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IMAGES OF CANADIAN FUTURES: THE ROLE OF CONSERVATION AND RENEWABLE ENERGY

W. R. Derrick Sewell
and Harold D. Foster

Office of the Science Advisor
Report No. 13

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PREFACE

How will Canadians meet the challenge of providing their energy needs as petroleum reserves decline rapidly both here and abroad, and as the cost of replacement sources becomes much more expensive? The kind of country that Canada will become during the next quarter century is being shaped in the response to this question. The industrial, cultural and environmental future of Canada will be formed directly by the alternatives selected today to provide future energy needs.

This study was undertaken on the premise that a view of the implications for the future will lead to a more optimistic prospect for Canada. There are no easy solutions to the Canadian energy situation, but the challenge fully taken should lead to a much more comfortable prospect than if decisions are made with only vague feelings of where they may lead Canadian society.

The response to the changing energy situation is particularly significant to the future environment of Canada. Our environment is threatened by intensified efforts to exploit new sources of energy and to develop advanced energy technologies. Equally important is the prospect that it will be necessary to look to the *renewable* energy sources

PRÉFACE

Comment les canadiens vont-ils relever le défi de subvenir à leurs besoins énergétiques alors que les réserves de pétrole au pays et à l'étranger s'épuisent rapidement et que les coûts des autres sources d'énergie deviennent beaucoup plus élevés? La réponse à cette question décidera du genre de pays que sera le nôtre au cours du prochain quart de siècle. Notre avenir industriel, culturel et écologique dépend directement des solutions adoptées aujourd'hui en vue de répondre aux besoins énergétiques futurs.

La prémisse de la présente étude était qu'une vision prospective de la situation donnerait lieu à des prévisions plus optimistes pour le Canada. Il n'existe pas de solution facile au problème de l'énergie, mais si on relève sciemment le défi, l'avenir devrait s'annoncer sous des couleurs moins sombres que si on se contentait de prendre des décisions en n'ayant qu'une vague idée de ce à quoi elles mènent

Notre façon de faire face à cette situation instable sera particulièrement importante pour notre environnement qui se trouve menacé par les efforts accrus d'exploitation des nouvelles sources d'énergie et de mise au point des techniques plus poussées en ce sens. Fait tout aussi important, il pourra être nécessaire de compter encore plus qu'aujourd'hui sur des sources *renouvelables*, comme le vent, le

(wind, solar energy, biomass potential, etc.) to contribute a larger share of the energy used in Canada, and this signals the possibility that a less wasteful and hopefully more *environmentally appropriate* pattern of development may emerge in Canada in response to this changing energy situation.

From this perspective, the Advanced Concepts Centre of Environment Canada sponsored a small, informal Workshop on Renewable Energy Resource Development in the spring of 1975. Approximately 45 persons from 15 federal government agencies, together with a number of other specialists were brought together for a three-day program of informal working sessions. Dr. Kenneth Hare, Director of the Institute for Environmental Studies at the University of Toronto was Chairmam for the session, and Dr. Derrick Sewell, Professor of Geography at the University of Victoria, acted as Rapporteur.

The Workshop provided effective and stimulating sessions, and generated considerable awareness of Canada's emerging energy problem. The working sessions revealed divergent viewpoints on the potential solutions. A majority of the participants foresaw a constantly mounting demand for more energy to be provided from all possible sources including the wind, the tides, direct solar heating, hydro power, and other renewable sources to supplement the energy from remaining fossil fuels and nuclear power. It was argued that the future demand could be met only if all prospective energy supply technologies

soleil et la biosphère ce qui laisse entrevoir une croissance moins axée sur le gaspillage et, espérons-le, plus respectueuse de l'environnement.

C'est pourquoi le Centre de spéculation sur les perspectives d'avenir d'Environnement Canada a décidé de parrainer, au printemps 1975, une table ronde sur le développement des ressources énergétiques renouvelables. Environ 45 personnes appartenant à 15 organismes fédéraux ainsi qu'un certain nombre de spécialistes se sont réunis pendant trois jours et ont tenu des séances de travail sans caractère officiel. L'événement était présidé par M. Kenneth Hare, directeur de l'Institute for Environmental Studies de l'Université de Toronto, et le rapporteur, M. Derrick Sewell, professeur de géographie à l'Université de Victoria.

Tout en étant fructueuses et stimulantes et bien qu'ayant favorisé une énorme prise de conscience du nouveau problème de l'énergie au Canada, les rencontres ont mis en lumière des points de vue divergents quant aux solutions possibles. La majorité des participants prévoyaient une demande toujours plus grande en énergie et sous toutes ses formes possibles (vent, marées, énergie solaire, énergie hydraulique et autres sources renouvelables) en complément du nucléaire ou des combustibles fossiles et soutenaient que l'on ne pourrait satisfaire à cette demande que si toutes les techniques nécessaires étaient d'avis que cette vue n'était pas réaliste et que la croissance de l'utilisation de l'énergie des dernières décennies ne pourrait pas se poursuivre de façon indéfinie. Certains parmi eux allaient

were brought to their full potential. But another group of participants felt that this was not realistic; they argued that the growth in energy use that had been witnessed during recent decades could not continue for an indefinite future. Some individuals within this group went further, claiming that even if this energy supply could be provided, it would not yield the kind of society they felt Canadians want for themselves and their children. This group saw the problem in terms of energy demand and looked to renewable energy to contribute within a quite different structure of development than we had experienced to date. This development would be characterized by changing patterns of settlement, new transportation systems, and other measures that would allow for the needs of Canadians to be met from the energy that could be provided on a sustained basis.

While individual participants held divergent views on the extent to which fossil fuel technologies or nuclear power should be developed, there was general agreement that a major effort should be made immediately to realize the full potential of renewable energy resources. A number of proposals were put forward to suggest how this might be accomplished. It was clear, however, that a more thorough analysis of possible new policy initiatives was needed before concrete proposals could be firmly made.

même plus loin et affirmaient que même s'il était possible de disposer de toute l'énergie voulue, on n'obtiendrait pas le genre de société que, d'après eux, les canadiens désirent pour eux-mêmes et leurs enfants. Pour eux, le problème en était un de demande et ils prévoyaient que l'apport d'énergie renouvelable se ferait en dehors des lois de la croissance que nous avions connues jusqu'ici, c'est-à-dire que cette dernière serait caractérisée par une transformation des formes de peuplement, par de nouveaux moyens de transport et par d'autres changements qui permettraient aux Canadiens de satisfaire leurs besoins à l'aide d'un apport constant d'énergie.

Alors qu'ils ne s'entendaient pas sur le degré auquel il faudrait perfectionner les techniques faisant appel aux combustibles fossiles et à l'énergie nucléaire les délégués étaient généralement d'accord sur la nécessité d'un effort immédiat en vue de la mise en valeur totale des ressources énergétiques renouvelables. Certaines propositions en ce sens ont ainsi été mises de l'avant, mais il était évident qu'il fallait faire une analyse plus approfondie de certains principes directeurs avant de proposer certaines solutions définitives.

A la suite de ces discussions, le Centre de spéculation sur les perspectives d'avenir, en collaboration avec le Secteur du développement de l'énergie du ministère de l'Energie, des Mines et des Ressources, a parrainé une étude de MM. Sewell et Harold Foster de l'Université

Following on the workshop, the Advanced Concepts Centre in cooperation with the Energy Development Sector of the Department of Energy, Mines and Resources sponsored a study by Dr. Sewell and Dr. Harold Foster of the University of Victoria to carry this debate a step further. They were asked to develop two scenarios for an energy future for Canada based on the two divergent points of view that dominated the Workshop. Specifically, they were asked to consider how a high growth in energy demand could be provided during the next 25 years and to assess what this might imply for Canadian society. Counterbalancing this outlook, they were asked to develop a *Conserver Society* scenario for the same period. From these two broad perspectives, the two researchers were asked to outline policy approaches that would be appropriate for the attainment of these two different prospects for the future.

Dr. Sewell and Dr. Foster have presented scenarios in this report that are readable and entertaining, and also very provocative descriptions of two possible futures for Canada. Neither scenario is a comfortable one. However, this should not suggest that prospects for the future need to be pessimistic. On the contrary, the scenarios show the broad scope of events within which constructive policies can be developed. The authors suggest some positive avenues through which renewable energy development and conservation can contribute

de Victoria visant à fouiller davantage la question. Il leur a été demandé de construire deux scénarios de la demande en énergie au Canada, inspirés des deux thèses inconciliables évoquées plus haut, c'est-à-dire, un scénario où seraient, envisagées les façons de répondre à une forte croissance de la demande en énergie au cours des 25 prochaines années et où en seraient estimées les répercussions sur la société canadienne, et un autre, pour la même période, décrivant une *société de conservation*. De plus, les deux chercheurs devaient indiquer les mesures qui permettraient d'atteindre ces prévisions.

Dans le présent rapport on trouvera les scénarios de MM. Sewell et Foster; d'une lecture agréable et intéressante, ils constituent des descriptions très frappantes de deux situations que pourrait connaître le Canada. Ni l'un ni l'autre ne sont totalement réjouissants; toutefois, il ne faut pas en conclure à une vision pessimiste de nos besoins futurs. Au contraire, les scénarios décrivent l'éventail des situations pour lesquelles des politiques constructives peuvent être élaborées. Les auteurs en suggèrent certaines grâce auxquelles la mise en valeur et l'économie de l'énergie renouvelable pourront non seulement constituer une réponse valable à la question de

significantly not only to the future energy scene but also help to shape a more stable and secure future for Canadians.

Robert W. Durie
Director
Advanced Concepts Centre
Environment Canada

l'énergie, mais également aider à assurer aux Canadiens un avenir plus stable et plus sûr.

Robert W. Durie
Directeur du Centre de spéculation sur les perspectives d'avenir
Environnement Canada

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With the refinement of our techniques for forecasting and planning, we are coming to realize that the image we hold of our future is itself an important element of that future. The expectations we arouse become a strong motivating force in realizing them.

Because of Canada's size and resources, there is probably no society which has wider or more promising choices in creating the image of its future. Defining those choices is the challenge we face.

Pierre E. Trudeau [1]

IMAGES OF CANADIAN FUTURES: THE ROLE OF CONSERVATION AND RENEWABLE ENERGY

REFLECTIONS ON HEAVEN AND HELL

While limited to only one past and one present, the human race faces a multiplicity of potential futures. Given this wide range of alternatives, it should be no surprise that visionaries disagree over the likely attributes of futurity. The spectrum of speculation stretches from those who anticipate a golden future, free from want, disease and inequity, to those who are actively preparing for the imminent demise of mankind.

Disciples of the Utopian school of futurologists include G.T. Seaborg, formerly Chairman of the United States Atomic Energy Commission, who has written:

> I believe we are going to see the rise of an entire generation of young scientists and engineers who will emphasize a new harmony between technology and the most human aspects of life as well as the considerations of the environment. They will use abundant energy with great imagination and ingenuity as the ultimate raw material to manipulate and manage the other natural resources with which we have been blessed. They will use it to recycle almost all waste and to store and keep on tap such recycled material not immediately needed. They will use it to extract, transport, and return to nature when necessary all materials in an acceptable form, in an acceptable amount, and in an acceptable place so that the natural environment will remain natural and will support the continued growth and evolution of all forms of life. And they will do this in a way that will allow economic growth to support a reasonable living standard for all people.[2]

Far less optimistic are those who extrapolate increases in present consumption to derive future demands and their environmental impacts. This, The Club of Rome[3] approach to anticipating the future, gives rise to predictions such as that of Harrison Brown who in *The Challenge of Man's Future* wrote:

> . . . the first major penalty man will have to pay for his rapid consumption of the earth's non-renewable resources will be that of having to live in a world where his thoughts and actions are ever more strongly limited, where social organization has become all-pervasive, complex and inflexible, and where the state completely dominates the actions of the individual.[4]

This vision sounds remarkably Orwellian, anticipating as it does the purchase of freedom at the price of slavery.

In even starker contrast to Seaborg's Utopia is the Doomsday school's vision of the future, put forward by environmentalists who forecast imminent, if not current, collapse of the ecological basis of human life. Proponents of this school include Paul R. Ehrlich whose vision of the future is perhaps best capsulized in the extract taken from his scenario *Eco-Catastrophe!* which follows:

> The end of the ocean came late in the summer of 1979, and it came even more rapidly than the biologists had expected. There had been signs for more than a decade, commencing with the discovery in 1968 that DDT slows down photosynthesis in marine life . . .
> But that was only the first of many signs. There has been the final gasp of the whaling industry in 1973, and the end of the Peruvian anchovy fishery in 1975. Indeed, a score of other fisheries had disappeared quietly from over-exploitation and various eco-catastrophes by 1977.
> . . . Japan and China were faced with almost instant starvation from a total loss of the seafood on which they were so dependent. Both blamed Russia for the situation and demanded immediate mass shipments of food. Russia had none to send. On October 13, Chinese armies attacked Russia on a broad front.[5]

In the face of such widespread apparent disagreement over the nature of the future into which we are rapidly advancing, where lies reality? The question is, of course, rhetorical since all such futures are possible and, therefore, realistic. Acceptance now of the assertion that "the present is the key to the future" necessitates planning and policy implementation to ensure a futurity with the maximum potential for fulfilment and least regret. In the final analysis we shall, no doubt, experience the future we deserve.

MEDITATIONS ON THE PRESENT

Realistic speculation about the future of the future must rest on an adequate appreciation of present's present. For this reason, an exploration of potential Canadian futurities must begin with due consideration of the current dimensions of that country's society.

Three characteristics of overriding significance to any nation are its economic development, flexibility (the number of viable alternative courses of action its institutions face) and the civil liberties guaranteed to its citizens. These three distinguishing criteria, each admittedly composed of a wide variety of discrete elements, many of which are interrelated antagonistically and synergistically, can be used to define a three dimensional social space, within which any country, province, ethnic group or organization can be located. The authors of this report, who developed this concept, have termed this model a growth-flexibility-freedom matrix. Each characteristic is located with reference to an axis, the derivation of which will now be described in detail (Figure 1).

Economic Development

A major objective, in most parts of the world, is to secure a progressive improvement in the standard of living. Generally this is taken to mean higher levels of material well-being, as indicated by rising outputs of goods and services, and as measured by Gross National (or Regional) Product, or per capita income.

The minimum aim, in this connection, is to improve upon the existing standard of living. Beyond this is an aspiration to reach levels achieved by economically more advanced countries (or regions). One can imagine a spectrum of economic development ranging from low levels of attainment, characterized by subsistence-type economies, to high levels, characterized by industrialization, mechanization and luxurious standards of comfort and welfare. Economies, like those of small Pacific islands, are at the lower end of this spectrum; these may have per capita incomes as low as $200 per annum or less. In contrast, countries like the United States and many Western European countries enjoy per capita incomes in excess of $3,500 per annum. The higher end of the spectrum is constantly expanding as new wants emerge and new ways of satisfying them are discovered. This provides additional motivations for those less economically developed to move along the spectrum.

The process by which progressively higher levels of living are attained has been the subject of much economic research, for more than a century. A number of those involved have suggested that the process is an evolutionary one consisting of several "stages" separated by "thresholds."[6] While there has been disagreement over the precise nature of the stages and the factors which enable movement from one to the next, most theorists now agree that higher levels are attained through the adoption of more sophisticated

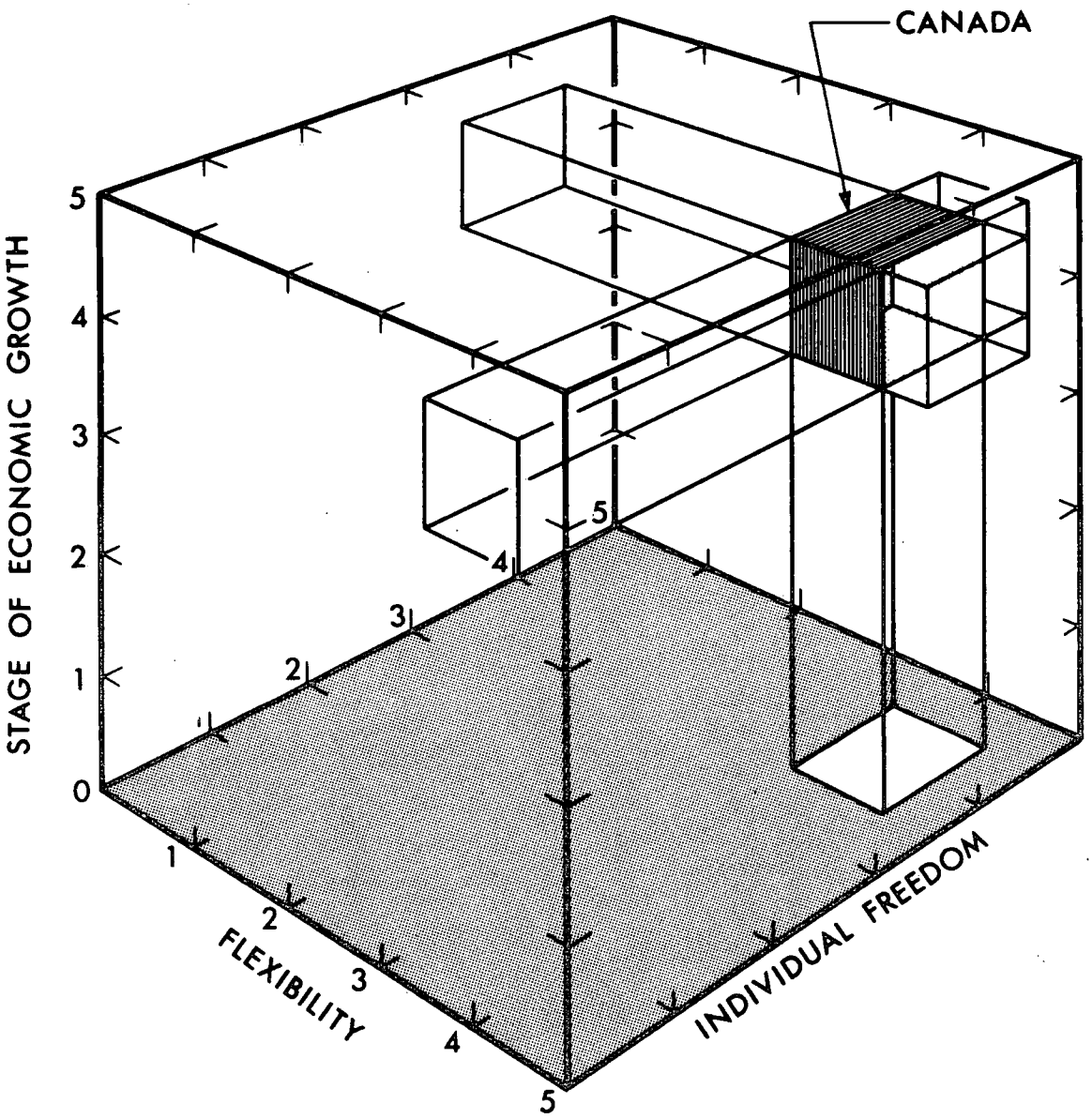

FIGURE 1. A GROWTH - FLEXIBILITY - FREEDOM MODEL.

technology, larger capital inputs, and increasing concentration of production. This movement tends to be accompanied by increasing consumption of raw materials, growing environmental disruption, increasing concentration of population in a few major urban centres, and an expanding dependence on other countries (or regions) for sources of raw materials or market.

Rostow [7], for example, recognized at least a five-stage subdivision of societies according to their attained levels of economic development.

Pre-E1 Traditional. The traditional society is one in which production is limited by the very low prevailing technology and knowledge of science. Output tends to fluctuate markedly with external factors such as climatic anomalies and plagues. Aggregate levels of production can rise and fall but only as a consequence of more or less efficient use of limited fixed resources. Output per head of the population is very low. Examples of this type of economy include that of the Bushmen of the Kalahari and the Tasaday Manuko tribe in the Philippines.

E1 Early Stage. During the early stage the preconditions for economic take-off are established. Processes begin which encourage a primitive society to see economic growth as a necessary prerequisite for the attainment of other goals, These might be the promotion of power, private profit or public welfare. A rudimentary infrastructure is developed. This stage of development might be exemplified by Tunisia.

E2 Take-off. The society undergoing economic take-off is the one in which growth has become the country's normal condition. Many new industries have been established and are expanding rapidly, yielding large profits. Much of this capital is re-invested. Urbanization is rapidly taking place. Ghana is currently at this stage of development.

E3 Intermediate Stage. During a long interval of sustained economic progress, 10 to 20 per cent of national income is re-invested. Population expands and expectations grow as in Czechoslovakia and Hungary.

E4 Mature Stage. During the mature stage of economic development, productivity shifts towards durable consumer goods and services. An increased percentage of resources are devoted to promoting social welfare and security. Examples of this phase include the United States, Sweden and Switzerland.

E5 Post-mature Stage (Speculative). In this post-mature stage, environmental stability and social well-being are the major imperatives. Government plays an increasing role in production and the public is becoming involved in decision-making.

Energy consumption plays an important role in the process of economic growth, and it may be one of the major means whereby "thresholds" of the various stages are overcome. Combined with more advanced technologies, increased energy use enables more efficient production as well as expanded output. Observation of statistics, on energy consumption and per capita income, indicates that the countries which have the highest standards of living also have the greatest levels of energy consumption (Figure 2). The role of energy, however, appears to vary as countries pass from one stage of development to another. Broadly speaking, those which are at the early stage of economic development have both minor energy consumption and a low rate of increase, generally below 2.5 per cent per annum. In contrast, countries in the take-off stage have somewhat greater levels of consumption and very much higher annual rates of increase, reaching in some cases as much as 12 per cent. At the intermediate stage of development, energy consumption reaches elevated levels and the rate of increase is also high. With maturity, however, levels remain high but the annual rate of increase tends to be below 2.5 per cent. Figure 3 provides a diagrammatic representation of these phenomena.

Empirical studies undertaken by Schurr and Eliasburg[8] seem to support these observations. In a study of United States energy consumption, for the period 1880-1955, they discovered that energy consumption per unit of gross national product rose progressively from 1880 to 1920, then began to fall. The rate of increase in energy consumption was highest in the period 1880-1905, after which it began to level off, and then consistently declined. The authors of the study offer several possible explanations, one of which was the increasing thermal efficiency of energy use (particularly through conversion of coal to electricity, and the subsequent replacement of coal by oil and natural gas). Another possible cause was structural change in the economy, which occurred as the United States gradually became a manufacturing nation and as its service industries accounted for an increasingly greater share of the GNP. A third explanation given was the growth in productivity, made possible by mechanization, education and training.

