LEGISLATIVE ASSEMBLY OF THE NORTHWEST TERRITORIES

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ENERGY STRATEGY

for the

NORTHWEST TERRITORIES

1980 - 2000

a discussion paper

for the formation

of

Energy Policy

Ministry of Energy
February, 1981.

Purpose of This Report

This report is intended to provide an overall perspective on the energy problems of the N.W.T. The report highlights the major problems facing the Territory and suggests where the solutions lie. Some specific direction for various departments is recommended.

The report was written initially in October, 1980 and was circulated to program departments and reviewed by the Executive Committee February 3, 1981.

With adjustment for appropriate changes, the report is hereby presented to the Legislative Assembly for discussion and approval of the recommended strategies. Subsequent to the consideration of the Assembly, formal energy policy will be drafted.

SUMMARY

It is rapidly becoming "old hat" to talk about high energy prices, so much has the subject been discussed lately. However, the N.W.T.'s energy problem is very real and of dangerous proportions, and can no longer be accepted without heavy penalties to our future economic growth.

Heating oil and diesel motor oil are the mainstays of our energy diet. Together they account for 60% of end use energy consumed in the N.W.T. For these fuels, we consume from 3 to 6 times the national per capita average. Coupled with the fact that these products are significantly more expensive in the North, this situation creates a financial burden of oppressing proportions.

Given the provisions of the recent federal budget, prices for these products will at least double by 1985 and rise by a factor of four by 1990, assuming that the products continue to be available in the quantities demanded.

Our current consumption levels are possible only with massive federal and territorial subsidies, support which will have to rise to keep the current North/South disparity from increasing.

Regardless of who funds the subsidies, no responsible government, particularly one seeking to develop its powers, can allow the current situation to continue. This government must accept energy as a priority focus equal in importance to economic or constitutional development.

In response to its energy problems, this government has adopted objectives of energy self-sufficiency and stable/reasonable prices. These goals appear attainable within the foreseeable future if the government is willing to launch an aggressive attack on the problem simultaneously on two fronts:

- conservation of considerable proportion is possible. While the private sectors have both an incentive to conserve and remedies that can be applied, there is too little in the way of incentive or remedy for the public sector (public housing and institutional government). The immediate focus of a renewed drive to conserve should be the public sector.

- alternatives to oil must be developed considering that conservation alone will reduce the size of the problem but not eliminate it. Economically viable alternatives to oil for space heating and power generation do appear to exist to-day for some communities. There is nothing preventing the initial development of these opportunities save the co-ordination of effort required between responsible agencies/governments and the appropriate channeling of existing pools of program funds.

  It can be expected that with further study of the known energy source potential of other communities, additional economically viable energy alternative projects will be identified.

The N.W.T. is recognized as a Canadian leader in the development of wood gasification, engine waste heat capture, and community heating systems. We have an opportunity now, albeit the necessity, to extend this lead to become the Canadian pioneers in remote community energy systems based on fuels other than oil. This is purely a matter of applying existing technology, and not a matter of undertaking R. & D.

This report discusses both strategies and their implications for current government programs. The role of subsidies is treated at length.

The report notes that unilateral action by the territorial government with respect to the development of alternative energy systems is not possible given the lack of key resource control powers. Therefore,

negotiations with DIAND and EMR are currently taking place with a view to assuring that developing federal policies properly account for northern problems. Acceptance of the principal strategies contained herein by the executive and legislative branches of this government will provide the force required for a more active role in these negotiations.

Notwithstanding the federal efforts, treatment of the problem will require a dedication of territorial resources in manpower and capital. It is anticipated that solutions will only be developed in an acceptable time-frame if this government "leads" the effort.

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A. THE PROBLEM

1. A Perspective on Energy Consumption and Comparative Prices

As commonly believed, living in the N.W.T. truly is an energy intensive activity. In comparison with the Canadian average, N.W.T. and Y.T. residents use roughly 50% more energy when all forms are combined (see Table 1). Much of this high consumption appears attributable to space heating requirements and the widespread use of diesel electric generating sets.

