase in February, 1977, will add another $250,000. A saving of ten per cent in energy consumption would represent a dollar saving of $300,000, which we think can be achieved through the judicial operation of electrical and mechanical operations.

It is therefore recommended that the Hamilton Board of Education adopt the energy conservation programme, as proposed by the Ministry of Education.

The objectives of the programme are:

1. Improve the efficiency of energy use,
2. Reduce energy consumption,
3. Control costs as energy prices escalate,
4. Institute a programme of education in energy conservation.

Cont'd....

Under such a programme, the Board would continue to examine methods used in the quantitative assessment of energy savings relative to extra capital costs and operating procedures.

Energy costs for all schools and buildings have been recorded and these will be monitored on a regular basis. It will be possible to compare energy consumption costs and savings in every school plant on a yearly basis. In order to achieve a full potential of energy conservation, it is necessary to have the involvement of all staff and students.

The largest savings in energy consumption can be achieved through the following operational measures:

1. Thermostat setting should be adjusted to between 68° - 70° F. in the winter and 76° in the summer for air conditioning. Since each 1° F. difference in thermostat setting represents 3% energy saving, we can obtain a minimum of 10% average reduction by maintaining the recommended setting.

2. Building ventilation and air conditioning systems should be shut down after school hours, which can result in an additional 8% energy saving.

3. Reduction of 50% in the intake of outside air will lower the cost of heating energy by up to 30%.

4. Switching off lights when classrooms are not in use will also save electrical energy. By reducing the light operation 1-1/2 hr./day, there is a saving of $11.80/year/classroom (656 KWH), i.e. $40,000/year for all buildings (1976 rates).

5. The cost to operate one 40W. fluorescent tube is $1.74/year (95 KWH). In some high schools, more than 1,000 tubes were removed, where lighting levels were excessive in accordance with new standards.

6. Hydro billings are based on peak electrical demand. Reduction of peak demand by 20% through a judicious operation of mechanical equipment could save $6,000 in an average high school.

With the adoption of the energy conservation policy and the co-operation of all staff, we feel it will be possible to exceed the present savings of ten per cent.

Respectfully submitted,

R. S. Cartmell,
Secretary-Treasurer and
Business Administrator.

RSC/dc

# END

1306885

# FIN