Although there does not appear to have been any similarly detailed study of the relationship between the growth of energy consumption and economic development in Canada, research by Davis[9] suggests that trends similar to those experienced in the United States have

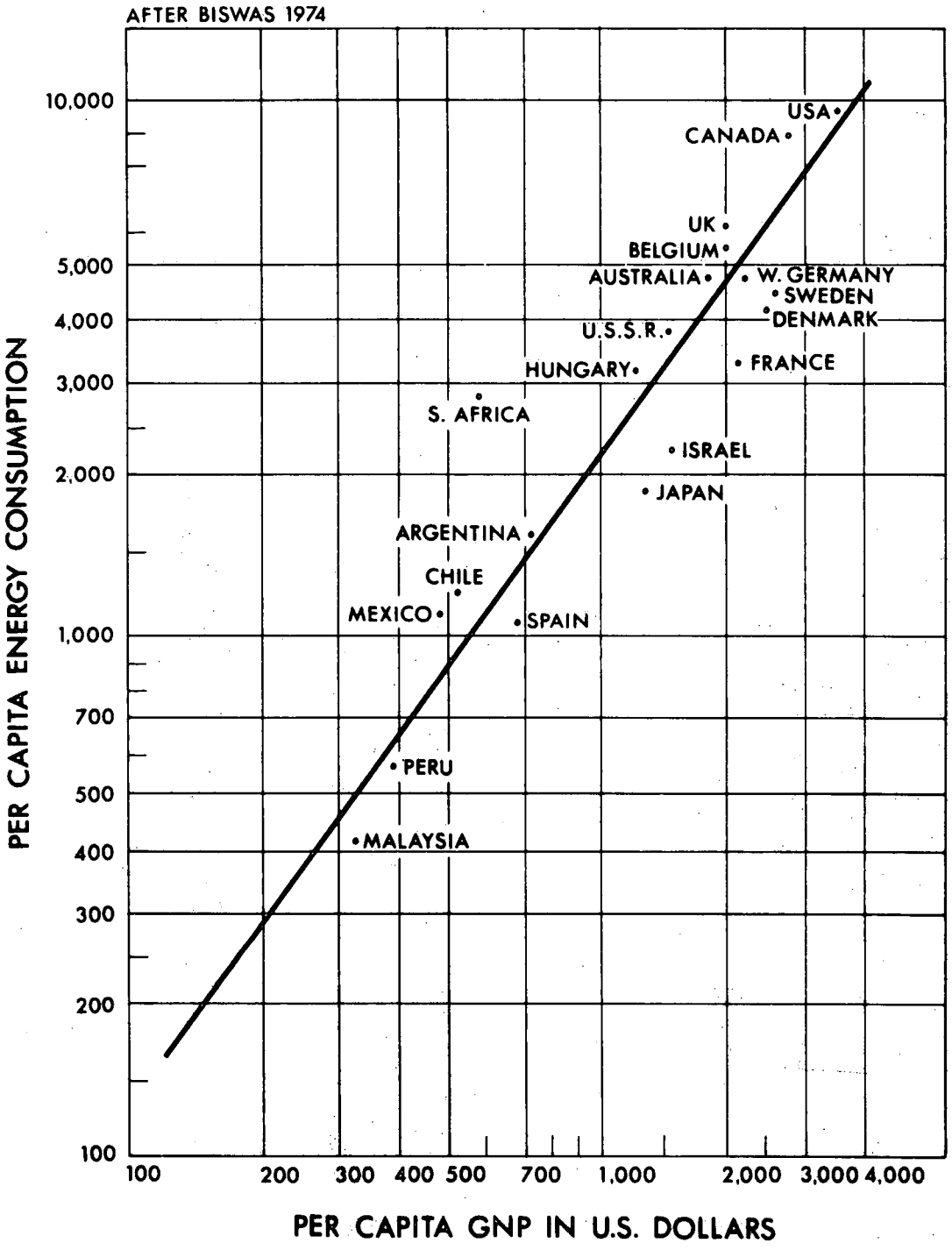

FIG. 2

RELATION BETWEEN GNP AND ENERGY CONSUMPTION PER CAPITA, 1965

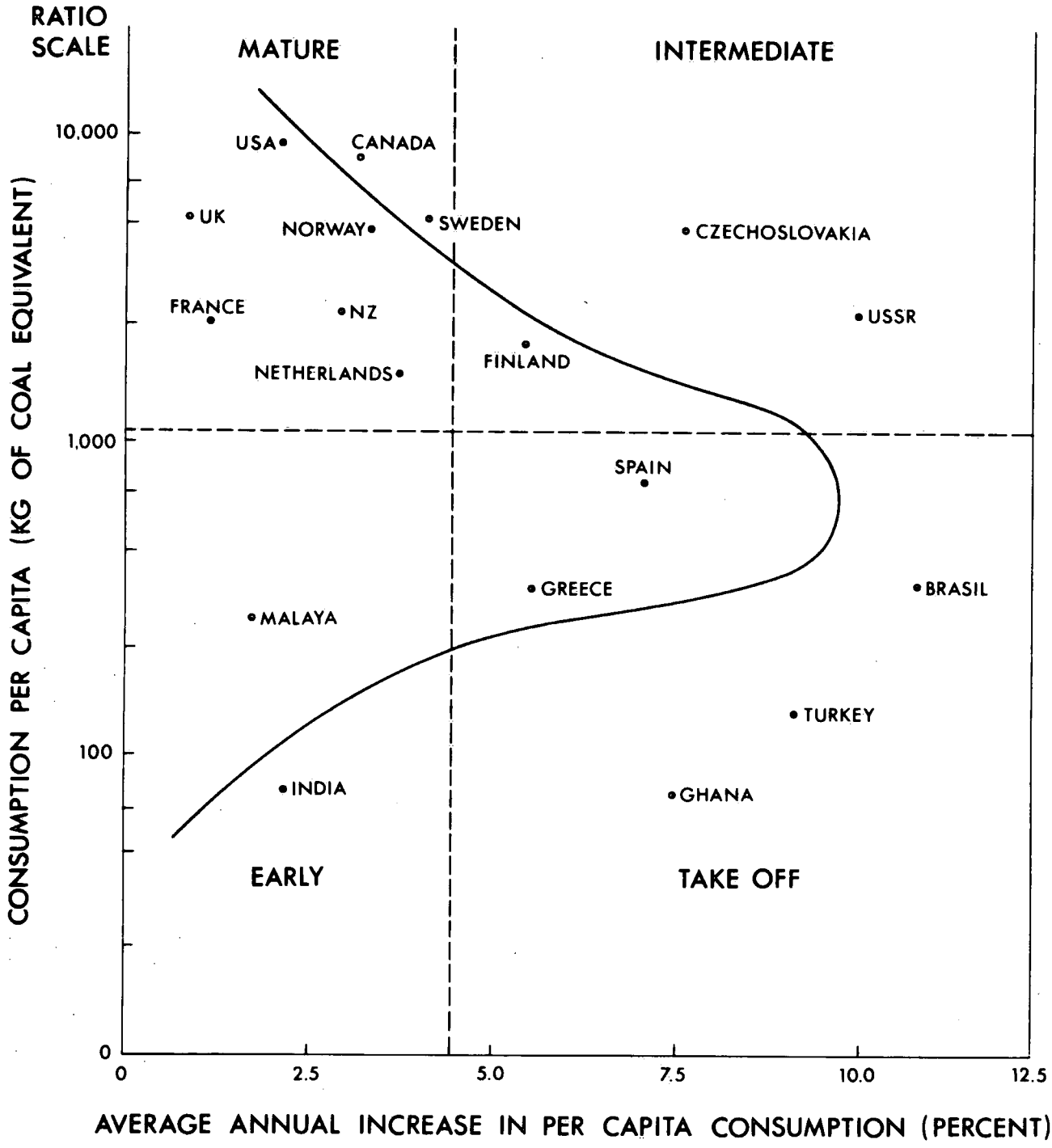

FIG. 3

RATE OF GROWTH AND THE DEMAND FOR ENERGY

occurred here too. Several implications follow if this is the case. One is that high levels of energy consumption may be expected to continue, demanding increasing investment in the search for and development of energy resources, or payments for imported sources. Another is that there will be growing conflicts in the use of the environment as more wells are drilled, new pipelines constructed, hydro-electric power plants installed, and thermal and nuclear power stations constructed.

A number of questions relating to energy and economic growth remain to be answered. The effect of the price of energy on its consumption is still uncertain. As scarcity increases, particularly of fossil fuels, the cost of energy will inevitably rise. How much and how fast this can be offset, by improvements in the efficiency of energy use or the development of cheaper, alternative sources, remains uncertain.[10] The future energy requirements of countries in the "post mature" stage of economic development are yet unknown. It seems clear that the "mature" stage described by Rostow is neither an optimum nor a Utopia, particularly as it seems attainable only at considerable economic and social cost, and may be accompanied by severe strains on the environment. Perhaps there is another stage of development which enables the attainment of higher levels of consumption but at lower social and environmental cost. Such a stage would represent position 5 on the Growth-Flexibility-Freedom Matrix shown in Figure 1.

Flexibility

Extinct species and defunct societies had at least one characteristic in common; they lacked the capacity to adapt adequately to changing circumstances. Ability to accommodate change, here termed flexibility, is a fundamentally significant characteristic of any nation. Although difficult to quantify, it is nevertheless a major element which can be subjectively used to rank societies.

Illustrative of the elements which promote flexibility are a wide range of political, institutional, economic, cultural and ecological factors. The probability of an adequate response to change, for example, is increased, in the democratic arena, by the presence of a vocal opposition. This constantly stretches the party in power to justify its actions and to remedy error. Similarly, in seeking to replace the governing party, the opposition must generate a more attractive platform, sufficiently different to warrant election. Even where this does not occur, such ideas are commonly "borrowed" and put into practice by the government, much to the opposition's chagrin. This process feeds a continuing stream of intellectual innovation into governmental decision-making, so promoting flexibility. In contrast, where opposition is not permitted, or where

there is an oppressive concern with tradition, the ability to respond adequately to changing circumstances is retarded.

The horror of institutional inertia has been well documented.[11] Research has shown that organizations resist innovation for two basic reasons. Change increases both the possibility of error and, therefore, of criticism. Institutions are most likely to modify past policies when there is an obvious and immediate probable gain resulting from doing so. Flexibility then is greatest where a premium is placed on justifiable innovation and where performance is open to public scrutiny and accountability. Secrecy permits crippling inertia to develop.

Many societies are rapidly losing their economic flexibility because of the growing influence exercised by multi-national corporations over their economies. Such large industrial units centralize control and commonly make decisions which, although in their own best interest, are detrimental to the country concerned. Multi-national corporations also lead to a reduction in competition and stimulus for innovation at the local level.[12]

Flexibility increases with the capital available, particularly where this is in excess of that required for the production of basic necessities. Just as the rich have more options than the poor, wealthy nations have more flexibility than destitute ones. The United States, for example, could choose to send astronauts to the moon, India could not.

Variety in options, at the cultural level, is connected with an ability to tolerate diversity. Different religions, racial, ethnic, political and social groups provide a broad spectrum of opinions and ideas, from which capable decision-makers are able to select those which appear most valuable. Just as a smorgasbord provides more choice than a dish of plain rice, cultural diversity allows more room for manoeuvring than homogeneity. Conversely, such a cosmopolitan society also requires more flexibility to govern adequately.

Certain basic physical laws, such as that of gravity, control the operation of the physical environment. These laws restrict social activity. The greatest range of viable social options are open to those groups which fully appreciate such limits, do not undertake actions which cause systems' thresholds to be accidentally crossed, and give full cognizance to ecology in decision-making.

Although realizing that the type of flexibility described herein depends upon a wide variety of elements, the authors of this report have attempted to devise a scale of measurement for this phenomenon.

It is not implied that divisions on such a scale are equal or that it is not capable of expansion, as new forms of institutions and planning processes are developed. On the contrary, it is expected that the scale itself may be extended at either end.

The five stages, used to differentiate societies in terms of the number of viable options facing them, are as follows.

S1 Disintegration. Disintegration represents the final stage of societal collapse. Organization is rapidly crumbling and traditional sources of power are in total disarray. The image of command is lost and members dread the future, since the situation cannot improve. The social system is in disequilibrium and receiving only positive (more disruptive) feedback. Examples of this type of society would include the Roman Empire in its final stages of collapse and the Third Reich in 1945.

S2 Paralysis. During paralysis the institutions of the state are incapable of fulfilling the functions for which they were established. Criticism is increasingly vocal yet innovation ceases, retrenchment occurs. There is little or no progress in any meaningful direction and economic expansion does not occur. Perhaps this description adequately, if unfortunately, fits that of the present-day United Kingdom.

S3 Rigidity. Rigidity occurs when the institutions of the state perform only those tasks for which they were established. There is no innovation or deviation from prescribed functions. Changes from the original goal or objective cannot be accommodated. This societal type is perhaps best exemplified by The Peoples Republic of China.

S4 Responsibility. During the stage of responsibility, institutions are capable of fulfilling the objectives which formed their raison d'être and have less "built-in" constraints. There is some latitude to innovate, although change is judged by its acceptability to the existing structure. It, therefore, tends to be incremental rather than revolutionary and involves alterations in form rather than in function. Institutions are, however, increasingly sensitive to shifts in societal values and newly emerging problems, although there is a tendency to respond by reapplying traditional methods. The United States might serve as an example of this class of society.

S5 Innovation. During a stage of innovation, institutions are constantly seeking out options from a wide variety of disparate sources, rationally assessing them and responding rapidly where necessary. A crisis detection system predicts future areas of concern, which are mitigated at an early stage in their development. Societal

shifts in goals, objectives and value systems are immediately accommodated. This type of organization, an open system in dynamic equilibrium, is exemplified by the social structure of Erehwon.

It is possible that fluidity could increase to the point where no institutional framework existed and where decisions were made by *ad hoc* committees that had no permanence. Such an arrangement would form a further extension of the societal flexibility scale.

It is interesting to note that Canadian governmental decision-makers are showing an increasing realization of the need for flexibility. It is, for example, one of the major aims expressed in the document *Towards a Minerals Policy for Canada: Opportunities for Choice*, and is specifically supported by the Science Council of Canada in Report No. 23, *Canada's Energy Opportunities*. Events of the past three years have clearly shown that if flexibility is not promoted, economic growth and individual freedom may well be jeopardized.

Change demands an ability to respond. Just as genetic diversity increases the probability that a species can accommodate shifts in its environment, so too, cultural variety encourages societal capacity to adapt to a changing milieu. However, in both animal and human situations, there must be a minimum unity within such diversity.

Individual Rights

A fundamentally significant dimension of any society is the personal freedom it permits, by right, to each of its members. Concern over such liberties is a necessary prerequisite of civilization and a characteristic which distinguishes man from other animals. It is this element which the authors have chosen as a third dimension for the classification of societies.

In antiquity such rights were considered "natural" rights to which "all" men were entitled by virtue of their moral and rational nature. However, slaves were not men within the contemplation of the Greeks who asserted the rights of man, nor were non-citizens and those in bondage in the Roman Empire. Similar selective promotion of civil liberties excluded serfs from the privileges of the *Magna Carta* and at a later date the Negro from the protection of the *Bill of Rights* in the United States.[14]

Despite such limitations in the past application of individual freedoms, it is this concept which provided the basis for the more modern view of absolute rights. Many philosophers, including Cicero and St. Thomas Aquinas, have stressed the inviolable nature of such human

rights, while Locke and Rousseau argued that, where the state violated natural rights, disobedience and rebellion were justifiable.

The deep-seated need for safeguarding human dignity was the *raison d'être* of both American and French revolutions. It was, therefore, not surprising that the former culminated in the *Bill of Rights* of the United States, enacted as an amendment to the Constitution while the latter in 1789 saw the birth of the *Declaration of the Rights of Man and of the Citizen.* The chief basis of both these documents was the belief that individuals had the right to be ruled by law, not men, and that such law should not deprive them of the rights of "life, liberty and the pursuit of happiness." Numerous other states have since passed laws promoting civil liberties, often appointing ombudsmen to protect them. In 1948, the *Universal Declaration of Human Rights* was adopted by the United Nations, a document designed to guarantee to all the rights to security of person, freedom from inhuman treatment or slavery and equality before the law, among others. [15]

The number and type of individual rights that a society should actively promote and seek to guarantee, have been the subject of endless debate. Few would argue with those listed in the *1960 Canadian Bill of Rights,* which affects only the federal jurisdictional sphere.[16] These rights are:

(a) the right of the individual to life, liberty, security of the person and enjoyment of property, and the right not to be deprived thereof except by due process of law;

(b) the right of the individual to equality before the law and the protection of the law;

(c) freedom of religion;

(d) freedom of speech;

(e) freedom of assembly and association; and

(f) freedom of the press.

Other basic rights that are often promoted are those of privacy, "the right of each individual to determine to what extent his thoughts, sentiments and emotions shall be communicated to others," [17] and the right to mobility.

It is a forbidding task to attempt to rank countries, provinces or ethnic groups on a scale which seeks to quantify the degree to which they attempt to eliminate the conditions which obstruct the intellectual and spiritual growth of their individual members, by acting as guarantor to his or her rights. Even this governmental process is not enough to give full meaning to human dignity, since the survival of some liberties depend upon the conscience of the society as individuals. Nevertheless, some societal ranking is possible. General agreement might be reached, for example, regarding the

relative positions of the Third Reich under the leadership of Adolf Hitler and of Britain under Winston Churchill's Prime Ministership; or of present-day Uganda and Switzerland.

The authors of this report naturally recognize that the elements, which together combine to reaffirm the dignity and divinity of the individual, are difficult to quantify. Nevertheless, for the purpose of stimulating debate, they have attempted to devise an appropriate scale of measurement. It is not implied that the divisions on this scale are equal or that it cannot expand or contract under the impact of technological and social change.

The five classes, devised to measure the position of the individual in society, are described below.

F1 Incarceration. In this stage, as a result of the deliberate action of society or some members of it, the individual is deprived of virtually all freedom of choice, and movement is restricted to a very limited environment. Inmates in a maximum security prison provide an example of this state of freedom.

F2 Serfdom. In the stage of serfdom, individual actions are largely controlled by the necessity to perform a number of rigidly monitored tasks. These obligations are chiefly for the benefit of others. All rights are held on sufferance. Mobility is limited. Serfs employed in British medieval agriculture or Negroes in the Confederate States provide examples of such a state of freedom. Their actions were largely controlled by other individuals who manipulated them for personal gain.

F3 Conformity. The range of action realistically open to the individual, in a society exhibiting conformity, is small, since it enforces, either through social sanction or economic and legal punishment, a rigid set of guidelines for personal behaviour. The individual is not expected to deviate from the norms such rules represent. Many communist states provide their citizens with this state of freedom.

F4 Emancipation. In emancipated societies the individual has greater personal freedom since rigid rules of behaviour exist for only a limited number of facets of his or her life. Social sanctions continue to exist, as do economic and legal restraints, but these are more selectively applied. The law provides greater individual protection from government. Most Western democracies, for example, the United States, would be included in this subdivision.

F5 Liberty. Liberty as defined here, implies total freedom of action to think, speak and act without fear of reprisal. No restrictions exist on mobility. This, of course, is the state of civil liberty enjoyed in Erehwon.[18]

The impact of guaranteed civil liberties on the consumption of energy and the impact of the production of energy and its distribution on individual freedom has received little Canadian attention. Some relationships are evident. Societies which promote the right to unfettered freedom of movement are likely to see the increasing use of the private automobile, as living standards rise, unlike those countries, like the Peoples Republic of China, which restrict mobility. Energy consumed in transportation is, therefore, clearly related to the individual's right to travel freely. Similarly, the freedom to communicate, and ready access to television, radio and news media increase energy consumption.

The relationships between the types of energy a society chooses to develop and the degree to which individual rights are protected are less apparent. Certain energy forms, such as coal obtained by strip-mining, and hydro-electric power associated with large scale water impoundments, imply extensive environmental and often social disruption, processes which lead to a *de facto* if not a *de jure* abrogation of individual rights. Examples of this process include the destruction of the Appalachian landscape by strip mines and of the inundation of the James Bay lowlands to increase hydro-electric power production.

Other energy forms affect the freedom of choice in the individual in more subtle ways. Nuclear power stations and electricity distribution networks can only function efficiently above a minimum and high level of demand. This adds momentum to the process of urbanization. In contrast, most renewable energy sources, including solar, wind and biomass, are capable of small scale development, so permitting a wide range of choice without sacrifice of technological amenities. Ideally a society's energy policy should allow for both population agglomeration and dispersal. A decision to specialize in energy production and transportation thus has implications for individual rights which, although difficult to quantify, are nevertheless significant.

Relationships between Economic Growth, Flexibility and Individual Freedom

The three characteristics, economic growth, flexibility and individual freedom, used to locate countries in Figure 1, are clearly related. A certain minimum flexibility is required, for example,

if economic growth is to be promoted. A society in the disintegration phase is incapable of maintaining the integrity of organization needed to promote financial well-being. Similarly, high levels of economic expansion probably preclude unlimited personal freedom, since certain constraints must be placed on individual decision-making if the institutional cohesion necessary for growth is to be maintained. It is, therefore, extremely difficult, if not impossible for any society to maximize growth along all three axes concurrently. Indeed it is not absolutely clear whether such movement would inevitably lead to the public good. There may be significant thresholds to individual freedom, for example, beyond which effective growth along other axes may become impossible.

It is stressed that these three axes, although perhaps defining societal experience to date, are all capable of expansion. Future levels of the GNP (not within the time constraints of this study) may be inflated by services provided to robots by robots or by continuous service through man-machine symbiosis. Similarly, flexibility may eventually be expanded to include total control over natural hazards, including geophysical and meteorological events.[19] New levels of individual rights are also being promoted, including guaranteed minimum income and health care.

Conversely, the social space, illustrated in Figure 1, is capable of rapid contraction. Nuclear warfare could simultaneously destroy the basis of both economic growth and flexibility, while individual freedom is threatened (as never before) by new chemical and computer-backed assaults on the sanctity of the mind.

It is of interest to note that it is the relative significance that is placed on future movement along these three axes that largely differentiates political parties.

Canada's Location in the Growth-Flexibility-Freedom Matrix

The position of Canada in the growth-flexibility-freedom matrix, illustrated in Figure 1, will clearly be the subject of considerable debate. Certain facts are basic to such a discussion. For example, it is evident that regional and ethnic disparities notwithstanding, Canadians enjoy a per capita income among the highest in the world. This nation also applies a fairly high degree of technological innovation although much of the research and development involved is accomplished elsewhere. Canada also has an enviable resource base. Despite its fairly heavy emphasis on primary production, the manufacturing sector of the economy is diversifying and a

growing proportion of Canada's work force is employed in service industries.

While Canadian governments have demonstrated an increasing appreciation of the need to accommodate change, there appears to be a degree of inflexibility in institutional frameworks and traditional policies which limit the range of options that are perceived and acted upon. In consequence, in many matters Canada still tends to respond to crises rather than anticipate and avoid them.

Canadian society is characterized by a fairly fluid social structure which enables individuals to move vertically through it on the basis of ability. Certain widespread prejudices make this process easier for some than others. Many of the basic civil rights are taken for granted, as are the institutions which protect their exercise. However, it should be noted that unlike many other democracies, Canada does not have a Canadian charter of human rights that has been ratified at both federal and provincial levels, although a document under that title was promoted by Pierre Elliott Trudeau while Minister of Justice under L.B. Pearson's leadership.[20] As a result, civil liberties have been infringed upon on numerous occasions, usually at the provincial or municipal level. Many racial, regional and sexual anomalies also still exist.

This qualification notwithstanding, in view of the above dominant characteristics of Canadian society, the authors conclude that Canada can best be located at E4/S4/F4 on the growth-freedom matrix. That is, Canada can be characterized as an economically mature, socially responsible and individually emancipated nation. Future possible locations within this three-dimensional matrix will now be examined.