Thus it is not surprising to find that the N.W.T. alone uses in the order of three to six times as much diesel and fuel oil on a per capita basis as the Canadian average (see Table 2). Fuel oil alone accounts for roughly 35% of total N.W.T. energy consumption.

On the other hand, our use of electricity and motor gasoline is considerably lower than Canadian averages.

The delivered cost of different energy forms to the user varies widely. Using the domestic consumer for comparison, prices move from a current high of $64.37 per gigajoule* for diesel generated electricity to a low of $5.65 for heating oil. Table 3 provides a summary of the cost of various energy forms.

These costs are roughly projected into the future on the basis of expected fuel price increases and inflation. Petroleum based forms of energy are shown to rise significantly in the near term, while hydraulically produced electricity rises more slowly and becomes increasingly cost competitive.

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* 1 gigajoule (10^9 joules) is equivalent to roughly 1 x 10^6 Btu or 275 KWh and can be used as a measure of delivered energy.

Diesel generated electricity is a highly fuel intensive activity. Prices will rise to unbearable proportions in the future, almost $200/GJ by 1990. Though this form of energy accounts for only 3% of total N.W.T. consumption, its extreme cost leads it to account for an estimated 20% of total N.W.T. energy expenditures. Obviously, the use of diesel to generate electricity is a key problem area.

Comparing the price of energy in the N.W.T. to Canada (Table 4), it is apparent that the private and corporate residents of the N.W.T. are generally at a decided disadvantage to consumers in major centres in the South. The price of domestic service hydraulically generated electricity in the N.W.T., is not out of line with prices charged in some areas of Canada. The price of petroleum products, on the other hand, is definitely out of line with all other areas of Canada save the Yukon.

Considering:

- the forms of energy on which we rely most heavily, and
- the current and projected costs, and
- the Canadian norm for these commodities,

it becomes apparent that this Government's immediate strategy must revolve around reducing the use of petroleum products for space heating and electricity generation. This is the most pressing of a number of glaring, politically sensitive, issues.

2. Supply Uncertainty: A Canadian Problem

We know that diesel and furnace fuel are the mainstay of our energy diet and that the cost of these fuels can be expected to rise dramatically. At least we have always had as much as we wanted. That situation may not continue in the near term.

Reserves of conventional crude in Alberta are declining rapidly and at the current rate of depletion will not last out the decade. These are being replaced by non-conventional oil (oil sands), heavy oil upgrading, fuel substitution and conservation, but not fast enough to prevent a rapid increase in the amount of oil imported. Canada currently imports about 450,000 barrels per day to supply refineries in the Maritimes and to some extent Quebec and Ontario. This represents 25% of the total Canadian demand. By 1985, imports have been forecast to grow to 660,000 barrels per day, and more recently 800,000 barrels per day. Canada will remain for the foreseeable future dependent on foreign countries.

The recent Federal budget included an aggressive energy package aimed at eliminating imports by 1990. In light of the continuing federal/provincial struggle and Canada's past performance, this objective appears highly optimistic.

In the event of a prolonged conflict involving oil-producing countries, the N.W.T. would likely find herself competing with the rest of the nation for fuel. The inability of Canada to make the normal deliveries of fuel to periodically supplied ice-bound ports would be an intolerable situation for the N.W.T.

To date we have been notably unsuccessful in gaining any concessions for the North with respect to priority in fuel delivery. Though the Minister of DIAND has made public statements which appear to give guarantees, he has, in his own right, no power over the matter.

