Energy Probe / Enquête Energie

ENERGY POLICY

and

INFLATION, UNEMPLOYMENT, ENVIRONMENTAL QUALITY & NATIONAL UNITY

A Submission to the Federal Cabinet

February 1977

By: The Canadian Coalition for Nuclear Responsibility, and Energy Probe

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ABSTRACT

Four of Canada's major problems are inflation, unemployment, environmental quality and national unity. Since supplying and distributing energy is a major economic activity, the effects of two different energy policies on these four areas is studied.

It is argued that a commitment to conservation and renewable energy would:

- help slow inflation by stabilizing long-term energy costs, by requiring less capital per unit energy supplied, and by supplying energy at a lower cost than the large-scale developments being considered.

- create jobs due to the labour intensive nature of the activities inovlved, and the small amount of capital investment required per job.

- prevent further environmental degradation that is inevitable with the developments being considered.

- aid national unity by relieving regional tensions due to energy supply and costing and by decentralizing control of energy.

It is recommended that:

- all new federal buildings be solar space/water heated.

- the Ministry of Small Business financially assist the renewable energy industry.

- a national residential retrofit program be developed.

- a crown corporation be instituted to stimulate, implement and develop conservation and renewable technologies.

ERRATA SHEET: Our mistake! We discovered too late that the Office of Energy Conservation had updated some figures on the home insulation program. Text should now read:

P. 2: line 10: ...that is, 318 trillion BTU's annually.
line 11: ...2 million gallons of heating oil or over one third of a trillion cubic feet.
line 17: ...insulation is $9 - $12.
line 18/19: omit 1 1/3 times the investment in insulation.
line 21: ...should read 50¢ rather than 45¢.
line 23: ...is $0.5 billion per year

There revisions still reflect the economic and energy savi[...] use. Savings at point of end use should be multiplied [...] reflect the savings in primary energy generation [...] combustion (eg. furnace use). In this case the [...] energy savings are the energy equivalent of [...] 0.5 trillion cubic feet of natural gas [...] [...]lculations in the Footnotes sho[...]

The people of this country understand that our major problems, inflation, unemployment, environmental quality, and national unity, are all related. This national understanding should provoke the development of an integrated policy perspective on our major problems. Without the understanding such a perspective brings, we continue to aggravate some problems, e.g. environmental quality, by supposed solutions to others, e.g. Tar Sands development for energy "self-reliance".

For many Canadians energy policy is a present and a future concern. There are questions about recent price escalations, but, more importantly, there are doubts and confusion over future prices, future sources and their impact on Canadian life.

Providing a continuing source of reasonably-priced energy is one of the biggest and most pressing challenges facing Canadians: our current lifestyle depends on this. One hundred and eighty billion dollars is scheduled for investment into energy supply over the next 15 years. Some of the projects represent the biggest technical and economic commitments in our history.

Therefore it is appropriate to consider how energy policy can be shaped to moderate our problems. Our proposition is that national energy policies founded on energy conservation and renewable sources -- the sun, wind, organic matter, and falling water -- offers the opportunity to positively influence Canada's inflation, unemployment, environmental quality, and national unity.

INFLATION

Inflation and energy policy are related through both the capital requirements of the energy sector and ultimate energy prices. The more capital the energy sector requires, the stiffer the capital competition, the higher interest rates rise, which means higher consumer mortgage rates, and more interest paid to foreign lenders. Since every good and service in the economy has an energy component, each energy price increase percolates through the economy to increase all prices.

In a situation of capital shortages and drastically increased energy prices a prudent energy policy would seek to minimize capital requirements and smooth out future inevitable price increases.

Energy conservation and tapping renewable sources offers the opportunity of doing both. Conservation costs vary from nothing -- good housekeeping practices such as turning down thermostats and plugging leaks -- to the more expensive measures such as insulation retrofits and industrial process changes.

An example of a major energy conservation program would be a national insulation program to retrofit the existing housing stock. The program would cost approximately \$6.3 billion (1975),[1] could be accomplished in ten years, and would save one third of the energy consumed in the residential space heating market -- that is, 7 billion BTU's annually, equivalent to 7 million gallons of heating oil or over one half a trillion cubic feet of natural gas.