The believable we do in this generation; the conceivable in the next. The third generation we do not understand.

John R. Platt [21]

SCENARIOS AS AN AID TO POLICY-MAKING

It is particularly important, in this period of flux, to take a holistic viewpoint, examining as wide a range of policy options and their implications as possible. To do this, predictions concerning Canada's future must be made. One major difficulty, normally associated with forecasting, is that bold assumptions are essential, yet critics are able to attack the validity of these, rather than respond adequately to substantive issues. Even so, such forecasts are necessary if policies are to be formulated successfully.

Futures research often includes such diverse activities as technological forecasting, corporate planning, socio-economic forecasting, market analysis and economic projections.[22] It is generally taken to involve "the projection of present trends into the future, predictions of future events or of the state of society at some future date, and long range planning for organizations, institutions or societies."[23] There are, as Coates has pointed out, a wide range of techniques currently being employed by those involved in futures research.[24] Methods commonly in use are listed in Table 1.

In this report, scenario writing is the major technique employed. Such images of Canada's future are rendered more meaningful, however, by the application of information derived from a modified Delphi study which yielded a synthesis of views now held concerning probable future global developments in the energy field and their implications for Canada. This Delphi study involved the use of information collected by researchers from the University of Manitoba,[25] data contained in several reports issued by Task Forces on Energy Research and Development of the Office of Energy Research and Development,[26] ideas presented at the Kingston Workshop on Renewable Energy Resource Development[27] and several publications of the Advanced Concepts Centre of the Department of the Environment.[28] Interviews were also held with several individuals involved in the formulation of Canadian energy policy. This information is synthesized in Tables 2,3, and 4.

Scenarios: Underlying Assumptions

The scenario approach would appear to provide a particularly valuable framework within which the broader evaluation of policies can be attempted. Scenario building consists of considering the consequences of alternative assumptions about the future. Instead of trying to arrive at a "best estimate" of, for example, future energy demand or supply, several different possible alternatives are considered in some detail. In this way a variety of futures can be discussed, actions necessary to attain them examined, the implied tradeoffs debated, and energy policy integrated with policies seeking to satisfy a wide range of other social goals and objectives.

TABLE 1

Techniques Currently Employed in Futurology

1.	Scenario building	13.	Objectives trees
2.	Delphi technique	14.	Operations research
3.	Simulation/gaming	15.	Survey research
4.	Trend extrapolation	16.	Causal models
5.	Dynamic modelling	17.	Decision matrices
6.	Cross-impact analysis	18.	Growth curves
7.	Correlation plotting	19.	Interviewing
8.	Expert position papers	20.	Operational gaming
9.	Relevance trees	21.	PERT adaptation
10.	Analogy	22.	Role play gaming
11.	Economic projection	23.	Speculation (disciplined)
12.	Morphological approach	24.	Values analysis

Source: V.T. Coates, "Technology and Public Policy: The Process of Technology Assessment in the Federal Government," in *Program of Policy Studies in Science and Technology*, vol. I, 1972, George Washington University, Washington, D.C.

TABLE 2

Consensus on Future Energy Production, Transmission and Transportation (50 Percent Probability Estimates)

No.	Item	Quartiles & Median
1.	Fuel cells for small scale power generation	1980-1980-1987
2.	Use of nuclear explosives in the production of natural gas and oil, geothermal heat etc.	1980-1980-1993
3.	Coal gasification or liquefaction	1979-1982-1984
4.	'Fail-safe' nuclear power generation	1976-1983-1995
5.	High temperature gas reactors (A-K cycle)	1979-1984-1990
6.	Extra high voltage transmission on very long distances (at least 1000 kv and 1000 km)	1980-1985-1990
7.	Fast breeder reactors	1981-1985-1990
8.	Cryogenic transmission systems using underground superconducting cables	1983-1985-1995
9.	Large scale shale oil recovery	1982-1986-1996
10.	Fossil fuel fired magnetohydrodynamics	1981-1988-1990
11.	Development of all practically feasible hydroelectric sites in populated regions	1982-1988-2000
12.	Techniques for economical recovery of additional 25 percent of crude oil from known resources	1985-1988-1998
13.	Fully automated underground coal mining	1983-1988-2000
14.	Cryogenic pipeline transportation of natural gas	1986-1988-2000
15.	Simple solar furnace for home power generation in tropical and sub-tropical regions	1980-1990-2000
16.	Low cost high voltage underground transmission	1988-1990-2000
17.	Microwave power transmission	1990-1993-2000
18.	'Fail-safe' systems for drilling and producing hydrocarbons at any water depth	1987-1995-2002
19.	Direct conversion--thermionics	1985-1998-2010
20.	Utilization of low thermal difference systems	1990-1999-Never
21.	Controlled thermonuclear power	1990-2000-2000
22.	Efficient storage of electric energy in large quantities	1990-2000-2010
23.	Laser power transmission	1990-2000-2010
24.	Large and efficient tidal power plants	1990-2000-Never

TABLE 2 (contd.)

No.	Item	Quartiles & Median
25.	High temperature gas reactors with thermal cycle other than helium	2010-2010-2020
26.	Widespread use of geothermal power	1990-2020-Later
27.	Relay of solar energy via satellite collectors	2000-2020-Later
28.	Solar energy devices for bulk power generation	2000-Later-Never
29.	Cryogenic superfluid transportation of mechanical energy on long distances	2020-Later-Never
30.	Utilization of gravitational energy (antigravity)	Later-Later-Never

Source: Modified after Vaclav Smil, *Energy and the Environment- A Long Range Forecasting Study*, Manitoba Geographical Studies 3, 1974.

TABLE 3

Consensus on Environmental Protection, Planning and Management (50 Percent Probability Estimates)

No.	Item	Quartiles & Median
1.	Energy sources become the great pawn in international politics	1971-1971-1975
2.	Environmentally motivated higher price of energy	1973-1978-1983
3.	Acceptance of the idea that all consumers share responsibility for pollution and its cost	1975-1978-1980
4.	Safe, large scale disposal of radioactive wastes	1975-1980-1990
5.	'Nonpolluting' internal combustion engine	1976-1980-1990
6.	Abolition of 'growth for growth's sake' concept	1977-1981-2000
7.	Practical, economical methods of stack gas desulphurization	1978-1980-1985
8.	Effective, harmless control of accidental oil spills	1978-1980-1985
9.	Dry cooling power plant towers	1976-1981-1986
10.	Development of waste heat utilization (desalting, heating, sewage treatment, etc.)	1977-1983-1989
11.	Control of water thermal pollution	1977-1983-1987
12.	Nitrogen oxides control	1979-1983-1987
13.	New car batteries, fuel cells, steam, etc.	1980-1985-1997
14.	Offshore siting of large power plants	1981-1985-1997
15.	Removal of noxious matter from fossil fuels before combustion	1981-1986-2000
16.	Establishment of world wide environmental quality standards (air and water)	1986-1988-2000
17.	Taxes to alleviate pollution problems (effluent taxes, tax incentives for dispersal of people from large cities)	1983-1990-2000
18.	Establishment of world wide environmental surveillance and warning agency	1985-1990-2000
19.	Sound suppression of highways and airways	1986-1990-Later
20.	New fast and safe mass transit systems	1985-1992-2001

TABLE 3 (cont'd)

No.	Item	Quartiles & Median
21.	Coordinated international planning of energy consumption	1986-1995-2020
22.	Application of Brayton power cycles to eliminate necessity of water cooling	1986-1996-Later
23.	Planned decrease of per capita energy demand and consumption	1988-2000-Never
24.	Effective population control	1990-2000-2000
25.	Conservation of fossil fuels for other future needs	1993-2005-Later
26.	Widespread use of renewable energy resources in Canada (5% of energy production)	1993-2000-Later
27.	Man will largely destroy his ability to survive in great numbers and in great cities	2000-2010-Later
28.	Utilization of heat sinks other than atmosphere and surface waters	1989-2020-Later
29.	Polar siting of large power plants	2005-Later-Later
30.	Application of new thermodynamic cycles (other than Brayton) to eliminate water cooling	2010- Later-Later
31.	Elimination of all fossil fuel fired generators	2016-Later-Later
32.	No private powered cars allowed	2017-Never-Never

Source: Modified after Vaclav Smil, *Energy and the Environment - A Long Range Forecasting Study*, Manitoba Geographical Studies 3, 1974.

TABLE 4

Post-Industrial Society in the year 2000

1. Per capita income about sixty times the preindustrial
2. Most "economic" activities are tertiary and quaternary (service-oriented), rather than primary or secondary (production-oriented)
3. Business firms no longer the major source of innovation
4. There may be more "consentives" (vs. "marketives")
5. Effective floor on income and welfare and ceiling on wealth
6. Efficiency no longer primary consideration
7. Market plays diminished role compared to public sector and "social accounts," large growth of government agencies
8. Widespread "cybernation"
9. "Small world"
10. Typical "doubling time" between three and thirty years
11. Learning society
12. Rapid improvement in educational institutions and techniques
13. Erosion (in middle class) of work-oriented, achievement-oriented, advancement-oriented values
14. Erosion of "national interest" values
15. Sensate, humanist, criteria become central

Source: Modified after Herman Kahn and Anthony J. Wiener, *The Year 2000: A Framework for Speculation on the Next Thirty-Three Years*, Hudson Institute, 1967.

The first step in the construction of a series of interrelated scenarios is the identification of the major alternative assumptions that underlie each one. These must then be discussed and their significance to the question being reviewed displayed. Once the selection of these assumptions has been justified, a variety of objective and subjective analytic techniques can be used to develop rigorous evaluations of their implications.

In this study, two differing assumptions are made concerning the type of philosophy to be pursued, by governing Canadian political parties, during the next twenty-five years. In the first scenario, a policy of promoting technological growth predominates, while in the second, conservation and recycling have been the dominant theme for many years. Naturally, projected Canadian energy demands in the year 2000 differ markedly as a result of such policies.

In each scenario the price of energy is critical. So too is the impact that energy extraction, generation, transportation and use have had on the Canadian ecology. The two scenarios, therefore, attempt to give full consideration to the many different possible combinations of policies which will affect these critical variables. This obviously means a consideration of successively more stringent levels of social and technological control. Such restrictions, naturally, would have a great impact on the rates of economic growth, flexibility and individual freedom and would, therefore, greatly affect the direction of movement of Canada within the growth-flexibility-freedom matrix previously described (Figure 1). In the final analysis, the basic issues are, where does Canada want to be, within this social space, by the year 2000, and how will it get there? The two scenarios, described in this report, should at least provide a basis for the discussion of this problem. Progress is movement towards some defined objective. Without at least an imperfect vision of a desirable futute, attempts to improve the present are disorganized and constructive efforts dissipated.

Scenarios: Presentation

There are at least five methods for the presentation of futuristic scenarios in common use. The first of these is essentially chronological, the temporal occurrence of **significant events being** predicted. An extract, using this technique, taken from Paul Ehrlich's *Eco-Catastrophe!* has already been quoted.[29] Since the validity of such scenarios rests on specific occurrences, they can rapidly lose their credibility. A typical example of such a loss of validity, drawn from *The International System in the Next Half Century*, written by Professor Ithiel de Sola Pool, Chairman of the

Department of Political Science at M.I.T., in presented below.[30] This author foresaw the following in 1966:

> Major fighting in Viet Nam will peter out about 1967;and most objective observers will regard it as a substantial American victory..... In the United States Lyndon Johnson will have been re-elected in 1968.

Because of the all too obvious pitfalls associated with this method, it has been rejected for use in the present study.

A second technique, a refinement of that already described, involves the selection of major themes, and the description of the future evolution of each. This is the approach taken by the Foreign Policy Association in their examination of the future entitled *Toward the Year 2018.*[31] In this volume, recognized authorities present predictions of futuristic developments in such disparate fields as weaponry, behavioural and educational technologies, weather modification, food and energy production. A weakness of such a multi-author approach is that such scenarios generally lack cohesion; different writers commonly predicting futures which are incompatible. The use of this technique is rejected here on the grounds that it rests too heavily on the occurrence of specific events, particularly technological breakthroughs, which may or may not take place. It is recognized, however, that when such scenarios are compiled by one author or by a small discussion group, such deficiencies can be largely eliminated. In this way such a major theme approach to predicting the future was used, quite successfully, by Stuart Chase in *The Most Probable World,*[32] and by Dennis Gabor in *Inventing the Future.*[33]

A variant of this method involves deep philosophical speculation about the more significant social aspects of the future human condition. Such an approach was employed, for example, by James S. Gunn in his edited volume entitled *Man and the Future.*[34] Themes discussed in this book, by a group of futurists, included man, time and prophecy; an appeal to reason; prospects for humanity; explorations in tomorrow and our crimes against criminals. Again, this was rejected as a possible method for use in this report on the grounds that it does not allow the holistic approach that the provision of a context for viewing current energy problems necessitates, and the fact that technological innovation is commonly underemphasized by it.

A third technique, by far the commonest, is the use of the future as a medium for the description of fictitious events and the societies in which they occur. Science fiction of this type, exemplified by such works as the *Orbit* series edited by Damon Knight[35] or *The Doors of His Face, The Lamps of His Mouth and Other Stories* by Roger Zelazny, [36] is gaining social respectability in Canada. In the Soviet Union, it is already considered an academically useful and intellectually respectable form of literature, capable of providing a major stimulus to scientific research. Such science fiction can be extremely valuable in exploring future societal problems, but is clearly unsuited for use in the present study.

A fourth technique, normally used by geographers to explain historical changes in the nature of the landscape, could easily be adapted for the presentation of futuristic scenarios. This involves the use of a chronological approach for a specific time period, for example ten years, followed by a detailed description of society and the environment at that time. The social and technological development in the following ten years is then described and an overview of the resulting societal and environmental milieu presented. In this way changes can be highlighted and their impact evaluated. It would be possible, for example, to predict developments in the field of Canadian energy until 1985 and to describe the nature of the country in that year. This pattern could be repeated to 1995, and beyond. The technique has considerable merit and could have been applied in this report. However, the authors opted to use the fifth alternative, a retrospective approach.

This latter technique involves making predictions from the vantage point of the future. In this way, the years ahead are presented as history. Jean-Pierre Wallot used this method in "A Visit to the Museum," which appears in *Visions 2020: Fifty Canadians in Search of a Future*, edited for the Canadian Forum by Stephen Clarkson.[37] In this exploration of the next fifty years, the author follows a robotic guide through the *Ottawa Museum of Man of Canada*, on Provincial Day, July 1st, 2020.

This general retrospective approach has been selected for the presentation of the two Canadian energy scenarios which follow, since its credibility is far less governed by the occurrence of specific events, but rather hinges upon the successful prediction of major societal trends, an easier task. The forum selected for the presentation of these scenarios is the House of Commons Debates for May 14, 2000. Both are presented as debates generated by an

energy Act appropriate to the Canadian society existing at the beginning of the twenty-first century. Such a strategy allows an examination of the implications of a wide range of potential energy policies, many of which are currently under discussion and which may be implemented between 1975 and 2000.[38]

Has not every major era in history been characterized by a division into a new class of power-specialists (who "know what they are doing") and an intense new group of universalists ("who mean what they are saying")?
.....It also seems reasonable to assume that without the apocalyptic warnings of the universalist, the new technocrats might not have been shocked into restraining the power they yield.

Erik Erikson [39]

SCENARIO A

May 14, 2000 COMMONS DEBATES

(English) GOVERNMENT ORDERS

NUCLEAR FUSION ADMINISTRATION ACT

MEASURE RESPECTING THE CONSTRUCTION OF NUCLEAR FUSION POWER PLANTS

Hon. David Elliot Reynolds (Minister of Technological Innovation) moved that Bill C-17, to facilitate the construction of nuclear fusion power plants, be read the second time and referred to committee of the whole.

He said: Madame Speaker, this government is dedicated to rapid economic growth, so that the gap between the "have" and "have not" provinces can be closed and so that every Canadian can enjoy the benefits of the three-day work week. This bill has been brought before the House because energy production, as cheaply and as efficiently as possible, is a major objective of this government. Canada is now faced with a significant change in its energy options, a change I might add which is definitely for the better. We stand poised for another period of accelerated economic growth promoted by an expansion of our energy supply.

Some hon. Members: Hear, hear!

•(1410)

Mr. Reynolds (Qu'Appelle-Moose Mountain): The basis of this improved situation is, of course, the recent technological breakthrough which now allows the fusion process to become a controlled, continuous reaction, suitable for use in commercially efficient power plants. [40] The significance of this development is enormous. Since the operation of such plants is based on the deuterium-tritium reaction, large quantities of fuel are readily available for use in the shortly to be constructed Canadian nuclear fusion installations. Deuterium, as the House is aware, is abundant in sea water, from which it can be separated at little cost. Tritium is currently being manufactured in large quantities in Quebec

from lithium 6 and lithium 7 by the nuclear bombardment of pegmatites, with which Canada, because of its geological structure, is well endowed. I am assured that the energy made available to us by this technological innovation will be infinitely greater than that left in our fossil fuels.[41]

I might add that work continues, at Outlook, on controlling the deuterium-tritium reaction. When this breakthrough is achieved, as I am sure it will be in the near future, one cubic metre of water will produce the equivalent of the heat of combustion of 300 metric tons of coal or 1500 barrels of crude oil. Think of the magnitude of this potential! One cubic kilometre of sea water contains one billion cubic metres, having the fuel equivalents of 300 billion tons of coal or 1500 billion barrels of crude oil.[42] Even if only enough deuterium were withdrawn from the oceans to reduce its initial concentration by one per cent, the energy available from fusion would amount to about 500,000 times the energy of the world's initial supply of fossil fuels! This work must go on at any cost. Canada, with the world's largest coastline, should be in its forefront.

Some hon. Members: Hear, hear!

Mr. Reynolds: Madame Speaker, I should like to take this opportunity to publicly congratulate those Canadian scientists who are at the forefront of nuclear fusion research and who have contributed so significantly to this achievement. In the 1970's Canadian research directed towards controlled nuclear fusion was insignificant, less than $5 million per annum, the bulk of the initial progress being made in the U.S.A., U.S.S.R., Japan and Europe. Although some notable research into laser and plasma physics and neutron studies was carried out at the Universities of Alberta and British Columbia, the impact of this effort on the problem was small.[43]

Fortunately, as the result of a wise political decision at the polls, this situation drastically altered in 1986. The new, far-sighted government adopted the recommendations of the Serpentine Commission contained in its report, *A Canadian Program for Controlled Thermonuclear Fusion, Phase III*. These, as you are aware, suggested the development of three hybrid fusion-fission plants at Outlook, Kenora and Sept-Isles; and stressed international co-operation with Euratom and other neighbours to the south. It was from these developments that this recent breakthrough sprang. Naturally the

the costs of such research have been high, but there can now be few who would deny its value. With the passing of this Act, abundant electrical energy from nuclear fusion, from Canadian sources, will be available to the continental network, by 2020. This achievement is, of course, in keeping with a major governmental objective, the guaranteed supply of cheap energy whenever and wherever it is required.

●(1420)

I would like now briefly to review the structure of Bill C-17 in relationship to certain of the other stated aims of government policy. I draw the attention of the House first to part II, the establishment of the fusion power plants at Lockeport, Nova Scotia; Chatham, New Brunswick;Port Hope, Ontario; and Simpson, British Columbia. Because of the large size of these complexes, the $58 billion investment they represent and their location away from the megalopoli, the government feels assured that they will reverse the unfortunate trend toward the concentration of population in major urban centres. Industry and jobs will follow power. To ensure this the Act includes credit-tax incentives to maser, intermetallic, cyborg and counterinsurgency manufacturers to locate in these areas. Naturally, desalination and undersea habitats will be developed, in these regions, by the Departments of Agriculture and Aquaculture respectively.

As the House will notice in part III, paragraph (b) of sub-clause (1) of clause 83, the Act proposes the declassification of two National Parks, the Pearson and Atlantic Rim Parks, and their use as nuclear fusion sites. This move is necessary. Progress requires sacrifice and, in these areas, the need for power is greater than the demand for recreation.

One hon. Member: No way!

Mr. Reynolds: In conclusion, Madame Speaker, I commend Bill C-17 to the House for its careful consideration and prompt passage. The objectives which it seeks to achieve are, for the most part, familiar to members, as being now well established components of an integrated national policy for energy and social change.

The rapid introduction of cheap electrical power from nuclear fusion plants will guarantee, for all time, Canadian self-reliance in energy supply. It will also protect Canadians against shortages of energy,

such as were suffered in the early 1970's and during the oil rationing period of the mid-1980's. Continued research and development in this area, although not inexpensive, guarantees an effective Canadian presence and participation in the significant international activities in the energy field. Fusion power will allow the management of the Canadian energy system with minimum adverse environmental impacts, guaranteeing that the tar sands disaster of 1989 will never be repeated. Fusion power, of course, will, in the relatively near future, allow power production far beyond the 37 quadrillion BTU's currently being generated. In consequence, after a period of some minor financial hardship, large economic and social benefits will accrue to our entire 35 million population. As a result of the potential benefits of the rapid development of fusion power, I believe that the direction of our policies in this area has widespread public acceptance. The Friends of the Earth, the Laplonde Society and the Sierra Club do not speak for the people of Canada but rather for a conservative minority, which is a roadblock in the path of progress. This public consensus, I believe, speaks well of the efforts of the Public Education Confederation. It is now the responsibility of this parliament to give formal expression to its will in these matters, as incorporated in Bill C-17, which is the focus for this debate and decision of this question.

●(1430)

Hon. Ann Sharper (Grenville-Carleton): Madame Speaker, the words of Lord Acton, as true now as when they were written in the nineteenth century, spring easily to mind:

> *"Power tends to corrupt, and absolute power corrupts absolutely."*[44]

Madame Speaker, despite his gender, the Minister of Technological Innovation has just played the role of Eve, offering Canadians the fruit of the tree of knowledge. Adam-like, this House appears on the verge of accepting it. Remember, once before this road led *out* of Eden. We stand poised on the brink of an ever widening nuclear abyss.

One hon. Member: Jump!

Ms. Sharper: Madame Speaker, The Minister equates increased power production with social progress. Let this House reflect soberly for

a moment on this assumption. In the past quarter of a century, we have seen many technological breakthroughs. Nuclear explosions were first used in the Canadian Arctic to aid in the production of oil and natural gas in 1983; large scale coal gasification initially took place in the same year and is now commonplace. In 1986, Hydro Quebec developed extra high voltage transmission techniques allowing the efficient movement of electricity more than 3500 km so that HEP sites far from the population centres could be developed. In 1989, the Simpkins method saw the retapping of hundreds of abandoned oil wells in Western Canada and elsewhere, and allowed the recovery of an additional 25 per cent of the crude oil from known resources. 1991 saw the advent of microwave power transmission and of the cryogenic pipeline transportation of Arctic gas. This year laser power transmission has been demonstrated, for the first time in the world, at B.C. Hydro's research laboratory in Vancouver. Not only have new technologies been developed, but old technologies have also been improved. Coal mining is now fully automated and the Alberta oil sands are producing 3 million barrels of petroleum daily. The CANDU nuclear system has been expanded so that there are already 99 reactors in this country.