B. THE OBJECTIVE

3. Energy Policy Objectives for Long-Term Goal Achievement

One goal of the GNWT has been stated as:

> *"Controlled growth, expansion and development in the North in keeping with the aspirations of the people, their culture, tradition, pursuits, lifestyles and skills, while affording useful and meaningful employment opportunities at all levels of society".*

Growth can never be controlled, expansion fostered, and economic development take place, without assurances about the fuel required to drive any economic activity. It follows that, with respect to this policy area, the goals of the GNWT must be:

- self-sufficiency in energy, that is the development of a supply that can be controlled within the region, and
- a pricing structure that is reasonable and moreover, is stable

Economic planning cannot take place without energy planning.

C. THE SOLUTIONS

4. Conservation

It has often been stated that the cheapest source of fuel is conservation, i.e. it is cheaper to save a gallon than to buy it. There is little doubt that this "truism" is valid in the N.W.T. in 1981.

It makes sense then for this Government to make sure that its conservation program is as strong as possible, before going on to other solutions to the energy cost crunch.

Conservation programs should vary by economic sector.

a. The private sector - residential, industrial, commercial - have ample incentive to conserve considering that units in this sector bear the cost of their own consumption. Moreover the Federal Government has established programs that provide assistance to customers to retrofit or switch "off-oil".

   It appears that the valid role for the GNWT here is one of education and encouragement, to change attitudes with respect to energy consumption and to inform as to the means/practices available to conserve.

   There is of course a real impediment to conservation of electric power in communities serviced by hydraulic generation. In these areas, the rate is comprised largely of a recovery of fixed cost. Moreover, variable costs are "sticky" with respect to reductions in production. This leads to the "conservation means price increases" conundrum for which no solution exists.

There appears to be a need for a more explicit building code for the N.W.T. that enforces standards appropriate to the climate. These standards should be based upon "life cycle costing" principles that ensure that future energy costs are considered as important as initial capital cost in the construction of any structure. The Department of Public Works and the N.W.T. Housing Corporation should actively sponsor an appropriate code to the Canada Mortgage and Housing Corporation.

b. The public sector - housing. 63% of all residential heating oil is consumed in public housing, and as this consumption is in the main totally subsidized, there is little incentive to conserve. The NWTHC is making an effort to stimulate "user pay" practices; this is appropriate strategy and should be fostered. However, it must be recognized that for the foreseeable future, given the economic nature of the remoter communities, it will not be possible to transfer even a majority of costs to the client. The price mechanism, as a force for conservation, becomes inoperative and therefore the Federal Government retrofit and fuel switching programs will fail.

Given this fundamental system failure, the GNWT must play a larger role in these remoter communities by planning, funding and installing alternative energy supply systems that will provide the benefit of long-term price stability.

c. The public sector - government operations. 31% of all heating oil used in the N.W.T. is used by the GNWT, for residence and building heating. Though fuel costs are rising, this Government is not adversely affected due to the method of utilities payment negotiated with the Federal Government.

A further impediment to effective GNWT conservation is the placement of the utilities budget with one Department - Public Works. This Department has often stated that they bear the burden of Government conservation planning and action, while the consuming departments are not burdened with the responsibility of controlling their use.

As a last point, no bench marks, guidelines, targets or objectives have been developed that can be used to evaluate our conservation performance or strike the right level of expenditures on the program.

To correct this situation, and as a matter of immediate strategy, four things must happen, and all four must take place for effective conservation.

- establish time frame specific conservation targets for each department/region and the Northwest Territories Housing Corporation;
- give departments responsibility for their utility budgets with the ability to make use of saved funds for other purposes;
- renegotiate the method of utility funding with the Federal Government to re-install a need to conserve;
- funds allotted to conservation education and information should be increased, particularly with respect to a continuation of the current public campaign.

As a general rule in conservation programs, whether for public housing, schools, or government departments, a portion of the moneys saved through conservation should be given back to the conserving agency for use in other programs.

5. Developing Our Strengths: Local Energy Sources

Despite the best efforts in the world, conservation alone will never achieve long-term price fairness/stability, or self-sufficiency. To achieve these goals, we must simply back-off the use of oil as an energy source. Faced with similar problems and goals, the provinces have each moved to capitalize on "home" resources in "off-oil" strategies of one kind or another.