Since most of our future energy capital <u>appears</u> destined to supply frontier oil and gas and nuclear power plants, we should compare the insulation program costs with the <u>useful</u> delivered energy costs of these systems.

The one-time capital investment required to save 10^6* BTU per year through insulation is \$9. Delivered Mackenzie Valley gas[2] has an initial capital investment of \$12 to provide a capacity of 10^6 BTU per year: 1 1/3 times the investment in insulation.

To express this another way, delivered energy from the Mackenzie Valley Pipeline will cost \$5 per 10^6 BTU,[3] compared with 45¢ for saving 10^6 BTU assuming a 20 year lifetime for insulation.

The saving on the national energy bill is \$1.8 billion per year.[4]

The equivalent costs for nuclear electricity are even higher. A capital investment of \$70[5] is required for the capacity to deliver 10^6 BTU's per year, and the delivered cost of 10^6 BTU will be \$7 - \$10.[6]

Thus major conservation programs offer the opportunity of decreasing the energy sector's demand for capital, and simultaneously smoothing the impact of price increases by delaying or even eliminating the need for new expensive sources of energy. Without such conservation programs, then, to quote Dr. Kates,

> "By the 1990's energy unit costs will probably be 2 - 3 times as high as they are today. This factor, combined with a per-capita energy consumption 50% to 100% higher than now, would mean that energy costs could require from 2 - 4 times today's proportion of personal income."[7]

* 10^6 BTU is equivalent to one thousand cubic feet of natural gas, or six gallons of fuel oil.

Cost estimates of renewable technology vary, according to sources and systems. But solar space and water heating is presently cost-competitive on a life-cycle costing basis with frontier fossil fuels and nuclear electricity. A life-cycle costing basis is the only fair comparison. Then renewable technologies (and conservation) can be costed over their life-times much as pipelines and power plants are amortized. Furthermore, since renewable energy is most appropriately implemented on a small scale, on-site cost comparisons with conventional energy technology, as in the case of conservation, should be made on a delivered energy basis. To provide 60% of the space/water heating, from solar energy, for a single family home (the most expensive solar use) our price estimates range from (best case) $5 for 10^6 BTU to $10 for 10^6 BTU (worst case).[8] Other figures are $4.70 for 10^6 BTU (assuming a 10 year payback and a 20 year system life),[9] and $8.20 per 10^6 BTU (assuming a 10 year payback and a 20 year system life).[10] to reiterate, this is competitive with <u>useful delivered</u> Mackenzie gas at $5 for 10^6 BTU's and nuclear electricity at $7 - $10 for 10^6 BTU's. Studies for the U.S. Energy, Research and Development Administration (ERDA) have recently concluded that solar space and water heating is competitive not only with electricity but also with oil in some States.[11]

It is significant that these solar systems are Model-T's produced without benefit of intermediate scale of production and yet they are already cost competitive.

Given the recent history of 100% + cost overruns on major large-scale energy projects -- Alyeska pipeline, James Bay, the Syncrude Plant, and the nuclear plant at Le Preau, it appears likely that future frontier pipelines and nuclear plants will experience cost escalations (already one Mackenzie Valley Pipeline applicant is calling for government cost-overrun guarantees). Yet the costs of renewable systems, if vigorously pursued should only decline as intermediate production and the experiences of wide implementation are obtained. Indeed, ERDA's goal is a 50% reduction in solar prices by 1980.[12]

Thus conservation and renewable energy technologies offer a less inflationary energy policy alternative several ways:

a) They can be implemented quickly, without long lead times (in direct response to need). Therefore, capital investment can start to be recouped immediately, freeing the capital for other projects, thus allowing for a decrease in financing costs.

b) Once implemented, their costs are relatively fixed, to minor operation and maintenance and capital pay-back. In contrast, conventional systems will require continual input of ever more costly fuels and support infrastructure -- transmission lines, feeder lines, and so on.

c) Capital costs of even the most expensive conservation programs are lower than capital costs of frontier oil and gas and nuclear electricity. The capital costs of renewable technology are now comparable with nuclear electricity and future projections indicate cost competitiveness with all forms of energy.