•(1440)

Naturally, energy demand, stimulated by the government agencies and crown corporations that benefit from its growth, has also risen. In 1975, it was some 8 quadrillion BTU's, by 1980 Canadian energy consumption had risen to 11 quadrillion BTU's. The figure had climbed to 24 quadrillion in 1990, while the latest data show current energy consumption to be 37 quadrillion BTU's.[45] Madame Speaker, in this country, we now use some 500 per cent more energy than was required in 1975. My question to the House is this, are we 500 per cent better off?

Some hon. Members: Yes!

Ms. Sharper: Madame Speaker, the cost of energy should not be measured in dollar/credits, but rather by its impact on society and on the environment. While it is true that the GNP has more than tripled in the past twenty-five years and that, inflation discounted, real incomes are double what they were in 1975, we have not progressed. Rather we have retrogressed.

One hon. Member: Speak for yourself!

Ms. Sharper: What has this so-called energy revolution meant to the average Canadian? A few material improvements in the standard of living. Is life better? Have we progressed because virtually every Canadian knows what the weather will be like three weeks in advance, or can induce computer controlled sleep and take three-dimensional photographs? The average life expectancy is now 88 and still climbing. Life is getting longer certainly, but is it really getting better?

Madame Speaker, I put it to you and to this House that the widespread introduction of the three-day work week, the advent of synthetic foods, the automation of grocery and department stores and the extensive use of robots and intelligent machines has undermined the fabric of Canadian society. We are suffering not from too little but from too much power. We are afflicted by the curse of leisure, of idleness, of the absence of necessity.[46] The past quarter of a century has seen a fivefold increase in the consumption and export of power in this country. During this period, private enterprise has declined and bureaucracy expanded. A guaranteed minimum income has been provided for all, as has advanced education. Yet what has been the result?

●(1450)

One hon. Member: More educated layabouts!

Ms. Sharper: During the last decade violent crimes have increased an average 8 per cent per annum, vandalism has become a national, indeed international disease. Bald-headed young zimbonies threaten citizens, even in broad daylight, on the streets of Ottawa. The work ethic has been eroded. Most Canadians are now uninterested in achievement or in advancement. Who wants to compete with a machine? The welfare state supplies their every need from the cradle to the grave. In between these two havens, they flock to the feely-houses to experience vicarious love affairs. Patriotism is dying too. The Continental energy network has linked this country, both physically and politically, for all time with the United States. The marriage is a permanent union. We do not have the strength or the will to seek a divorce. We might well ask ourselves, O Canada, glorious and free, what is there left to sell of thee?

Madame Speaker, honourable members, today is not a day of triumph but rather of tragedy. Canada has chosen comfort over effort, leisure over creativity and material well-being over spiritual and psychological health. To replace the God of our founding fathers with that of our scientists, is a form of sun worship that we shall live to regret.

Mr. Lazlo Polinski (Winnipeg South Centre): Madame Speaker, I for one have more faith in the future of Canada and the strength of Canadians than the leader of the opposition. The Minister of Technological Innovation deserves the heartfelt thanks of each and every member of this great nation. Thermonuclear power production will, I feel sure, bring us into a golden age of development. The comments of the last Jeremiah notwithstanding, the future has never looked brighter. Madame Speaker, the Minister has told this House of an exciting breakthrough in fusion power research and is immediately blamed, by the opposition, for everything from the poor standard of feely productions to the mischief carried out by the young zimbonies. This, I put to the House, is a tactic designed to hide the fact that Ms. Sharper and her party have no viable energy policy of their own to promote.

Some hon. Members: Hear, Hear!

Mr. Polinski: There are four major points I should like to make in support of this Act. These are directed against those involved in the scurrilous campaign being waged, on a purely emotional level, by members of the Laplonde Society and other econodepressives, both in the media and, unfortunately, in this august body. Firstly, the charge has been made that, because of heat being liberated in the atmosphere, fission and fusion power are leading to adverse climatic change. This is simply untrue. As J. Abrahams pointed out over twenty-five years ago, even a global population of 20 billion, a figure we are yet nowhere near reaching, using power at the current Canadian rate, would raise the average temperature of the atmosphere only about one degree Celsius.[47] This is true because of the rate our atmosphere rejects heat into space. So, the total effect of waste heat is no matter of concern. Besides, the Manitoban winters could do to be warmed up a little!

•(1500)

One. hon. Member: Hear, hear!

Mr. Polinski: True, there may be some local thermal difficulties. There were, I am among the first to admit, some unfortunate side effects experienced by Lake Ontario and the South Saskatchewan and Thames Rivers in the late 1980's, caused by waste heat from nuclear power plants. These fish kills will not be repeated. The Canadian Nuclear Fission and Fusion Commission (CNFFC) have developed a thermal-effects program that it is co-ordinating with other agencies, through participation in the activities of the Prime Minister's Office of Applied Science. A nation-wide stream temperature prediction system--designated Stopheat--developed by the University of Calgary and the Environmental Protection Service is in full operation.[48] In addition, it is now widely accepted that there is no such thing as waste heat. Thermal pollution problems are only associated with old, virtually obsolete nuclear plants, such as the Pickering complex. No nuclear installation designed since 1985, when the Thermal Efficiency Act was passed by this House, is a polluter. In fact, the high grade heat from the St. Anthony, Newfoundland; Godbout, Québec; Sand Lake and Thunder Bay in Ontario; Lynn Lake, Manitoba and McLennan, Alberta nuclear power plants have been a major stimulus to industrial growth. Cheap steam has promoted the large scale manufacture of ground-effect machines and inter-metallics at every one of these areas. As this House well knows, district heating is provided free of charge to workers at each of these settlements, as a result of the benevolent policies of this government. The Athabasca Tar Sands industry also requires large amounts of energy, and today much of this is derived from high grade nuclear-generated heat.[49]

Even low grade waste heat, found in the cooling circuits of turbine condensers and moderator systems, is no longer allowed to pollute our lakes and streams. The Moose Jaw, Saskatchewan nuclear plant supports over 15,000 acres of winter wheat production and has increased the cattle carrying capacity of the ranges in this area, fivefold. Similar success stories could be told for other plants and mention should be made of tenfold aquacultural production increases at Squamish, British Columbia. In short, the suggestion that thermal pollution from thermonuclear plants will have adverse environmental effects is completely untrue.

Some hon. Members: Hear, hear!

●(1510)

Mr. Polinski: My second point is this. Opponents of fission and fusion power deny the possibility of the safe management of the nuclear materials involved--the handling, shipping and storage of fuels and wastes, as well as the accident-free operation of the plants themselves.[50] All segments of the nuclear industry can be managed safely by the conscientious development, application and regulation of our technologies.

One hon. Member: What about Bodega Head, California?

Mr. Polinski: The construction of a nuclear power plant, by Pacific Gas and Electric, in close proximity to the San Andreas Fault, was an error in judgement not in technology.[51] It will not be repeated. Such a course of action would be illegal in Canada. The Natural Hazard Amelioration Act of 1987 ensured that.

One hon. Member: What about Whiteshell?

Mr. Polinski: The ransoming of Whiteshell was a political act, carried out by a group of fanatical econodepressives. It represented a failure in society not technology. It will not be repeated. The electronic surveillance network and counterinsurgency screening-mesh system will not permit it.

If I may be allowed to continue without interruption, Madame Speaker, my second point is this, thermonuclear power will allow the safe disposal of fission wastes, including plutonium. Errors, such as the 1989 Fraser River contamination and the East Coast foodchain break of 1991, will not be repeated. The answer to the disposal problem is obvious, the strategy of waste concentration and containment is obsolete. Canada should follow the advice of Professor Eric Smakloft, given in last month's issue of the *Social Technocrat*. Nuclear wastes should be concentrated and, in a joint effort with the United States, disposed of into the sun by several Nephrodites space craft. If launched from the enclosed drainage basin of an inland sea, such as Lake Eyre, Australia, even a rocket malfunction would be relatively harmless.

I have a third point. Thermonuclear power will improve the environment, not destroy it. Energy production, in some ways, in the past twenty years, has had adverse side-effects, which this government has made every effort to mitigate.

One hon. Member: Pull the other leg!

Mr. Polinski: Madame Speaker, it is true that the exploitation of the Athabasca oil sands has led to some environmental pollution. It is unfortunate that the bitumen plant extraction technologies require very large quantities of fresh water, some five barrels for every barrel of oil produced.[52] Since our current production averages 3 million barrels daily, it takes little mathematical ability to calculate that 15 million barrels of fresh water, contaminated with petroleum products, salts and silts, are also generated. Understandably, there has been some adverse reaction from our American neighbours in the southerly portions of the affected drainage basins. Similarly, the strip mining of tens of thousands of acres of oil sands has not added to Alberta's natural beauty, nor the sulphur dioxide released during the refining process to the quality of its atmosphere.[53] Madame Speaker, I put it to you that the extraction of oil from the Athabasca Tar Sands was a necessary evil. It has been rendered obsolete by these new developments in fusion power and should be allowed to run down, as the demand for oil declines. Similarly, we are all familiar with the unfortunate impacts of coal extraction in both western and eastern Canada. My comments with regard to the oil sands also apply to this resource.[54] In short, the clustering of nuclear power plants in remote areas, far from the major megalopoli, will lead, not to a further deterioration of the environment, but to its improvement. With virtually unlimited energy we can heal the scars of the past.[55]

●(1520)

My fourth and final point is simply this. With a vastly expanded energy supply, we can greatly increase Canada's GNP. Technology can be used to support our efforts to achieve a pollution-free environment, to aid in the recycling of all metals and consumer products, to assist in improved land management including more livable urban communities and to ensure the development of better transportation systems. Properly developed and directed, fusion power can be used to emphasize both the quality and quantity of life, providing additional amenities, yet with relatively less environmental impacts. We can see the promised land. I put it to this House that we should cross the Rubicon which separates us from it and support Bill C-17.

Some hon. Members: Hear, hear!

Mr. Alistair MacLaren (Halifax West): Madame Speaker, Part II of Bill C-17 outlines the rationale and procedures associated with the establishment of yet another arm of government, the Canadian Fusion Power Development Corporation. I have recently been involved in research concerning this expansion of governmental interference into the rights of private enterprise. I think many hon. members might be interested in my results.

Some hon. Members: No!

Mr. MacLaren: There are now over 115 Crown Corporations, a mind-boggling figure. I, for one, did not realize there was such a necessity for government control over every aspect of the lives of Canadians. Let us look at the short period of five years between 1995 to 1999. During this time, the House passed legislation creating no fewer than twenty-three such corporations. For example, in 1995, to name but two, the Weather Control and Mestiplastics Corporations were established, followed a year later by the Continental Shelves Aquacultural Corporation and the Intelligent Machine Control Board. In 1997 the Environmental Stability Corporation and the Dissident Personality Improvement Association were created. Thankfully, by some oversight, possibly because of the election held in that year, no new corporations were set up in 1998. However, unfortunately, this set no lasting precedent, and eleven, I repeat, eleven, corporations were established in 1999, of which, perhaps, the Telechiric Corporation is the most well known. The Synthetics Association came into being also in 1999 and was quickly followed by the Leisure Time Corporation.

I could go on and expand the list, but the point is made. This government, through its reckless intervention into the market place and the private lives of its citizens, made necessary by its thoughtless dedication to technological development and economic growth, is weaving an ever more restrictive web. I put it to this House that the Canadian Fusion Power Development Corporation is yet another strand.

●(1530)

Some hon. Members: Hear, hear!

Mr. MacLaren: Neither the Minister nor the hon. Member from Winnipeg South Centre, in their elegant, if traditional support of economic

and technological growth have, as yet, made mention of the impact of fusion power on Canada's renewable energy program, the Cinderella of the Ministry of Technological Innovation. Has the clock struck twelve for solar, wave, wind, geothermal and tidal power? Has the biomass program turned into a pumpkin? Is energy conservation a dead issue?

One hon. Member: If the shoe fits, Cinderella, wear it!

Mr. MacLaren: In case some hon. Members of this venerable body are unfamiliar with the progress made in renewable energy research and development, I should like to remind them of its major achievements. Let me begin with a description of the tidal power program. After over half a century of debate, in 1987, the Bay of Fundy tides were finally harnessed,[56] power from the project being fed into the Maritime section of the Continental Grid System, which also, in this area, included three Cumberland coal fired stations and two nuclear power plants, those at Point Lepreau and Cape Sable. The tidal power station alone generates 6,500 million kwh annually, at a price of 12.2 mills per kwh, quite competitive with that of the other alternative sources in the system. Despite the fact that the French, spurred on by the successful operation of the La Rance tidal plant, have added four similar power stations in the European network, no further Canadian developments have occurred in this field. This is quite surprising since the Fundy power plant has operated, without problems, for ten years, yet both the Point Lepreau and Cape Sable nuclear stations have been shut down for repairs on at least one occasion. Indeed, if all available sites in the Maritime provinces were utilized, tidal stations could yield an annual energy output of 51 billion kwh.[57] This is almost the entire current energy requirements for New Brunswick, Nova Scotia and Prince Edward Island.

Let the House now turn its attention to solar power. In 1979, the Space Heating Act was passed, which set up the Solar Home Corporation and launched both the Suntap Rental (SRP) and the Energy Self-Sufficiency Urban Unit Programs (ESSUUP). As hon. Members will no doubt recall, the government was embarrassed at the success of both. After solar space rights had been guaranteed to all home owners, the demand for rented plate collectors, insulated shutters and radiating pipes was so great that the Solar Home Corporation had to introduce a lottery system to allot the limited supply. There are few who will argue with the benefits this country has derived from the Energy Self-Sufficiency Urban Unit Program. When work was

completed on Trudeauville, Quebec in 1987, the world's first city to be exclusively powered by renewable energy sources (solar and wind) and dedicated to the concept of complete recycling, the number of those wishing to become residents exceeded five per cent of this country's population. Diefenbaker, Saskatchewan, another such new town which runs on electricity supplied by prairie biomass, was first opened to the public in 1988. It is now a settlement of some 80,000 inhabitants. Diefenbaker is a further striking success of the ESSUUP. The latest figures show that there are now 220,000 solar heated homes in Canada, of which 80 per cent are newly built and the remainder converted.[58]

●(1540)

Let the House now turn its attention to the use of biological waste to generate energy, a process stimulated by the 1980 Biomass Act. The tax write-offs this legislation contained were the major motivating force behind the large scale prairie promotion of biogas production. By 1992, the latest figures I have been able to discover, there were 11,000 methane digesters in Alberta, Saskatchewan and Manitoba, powered by wheat stubble and the wastes from feedlots, making many farmers energy self-sufficient.[59] Madame Speaker, Calorific Anaerobic Recovery Systems Ltd. built a large plant to process 210,000 tons of waste per year at Lethbridge, which by 1986 was producing over 1,370 million cubic feet of methane annually. The entire output was sold at $7.20 per thousand cubic feet to the U.S.A.[60] Three similar digesters, using pelletized straw and human and animal sewage, were to my knowledge built in the late 1980's at Moose Jaw, Regina and Portage la Prairie. The Slash Burning Prohibition Act of 1981 also promoted the use of forest wastes for the generation of thermal electric power, particularly in British Columbia. It is my understanding that after the Campbell River dam disaster in 1983, the rebuilt city had a slash powered electrical system, designed by members of the Winnipeg Biomass Energy Institute.

Wind power generation has also made some remarkable progress during the past twenty years. Although the basic technology is several thousand years old, it was not until 1981 when the so-called 'Mill Bill' was passed that the Canadian government began to pay serious attention to this form of power. Yet Canada has one of the highest overall wind regimes on earth. Moresby Island in British Columbia and the Magdalen Islands in the Gulf of St. Lawrence have average wind speeds in excess of 20 miles per hour. In some regions of

Labrador and Newfoundland, they are normally 15-20 miles per hour, while most of Arctic Canada, northern Ontario, Quebec, the Maritimes, the Prairie Provinces and northern Vancouver Island have winds that average between 10-15 miles per hour.[61]

The so-called 'Mill Bill' and its successor the 1984 Wind Act increased Canadian interest in this form of renewable energy. Hydro Quebec used the maximum allowable subsidy to build, with the aid of the Low Speed Aerodynamics Division of the National Research Council, twenty-five vertical axis windmills in isolated communities. A $55 million grant, given by the Renewable Energy Corporation, in 1985, to the Department of Mechanical Engineering at the University of Sherbrooke and the $88 million, given a year later, to the Brace Research Institute, were the driving force behind the expansion of wind power use in the Arctic and in northern B.C. Earlier designs were also incorporated into Pearsonville.

●(1550)

Perhaps one of the most significant moves, in the direction of expanding our use of renewable energy resources, came in 1979, with the passing of the Geothermal Energy Act. As Hon. Members are no doubt aware, this Act allowed substantial tax write-offs to private companies willing to enter the exploration and development phases of geothermal power. It also included direct payments to those provinces involved in geothermal research and construction. As a result, major strides were made in developing such power sources. A new settlement, Barrettown, as the House is well aware, was constructed between 1981 and 1990 at Meager Creek, north of Vancouver.[62] This was exclusively supplied with energy from geothermal sources. Terrace, also in British Columbia, tapped abundant supplies of hot water, which were then used to encourage the growth of the intermetallic, maser and cyborg industries in the area. These power stations were not particularly large. None of them exceeded 500 mw in capacity. But they did produce electricity and hot water for space heating at a cost of 9.9 mills per kwh, a price comparable with that from fossil fuels.[63]

The Automobile Restriction Act of 1983 was also a major stimulus to the development of renewable energy sources, ensuring the large scale adoption of the energy conserving small car[64] and the use of oil substitutes. Madame Speaker, I have talked at some length

One hon. Member: Some great length!

Mr. MacLaren: about the Canadian renewable energy field, not because I am proud of our achievements. They are, compared with developments in the U.S.A., U.S.S.R. and Japan, picayune. One has only to think of the hydrogen economy of New England or the Huronemus Windmill complex east of Atlantic City, to put our efforts into perspective.[65] This is no fault of the scientific community nor of the Canadian people, but rather the result of the deliberately restrictive policies of the present administration. Since its election in 1986, this government has not given one major stimulus to the renewable energy field, its funding has been less than 3 per cent of that provided for research into fusion and fission. That renewable resources still continue to supply 5 per cent of our total energy demands speaks for itself.

Madame Speaker, I should like to make two final points before closing. The first is this. The major problem facing Canadian society today is not lack of power but rather an absence of direction. People should relate to the sun, the wind, the sea and the energy of the land. Collecting wheat stubble, timber chips or oiling the blades and moving parts of a windmill are menial tasks, but they provided Canadians with the right to work, a belief in the necessity of their own existence. Take work away and you take away man's dignity. What has the three-day work week brought us? More idle time, more crime, more vandalism, more decadence. It used to be said, as an insult, that a thirty-year-old Canadian was as fit as a sixty-year-old Swede. Today, that would be taken by most of our population as a compliment.

●(1600)

My second point is this. The development of fusion power can only exacerbate the harmony gap between the over-industrialized and the under-industrialized world. This gap represents an inequitable distribution of decision-making powers, research, markets, goods and resources.[66] After the nuclear debacles of 1986 and 1988, no country will export thermonuclear plants in violation of the United Nations ban on nuclear trade. Inevitably, developing countries will be denied access to this new source of power and the unfortunate division between the "haves" and the "have nots" will increase. Renewable energy technology, which does not stimulate wars, pollute the oceans, scar the landscape or despoil the atmosphere, could have

helped to close that gap. Bill C-17 ensures that this country will continue to be locked into symbiotic, exponential growth of both energy and material production, while deprived societies, like the Southeast Asian Alliance, must suffer the self-perpetuating, vicious circle of population growth and poverty. That, Madame Speaker, is the full horror of this Bill. For a cornucopia of trivia, we are denying the developing world the rights of humanity.

Some hon. Members: Hear, hear!

Mr. Reynolds: Madame Speaker, if I might reply. Nowhere in Bill C-17 does the government state it will disband the renewable energy program. Neither will we abolish work. Those of us who sit on this side of the House are fully aware of the value of work.

One hon. Member: You'd never guess!

Mr. Reynolds: There may be some reduction in the funding available for renewable energy research but it will continue. There are, for example, plans for two more Alternative Life Styles Society reserves. These are to be powered solely by renewable energy resources. My government supports this increase in its energy options. It also recognizes the value of guaranteeing individual members of this society the right to live away from major urban centres. Indeed, the contribution that wind, solar and biomass energy has made to the dispersal of Canadian population, or at least in retarding the growth of Vancouver-Lower Mainland and Toronto, is to be applauded.[67] Simply because the ESSUUP was established by the opposition, before their removal from office by the electorate, does not mean that its aims cannot be supported by the present administration.

Some hon. Members: Hear, hear!

●(1610)

Ms. Anne Blakeslee (Toronto-West Central): Madame Speaker, many years ago I shared the smoking compartment of a train, on its way from Toronto to Vancouver, at midnight, with a ragged derelict.[68] His face was sunken, teeth rotten and clothing threadbare. What remained of his possessions were contained in a sack, resting on his bony knees. His eyes were glazed and he drowsed, either from fatigue

or liquor or NTP. He was one more example of the flotsam or jetsam swept along in the current of humanity. The train soon filled and a little later the conductor shouldered his way into the compartment, demanding to see our tickets.

All eyes turned to the half dead social relic, expecting the usual to occur. What happened was far more devastating. Slowly the 'corpse' opened his eyes, reached down and after fumbling in his sack, produced a large roll of hundred dollar bills. "Let me," he said with a croaking, broken voice, "have a ticket to wherever this is going."

The conductor stopped in his tracks. The 'dead man' sank back, the oracle had spoken. Madame Speaker, that human wreckage was a symbol of Canadian society, it doesn't know where it's going and doesn't care, so long as it's moving fast. The trip is everything, the destination nothing. Madame Speaker, the Minister of Technological Innovation has given the accelerator another push, we are moving faster, always faster, but where are we going?

One hon. Member: Speak about the Bill.

Ms. Blakeslee: Darwin robbed man of the status of being a little lower than the angels. Freud took away his rationality. Godee demoted him to an intelligence level beneath the maxiputer and now Mr. Reynolds would like to remove the necessity for his effort. Man needs work with meaning to maintain his equilibrium. Mark my words, the devil will make work for idle hands.

Mr. James Fuller (Prince Albert); Madame Speaker, I should like to take this opportunity to congratulate the Minister of Technological Innovation for his far-sighted support of the Canadian nuclear fusion program. Its success is clearly, in no small part, due to his strength of character and ability for hard work. I intend to speak on the international implications of this breakthrough. The opposition equates the availability of power with its abusive and irrational use and draws the conclusion that energy is the root of all evil. They, therefore, advocate reducing energy availability as a means of controlling man's transgressions and indiscretions. Madame Speaker, this argument is irrational, illogical and improper. Despite the efforts of the World Food Bank and the Redistribution of

Wealth Program, more than 3 billion of the world's population are energy starved and this lack is a direct cause of their hunger for food and the poverty in which they must continue to live.

Thermonuclear power will provide unlimited quantities of fertilizer while abundant fresh water can be created by desalination.[69] With our aid, the Sahara, Atacama, Kalahari and Gobi deserts can bloom, producing enough food to meet the desperate needs of this hungry world. Yet again, we will disappoint the neo-Malthusians.