Quebec is making increased use of hydro-electricity, the Prairies are heating with natural gas and British Columbia is converting to gas, developing its coal and using forest industry waste.

Our own particular strengths lie in the energy alternatives available locally to our communities.

Enough studies have been carried out by various governments and agencies in the recent past, to indicate that water, wood or coal are viable now or in the near future. Map 1 shows communities in the N.W.T., and the alternative sources of energy that have been identified in a cursory search of the research available.

Keeping in mind, that alternatives must be applied to replacing oil for space heating and electricity generation, the following is a summation of how these alternatives can be used.

a. Water

Hydrological surveys have been completed for most rivers in the N.W.T., backed by specific power site proposals for promising locations. Hydraulically produced power offers a long-term source of stable cost energy for domestic and industrial use including space heating. Power can be produced:

- from rivers with widely varying flows, by conventional high head dams requiring relatively large water storage requirements and providing large capacity, or, by low head dams requiring relatively little storage and providing relatively low capacity;
- from constant flow rivers by "run of river" generation utilizing no water storage.

There are no absolutes in the design of a hydro facility, each project varying according to the nature of stream flow, the peculiar topography of the site, and the requirements of the market.

There appear to be alternatives in the N.W.T. which can at this time compete favourably on an economic basis with oil based energy supply.

As an example, a report done for DIAND completed in March, 1980, indicates that a 30 MW development on the Thlewiaza River was capable of providing the future needs of Eskimo Point, Baker Lake, Rankin Inlet, Chesterfield Inlet and Whale Cove at a cost lower in energy terms than oil alternatives, assuming that electricity was used also for space heating. The consultants analysis included the

construction of necessary transmission lines.

The consultants noted further that:

> *The evaluation of 'mini hydro' schemes, tailored to suit the needs of individual communities was not within the scope of this study. It is recommended that future study should consider the development of such mini-hydro projects. It is likely that capital costs associated with such project specific mini-hydro schemes could be significantly lower than costs reported in this study for single site development.*

Studies have been carried out in some provinces to identify the potential of "mini-hydro" (under 2 MW) developments as sources of remote community energy. A recent study for British Columbia, funded by E.M. & R. found over 50 communities in that province in which this form of energy generation was a likely low cost alternative.

Similar work for the N.W.T. is woefully lacking and should be undertaken on a high priority basis.

b. Wood

Readily available throughout the Western Arctic, this resource can be burned directly for space heating, or chipped and gasified for the small scale production of electricity.

In the Mackenzie Valley given the relative value of wood and oil, their combustion efficiencies and natural heat value, wood is significantly cheaper than oil (Table 5).

The Housing Corporation has reacted by planning the installation of wood heating in "home ownership" houses to be constructed in 1981, but undoubtedly, significant additional conversion is possible.

c. Wind

Wind turbines for electricity generation can serve as useful supplements to the electrical supply of any structure, but at this stage of development, only under a rather restricted set of circumstances.

Devices to enable the connection and synchronization of wind turbines into existing grids, to provide a supplement to diesel, are still in the development stage.

Though wind holds much promise in the long term, and is worthy of further study, it does not appear to be as strong an alternative as other sources of energy in terms of its ability to replace diesel electricity in the near future.

d. Coal

Coal deposits are scattered throughout the Arctic (see Map 1). Coal can be burned directly to provide space heat, or, can be used to fuel boilers for the central generation of heat. A preliminary study completed in 1978 indicated that coal was a viable alternative at that time for three communities. This conclusion was reached even after the coal alternative was weighted downward due to the greater inconvenience of that fuel.

e. Natural Gas

Gas wells are situated within easy reach of some settlements in the Mackenzie Valley and could feasibly be tapped for space heating and electrical generation. Studies into the use of this potential have not been carried out for any community except Inuvik. In the Inuvik case, studies into the use of gas to generate electricity and provide space heating showed the economies to be marginal. Further study is apparently taking place to assess the possibility of simply generating electricity for distribution to Inuvik and Tuktoyaktuk.

f. Other

Peat deposits may be of some use in the future.