UNEMPLOYMENT

At a time of continued high levels of unemployment, it seems reasonable to choose those projects which will most effectively employ the greatest number of people with a diverse range of skills. Once again the data indicate that conservation and renewables are superior to conventional energy development.

Conservation and renewable technologies would employ people in <u>all</u> sectors of the economy, particularly the manufacturing and service sectors. Small and medium-sized businesses and manufacturing firms would hire a cross-section of skills. In contrast, large-scale energy projects require predominantly construction workers and engineers, causing distortions in employment opportunities. It has been argued that direct labour costs are generally 50% of conservation investment.[13.] If this is the case, then a $6.3 billion national residential retrofit program could result in $3 billion of employment: at $15,000 a job, this equals 200,000 person-years of employment.

Science Council figures indicate sales of approximately $50,000 worth of renewable energy technology equipment per person-year of employment.[14.] The Science Council also expects capital investment/job in solar technology will be equivalent to the heating, ventilation and air conditioning sector of the economy.[15.]

$125,000 is the capital investment estimate per permanent employee in a forest products based methanol industry producing a supplementary source of transportation fuels.[16.]

While many planned energy projects are touted as job creators the actual case is that the oil, gas, and nuclear electricity industries are the most capital and energy intensive to the economy. Furthermore, the trends are for such sectors to become ever more capital intensive. For example, capital investment per permanent job at Ontario Hydro in 1966 was $600,000, in 1975 it was $700,000.[17.] (In contrast, even Ontario primary industries have an average investment per job of $200,000).[18.] Between 1965 - 1975 Hydro increased its Kwh sold by 88%, annual revenues rose by 230%, but Hydro's employment rose only 69%.[19.] One paper has demonstrated, using official U.S. figures, that solar technologies will provide 2.5 more jobs per unit of energy than nuclear development.[20.]

Not only are there fewer jobs per dollar of investment in oil, gas and electricity but the location of the work (e.g. northern frontiers) and the categories of occupation -- predominantly construction workers and engineers -- do not greatly assist our regional unemployment situation.

In contrast, employment in conservation and renewable technology programs are where the people are.

ENVIRONMENTAL QUALITY

Energy conservation and the use of renewable energy sources are complementary with environmental protection. Many pollutants are associated with the production, transportation and consumption of energy. Conservation through reducing energy demand reduces the level of these pollutants at each stage of the process. At the point of end-use, we can utilize waste heat and hot gases, install more efficient furnaces, reduce the volume of solid waste. All these conservation approaches enhance the environment.

Small-scale renewable energy sources, when trapped on site do not, by and large, have a detrimental impact on the environment. They merely interrupt energy flows -- the wind, the sun, the water, to channel such energy flows to meet our energy requirements. Indeed, our physical environment can better tolerate these many small renewable energy impacts than the threshold-breaking environmental impacts of projects like the Tar Sands or massive coal strip-mining.

But the basic thrust of our energy policy will only intensify our environmental programs and generally increase environmental risk. In the North and off-shore, we risk oil spills and blow-outs from both drilling and transportation by ice-breaking tankers in the Arctic.

> "The consequences of a major oil spill under Arctic circumstances, and the destruction of sea birds, marine mammals, and other aquatic organisms could be beyond recovery..."21.

Pipelines and the necessary ancillary activities will, no matter how extensive our precautions, damage the fragile ecology of the north -- e.g. the Alyeska project, despite the most extensive monitoring/regulations of any major construction project, has still had a severe impact on the Alaska environment.

In the south, more intensive tanker traffic, pipeline routing, and refining will result in a variety of chronic daily spills and leaks and the occasional major accident.