●(1620)

Mr. Joe Sam (Inuvik): Madame Speaker, has the honourable Member from Prince Albert learned nothing from the experience of the past twenty-five years? Are we to export fusion like we exported fission? Let me remind this House that in 1976 a CANDU nuclear system was sold to South Korea, with, of course, "adequate" safeguards. In 1977, further sales were made to Iran and a year later to Argentina, Chile and Saudi Arabia. Surely, we have not forgotten the surprise nuclear attack launched against North Korea in 1986 and the Israeli-Arab holocaust of 1988. I for one recall, only too clearly, the painful censure of Canada by the United Nations General Assembly in 1986.

Mr. Fuller: We have learned from our mistakes; future facilities will be manned, operated and totally controlled by Canadians, regardless of their location.

(Translation)

Mr. Pierre Leuve (Montreal South): Madame Speaker, with this government, to quote that famous English realist, Lewis Carroll:

> The rule is, jam to-morrow and jam yesterday - but never jam to-day.[70]

The Minister's message is clear. Thermonuclear power will be very, very expensive. Where, I ask the House, will this money come from? This question is, of course, rhetorical, since we all know where it will come from and how it will be collected, and what the repercussions will be. I have a formula for predicting the true cost of major engineering projects, it was derived over the years by

studying the construction of the Mackenzie Valley Pipeline, the Western Arctic Network, the James Bay Project and numerous nuclear power plants. The Mackenzie Pipeline, when first proposed in the early 1970's, was expected to cost $5.3 billion;it actually cost $17.6 billion. The Western Arctic Network was estimated to require $17 billion to complete, the final total was $41 billion. Overruns on Sand Lake, McLennan and other nuclear plants has been well over 300 per cent. In estimating the final cost of technological 'progress', I multiply the initial figure quoted by the engineers by 3.2 and divide the benefits claimed by a similar amount.

In applying this rule of thumb, which gives an infinitely more realistic figure than agency reports, I estimate that during the next twenty years the thermonuclear program, outlined by the Minister, will cost Canada some $185.6 billion.

This money will come from the same sources as that used to construct the Western Arctic Network. It will come from higher taxation and the reallocation of taxes from desperately needed social programs.

Some hon. Members: No!

●(1630)

Mr. Leuve: Some of it will also come from enforced savings and the remainder we will borrow abroad from the United States, Japan, Brazil, the U.S.S.R. and the United Arab Front. The process that began in the early 1900's will continue. On the one hand we will continue to decry our loss of sovereignty, while on the other we will sell it to anyone with credits in hand.

One more aspect of this Bill worries me. Once again, we are putting too many eggs into one basket. We should diversify our efforts, keep our options open, not fall into the same tray which caught us in the 1970's. Remember, only Trudeauville and Diefenbaker did not suffer during the Great Blackout of 1988. These new towns, being powered entirely by renewable energy resources, are totally self-sufficient and, therefore, unaffected by such breakdowns in the Continental Grid System.

Madame Speaker, if I may be allowed to make one final point. If

this country relies, for its energy supply, on a small number of pipelines, a few large hydro-electric schemes, seven major oil sand operations and interlinked nuclear fission and fusion plants, it is strategically weakened. As our power generation system becomes bigger and more integrated, the ability of an enemy to cripple it quickly and virtually effortlessly, from within or without, is increased. A widespread dispersal of population and industry, based on renewable energy sources, would provide major strategic strength.

(English)

Ms. Clare Broadbent (St. John's East): Madame Speaker, power is energy, energy is power. It provides those on the other side of this House with their high standards of living, it allows them the luxury of opposition. True, there are many who have criticized our goals during the past fifteen years, of rapid economic growth and of climbing GNP. They can afford to do this, only because of the $10,000 guaranteed minimum income they receive, paid for by electrical energy generated by the CANDU system or the James Bay Project or by natural gas transported by the Western Arctic Network.

Members of the House no doubt have read in the press or seen at the feelies, details of the Alternative Life Styles Society's communes in northwestern British Columbia and eastern Labrador. They may not be aware, however, that these so-called outdrop projects are funded directly by the Leisure Time Corporation, using taxes collected from major electrical users. Even those who decry our drive to total economic freedom need its products to support their rejection. What hypocrisy!

●(1640)

Some hon. Members: Hear, hear!

Ms. Broadbent: Madame Speaker, I will close my remarks with a quotation from the great scientific thinker, Arthur C. Clarke, who many years ago wrote in *Profiles of the Future:*

> The only way one can find the limits of the possible is by going beyond them into the impossible.[71]

Canada has a long way to go yet.

Mr. William Anderson (Diefenbaker): Madame Speaker, my sentiments on Bill C-17 were best expressed nearly thirty years ago by Alvin Weinberg, one of the few technologists to face up to the social and political implications of his research:

> We nuclear people have made a Faustian bargain with society. On the one hand, we offer..... an inexhaustive source of energy....But the price that we demand of society for this magical energy is both a vigilance and a longevity of our social institutions that we are quite unaccustomed to.[72]

Madame Speaker, the Minister should go back to his nuclear devils and call off the bargain. Canada needs its soul.

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Predictions of future worlds have typically been overfulfilled in the realm of the physical sciences and grotesquely underfilled in the realm of political, economic and social organization.

A. Larson[73]

SCENARIO B

May 14, 2000 COMMONS DEBATES

GOVERNMENT ORDERS

INDUSTRIAL ENERGY ALLOCATION ACT

MEASURE RESPECTING THE RATIONING OF ENERGY FROM NON-RENEWABLE SOURCES TO INDUSTRY ON A BASIS OF SOCIAL DESIRABILITY

Hon. Claire Meadows (Minister for Environmental Quality) moved that Bill C-29, to allot energy supply to industry on a basis of its social desirability be read the second time and referred to the committee of the whole.

She said: Mr. Speaker, this government is noted for its dedication to the principle of orderly social progress, the guiding philosophy of the Conserver Society. Much has already been achieved in Canada by the more efficient use of energy, by emphasizing the role of renewable resources and by recycling. Our twin goals are social equality and environmental stability. This Bill, which is fully in keeping with these aims, has been brought before the House to ensure that our progress is not threatened by the anti-social overexploitation of our non-renewable energy resources, by industries having a low social desirability. It is my pleasure, as Minister of Environmental Quality, to bring Bill C-29, which surely merits the support of all members, forward for second reading today.

●(1410)

Mr. Speaker, Bill C-29 is based on two models, developed by Canadian social scientists, of which this government is justly proud. It incorporates, for example, the theories of Industrial Energy Analysis, developed by Professor Alan Paul at the University of Yellowknife. Energy analysis, it is true, was well known before this comprehensive model was developed. Simons, the Nobel Laureate, virtually lost his reputation in his efforts to argue that energy was the driving force of the economy. Indeed, the accounting of energy, in physical rather than monetary terms, has been toyed with

by several people from Lewley and Robinson to Chawley. In the mid-1970's, Winfield from the Office of Energy Conservation also contributed much to our understanding of energy analysis as did Milhurst for N.R.C.[74] Concurrent research was also being conducted by the Advanced Concepts Centre of what was then the Department of the Environment. This topic had aroused some international interest, an Energy Analysis Workshop on Methodology and Conventions[75] being held in Guldsmedshyttan, Sweden under the auspices of the International Federation of Institutes for Advanced Study in 1974. Even by the late 1970's many researchers had realized that, in every step of the manufacturing process, there is an associated change in free energy, increments being added until the finished product stands at the apex of the thermodynamic potential triangle. It was also understood that with use and discard, this potential declines until, at the base of the triangle, goods are degraded and material contents dispersed. Naturally, it was also recognized that the thermodynamic values of such materials undergoes a vast change with chemical upgrading, such as smelting, but only slightly during physical changes such as assembly. Despite this knowledge, the use of energy was traditionally not reflected in price, since the economic value of goods, which reflected the scarcity and the customer utility, increased more during the final manufacturing stages than in component production. Until Paul's research, the results of which were published in *The Journal of Social Concern* in 1984, no one had produced a satisfactory energy input-output model for the entire Canadian economy. It was this paper which, after the election of my party to government in 1986, provided the stimulus for the coupling of the energy accounting method with the traditional monetary system based on the dollar. A modified version of the Paul Energy Consumption Table is found in Part III of Bill C-29. In the legislation currently before the House, industries are awarded points for their use of energy, ranging from 1 to 100. Those industries which are the most efficient, such as handicraft manufacture, receive 1 point whilst others, such as aluminum smelting and heavy water manufacture, which are profligate users of energy, receive 100. Although useful on its own, it required the development of a second model at the Winnipeg Institute for Cultural Stability, the Osterland Social Desirability Scale, before its full potential could be realized. This, as the House is aware, allots points to activities on the basis of two criteria, the degree of environmental disruption they cause (for which they are given between 1 and 10 points) and the degree to which they fulfil basic human needs (also

ranked from 1 to 10).

●(1420)

The Osterland Scale allots low scores to activities such as closed system agriculture, which does not disrupt the ecology (in that case 1), and high scores, for example 10, to those industries such as steel manufacture which seriously damage the environment. These scores, therefore, reflect the ecological impact associated with all stages of manufacture, use and discard of a product. Osterland also subdivided all activities into one of four classes. These were **primary**, which are basic to survival such as bread manufacture; **secondary**, which are essential to an acceptable quality of life, exemplified by home construction; **tertiary** activities, which are psychologically desirable, like education and leisure time pursuits; and **quaternary**, those which are essentially convenience and divisionary industries, for example the manufacture of plastic bottles or children's aluminum toys. Each of these classes was allotted points ranging from 1 to 10, **primary** activities receiving low scores, **quaternary** activities high scores. By multiplying environmental disruption points and human need points, Osterland was able to provide a ranking of social desirability for all those industries for which Paul had carried out energy analyses. For example, the manufacture and use of large automobiles, with heavy gasoline consumption, scored high on the environmental disruption scale, 9, I believe, and high, 8 that is, on the basic human needs scale. By multiplying both points, a high score of 72 was awarded to this activity, resulting in a low position on the Osterland Social Desirability Scale. Conversely, the growing of vegetables scored low on the environmental disruption scale, 2, and low on the basic needs scale, 1, giving a social desirability index of 2. Vegetable growing, as a result, is given a high position on Osterland's scale.

Mister Speaker, my Department has been able to combine the Paul Energy Analysis Model and the Osterland Social Desirability Scale to develop an index which takes into account the energy consumption of an industry, how much it is required to fulfil Canadian needs, and the size of its impact on the milieu. The 563 industries shown in Part III of this Bill are ranked in declining desirability on the basis of this index. Bill C-29 aims to ration energy from non-renewable energy sources to Canadian industries, according to their location on the list. The largest volume of power is to be made available to the most necessary and energy efficient, and least environmentally

disruptive industries. Mister Speaker, this is the type of responsible legislation that the people of Canada have been waiting for.

Some hon. Members: Hear, hear!

●(1430)

Ms. Meadows (Brandon): This industrial rationing of energy, derived from non-renewable Canadian resources, together with the measures already imposed by this venerable body with the passage of the Energy Import Prohibition Act of 1999, will have a twofold impact on this country's energy scene. Firstly, it will cause a decline in anti-social industries, that is those that despoil the land, air and water. Environmental quality must of necessity, therefore, improve. Conversely those industries which meet basic Canadian needs, such as the food manufacturing industry or those involved in the production of windmills, solar reflectors or geothermal turbines, will be promoted. Secondly, by the passage of Bill C-29, this House will further accelerate the development of our renewable energy supplies. The Industrial Energy Allocation Act specifically excludes the power derived from inexhaustible supplies from consideration in energy analysis. This can only result in an increase in application for geothermal leases from the Federal-Provincial Rights Board and in a stimulation of the use of solar heating and cooling systems, windmills and biomass energy. Recycling already successfully promoted by the National Energy Conservation Board will also increase. [76]

Some hon. Members: Hear, hear!

Ms. Meadows: Mister Speaker, this Bill has public support. It is now the responsibility of this parliament to give formal expression to its will in these matters, as incorporated in Bill C-29, which is the focus for this debate and decision of this question.

Mr. James Sharpe (Vancouver West): Mister Speaker, I will only say of Bill C-29:

> C'est pire qu'un crime, c'est une faute.
> (It is worse than a crime, it is a blunder.)

The Industrial Energy Allocation Act is one more gigantic mistake made

by a government altogether too fond of the right to pursue the expedient. It is a giant plank in the Canadian coffin which this administration insists in calling the Conserver Society, but which the whole world has named the Conformer Society. This piece of legislation introduces energy rationing for industry. Are we at war? No, we are not. Are we short of energy in Canada? We are, but with enormous coal, natural gas and oil sand reserves, we need not be.[77] Why then does this government propose to ration the distribution of energy? The answer is clear, Canadian industry is to be martyred yet again, by the unintelligent in pursuit of the unobtainable. This country, Mister Speaker, is rapidly losing its most dynamic citizens, it is becoming a haven for the indolent, the incompetent and the timid. It's altogether too early for the meek to inherit the earth.

Some hon. Members: Hear, hear!

Mr. Sharpe: Mister Speaker, this Bill, like so many others brought before this House by the current administration, is opting for small-minded, immediate security, a state I might add which, as Thomas Fuller pointed out three and a half centuries ago, is the mother of danger and the grandmother of destruction.

●(1440)

We see the continuation of this debilitating process today. It is a course which has been forced upon the government by fifteen years of its own misadministration of the Canadian energy field. This Bill is, in fact, an admission of defeat. Our energy supply system can no longer meet even the present picayune demands for 7 quadrillion BTU's, made upon it by an eviscerated industrial sector and a cowed, over-regulated public. There is an energy shortage. What does this government attempt to do? Reduce demand of course. Ms. Meadows is trying to persuade the House to make yet another fierce vindictive scribble of red across the accounts of every worthwhile Canadian industry. Why is it, I ask myself, that this, one of the world's largest, least-populated countries, stands on the brink of economic ruin? To answer this question one needs to review the activities of this House during the past twenty-five or so years.

In 1973, the outbreak of hostilities in the Middle East was followed by the imposition of a selective embargo and production restrictions by the Arab oil exporting nations. After this flexing of OPEC's

muscles, increases in oil prices took place in December of that year, in January 1974 and successively in 1975, 1976, and twice again in 1977. By 1978 the price of oil (in constant Canadian 1973 dollars) f.o.b. the Persian Gulf, was averaging about $18 a barrel.

Yet Canada stood to benefit from this, its first energy crisis. This country, although traditionally importing oil to meet its own energy needs in the east and supplying it to the United States in the west, was basically a net energy exporter. High oil prices, in a correctly orchestrated economy, would have been greatly to our advantage. Had we adequately expanded our system, expensive Canadian energy could have been used to sustain the economy of our neighbours to the south, in the style to which they had become accustomed, while at the same time building a standard of living higher than the Canadian public had ever dreamed of. An annual 4,5, or even 6 per cent increase in the GNP could have been a realistic goal. With accumulating capital and a favourable balance of payments situation, Canada could have rapidly bought back its energy resources from American dominated multi-national corporations. In 1973 foreign interests owned 76.8 per cent of the Canadian oil and gas industry, 60.3 per cent of this country's coal production and 24.3 per cent of its uranium.[78] With an aggressive policy of energy sales, we could by now have regained control over the vast majority of these resources. Such a buy-back policy stands in marked contrast to the pathetic nationalization efforts of the present government. There is no way we can take over American, Japanese and Arab interests in this country without retaliations.

●(1450)

Mister Speaker, until 1986 Canada had been following, fairly successfully, a policy of maximizing energy-related profits and so expanding its options. In 1977 the Electrical Expansion Act was passed with the aim of developing a continental electrical grid system, supported by a variety of nuclear, coal and hydro-electric power stations. This Act envisioned the construction of over sixty additional CANDU power stations, a rapid expansion of coal mining in both western and eastern Canada, and the large scale development of the Athabasca oil sands, involving the construction of six new extraction plants. If this policy of promoting vigourous expansion had been continued, Canada's annual energy supply would now

have been over 40 quadrillion BTU's, of which perhaps a third could have been sold to the United States. What actually occurred, Mister Speaker, as this House is only too well aware, was the concurrent sinkings of the Prince Albert and the Queen of the Pacific tankers off Nova Scotia and Vancouver Island, respectively, and the Pickering incident. These events, taking place as they did, only a few days before the 1986 election and ushering into power the disciples of the Conserver Society, marked the largest disaster ever to befall this unfortunate nation. I thought then, Mister Speaker, and I still do, that they had the stench of the Reichstag fire about them.

One hon. Member: Rubbish!

Mr. Sharpe: Mister Speaker, do I hear an objection? Why, at this moment, sorely provoked by Bill C-29, I stand astonished at my own moderation. In 1986, an altogether different era dawned for Canadian power development. To those of us who, like William Blake, [79] believe:

energy is eternal delight

the Conserver Society has been a disaster, several orders of magnitude greater than the unfortunate sinking of two oil tankers or the failure of a nuclear reactor. The present government has adopted a motto: Nothing ventured, nothing lost.

Some hon. Members: Hear, hear!

Mr. Sharpe: Numerous Acts, all of which have damaged Canadian society, have been forced through this House during the past fifteen years. The worst of these was the Zero Population Act of 1987, which severely restricted immigration and fostered rampant sexuality under the cloak of contraception and abortion. Canada could not allow her population to grow, simply because its inadequate government policies could not sustain an increasing citizenry. The 1988 Safety Act strangled, in its emergent stage, the jewel of Canada's nuclear energy policy, the CANDU series of reactors. The Technology Assessment Act of 1989 has thwarted Canadian scientists, investors and entrepreneurs for eleven years. Since virtually any new scientific breakthrough or technological invention can be claimed to be socially disruptive, the Technology Assessment Board has denied licenses to practice or produce to almost all the major scientific brains in the country.

What, Mister Speaker, has happened? These men and their financial backers have left Canada, a country that even in 1975 was deficient in, and unsupportive of, research and development. They are now inventing, promoting and selling their products to the world markets, not as Canadians but as Americans or Europeans. As a result, our industries have naturally declined and our balance of payments worsened. Similarly, in 1991, by the addition of the so-called 'social stability' tax to Canadian manufactured goods, the government effectively priced many of them out of the world export market. The balance of payments worsened and many imports have had to be severely restricted, the true reason behind the 1996 Import Prohibition Act.

●(1500)

Mister Speaker, what has all this meant to the average Canadian? It has resulted in the decline of the private enterprise system and the centralization of power into government hands. The Industrial Energy Allocation Act can only accelerate this process. Cottage industry and inefficient small scale farming will increase, the production of all individuals will decline under the watchful eye of a bureaucracy of ever-increasing size. In 1974, 17 per cent of the working population were employed by some level of government, in 1984, 26 per cent, by 1994, 31 per cent, and by 2000, 36 per cent. As the result of this Bill, this horrifying figure will climb higher.[80] Production declines per capita as the size of government increases. My poor constituents now have to pay over half their incomes in tax to support an ever more oppressive bureaucracy. When nothing is permitted, everything has to be regulated, checked, controlled. During the past fifteen years, the rights of the individual to switch jobs, to travel, to bear children and to own and develop land have been eroded.

This government, Mister Speaker, has missed its opportunity for greatness. We are falling into the abyss of mediocrity. Members of the House, remember this:

> A man's reach should exceed his
> grasp, or what's a heaven for.[81]

Ms. Jane Selton (Whitehorse): Mister Speaker, I must confess that when I first realized that the 'Conserver Society' might become the

trademark of the Adamson Administration, I was slightly apprehensive. I thought that the attempt to create a society dedicated to improved individual welfare, by conserving resources rather than consuming them, might lead to economic collapse, escalating unemployment and widespread social unrest.

But as the years progressed, and as official pronouncements and specific programs were articulated, the appropriateness of this noble goal became increasingly obvious and indeed the objective itself more necessary. During the past twenty years our choice has been between a Conserver Society, based on resource conservation and recycling, and an expansive one, plagued by environmental disintegration, dissension, misery and ethnic and class conflict. The very resources and commitments which make possible the Conserver Society serve also as the basis for the great expectations of the future, which millions of Canadians insist must be realized. Many have tried to define the Conserver Society, and numerous eloquent words have been written about it. Perhaps the best single effort was made several years ago by Emanuel Levowitz, in a speech to a group of United Nations delegates, at the 1987 Canadian Immigration Conference in Montreal. He said, and I quote:

> The Conserver Society looks beyond the prospect of abundance to the problems of abundance. It is aimed at the large majority of Canadians who have conquered material want, who look forward to a fuller and more meaningful life, who live in a nation of potential unmatched elsewhere on earth....yet instead of happiness find discontent in material wellbeing, dissatisfaction with the life that unsupervised economic growth has produced, who suffer instead unhappiness and restlessness.... There is one core cause for this condition. It is the fear that the individual has become meaningless in the great human enterprise and that, together with the environment and its ecology, has been discarded onto the scrap heap of history. Everywhere there is growth and movement, activity and change. But where is the place for the average Canadian? The task for the Conserver Society is to ensure for all our people, the milieu, the capacities, and the social structures which will give them a meaningful chance to pursue their own right to happiness.....Thus the Conser-

ver Society is concerned, not with the quantity of material goods, but rather with the quality of our lives.[82]

Some hon. Members: Hear, hear!

●(1510)

Ms. Selton: Mister Speaker, it may be difficult to define exactly what is meant by the term the Conserver Society, but it is not too difficult to spell out its major goals. These are: human rights and dignity; cultural and educational fulfilment for all regarless of age, sex, class or ethnic group; healthful, crime-free, liveable cities; and a countryside that is non-polluted, in which all are free to enjoy clean air, water and landscape unscarred by aesthetic blight. In short, Mister Speaker, the Conserver Society is one in which Canadians can lead a life of quality rather than quantity.

These are the Conserver Society goals. But equally important are the methods chosen for this achievement. Amongst these are: Creative Federalism, which involves active national leadership in the fields of natural resource and energy development, minimum guaranteed income, employment, and age, social and sexual equality. Also, it involves the promotion of active citizenship by all people, through the stimulation of small scale, renewable energy powered industries and activities. Similarly, this government supports the increased public ownership of land, resources and the means of production to ensure the maximum benefit for the largest number. In short, we stand for happiness through creative planning by the community at large.

How far has the present administration come in the establishment of the Conserver Society?

One hon. Member: Too far!

Ms. Selton: On the contrary, Mister Speaker, insufficiently far. There is plenty of evidence we have not moved fast enough. The Lorrimer tanker spill in the Strait of Georgia, the Toronto race riots, the Vanadium poisonings, the bankruptcy of Montreal, the

Lake Ontario fish kills, these are all evidence enough of insufficient progress. But even these are, in a sense, tributes to what we have achieved. Each time we pass a new law or make a new commitment, we raise Canadians' expectations and if their hopes are not realized quickly there is impatience, frustration and, unhappily, social unrest.