6. The Use of Subsidies: A Temporary Solution

It has been said that the provision of subsidies to one group of society, for whatever reason, over the long-term creates unhealthy anomalies within the economy of that society and in the end harms it. This is true in the case of energy. Artificially low Canadian prices in past years have induced consumers to demand a disproportionate quantity while at the same time preventing the capital expenditure required to bring on new sources, hence Canada's current situation.

Within the N.W.T., as in Canada, subsidies have succeeded in masking the fact, for some time, that *our energy problem is really one of the form of energy we use and not one of supply.*

The conclusion must be that subsidies should be short-term only, lasting only as long as it takes to bring about the solution to the underlying problem. Only if no solution

can be found, must the subsidy continue, and then only if:

- the good is of a critical nature necessary for the health and well-being of the populace,
- the price is beyond the level which the normal consumer can purchase even a "distress level" quantity,
- national policies with respect to the establishment of basic regional economic equity demand it.

It follows then that:

- *for heating fuel and thermal electricity, given that solutions to high and rising prices are possible, that subsidies should be of a short-term nature, and used only for the period required to bring new sources on line;*
- *for motor fuels, gasoline and diesel, given that no solutions are available, now or in the near term, subsidies should be applied to achieve a basic regional economic equity.*

7. Economic Stimulation and Energy Policy

It seems appropriate to note in a very brief way here, that the use of local energy sources will provide an economic lift to communities in the form of employment and secondary industry stimulation. This applies particularly to the use of wood and coal, both of which must be gathered/mined and transported. It applies also to hydro projects which involve larger scale construction efforts and subsequently offer opportunities in the skilled trades.

D. ITEMS FOR ACTION

8. Immediate Action Required

a. As a matter of principle, the legislative and executive branches of the GNWT must accept energy goals as priorities for government equal in importance to economic development goals.

b. As a matter of principle, we must recognize that the development of alternative energy sources cannot be carried out by this Government alone given the current federal jurisdiction over waters, forests and mineral resources, power generation and other key matters. *It will be necessary for this Government to work in concert with federal departments and agencies.* In order that solutions be undertaken in the appropriate time frame, we should *continue to lead* by taking whatever steps we can to inform, encourage and assist the appropriate agencies while assuring that their northern programs conform to the appropriate long-term strategy.

This effort has started in an important way through our partnership in the development of the federal Northern Energy Policy.

c. The development of alternative energy sources cannot take place without *additional delineation of the options* available on a community by community basis. *This Government must be willing to allocate additional funds to this effort if it is to play a significant role in northern policy development.*

This delineation is required for the *preparation of* an "*energy alternatives development*" plan -

required now to guide current departmental plans. For example, it makes little sense to develop wind power in the Keewatin now, if a delineation of the options indicated that hydro power was to be developed in that area, making other generation forms redundant.

d. The proposed strategy suggests that *federal funds available for energy demonstration projects be employed aggressively* through the initiation of new and imaginative GNWT sponsored projects. Moreover, the strategy suggests that *these funds be supplemented by Territorial funding* if projects with a favourable pay back cannot be otherwise funded because of their nature.

Moreover, the proposed strategy suggests that *locations faced with thermal generation and high oil space heating inputs should be the first targets for experimental projects.*

e. As a matter of government policy, the effectiveness of GNWT in-house conservation must be improved. The following will be examined as methods of effecting this improvement:

- establishing time frame specific conservation targets for each department, region and the N.W.T. Housing Corporation;
- transferring responsibility for utility budgets from D.P.W. to the consuming department or agency, and where that unit can demonstrate energy dollar savings through their own conservation efforts, allowing a retention of the saved funds as a positive incentive to act;
- renegotiation of the method of utility funding with the federal government to re-install the conservation imperative for the territorial government;

- increasing the funds allotted to conservation education and information, particularly to allow a continuation of the current public campaign.

f. *Government employee benefit packages should be redesigned so that employees pay for their utilities directly, at the going community rate,* substituting some other form of assistance in their place. This will provide a positive incentive to conserve.

g. A Northern building code must be developed based on life cycle costing practices to assure that energy costs are included in the design parameters of Northern construction.