The nuclear fuel cycle of mining, refining, fission and disposal, will result in the release of some radioactive wastes and discharge millions of gallons of hot water into the environment. While scientists debate the probabilities of accidents happening every thousand reactor years or is it a million reactor years (?), most people, relying on common-sense, would say we are not gods and therefore accidents will occur. And no one really knows that would be the impact of a major credible accident in a CANDU reactor. What may be just as important as the risk of a major accident will be the management and routine operation of the fuel cycle. The population is becoming increasingly concerned over this. Recently, the announcement that Madoc was the site chosen for an experimental nuclear waste disposal facility was made. Citizens' groups representatives were seeking information and help from Probe only one day later. Within the last 18 months a number of situations -- Port Hope, Serpent River, and Elliot Lake, have demonstrated that we do not have a history of strict ever-vigilant environmental control; rather the picture is one of confused jurisdictions, negligence and incompetence. So it is that present energy policies will intensify both environmental damage and hazards.

NATIONAL UNITY

In many parts of this country there is a genuine concern about ever more centralizing control of our lives, whether by multinational corporations or by governments. This concern is reflected in calls for decentralization of authority/power not just to the provinces, but to regions, cities, towns, villages, and neighbourhoods. Existing energy policy thrusts generally do little if anything to assist these calls for de-centralization.

Indeed, existing policy enhances centralized control in three ways:

a) The focus on large-scale, complex technology requiring long-lead times to plan, design, obtain permits and construct, precludes on-going citizen participation and influence. When utility managers find themselves seeking a government permit to construct after they have let construction contracts citizen participation becomes a farce.

b) The management and control of such projects becomes intertwined between corporate consortium and government representatives so that it becomes difficult to recognize whose side the ever-diminishing number of players represent. In the nuclear industry, we are vesting control of our energy supply to a small number of people with a rare expertise. How would a long-lived A.E.C.L. engineers' strike affect a society dependent upon nuclear electricity?

c) Large-scale projects are designed to take from the hinterlands and continue to supply metropolitan areas. This intensifies centralizing growth patterns that many find socially inappropriate.

Since we can conserve and supply renewable energy throughout the country we can decentralize our energy planning to all regions and moderate dependencies upon any particular provinces. Furthermore, many conservation and renewable technologies are small-scale and easily understandable. This means that the capital required to enter the field is not beyond the capacity of the individual, small business, local utility, or municipality. The simplicity of these technologies increases the potential for more people to participate in a more informed fashion at the local accessible level.

Such an increase in local autonomy with respect to energy planning would act to alleviate regional alienation and resulting social and political tensions that threaten confederation. Ironically, more independence would be a force for unity.

CONCLUSIONS

Energy planning is a matter of choice; we cannot do everything. We have limited resources -- time, capital, people, materials, energy demand, and most of all political and institutional attention.

As a society we ought to choose the mixture of policies that will not only obtain and conserve new energy supplies but will also beneficially influence our other major problems -- inflation,uunemployment, environmental quality, and national unity.

We contend that an energy policy founded on conservation and renewable sources would, to a large degree, meet this complex objective. Tragically, continued development of nuclear electricity and frontier fossil fuels, with their huge resource requirements, will <u>foreclose</u> the opportunities offered by conservation and renewable energy sources.

POLICY RECOMMENDATIONS

Our present reliance on fossil fuels and anticipated nuclear development is reflected in all institutions of our society. Tax-breaks, subsidies, research money, infra-strucutre support, educational training, political and organizational planning, all undergird and support the old ways of supplying energy. The result is a strong cultural and institutional psychological bias toward oil, gas, and nuclear electricity. To shift our society to conservation and renewable sources requires involvement of all sectors of society, but this will not occur without sustained government leadership.

Creation of offices of energy conservation and renewable energy are merely the first small steps in beginning these necessary shifts of capital, people, training, research, and management to the conservation and renewable sectors. Now we should strengthen the small but growing base of support for the renewable/conserving technologies by a number of new and reasonable initiatives:

a) Crown Corporation Involvement

Either Petro-Canada or a new crown corporation (Solar-Can?) should be instituted to stimulate, implement, and develop conservation and renewable technologies.

b) Begin at Home

All new federal buildings should be solar space and water heated. Such a practice would stimulate the industry and demonstrate the government's commitment. The U.S. government has recently enacted such a policy.[23.]

c) Small Business

The newly created Ministry of Small Business should aid and support the fledgling renewable energy industry with research, grants, and low-interest loans.

c) Insulation - Retrofit

Establish a National Insulation Retrofit Program with the goal of insulating the national housing stock by 1987. Such a program would enlarge upon the recent conservation initiatives with the governments of Newfoundland and Price Edward Island.

e) Financing the Program

It is recommended that the government of Canada make these investments top priority as they will provide long-term returns both socially and financially. Perhaps an additional surcharge on the consumption of traditional energy would be appropriate.