Yet despite these setbacks, progress in the building of the Conserver Society has been real and rapid under this government. We passed crucial legislation forbidding future large scale hydro-electricity power schemes in 1986 and 1987, setting up the Winnipeg Institute for Cultural Stability in the same year. We passed the Safety Act of 1988 which prohibited the creating of further nuclear waste materials and the establishment of means for dealing with previously accumulated wastes. Five months later, the Technology Assessment Act became law. We won a decade-long battle for federal-provincial aid to recycling early in 1990, and passed the New Towns Act later in the same year. Throughout this period we have enacted a series of vital conservation, renewable energy resource, and air pollution and beautification programs, including legislation prohibiting the establishment of further strip mining activities in the Rockies in 1991. Despite great opposition from the supporters of private enterprise, the Minimum Income Act of 1992 was also successfully passed.

●(1520)

However, none of this legislation can match in impact that of the Industrial Energy Allocation Act. Naturally Bill C-29 faces criticism in the press, on videovision and in this House. But we do not need consensus. There are some diehards, such as the Canadian Chamber of Commerce, who have always been dedicated to economic growth, regardless of social and environmental cost. We believe, however, that for the most part Canadians accept the need to temper their demands for material goods. Their votes at the polls clearly show that they want the richer, fuller life we offer. This is good. For the Conserver Society cannot be built completely by the actions of Parliament alone. The people must, in the final analysis, decide whether they wish to support the effort and make the sacrifices and personal adjustments that will lead to its complete establishment. If they do, as I feel sure they will, we will see the realization of James Johnson's view that:

> In every human being there is a spark of the divine, it is the highest purpose of government to fan that spark into a shining light of fulfilled potential.

Mr. James McNeill (St. John's East): Mister Speaker, with typical shortsightedness this government has, yet again, overlooked its international responsibilities. The greatest lesson thinking men have learned from the sad events of the twentieth century is that there are ever-tightening bonds between nations which do not allow for totally self-serving acts.

The world can no longer survive as a collection of 197 nations, linked together in an assortment of political blocs, each pursuing its own selfish ends. Rather, it must function as a series of national and regional economic units which together, through an assortment of industrial interdependencies, form a cohesive world economic system. The Industrial Energy Allocation Act, by dampening down Canada's growth rate and by depressing many energy intensive industries, will inevitably contribute to the undermining of the economic system of the free world.

This country will not attract, and may not continue to hold, scientists, technologists and other men of vision, already frustrated by the irrational dictates of the Technology Assessment Board. The brain drain, the loss of the young, the dynamic and the well-educated will gain even greater momentum. A recent survey by the Faculty of Creative Science at the University of British Columbia has shown that, of the 29,000 graduates trained there in the years 1980-1990, fully 72 per cent are now resident abroad. Canada will soon be in no position to aid the Developing World. We will need assistance ourselves, if this government insists on implementing this Bill! By alienating our technologically competent youth, we are mortgaging our future.

In so doing we are also destroying the hopes of those of our allies in the Commonwealth and elsewhere who look upon Canada for technological and economic leadership. What this Bill does, let no one be mistaken, is to withdraw Canada's helping hand from the world community. Although I am not arguing that more Canadian economic growth could seriously reduce the suffering associated with the current Indian and South American famines, nor do I claim it would

stop the African food riots, this Bill is symbolic. At a time when the Developing World is crying out for assistance, this House stands ready to slam the door in its face. We are ignoring the biblical admonition of responsibility to all men. The earth is Canada's problem, the so-called Conserver Society cannot save itself, let alone aid the world.

•(1930)

History has many lessons to teach us. In a letter to his son, written in 1648, Count Axel Oxenstierna described his impressions of political affairs. He wrote:

> An nescis, mi fili, quartilla prudentia regitur orbis? (Dost thou not know, my son, with how little wisdom the world is governed?)[83]

Mister Speaker, if the Count were alive today and had read Bill C-29, I am sure he would show little inclination to change his mind.

Ms. Paula Ericson (Grande Prairie): The hon. Member for St. John's East quotes the Bible to support his belief that we are our brothers' keepers. I put it to this House that we are charged with more than that. We are no longer simply responsible for ourselves, or for our families, or local communities, or nation, or even for humanity itself. Our new responsibility is more, much more. We must be the keepers of all space and all time. This House stands guardian of the planet earth and all its ingredients, its air and water, its non-renewable resources, its life, not just now or in the immediate future, but in the eternity to come.

Some hon. Members: Hear, hear!

Ms. Ericson: Our responsibility is universal in concept and planetary in scope. It falls with particular weight on Canadians because it is we who have the knowledge, the wealth and the discipline to positively alter the course of human destiny. It is for this reason that Bill C-29 has been brought before the House. Responsibility must begin at home. We must ensure a stable, contented, fulfilled Canadian society, living in harmony with an environment capable of sustaining it indefinitely.

Mister Speaker, this Bill is no new departure. It contains a trend begun in 1986 when the people of Canada chose a new direction. Government policy since that date has had two complementary thrusts. The first has been determined by the attempt to reduce non-renewable resource consumption, or at least to retard the rate of increased use. The second policy direction involves the emphasizing of socially desirable technology, that is, those scientific developments that can be shown to have significant human benefits and low, if any, environmental costs. Such a philosophy was evident in the Technology Assessment Act of 1989, the Environmental Stability Act of 1991 and the more recent Weapons Manufacture Prohibition legislation. The end result of this policy has been social stability and full employment for all, in strict contrast to conditions in much of the rest of the world, where most countries are still dedicated to exponential economic growth and are suffering its concomitant catastrophes. Canada is a lifeboat for sane men, yet we cannot save the world. Nor should we sink trying to do so. The Conserver Society is a model. Let the growthaholics realize its merits and attempt to emulate its success.

●(1540)

Mr. Marcus Liudzius (Regina North): Mister Speaker, it is my understanding that:

> Whom God wishes to destroy he first makes mad.[84]

Unfortunately, this House has seen a fine example of this process today. Bill C-29 is a despairing act of a government in the final throes of collapse. It is, so the Hon. Minister for Environmental Quality has told us, based on the research of two philosophers. Having read both the articles in question, I can think of nothing better to express my reactions than the words of Cicero, spoken before the birth of Christ, but no less true for that:

> Nihil tam absurde didi potest, quod non dicatur ab aliquo philosophorum.[85]
> (Nothing so absurd can be said, that some philosopher has not said it.)

Paul and Osterland were experts, that is, men who knew more and more about less and less, until they knew everything about nothing

and nothing about anything. This Bill clearly demonstrates both their expertise and that of this government. Apart from the many problems that will be caused by Bill C-29, which the hon. Member from Vancouver West has already pointed out, there are still other obvious pitfalls. Energy allows work to be done, if it is unavailable from fossil fuels or renewable energy sources, it must come from the sweat of man's brow. Too much has already been made of the full employment this government has been able to sustain. This has been achieved by turning the population into peasants. Hundreds of thousands of young people are now engaged in inefficient, back-breaking labour, toiling unnecessarily in the fields and forests of this country. This work could all be done far more easily by machinery. We are now seeing the reintroduction of the five-day work week. Mister Speaker, income is declining, poverty is increasing, we cannot afford a decent guaranteed income, leisure is being eroded. I ask this House, is this the promised land? Without a large and guaranteed energy supply there can be no mass production, without mass production there is no surplus capital, without surplus capital there is no industrial growth, without growth there can be no real improvement in the standard of living. The Conserver Society is levelling us, that is true. It is also flattening us. There are now no rich, they have left Canada. The middle classes are in decline, everyone is becoming poor.

●(1550)

One hon. Member: But not in spirit!

Mr. Liudzius: On the contrary, alcohol production was reduced as a result of the Addictive Substances Act of 1977. Mister Speaker, where is my freedom of choice? By inhibiting technology and insisting on conformity, this government is denying me the right to differ, my life style must be your life style, my ethics your ethics, and my goals those you cherish rather than those which I hold dear. This definitely is the Conformer Society.[86] Mister Speaker, I shall close with one last request of the Minister for Environmental Quality. Please Ms. Meadows:

Stand a little less between me and the sun.[87]

Mr. Brian Brown (James Bay): Mister Speaker, I ask this House why do so many members of the opposition still continue to worship that goddess of seduction, the Gross National Product? Why do they fail

to join with the government in halting Canada's resource depletion, environmental deterioration and class distinction? This government has consistently tried to dampen energy demands by reducing unnecessary advertising, outlawing planned obsolescence and wasteful over-packaging. Credit buying has been discouraged and mass production de-emphasized.[88] We do not like, nor do we support, the disposable, throw-away ethic. My party is building a new culture, that of the Conserver Society, in which durability, repairability and recyclability are stressed and in which development of renewable energy resources is emphasized. It is to this point that I wish to speak further. I have been a supporter of the Canadian Renewable Energy Program (CREP) since its inception in 1986. The Bill now before the House will give this program additional impetus. Some members appear to have forgotten or are underestimating the great strides made by the environmentally compatible technology developed under this program during the past two decades. They feel that the cutback in the exploitation of non-renewable energy sources, guaranteed by Bill C-29, will inevitably lead to a drop in power production. In the short term this may well be true, but not over the long haul. Eventually the renewable energy resources of this country can fill this gap.

In the 1970's, unconventional energy resource development and conservation struggled under totally inadequate budgetary restrictions. Task forces on Energy Research and Development, set up by the Office of Energy Research and Development to examine the financial requirements of wind, solar, biomass, geothermal and other renewable energy development programs, recommended totally inadequate budgets for political reasons, the total annual request for financial support being less than a week's expenditure for drilling on the Mackenzie Delta.[89] Similarly, although billions of dollars had been spent on promoting the extravagant use of energy from fossil fuels, the Office of Energy Conservation received a miniscule budget in 1975, less than 5 per cent of that used to promote the sale of a new underarm deodorant by a major multi-national corporation. Despite these handicaps, considerable progress was made between 1975 and 1985. Promising geothermal sites in western Canada were pinpointed, an inventory of other renewable energy resources completed and a best seller, *A Hundred Ways to Save Energy and Money in the Home*, was published.[90] It was at this time too that the initial work was carried out on the energy conserving small car by the National Research Council.[91]

●(1600)

It was, however, Mister Speaker, not until the election of my party to power in 1986 that renewable energy and conservation, the cornerstone of the Conserver Society, were given the attention they merited. By 1994, after half a century of procrastination, the Bay of Fundy tides were harnessed. This power station alone now generates 6,500 million kw hours annually. Two smaller tidal stations are under construction in Labrador and three more are in the planning stage elsewhere in the Maritimes. This government, in a joint program with the United States, is also studying the possibility of building a 400-megawatt ocean-thermal-generator, to be tested in the Gulf Stream off the coasts of Nova Scotia and Florida. This new power concept was first developed by the Energy Research Team of the Universities of Massachusetts and Dalhousie.[92] This huge generator will use the temperature differences between warm surface water and cold subsurface water to vapourize and condense a working fluid that drives a turbine. Scale models using propane are already functioning well.

Let the House now turn its attention to solar power. This administration has promoted the use of the sun's energy through tax incentives, subsidies and the rental of equipment. Twelve new solar towns have been built, at least one being established in each province. As the House is well aware, Douglasville and Lewistown have been selected, by the International Society for the Promotion of Ecological Sanity, as the joint recipients of their Gold Medal Award. Figures published last year by Statistics Canada indicate that there is now some 970,000 solar heated homes in Canada.[93]

Success has been almost as great in the use of biomass energy.[94] There are now over 48,000 methane digesters in this country making use of fish skins on the East Coast, wheat stubble and animal waste from feed lots in the Prairies, and forest slash in British Columbia and Alberta. These developments alone have resulted in a reduction of demands on other sources equivalent to three nuclear power stations. The 1991 Wind Subsidy Act has promoted the development of Canada's most neglected assets, its winds. In the past decade, over 3 billion dollars have been spent by CREP in the construction of windmills in more remote settlements. This form of power has proved most successful in western British Columbia, Arctic Canada, Labrador and Newfoundland. Researchers

from the Brace Research Institute have undertaken to design a new town for the Magdalen Islands in the Gulf of St. Lawrence, which will be powered entirely by wind energy.[95]

●(1610)

The Geothermal Energy Act passed in 1987 allowed any company to deduct immediately the full cost of purchase and maintenance of equipment powered by geothermal energy from its pre-tax profits. All favourable sites such as Meager Creek, north of Vancouver, and Terrace, British Columbia, were quickly developed. There are now seventeen company towns making use of geothermal energy in western Canada, including six utilizing sources of hot water accidentally discovered many years ago by well drillers in Alberta.[96]

The gradual reduction of the allowable engine size of gasoline powered automobiles, together with the subsidized introduction of the electric car, has also reduced energy demands from the transportation sector. The reduction of the maximum allowable speed limit to 70 kmph on the highways and 30 kmph in urban areas, has resulted in considerable energy conservation, as has the widespread increase in the installation of rapid transit systems. Demand has been reduced further by the adoption in 1990 of the re-Revised Building Code, which forbade the construction of buildings without computer aided energy control systems incapable of raising the temperature above 20°C. Double glazing, caulking, insulation and heat pumps are now mandatory on all residential buildings.

The buildings of recycling depots, by the Federal Government, in any municipality willing to underwrite 10 per cent of the cost, coupled with the outlawing of Sanitary Landfills, have successfully halved the demand for timber, and a wide variety of metals.

Mister Speaker, although these major shifts in Canadian society were not without their critics, the Lifetime Guaranteed Government Employment Act of 1992, which ensured that no one would be out of work as a result of the adoption of Conserver Society policies, has led to continuing public support of these measures. I put it to this House that the Industrial Energy Allocation Act will promote this process of rational resource use and its associated improvement in the quality of life. In the words of a former Prime Minister:

> The meaning of the growth ethic must change. We should expand, not the use of our resources, but rather the spiritual satisfaction derived from them.

Mr. James Anderson (Lethbridge): Mister Speaker, the Industrial Energy Allocation Act will have the same effect on Canadian industry as a glass of water on a drowning man. It will be the straw that breaks the camel's back. The Toronto Industrial Average now stands at 87 and is still falling. The international business community has abandoned Canada. Our bond issues are undersubscribed. It is, therefore, impossible for the remnants of Canadian industry to raise the capital to renovate. This Bill, Mister Speaker, will have a more detrimental effect than even the Energy Pact Cancellation Act and the associated trade war with the United States. Once again, our balance of payments position will deteriorate. Canada's industry is rapidly moving into bankruptcy, a stage reached long ago by this government.

●(1620)

Some hon. Members: Hear, hear!

Ms. Alice J. Soames (Pearsonville): Mister Speaker, during the past fifteen years, this government has been involved in reshaping Canada, in developing an ecologically and environmentally responsible economy, capable of withstanding the test of time. Naturally such a fundamental change of direction has not been without its price. I admit that the reduced flow of technological innovation has diminished the range of consumer choice, and limited the number of new openings available for scientists, marketing men and assembly-line workers. This downturn in manufacturing has also softened the Canadian service sector. Yet after an initial surge in unemployment, this excess labour has been successfully absorbed into agriculture. Canadians are developing a new 'conservation ethic'. The future looks bright. During the last ten years we, in Canada, unlike our neighbours to the south, have not suffered multiple oil spills, nor have we been killed, injured or made homeless by nuclear malfunctions. Why not? The answer is simple, Mister Speaker, this government had the foresight to ban oil tanker traffic from its 200-mile territorial waters, prohibit offshore drilling and has halted expansion of the nuclear program. Minor

material sacrifice is a small price to pay for the survival of the human race.

* * * * *

Ideally, we want the beneficial social effects of economic growth with none of the detrimental environmental consequences. We want a just society with well-fed, well-housed people who are educated and enlightened enough to move easily between productivity and leisure. We want a modern civilization--a highly human one--that approaches a physical equilibrium but is creatively dynamic. In short, this is our new version of Utopia. The question is, why can't we have it?

Glenn T. Seaborg[97]

FACING INTO THE FUTURE

The future holds both threat and promise. All portents indicate a continuing acceleration of time and compression of space. Futurity, therefore, can offer only one certainty, a fundamental difference from the past. Since experience has taught that hindsight is invariably more persuasive than foresight, seats in the visitors' galleries of two very different Commons have been proffered to the reader, so providing an opportunity to review the future's past.

The first scenario portrays a debate on the advisability of promoting nuclear fusion. Illustrated is a Canadian society in which a dedication to energy production and associated economic growth has bought greater material prosperity and increased leisure. Environmental decline and the erosion of religious and humanitarian traditions together with the civic freedoms they support have been the ultimate price of purchase. In striking this bargain, society has forfeited its sense of direction. Violence and extremism have increased. In part this has been due to the alienation of the individual which has accompanied the expansion of both technological infrastructure and governmental control.

Canada no longer speaks for itself. The economic advantages of a *de facto* union with the United States have overcome the emotional attraction of nationalism. Globally, Canada continues to export its vision of a technological Utopia, despite the fact that less restrained societies have already misused the nuclear fruits of the tree of knowledge. A loss of vision has been insufficient to stimulate a change in viewpoint.

An alternative Canadian future is illustrated in the second scenario. In this, the reader is privy to a Commons debating the necessity of reducing energy supplies to environmentally or socially disruptive industries. From the resulting discussion, the image of a Canada dedicated to sacrifice emerges. Ecological stability has become the over-riding governmental objective. Its attainment has been purchased at the cost of a decline in material well-being, accompanied by a levelling of society. Since the government interprets the potential for individual affluence as a threat to both the environment and the disadvantaged, taxation has removed this spur. As a result, anticipated victors in the race to economic superiority are participating elsewhere. This lesion to talent and capital has caused a

decline in innovation and industrial production, whilst simultaneously undermining Canada's fiscal stability. Despite this threat to governmental viability, regulations have been multiplied, immigration halted and birth control made mandatory. With increased philosophical divergence, friction with the United States has grown. Declining productivity also precludes substantive aid to the international community. This scenario, essentially an attempt to avoid the future by returning to the past, has demonstrated that scientific knowledge is irrepressible. Once out, the genie cannot be tempted back into his bottle.

Fortunately, like transitory glimpses of Scrooge's destiny, these scenarios are but the shadows of things that may be, not necessarily of those that will be. They do, however, represent the authors' perception of two Utopias, actively being promoted by pressure groups in Canada today.

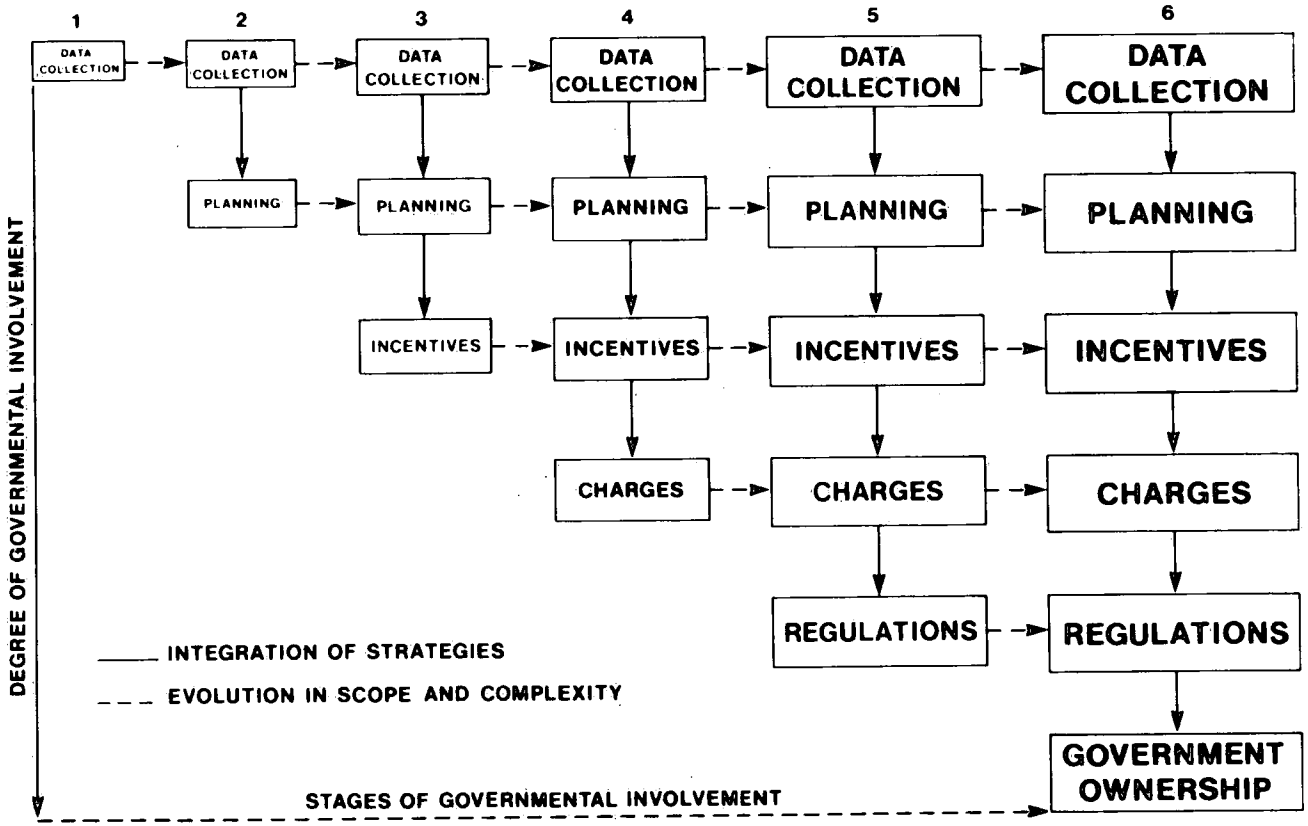
Doctrinaire adherence to outmoded philosophies, in the face of unanticipated repercussions, is the unifying theme of both scenarios. The pursuit of either unfettered growth or of rigidity, masquerading as stability, can ultimately undermine the quality of life. To remain viable, a society should constantly prepare to accommodate unanticipated change by maximizing its spectrum of choice. The remainder of this report explores how such flexibility can be expanded by the promotion of renewable energy resources and conservation. It also demonstrates that this objective might be pursued by the Canadian government with the minimum sacrifice of either economic growth or individual freedom (Figure 1).

.....our decision-making must be based on visions of the world that may be realized, and these alternative futures must be developed by a labour of imagination and thought.... If we are to have a future of promise rather than threat, we must conceive that future and then develop ways that our institutions can work collectively to bring it about.

Charles W. Williams Jr.[98]

FIGURE 4

CHANGING SCOPE AND SCALE OF GOVERNMENT INTERVENTION



ADAPTED FROM CRAINE, E.L., WATER MANAGEMENT INNOVATIONS IN ENGLAND, 1969.

POTENTIAL STRATEGIES FOR MOLDING THE FUTURE

Canada faces many alternative futures. In part its futurity will be shaped by "external forces" such as international conflict, political alignments or fluctuations in world commodity prices, over which it has little or no control. While it is possible to mitigate the impact of some of these variables, no country can be completely free from their influence. Nevertheless, there exists a considerable latitude for deliberate choice. Through rational decision-making, building upon a varied resource base, democratic institutions, and a tradition of generating and adopting technological innovation the quality of future life can be largely controlled. Government policies are an especially important determinant, not only of the range of practical alternatives available but also of the process of selecting the future itself.