9. Longer Term Action

a. The development of energy alternatives will require a high level of integrated planning between suppliers of various energy forms. It is doubtful that this planning can take place successfully between separate agencies pursuing their separate goals. The planning necessary to phase out one energy system in favour of another is likely to require the firm hand of a single agency and therefore, *consideration should be given to the formation of an N.W.T. Energy Corporation responsible for the delivery of energy to communities, to acquire at the outset the N.W.T. assets and responsibilities of the Northern Canada Power Commission, and to take policy direction from the Ministers of the Government of the N.W.T.* Organizations of this nature are being employed by several of the provinces.

b. As a matter of direction, *this government should consider the possibility of replacing the many energy subsidies now in force with a single fuel transportation subsidy.* The single transportation subsidy would achieve a basic regional economic equity by reducing the N.W.T. community landed price of fuel to a Southern Canada bench mark. Consumers in the N.W.T. should thereafter pay the going Canadian price.

Comparative Energy Consumption
1979 First 3 Quarters
Terajoules (TJ)

	NWT/YT	ONTARIO	ALBERTA	CANADA
Residential	1,794	323,199	95,277	859,187
Public Administration	2,594	31,739	7,245	93,962
	4,388	354,938	102,522	953,149
	(67.5)	(41.7)	(50.5)	(40.1)
Total Energy Use, Final Demand All Categories	17,914	1,625,678	584,137	4,456,407
	(275.6)	(190.9)	(287.6)	(187.7)

(xx.x) consumption per 1000 people

Sources: Statistics Canada 57-003 1979 III

Table 1

N.W.T. - CANADA

Selected Comparative Energy Demand

	000 MWh	$000m^3$		
	Electricity	Motor Gas	Diesel Fuel	Light Fuel
Canada Sales	126,551	38,285	14,648	14,295
N.W.T. Sales	161	44	172	88
Pop.Can(ooo) Dec.1979	23,742			
Pop. NWT (ooo) Dec.1979	43			
Per capita Can. demand $000m^3$/1000 pop., or MWh/1000 pop.	5.33	1.61	.62	.60
Per capita NWT demand $000m^3$/1000 pop., or MWh/1000 pop.	3.74	1.02	4.00	2.04

Sources:

Petroleum product sales are 1979 domestic sales as per Stats Canada 45-004 June 1980

Electricity sales are January to June, 1980, cumulative sales as per Stats Canada 57-001 June 1980

Table 2

TABLE 3

COMPARATIVE CONSUMPTION and COST OF ENERGY FORMS
N.W.T. 1979

NCPC 80/81	Generation MWH	Generation GJ	Total Cost $(000)	Total Rev. $(000)	Cost/ $/GJ	Fuel as a % of Cost	% Total N.W.T. Energy Consumption	Forecast 1985 Energy Cost	Forecast 1990 Energy Cost
								$/GJ	$/GJ
Hydraulic	254,176	915,034	13,196	13,860	14.42	3	7	23	38
Thermal	109,178	393,041	25,301	24,638	64.37	44	3	113	193
Total		1,308,075	38,498						
ALTA. Power '80									
Thermal	24,626	88,654	2,760	3,033	31.13	49	1	55	94
TOTAL ELEC.									
Hydraulic	254,176	915,034	13,196	13,860	14.42				
Thermal	133,804	481,695	28,061	27,671	58.25				
		1,396,729							
SAB	(000/gal.)	GJ							
Heating Oil	25,836	4,525,000			5.65-13.07 Yk.-Coral Harbour		34	11-26	20-46
Diesel Motive	19,981	3,500,000			7.20-14.62 Yk.-Coral Harbour		26	14-29	25-51
Motor Gasoline	8,800	1,385,000			9.21-15.50 Yk.-Gjoa Haven		10	18-30	32-54
Aviation Fuel	2,278	372,000			8.98-13.91 Yk.-Fort Liard		3	18-27	31-49
Turbo Fuel	11,877	2,033,000			6.93-14.02 Yk.-Rankin Inlet		15	14-27	24-49
Other		63,000							
TOTAL		13,274,729					99		