REFERENCES/CALCULATIONS

1. The Conserver, Vol. 1, #2, Office of Energy Conservation, November 1976.
2. The latest Foothills Pipeline cost estimates are $4.5 billion for their transportation facility alone (42" pipe); a conservative estimate of other necessary costs are $1.5 billion in further exploration and development of the Delta, and $1 billion in expansion of Southern facilities. Total costs = $7 billion. This will produce almost a trillion cu.ft. of gas a year, but useful delivered energy to the consumer will be only 548 billion cu. ft. (20% transportation loss, and an average furnace efficiency of 75%). Therefore investment for 10^6 BTU's equals

   $\frac{\text{548 billion cu. ft.}}{\text{\$7 billion}} = \$12 \text{ per } 10^6 \text{ BTU}$
3. Canadian Arctic Gas estimates* for Delta gas delivered to the Toronto City Gate are $2.75 - $3.25 per Mcf. The local distributor will add at least $1 per Mcf: the cost is then $3.75 to $4.25. If the gas is used with a furnace efficiency of 75%, then the cost averages $5 per Mcf of useful energy.

   * Speech by V.L. Horte to the Petroleum Society of the Canadian Institute of Mining and Metallurgy. Ottawa, Jan 27, 1977.
4. The difference in saving .7 trillion cu. ft. at 45¢ per Mcf and supplying 17 trillion cu. ft. at $2.25 per Mcf.
5. A conservative nuclear figure is $1000 capital per installed Kw. A conservative capital estimate of incremental transmission facilities is $500 per installed Kw. Total equals $1,500 per installed Kw. Given a capacity factor of 80% and a 10% loss on transmission lines, the capital cost for 10^6 BTU's equals .7 x 24 hours x 365 days x 3412 BTU's = 21 million BTU's ÷ $1500 = $70 per 10^6 BTU's.
6. From Canadian Arctic Gas figures, ibid.
7. Science Council Annual Report, 1975 - 76, p. 34.
8. Best case -- a mass produced system costing $5000 providing 60% of space and water heating for 20 years (116 x 10^6 BTU assumed to be full annual heating requirement). Capital expense $3.5/$10^6$ BTU, assume an additional $1.50 payback equals $5.

   Worst case -- the system only provides 40% of space/water heating.
9. Extrapolated from Science Council figures -- Conserver Society Notes, Vol. 2 #1.
10. Canada's Renewable Energy Resources, Peter Middleton Associates, 1976, p. 60.
11. ERDA weekly announcements, Vol. 2 #51.
12. Ibid.
13. Energy and Employment in New York State, Draft Report to the New York State Commission on Energy Systems, May 1976.
14. Conserver Society Notes, Vol. 2 #1.
15. Ibid.
16. Studies of Inter-Group Consulting Economists for the Dept. of the Environment indicate that $5 billion investment in forest based alcohol production would result in 40,000 permanent jobs.
17. Derived from the Ontario Hydro Stastical Yearbook, 1975.

18. Derived from Ontario Statistics Economic Series 1975.

19. Ontario Hydro Statistical Yearbook, 1975.

20. Skip Laitner: "The Impact of Solar and Conservation Technologies Upon Labour Demand", Conference on Energy Efficiency, Washington, D.C., May 1976.

21. D. Pimlott et al, Oil Under Ice, Canadian Arctic Resources Committee, 1976, p. 93.

22. See G. M. Zemansky, "Environmental Non-Compliance and the Public Interest", presented at the 27th Alaska Science Conference, AAAS, Alaska Division, Fairbanks, Aug. 1976.

23. Federal Energy Administration, press release, December 1976.