Since energy will always be a critical ingredient, policies affecting it are of particular concern. As traditional sources of energy decline, policies relating to alternatives gain in significance. Where no guidelines exist, the urgency for their development becomes progressively more obvious. This is now true in the case of renewable energy resources and conservation. A consideration of possible policies and agency functions is essential to the formulation of future strategies. Governments can influence the development and utilization of energy in numerous ways.[99] These range through the collection of data and the sponsorship of research, the imposition of taxes on production and consumption, the provision of subsidies, to public ownership of production and distribution facilities (Figure 4). Influence can be exercised at federal, provincial and local levels of government but to varying degrees.

Through time the scale and scope of government intervention in the energy industries in Canada have gradually increased. They now affect all branches of these industries. Policies and agency functions may be grouped into the following six categories:

(1) data collection and research

(2) planning and public participation

(3) incentives

(4) taxes, royalties, and other charges

(5) regulations

(6) government ownership of production and/or distribution facilities.

The strategies listed above represent a progressively higher level of government involvement and control. Although there are probably few instances where movement has taken place systematically from category (1) to (6), the overall effect has been motion in this direction. The actions and activities undertaken at each stage of intervention has also expanded. Attempts have been made, with varying success, to integrate these strategies.

Data Collection and Research

A minimum level of government involvement in the management and utilization of energy resources is the provision of information and the sponsorship of research. Governments in Canada have traditionally engaged in the collection, analysis and dissemination of data relating to the supply of and the demand for energy and have invested considerable sums in energy research. Public utilities and the private sector have also contributed significantly to this field.

Discussions with industry representatives and government agency officials suggest that reliance for research into the fossil fuels is placed primarily with the private sector, while governments (principally the federal government) have undertaken responsibility for sponsoring research into nuclear power, renewable energy resources, and energy conservation.[100]

Expenditures on energy research and development in Canada appear relatively small, however, when compared with the economic and social importance of the energy industries. Nevertheless, the size of such support has grown, reaching a total of some $150 million in 1974-75.[101] Of this, federal expenditures have amounted to approximately $86 million; some 74 per cent of the latter was allocated to research and development in nuclear power, 18 per cent on oil and gas, and 3 per cent on coal. Less than 2 per cent was spent on studies of energy conservation.[102]

The main orientation of Canadian energy research and development

policy has been towards stimulating supply, particularly from non-renewable sources. Little attention has been paid to demand. Where research in this connection has occurred it has been directed more towards the discovery of additional opportunities to use energy, rather than to means of increasing the efficiency of utilization. Total national expenditures on research into energy conservation in 1973-74 amounted to only $180,000.[103] There have been few investigations of the actual or potential social and environmental impacts of energy development, and almost no attempt to devise rational means for technology assessment. An interesting exception is the work of Gibbons and Voyer who developed a methodology for the assessment of East Coast offshore petroleum exploration.[104]

Various studies undertaken recently for the Science Council and for OECD have drawn attention to the deficiencies in existing energy research and development programmes in Canada and have called for considerable expansion of effort, and change of perspective.[105] The majority of the studies emphasize the need for governments to stimulate research into renewable energy resources and conservation. This is particularly important since the private sector is unlikely to undertake such work. Such studies also pointed out that there is a need to investigate more thoroughly the potential impacts of energy resources exploitation and utilization, and the effectiveness of various policies and institutions.

In the fields of both renewable energy resources and conservation, existing data collection programmes in Canada are inadequate. The information currently available, for example, on wind regimes, wave movements, groundwater temperatures or the regional effectiveness of insulation has commonly been collected for other purposes. As a consequence, it usually allows only an overview without providing the basis for detailed estimates of actual physical and social potential. If renewable energy resources and conservation are to play a major role in Canada's future, there must be a quantum change in the nature and scale of data collection.

Planning

Planning is now recognized as a key element in the policy-making process. A growing number of federal and provincial agencies have special branches or divisions responsible for it. They analyze supply-demand situations, within their area of responsibility, and make proposals for meeting future needs most efficiently. Generally

such bodies have been concerned with only one resource, for example oil, natural gas, coal or hydro-electric power. Exceptions have occurred recently, however, at both the federal and provincial levels where agencies have been established to foster the co-ordination of planning relating to various energy forms.

Planning has traditionally concentrated upon the examination of physical opportunities of energy supply, and the financial implications of their development. Increasingly, however, broader questions of inter-energy competition, federal-provincial relations, social consequences and environmental impacts of energy exploitation have become major planning issues. The planning staffs of some agencies have been broadened to deal adequately with these matters. Most of the larger agencies now employ social scientists, and, in a few cases, ecologists, as well as engineers or geologists in their planning division.

The nature of the planning process has altered in other ways as well. One of the most important is the involvement of the public. Until recently planning in the energy field was undertaken principally by specialists, who had only minimal public contact. Events in the recent past, however, clearly indicate that a broadened role for the latter is needed, particularly if planners are to obtain a more accurate view of current social preferences and potential responses to policies. There have been growing demands for greater public information, more continuous consultation, and for a higher degree of involvement in the formulation of goals and the identification and evaluation of policy alternatives. This pressure has been particularly intense with respect to proposals for the development of Arctic pipelines, transmission lines in Ontario, hydro-power projects in Québec, Manitoba and British Columbia, and nuclear power projects in various parts of the country.[106]

Governments have responded to the call for a greater degree of public participation in a variety of ways, ranging from the holding of a larger number of public meetings and hearings, the provision of a more continuous flow of information, the establishment of advisory boards composed of members of the public, to workshops and seminars. Several experimental public participation programmes have also been organized in connection with the Okanagan, Qu'Appelle, and Saint John River Basin studies.[107]

As yet it is uncertain as to which forms of public participation are most useful at particular stages of the decision-making process, particularly in those instances where the public is geographically remote from the locus of the actual decisions. What is clear, however, is that the demands for a greater degree of public involvement in energy-related decisions will continue, and will probably increase.

An unfortunate aspect of renewable energy and conservation policy-making has been the absence of a planning input. Unlike the situation with respect to non-renewable energy resources and hydro-electric power, the development of unconventional sources has been hindered by a dearth of planning. Even where it has taken place, it has been small scale and unco-ordinated. As a consequence, the management of renewable energy resources and conservation have suffered from an insufficient implementation of available technology, an inability to stimulate public awareness and a lack of government commitment.

Incentives

Incentives take a variety of forms, including subsidies, tax reductions, land leases, license terms, and freight rate modification. In Canada they have been used by both the federal and provincial governments and have been applied to various phases of the management of the coal, oil, natural gas, hydro-power and nuclear power industries. A wide variety of objectives have been pursued through the use of such incentives. These have included the expansion of exploration, for example in the oil and gas industry, the stimulation of development of a new source of energy, such as nuclear power and the support of energy industries that were experiencing the effects of rapidly rising costs, as in the case of the coal industry. Incentives have also been used to ensure the expansion of energy distribution into areas where costs were too high for consumers to bear without financial aid, such as electrification of rural areas, and in the cushioning of industrial and domestic consumers against the impact of rapidly rising costs of a given type of energy, as recently occurred in Ontario in the case of oil.

The use of incentives, as an instrument of policy in the energy industry in Canada, has been a matter of continuing debate, parti-

cularly among economists. Incentives may not succeed in stimulating the intended expansion of output or improvement in efficiency. Subsidies in the coal industry, for example, increased from $50,000 a year in the late 1920's to more than $8 million a year in the mid-1950's but production at the end of the period was lower than at the beginning.[108] The objectives in supporting the coal industry, of course, were not solely economic in nature, but also strategic, political and social. Criticisms have been levelled against corporation tax provisions which permit oil and gas producing companies to deduct the costs of exploration and development, and one-third of their taxable income as depletion allowances. Some critics have suggested that not only are such provisions inequitable, since they are unavailable to other industries, but they are probably much more generous than necessary to ensure the desired effort in exploration and production.[109]

In the face of high risk resulting from embryo technology and uncertainties over public preferences, incentives may play a critical role in the promotion of new industries or endeavours. This may be especially true in the case of renewable energy resources and conservation, because of the lack of data, experience, and appropriate institutional structures. Unconventional energy use, for example, might be stimulated by lowering taxes on equipment which uses energy from renewable sources. Another illustration would be furnishing subsidies for the development of energy conserving technologies, such as high efficiency automobile engines, or for the introduction of insulating materials in building construction.

Taxes, Royalties and Other Charges

Energy resources are income-producing assets. However, since some of these are non-renewable and rapidly becoming exhausted, their exploitation must be carefully controlled. Taxes, royalties, license fees and other charges can be used for this purpose. There are numerous illustrations in the oil, gas and electric power industries in Canada of various kinds of levies being imposed by both the federal and provincial levels of government.[110] Generally, these charges have been effective both in regulating production, and in providing revenues for the administration of various government programmes.

Taxes, royalties, and other charges could play an important role in the development of renewable energy resources. For example, such disincentives might be levied against non-renewable energy revenues that are nearing exhaustion, and the revenues so derived could be used to stimulate the adoption of renewable alternatives.

Regulations

Energy-related federal and provincial regulations already influence the location and rates of production, the degree of associated environmental disruption, prices charged, and volumes exported and imported. Special agencies have been established to administer such regulations.

Regulations reflect the government's philosophy and prevailing economic conditions and technological sophistication when the measures are imposed. As these variables change, modifications in regulations may also be required. In some cases this can be accomplished fairly easily by the simple statement that requirements for a license or permit have been altered or prices have been revised. In other instances, however, lengthy negotiations among agencies and energy suppliers or among federal and provincial governments may be required to facilitate change.

In the prevailing period of social flux, numerous opportunities exist for the introduction of regulations designed to stimulate renewable energy resource development and conservation. Illustrations of such a strategy were set out in the federal government's "in-house" energy conservation programme, as announced in the House of Commons on 6 February, 1975, by the Honourable Donald MacDonald.[111] These regulations included the restriction of maximum room temperatures and lighting in federal buildings, reduction of engine capacity of vehicles used by federal agencies, and limitation of use of paper by utilization of both sides of a page and by re-use of envelopes. This spectrum of potential regulations could be expanded within both the public and private sectors.

Government Ownership

The most direct means of intervention in the development of energy resources is government ownership of the production and/or distribution facilities. This can be achieved in several ways. A crown corporation, for example, with the responsibility of providing a particular form of energy, such as electricity or natural gas, might be established. It could be given authority to borrow capital on the open market to finance the construction of facilities and their subsequent operation. This has been the pattern typical of the Canadian electric power supply industry, where some 80 per cent of the capacity is now operated by provincial publicly-owned utilities. The Québec government's Québec Petroleum Operations Company is organized in this way, and this model may be followed in the establishment of a National Petroleum Company.[112]

Another form of direct government involvement is a partnership of public interest and private enterprise. Panarctic Oils Ltd. is an example of such a union. The federal government has 45 per cent ownership of this company, being a shareholder along with more than 20 other investor groups. Panarctic is not a crown corporation, but a normal joint stock enterprise. Its directors are drawn from the business sector. Recently the Canadian government became further involved in the direct management of energy resources through its provision of capital for the exploration and development of the tar sands in the Syncrude Corporation. The federal government, together with those of Ontario and Alberta, committed at least $600 million to this project.

To date renewable energy resources have not proved sufficiently attractive to encourage large scale private investment in their development. Competition from non-renewable sources, relatively unsophisticated technology, and uncertainties over public responsiveness have combined to inhibit their adoption. To remedy this situation the government might consider a variety of degrees of direct involvement, ranging from complete public ownership to the provision of risk capital. The appropriate level of governmental participation in the development of renewable energy resources would vary among individual resources, and might be expected to decline over time.

THE ANALYSIS OF ALTERNATIVES

Potential strategies may be assessed against two sets of criteria:

(a) those which measure implications for the three major goals of government discussed earlier; namely, economic growth, flexibility, and individual freedom; and

(b) those which indicate their inter-relationships with such systems as the physical environment, administrative organization, and legal framework.

The first assessment set permits a broad overview of the large public aims; the second focusses upon institutional and political constraints to policy strategies and their specific effects upon various sectors of the economy and the physical environment. The use of these criteria represents a two-phase evaluation process, the second stage being an elaboration of the issues raised in the first.

Such evaluations can be best undertaken through the use of matrices. An illustration of the application of the first set of criteria in matrix form is provided in Figure 5, and the second set in Figure 6. Neither of these matrices is intended to be comprehensive. Other strategies might be added and a greater variety of constraints and impacts considered.

It is not sufficient to merely list evaluation criteria or strategies. Each of these needs to be given a relative ranking in importance. It must be decided, for example, whether it is more desirable to have freedom of mobility than to improve the balance of trade (Figure 5). In addition, decisions must be made on such matters as the relative importance of political acceptability and environmental stability (Figure 6). All criteria and strategies are not equal, and this inequality must be reflected by a weighting system. Ultimately, this ranking mechanism must be determined politically but should be based upon rational foundations.[113]

A further problem is the measurement of strategy impacts on each of the parameters represented by the criteria. Some of these impacts can be quantified relatively easily. For example, it is possible to

FIGURE 5

Strategy Evaluation Matrix: Growth-Flexibility-Freedom Parameters

Possible Components of Management Strategy	Economic Growth				Social Flexibility			Individual Freedom							
	Capital Formation	Labour Supply	Managerial Expertise	Technological Innovation & Application	Maintenance of Existing Options	Stimulating New Alternatives	Removal of the Problem	Liberty	Property	Equality	Religion	Speech	Assembly	Privacy	Mobility
Data collection and research															
Planning															
Incentives															
Charges															
Regulations															
Government ownership															

FIGURE 6

Strategy Evaluation Matrix: Constraints and Impacts

Possible Components of Management Strategy	Constraints and Impacts												
	Legal			Economic			Administrative		Political				
	Constitutional	Precedent	Financial	Regional Employment	Income Redistribution	Trade Balance	Complexity	Costs	Federal-Provincial Relations	Public Acceptance	Time Fruition	Timing	Environmental Impact
Data collection and research													
Planning													
Incentives													
Charges													
Regulations													
Government ownership													

measure the likely effects of the imposition of a gasoline tax on government revenues, or the probable impact of the regulation of thermal discharges on receiving waters. In general, ordinal measures can be used in assessing the magnitude of effects on the physical, economic and environmental systems. In contrast, the implications for social, political, and institutional dimensions are much more difficult to quantify with precision and these are best represented by cardinal measures.[114]

Strategy Impacts on Growth, Flexibility and Freedom

Proposed strategies should be analyzed for their potential impacts on economic growth, flexibility, and freedom. As indicated in Figure 5, effects on each of these major goals might be indicated in a variety of ways. For example, the implications of an energy management strategy for economic growth might be considered in terms of its impact upon capital formation, labour supply, managerial expertise, or technological innovation and application. The ramifications of a proposed strategy for each of these factors could then be compared with those of other alternatives.

For example, the relative merits of a proposed scheme of public education designed to encourage more efficient use of energy might be considered against the merits of establishing a crown corporation to stimulate the development of renewable energy resources. The matrix indicates that a public education programme would have few, if any, adverse effects on the attainment of the three major governmental goals. It would not retard economic growth, nor reduce any of the individual freedoms identified in the matrix. Similarly, by raising public awareness of the possibilities of utilizing unconventional sources of energy, it would increase governmental flexibility.

If a crown corporation were established to promote the development of renewable energy, the potential for achieving economic growth would be increased through the provision of additional sources of energy and the stimulation of technological innovation. Such a corporation would have few, if any, harmful effects on individual freedom. The latter might indeed be increased if its products improved the prospects for privacy and mobility. Only if this body were given widespread powers of expropriation would it constitute a significant threat to individual freedom. Its major contribution would be in expanding flexibility. Renewable energy would provide

additional energy sources and would, therefore, increase the range of social options. If appropriate conversion technology could be developed, the number of possible new applications could prove very extensive.

It should be noted that only rarely will a management strategy be applied in isolation. Typically, they are adopted in combination, since the success of one generally hinges on the existence of others. Efficient regulation, for example, requires the provision of effective data collection and analysis. It is probable that the evaluation of combinations of strategies will also often be required.

Strategy Impacts on Specific Parameters

Although broadly desirable, some strategies may prove extremely difficult to apply in practice. The matrix illustrated in Figure 6 is designed to facilitate consideration of specific parameters, such as legal or financial constraints, or economic or environmental ramifications. This matrix stimulates the posing of more detailed questions, such as, is this strategy constitutionally permissible and is there a legal precedent for it? Other queries that might be raised include: would the revenues derived outweigh costs of collection, or are the funds available to effectively put the strategy into operation? What would its effects be on regional employment or on particular economic activities? How would it alter Canada's trade balance? How long would it take to become effective? Would the timing of its introduction have adverse effects outside the energy industry? What would be the impacts on physical systems and social relationships? Obviously many other pertinent questions could be added to this list. Clearly, it is important to ensure that as many of the potential constraints and ramifications as possible are taken into account, and that comparisons of the relative merits of each strategy (or combinations of strategies) are made before any one is selected for adoption.

The use of this matrix might be illustrated by an examination of the merits of a proposed uniform federal tax on oil and gas consumption, the revenues derived from which were to be used to stimulate the development of renewable energy resources, and the promotion of conservation. There would appear to be no constitutional difficulties in the way of such a strategy and there are certainly legal precedents for its imposition. The revenues derived from even a small tax,

such as a few cents per gallon, would be considerable and would more than offset the costs of its collection. It is unlikely that there would be adverse effects on employment in the oil and gas producing provinces, and it is conceivable that, if the revenues were re-allocated to assist development in the energy deficient provinces, economic growth could be stimulated in those regions. If a comparable levy were placed on imported oil and gas, the strategy could also have favourable effects on the nation's trade balance, especially if development of renewable energy resources were successful in replacing imports of foreign oil. The administrative machinery for collecting and re-distributing the revenues from such a tax already exists, and the additional costs involved in its imposition would not be high. Complexity and expense of administration, however, would be increased if exemptions in the tax payment were made or if the formulae for re-allocation were highly complicated. The effects of such a tax on federal-provincial relations would be diverse. Like each proposal for increased federal taxation, it would meet with varying resistance from all provinces. However, since all would be subject to it and eligible for a share of the revenues derived, opposition could be expected to be relatively muted.

Public opposition to the imposition of such a tax could be anticipated since there is a widespread belief that the financial burden of government is already too high. However, such displeasure would be much less if there were a clear understanding of the objectives of such a tax and its advantages over alternative strategies. The imposition of an oil and gas levy would have the distinct advantage that it could be introduced immediately and its returns would appear very quickly. Provided that it did not rapidly follow other restrictive measures, there should be few political problems of timing. The environmental repercussions of such a measure could also be highly favourable, depending on the extent to which it promoted the development of non-environmentally hazardous alternative forms of energy. The more efficient use of all types of energy, if it resulted, would also be beneficial.

The evaluation matrices described above are not presented as definitive methodologies. They do have, however, several distinct merits which include the display of alternatives and the various factors that require consideration. Even if incomplete, they may stimulate the analyst to ensure that a comprehensive listing is developed. A further advantage is that they emphasize that almost invariably some trade-offs must be made. Few strategies have wholly favourable implications for economic growth, flexi-

bility and individual freedom. Similarly, none are completely free of institutional constraints or adverse effects on some aspect of the economy, social relationships or the environment. It is important, however, that such trade-offs are identified and potential gains and sacrifices carefully weighed against a vision of the future desired.

To see the future only in terms of continuity is to be guilty of presentism, that is, to emphasize current issues as though they have lasting and deep import. To stress change seems to lead contemporary writers into a compulsive attraction to the projection of technological trends, leading to the neglect of social issues.

S.M. Miller and Pamela Roby[115]

IN CONCLUSION

Sacrifice has proved particularly unappealing to North Americans. Adopted as a catchword, it will undermine use of Canadian renewable energy and conservation. Fortunately, such a stance is unnecessary since a far stronger case for both can be made. Many pressing problems stem not from shortage but rather from misuse. Frequently, with forethought, more can be achieved with less. Just as the replacement of thousands of miles of submarine telephone cable by a single satellite can save power and materials, yet provide a better service, the adoption of widespread conservation and the greater use of renewable energy resources can increase efficiency without personal sacrifice. Underused renewable energy potential and over-exploited non-renewable resources are both symbols of present inefficiency. A change in this energy mix can increase flexibility.

The need is for a more technologically and institutionally sophisticated Canada, in which waste, whether physical, environmental or social, is the ultimate stigma. By adopting an improvement of the ratio of useful work performed to the total non-renewable energy expended as a major objective, Canadian society could maintain its viability without undue sacrifice. Deliberate cognizance of personal significance could ensure that such improvements in efficiency were not paralleled by a marked decline in the liberty of the individual. The fact is that, during the next twenty-five years, Canada does not need to move backwards on any of the three axes of the economic growth-flexibility-freedom matrix, and can probably move forwards on two, if not all three.

Fundamental alterations in the fabric of Canadian society, however, are necessary to ensure this progress. Such a re-organization will be expensive, yet so would inactivity. Since Canada cannot opt out of the global community nor fully meet her own future energy requirements without radical re-thinking, some change is inevitable. Its price will be paid either sooner or later, and will no doubt escalate in the face of indecision. For example, Canada could cover part of the anticipated shortfall by widespread conservation, extensive construction, and/or massive and expensive energy imports. If the current rate of increase in energy demands could be reduced through conservation measures by one per cent per annum, a saving of 150,000 barrels of oil per day would accrue by 1990. Such a saving

represents the output of one $2 billion Syncrude-sized oil sands plant, or imports costing perhaps $30 million a day.[116] Moreover, as lead time declines the cost of viable options increases and the potential for their implementation is reduced. More important still, two of the alternatives noted above would result either in an enormous commitment of capital resources and/or a major adverse trade balance. As a consequence, they have prophetic significance for future Canadian economic growth, social flexibility, and individual freedom.

Effective action is mandatory and the need for it urgent. The lead time is dwindling, but the need for response is growing. The authors believe that the Canadian federal government must now show leadership and take a firm, unequivocally positive position on the essential role that renewable energy resources and conservation must be made to play in this country's future.

There are going to be some major changes in our energy system over the next fifty years. The resource base for the present power technology is inadequate; consumption is increasing rapidly, and the fuels are finite and non-renewable.

Earl Cook[117]

RECOMMENDATIONS

The two scenarios described earlier are examinations of the implications of over-promoting or actively retarding economic growth. Neither strategy appears to offer prospects for the best possible Canadian future. The authors have proposed an alternative philosophical approach, that of progress through increased efficiency. The recommendations which follow are consistent with this third alternative. As such, they should provide assistance in bridging the anticipated gap between future energy demands and the internal production of oil and gas supplies.

1. A Tax on the Production of Oil and Natural Gas

History's major thrusts are repetitious. Technologies, like organisms, thrive or perish. On several earlier occasions the necessity to change major power sources has arisen. In the early stages of the Industrial Revolution, wood gave way to coal, the supremacy of which was later surrendered to oil. These demonstrations of the Darwinian principle of the survival of the fittest have traditionally been both expensive and disruptive. Nevertheless, they have also been necessary and productive. Similarly, as the relevance of particular resource bases to current technologies has altered, the power and prestige of individual countries and alliances have grown or waned.