*see assumptions

Table 3 is based on the following assumptions:

1. All costs save fuel rise at 10% per annum.

2. The product cost of fuel rises proportionately to increases in the Toronto City Gate price of Crude Oil set at $4.50/bbl per year for the years 1981 to 1985 inclusive, and $7/bbl per annum thereafter, from a base August 1980 price of 16.75.

3. The product cost of liquid fuels is assumed as 50% of the delivered price to the consumer, the balance comprising all acquisition, transportation, handling, storage and delivery costs.

4. Electricity generation will remain constant in the future in terms of KWH produced.

5. Power generation figures exclude industrial power generation for own use.

N.W.T. Known Coal & Hydro Potential

Map 1

NOTES: Coal apparently no active exploration for coal has taken place. Coal deposits shown are either local community knowledge or were uncovered in the course of exploration for other minerals.

Hydro potential has been extensively surveyed only in the Western Arctic and then only with a view to large scale development. No work has been done with regard to small scale hydro in the East or the West.

COMPARATIVE FUEL PRICES

Major Regional Centres in Canada

(net of provincial fuel taxes and Northern Subsidy)

Data contained in this table suffers from collection at varying points in time. Figures cannot therefore be taken as absolutes but must be used with great caution and only as a general indication of the regional differences within Canada.

		Full Service Regular Gasoline	Home Heating Fuel	Electricity Residential
		¢/l	¢/l	$/1000 kwh
Canada	Low	Edmonton 20.5	Saskatoon 16.02	Trail, B.C. 14.94
	High	St.John's 24.1	St. John's 17.9	Summerside 67.95
NWT	Low	Hay River 22.5	Hay River 19.2	Yellowknif 53.87
	Yellowknife	29.5	21.7	53.87
	High	Rankin Inlet 46.5	Rankin Inlet 46.3	Rankin Inlet 146.62

Sources:

Statistics Canada - June 1980

Govt. N.W.T., POL Division - September 1980

Alberta Power Ltd., Rate Application - May 31, 1980

Stats Canada 57-203 - 1980

Northern Canada Power Commission, Proposed Rate Adj., August 1980

Taxation Summary

Regular gasoline - Nfld. 6¢/l, NWT 3.5¢/l

Fuel Oil: No provincial taxes, NWT .7¢/l

Table 4

COMPARISON OF WOOD AND HEATING OIL

Wood: A standard 4' tall by 4' wide by 8' long cord of spruce with a 20% moisture content (air dried) and 50 cubic feet of solid wood contains 15.5 million BTU or 16.35 GJ. Assuming 80% conversion efficiency of an airtight stove, each cord provides 13.08 GJ.

Home Heating Oil: An imperial gallon of heating oil contains 166,000 BTU or .18 GJ. Assuming 65% conversion efficiency of an average furnace, each gallon provides .11 GJ.

Comparison: 1 Cord wood is equivalent to $\frac{13.08}{.11}$ = 119 gallons of fuel

	Est.cost/cord delivered	Price of Oil $/gal.	Cost per GJ Wood	Cost per GJ Oil
Fort Providence	$40	.95 (est)	3.06	8.64
Aklavik	90	.925	5.50	8.40
Yellowknife	80	1.06	6.12	9.64

Table 5