This country is now entering such a transitional period. As internal supplies of oil and gas dwindle and imported energy is used increasingly by its producers as both a political weapon and an economic leech, the urgency of innovation in Canada is becoming ever more apparent. In the authors' opinion the federal government's role in this process should be that of a lubricant, ensuring maximum productive change with minimum internal friction. A guiding principle of the future should be increased flexibility through greater diversity of energy supply.

RECOMMENDATION

It is recommended that an additional tax be levied by the federal government on the consumption and export of oil and natural gas. The revenues from this tax would be used exclusively to promote the adoption of conservation techniques and renewable energy resource use. They should not flow into the general revenue but should be used to fund the implementation of the recommendations which follow.

If the tax rates were set at 7 per cent of the current retail price of oil and natural gas, revenues in 1975 would amount to at least $500 million. As the prices of these commodities were increased, so would the anticipated yields of the tax.

2. The Establishment of a Crown Corporation

The past's inertia is largely maintained by the institutions that rely on it for their present authority. Such conservation plays both a positive and negative role. By subjecting new ideas to the fires of the past, unnecessary, retrogressive change can be avoided. Traditionalism becomes destructive, however, when it retards beneficial innovation on the grounds that it threatens existing, perhaps obsolete, principles.

Non-renewable resources have been the basis of Canada's economic strength. The quality of life of its inhabitants has been largely supported by the discovery, exploitation and consumption of minerals, coal, oil and natural gas. Naturally, its institutions reflect and, therefore, promote this bias, so too do governmental expertise and expenditures.

In the energy field, financial investment in a resource tends to reflect only the current state of its development, rather than its inherent importance. This is painfully obvious in the area of renewable energy resources and conservation. Research workers may be similarly constrained by the institutional framework within which they must function. In consequence, there is, as yet, no adequate Canadian commitment to promote either research into or the development of unconventional power resources or techniques for reducing energy demand. Nor do the expenditures suggested to date,by those working in this field, appear adequate to ensure

significant future change.[118]

RECOMMENDATIONS

It is recommended that the federal government establish a Crown Corporation for the stimulation of renewable energy resource technology and utilization. Such a corporation should also promote conservation. This body should be directly funded by the revenue derived from the tax on the consumption of oil and natural gas, proposed above. Capital stock might also be issued and bought by the government, whilst bonds could be sold to the general public. At a later date funds would also be available from successful patents and from the sale of power generated by government-owned or rented equipment.

It is recommended that such a Crown Corporation be given considerable independence. It should, however, be committed to meeting specific objectives. These should be clearly enumerated, allowing performance to be evaluated. To ensure the widest possible co-operation, the possibility of a federal-provincial structure should be explored and the Corporation's activities should be carefully coordinated with those of line agencies already active in the field such as the Department of Energy, Mines and Resources, the Department of the Environment, the National Research Council and Central Mortgage and Housing.

It is recommended that the Corporation also be charged with assisting research and development agencies to initiate schemes at the international level. Countries such as the United States, Sweden, Israel, and the USSR, whose expertise might be of great Canadian benefit, should be approached. Further Corporation roles would include the promotion of private investment in the renewable energy and conservation fields, together with development of public awareness of its potential benefits.

3. Stimulation of Private Enterprise Investment

Where the potential for profit is absent, so too is private investment. The past unwillingness of business to commit funds to the development of renewable energy resources has reflected this truism. Although the escalating price of conventional energy is improving the competitiveness of more unconventional power sources, this alone does not necessarily guarantee their rapid private development. Money has become increasingly mobile and capital seeks its highest return, on a global scale. If renewable energy resources are to be rapidly tapped by private enterprise in Canada, the profits for such development should be equal at least to those available elsewhere and should be guaranteed even if the cost of foreign oil declines. A climate amicable to investment is, therefore, required, one in which the potential for return is not masked by federal-provincial rivalry and indecision.

RECOMMENDATIONS

It is recommended that where the manufacture or installation of renewable energy or conservation technology is retarded by the federal tax structure, such levies be reduced or removed. Where this relief alone is insufficient to guarantee large scale private enterprise investment in these fields, subsidies, funded by revenues from the suggested tax on oil and gas production, should be provided. Conversely, where current practice promotes the wasteful use of energy or retards the adoption of unconventional energy sources, disincentives, in the form of additional taxation, should be levied.

It is recommended that tax relief be provided to the automobile industry on a scale which is proportional to the mileage per gallon achieved by the cars produced.

It is recommended that a disposal tax be levied on bottles, cans, newspapers or magazines produced or imported into Canada. The revenue accruing from such a levy should be used to subsidize the adoption of recycling at the local level.

It is recommended that a market for solar space heaters, windmills and heat pumps be guaranteed. This could be achieved by the federal government, in conjunction with private enterprise, agreeing to make at least one town in each province energy self-sufficient. In addition, demonstration projects, consisting of at least single streets of unconventionally powered houses and industrial plants using energy from such sources should also be widely established.

4. Ensure Integrated Public Policy

The diversity and omnipresence of government has led to frequent policy conflicts. All too often an objective is promoted by one level or branch at public expense, whilst its attainment is actively resisted by another. The Québec support of the French proposal for a nuclear enrichment plant, using James Bay hydroelectric power and the federal promotion of the CANDU system is an example of such a goal conflict.[119]

RECOMMENDATIONS

It is recommended that to ensure co-operation at the federal level, budget allocations to departments be made partially contingent upon the active, demonstrated promotion of unconventional energy sources and conservation. The Department of Agriculture, for example, might be required to stimulate biomass use and the Department of Public Works could be obliged to install heat pumps in all public buildings. Similarly, it could be compulsory for the Central Mortgage and Housing Corporation to promote the use of solar heating and the renewable energy sources together with greatly improved insulation. Other relevant bodies, such as the Department of Energy, Mines and Resources and the Department of the Environment, might be set targets in this field, against which their performances should be judged.

It is recommended that the budgets of complying departments be increased by revenue derived from the additional tax on oil and gas. Such monies should be made available only if it could be clearly demonstrated that this additional funding was

to be used on some major renewable energy or conservation project.

It is recommended that conservation and renewable energy development targets, over a number of five-year intervals, be set for each province by an independent committee. Federal development grants should be made available to provide part of the necessary risk capital required to achieve such goals. Any province attaining its target by the date established should receive a fixed percentage of the revenue derived from the tax on oil and natural gas.

It is recommended that grants be made available to assist municipalities in the exploitation of renewable energy resources and conservation technologies. This assistance should be provided only if such bodies remove any local regulations, such as restrictive building codes, that retard the widespread public adoption of unconventional energy use. Financial support, for example, should be provided for the construction of services in subdivisions which will be powered by renewable energy technology and for the installation of energy conserving facilities such as rapid transit systems or recycling and pyrolisis plants. Federal assistance should also be made available to those municipalities wishing to purchase energy conserving vehicles for public use, to aid, for example, the adoption of electric buses or methane-powered garbage collection trucks.

It is recommended that the proposed Crown Corporation undertake to guarantee a minimum price for recycled materials collected by municipalities.

5. Stimulate Public Interest

Government funding and commitment in many fields has displayed a tendency to mirror the bell-curve of public interest. As the collective memory of problems and their possible solutions dims, often so too do the prospects for meaningful change. As a consequence, it is not enough for an agency to have a mission: it must also have continuing public support. Nor is it sufficient for the public to be aware of an issue: there must also be some prospect of its participating in its solution.

RECOMMENDATIONS

It is recommended that a comprehensive, continuous public education programme be established, designed to use every available media and to reach all sectors of the general public. This programme should stress the significance, adoption, use and availability of renewable energy resources and conservation techniques.

It is recommended that the proposed Crown Corporation, in co-operation with private enterprise, establish numerous demonstration projects. These should be large scale and illustrate viability in a variety of geographical environments. Such projects might include the construction of company towns powered by unconventional energy or involve the promotion of non-conventional means of transportation, such as small-engined or electric or biogas cars.

It is recommended that at least one town in each province be chosen for the installation and testing of a wide range of renewable energy and conservation technologies. Such construction and adoption should be undertaken by private enterprise with the assistance of the Crown Corporation.

It is recommended that solar space heaters, heat pumps, methane digestors, electric cars and other similar equipment be made available for public rental from the Crown Corporation. Installation costs should be subsidized.

It is recommended that the revenue raised from the taxation of materials production be given to municipalities to be used to purchase sorted newspapers, clean and compressed cans and crated bottles from householders. Payment might be in the form of a reduction in rates to those complying.

It is recommended that the cost of insulating older homes be made deductible from federal income tax.

It is recommended that homeowners or renters should be allowed to deduct the value of electrical energy (conserved over the previous year's consumption) from their federal income tax.

It is recommended that competitions be sponsored by the Crown Corporation with the aim of stimulating energy con-

serving ideas that have widespread public application.

6. Promotion of Research

In the current system of allocating public money for private research, the government plays a relatively passive role. Typically, information that funds are available is distributed, proposals are solicited and those with merit are supported. There is no guarantee that the money spent in any way produces the best possible return. When lead time is short and the need for socially valuable results is great, this system appears singularly inappropriate.

RECOMMENDATIONS

It is recommended that the proposed Crown Corporation and agencies involved in research into the development of renewable energy resources and conservation techniques establish a joint research funding committee. This body would detail research and development requirements and actively solicit proposals for their fulfilment. After three years this committee's performance should be evaluated by independent consultants, a procedure to be repeated at regular intervals.

It is recommended that university, government or private employees engaged in research be guaranteed significant financial benefits from successful inventions. Additional revenue generated by such projects should be used in the support of further relevant research.

It is recommended that the Crown Corporation hold competitions for designs or innovations which would lead to the development or adoption of renewable energy or conservation technologies.

It is recommended that traditional funding agencies, such as the National Research Council and the Canada Council, be directed to give favourable consideration to proposals for research into the unconventional energy fields.

7. Promotion of International Co-operation

Recognition of the growing obsolescence of petroleum-based technologies is increasing. Consequentially, research into the unconventional is gaining momentum, as exemplified by Project Independence in the United States. Many major breakthroughs can be anticipated in several countries and Canada should explore possibilities of co-operation with the latter.

RECOMMENDATIONS

It is recommended that the Crown Corporation either itself or through supporting agencies and departments establish watching briefs with major foreign agencies and develop liaison with multi-national corporations and private industries working in this field.

It is recommended that a number of joint or multi-national co-operative ventures be established with those countries with expertise currently unavailable to Canadians. Of interest might be Sweden's waste heat recovery technology, Israel's solar home heating experience and the British recent innovation which allows the generation of electricity from the fumes emitted from factory chimneys.[120]

This is not the end. It is not even the beginning of the end. But it is, perhaps, the end of the beginning.

Winston Churchill[121]

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IMAGES DES AVENIRS CANADIENS: LE RÔLE DE LA CONSERVATION ET DES RESSOURCES D'ÉNERGIE RENOUVELABLES

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Avec le raffinement des techniques de prévision et de planification, nous réalisons maintenant que l'image que nous nous faisons de l'avenir est elle-même un élément important de cet avenir. Les espoirs que nous avons deviennent une force de motivation importante dans leurs réalisations.

A cause de la taille et des ressources du Canada, aucune société sans doute n'a des choix plus larges ou prometteurs pour façonner l'image de son propre avenir. Définir ces choix est le défi auquel nous faisons face.

Pierre E. Trudeau[1]

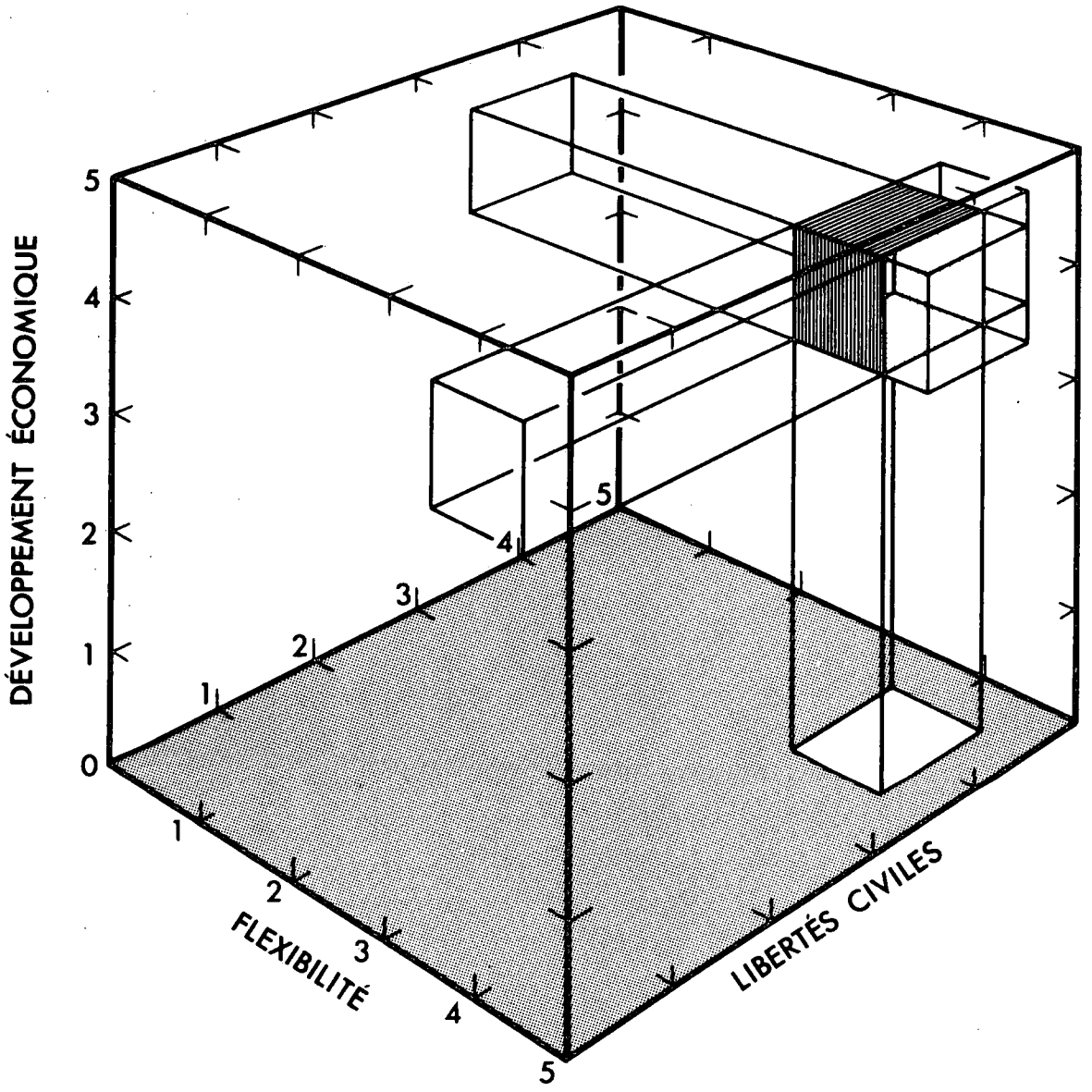


FIGURE 1. UN MODÈLE: CROISSANCE – FLEXIBILITÉ – LIBERTÉ

RÉFLECTIONS SUR LE PARADIS ET L'ENFER

Bien que limitées à un passé et un présent, les races humaines font face à une multiplicité d'avenirs. Etant donné ce large choix, ce n'est pas surprenant de voir que les visionnaires sont en désaccord sur les qualités probables de cette futurité. L'éventail des spéculations s'étire de ceux qui anticipent un avenir doré, sans besoins, maladies ou inégalités à ceux qui se préparent à l'extinction imminente de l'espèce humaine. Parmi les disciples de l'école utopienne des futurologistes notons G.T. Seaborg,[2] tandis que Paul R. Ehrlich est le porte-parole des partisans de la fin du monde.[3]

Devant des désaccords si évidents sur la nature de notre avenir prochain où se trouve la réalité? La question est, bien sûr, de pure rhétorique puisque tous ces avenirs sont possibles et donc réalistiques. Accepter dès maintenant l'affirmation que "le présent est la clef de l'avenir" oblige à une planification et une politique garantissant une futurité avec le maximum d'éléments de satisfaction et le minimum de regrets. En fin de compte, nous aurons sans doute la sorte d'avenir que nous méritons.

MÉDITATIONS SUR LE PRÉSENT

Pour être réalistiques, les spéculations sur l'avenir de l'avenir doivent être basées sur l'appréciation actuelle du présent. C'est pour cela qu'une exploration des futurités potentielles canadiennes doit commencer par examiner certaines des dimensions de la société de ce pays.

Trois caractéristiques: le développement économique, la flexibilité (le nombre d'alternatives possibles dans les institutions) et les libertés civiles garanties aux citoyens sont d'une importance essentielle. Ces trois critères qui sont composés d'une grande variété d'éléments peuvent servir à définir un espace social à trois dimensions. Ces éléments sont liés soit par antagonisme soit par synergie et servent à définir la place d'un pays, d'une province, d'un groupe ethnique ou d'une organisation dans cet espace social. Les auteurs de ce rapport après avoir développé ce concept ont appelé ce modèle une matrice de croissance-flexibilité-liberté. Chaque caractéristique est placée sur un axe.

La position du Canada dans cette matrice, représentée sur la figure 1, sera l'objet de discussions considérables. Certains faits sont essentiels à une telle discussion. Par exemple, c'est un fait que nonobstant les disparités régionales et ethniques, les canadiens jouissent d'un des revenus par habitant les plus élevés du monde. Ce pays adopte beaucoup d'innovations technologiques bien que la plupart des recherches et des développements se fassent ailleurs. Le Canada possède égalemment une quantité appréciable de ressources naturelles. Le secteur industriel de l'économie canadienne se diversifie et la proportion de la main d'oeuvre dans le secteur tertiaire des services augmente bien que la production soit surtout basée sur le secteur primaire.

Un certain degré d'inflexibilité dans les cadres institutionnels et les politiques traditionnelles ont limité la perception et les décisions des différentes options. Ceci bien que les gouvernements canadiens aient souvent admis un besoin de s'adapter aux changements. Par conséquent, dans de nombreux cas, le Canada essaie de résoudre les périodes de crises au lieu de les enrayer.

La société canadienne est caractérisée par une structure sociale relativement fluide qui permet aux individus de s'y mouvoir selon leurs compétence. Certaines idées préconçues rendent ce procédé plus aisé aux uns qu'aux autres. De nombreux droits civils essentiels sont considérés normaux ainsi que les institutions qui les garanti ent. Cependant on doit remarquer que le Canada, à la différe ce d'autres pays, n'a pas de charte canadienne des droits humains ratifiée au niveau provincial et fédéral. Pierre Elliott Trudeau l'avait pourtant recommandée quand il était ministre de la justice sous le gouvernement de L.B. Pearson.[4] Par conséquent, des libertés civiles ont été souvent transgressées au niveau provincial ou municipal. De nombreuses anomalies raciales, régionales et sexuelles existent encore. Nonobstant cette qualification et étant données les caractéristiques majeures de la société canadienne, les auteurs ont conclu que le Canada devait être placé au point F4/S4/F4 dans la matrice de croissance-flexibilité-liberté. C'est-à-dire le Canada peut être défini comme une nation mûre au point de vue économique, responsable au point de vue social et émancipée au point de vue individuel.

LES SCÉNARIOS COMME AIDE D'ÉLABORATION DE POLITIQUES

C'est très important dans cette période de flux de prendre un point de vue holistique pour examiner le choix des options de la manière la plus large possible. Pour ce faire, on doit faire quelques prédictions sur l'avenir du Canada. En prédisant on s'attire des cri-

tiques souvent valides au lieu d'attirer des commentaires fructueux. Cependant ces prévisions sont nécessaires à la formulation d'une politique.

Les recherches prévisionnelles comprennent les prévisions technologiques, la planification incorporée, les prévisions socio-économiques, les études de marché et les projections économiques.[5] On utilise généralement "la projection des tendances présentes dans l'avenir, des prédictions d'évènements ou de l'état de la société future et des planifications à long terme pour les organisations, les institutions ou les sociétés."[6] Ceux qui font ces recherches utilisent de nombreuses méthodes ainsi que le montre Coates.[7] Le tableau 1 présente une liste.

Dans ce rapport, on a utilisé la technique de rédaction de scénario. Ces images de l'avenir canadien sont rendues plus significatives avec l'utilisation d'informations venant d'une étude Delphi modifiée qui a fait une synthèse des développements futurs dans le domaine de l'énergie et ses implications au Canada. Cette étude Delphi a utilisé des renseignements réunis par des chercheurs de l'Université du Manitoba,[8] des données des rapports des projets de travail sur la recherche et le développement de l'énergie (du Bureau de Recherche et de Développement de l'Energie),[9] des idées présentées à l'atelier de Kingston sur le développement des ressources énergétiques renouvelables [10] et de plusieurs publications du Centre de spéculation sur les perspectives d'avenir d'Environnement Canada.[11] On a aussi interrogé plusieurs personnes qui sont impliquées dans la formulation de la politique de l'énergie canadienne.

FACE À L'AVENIR

L'avenir contient menaces et promesses. Les présages indiquent une accélération continue du temps et une compression de l'espace. Donc la futurité n'offre qu'une chose sûre: la différence fondamentale d'avec le passé. L'expérience ayant prouvé que les regards en arrière sont plus persuasifs que les prévisions, on a proposé des places dans la galerie des visiteurs de deux Chambres des Communes fort différentes, donnant ainsi l'occasion de faire le compte-rendu du passé de l'avenir. Il est impossible de donner ici dans cette présentation abrégée des idées exprimées lors de deux débats. Nous référons le lecteur au rapport complet s'il veut apprécier la technique du scénario.

TABLEAU 1

Techniques couramment employées en futurologie

1. Etablissement de scénarios	13. Arbres de buts
2. Technique Delphi	14. Recherches opérationelles
3. Simulation/jeu	15. Recherche par enquêtes
4. Extrapolation des tendances	16. Modèle de causalité
5. Modèle dynamique	17. Matrices de décisions
6. Analyse des impacts transverses	18. Courbes de croissance
7. Relevé des corrélations	19. Enquêtes par entrevues
8. Rapports d'opinion des experts	20. Jeu opérationnel
9. Arbres de pertinence	21. Adaptation du "PERT"
10. Analogie	22. Jeu de rôles
11. Projection économique	23. Spéculation (disciplinée)
12. Approche morphologique	24. Analyse de valeurs

Source: V.T. Coates, "Technology and Public Policy: The Process of Technology Assessment in the Federal Government," dans *Program of Policy Studies in Science and Technology*, vol. I, 1972, George Washington University, Washington, D.C.

Le premier scénario dépeint un débat sur l'opportunité de promouvoir la fusion nucléaire. La société canadienne décrite ici s'est consacrée à la production d'énergie et à la croissance économique qui lui apportèrent une plus grande prospérité matérielle et des loisirs accrus. Le déclin de l'environnement, l'érosion des traditions religieuses et humaines, les libertés civiles qui leur sont attachées ont été le prix d'achat ultime. En profitant de cette aubaine, la société s'est confisquée elle-même son sens de direction. La violence et l'extrémisme ont augmenté. Ceci étant dû en partie à l'aliénation de l'individu qui a accompagné l'expansion de l'infrastructure technologique et le contrôle du gouvernement. Le Canada n'a plus droit à la parole. Les avantages économiques d'une union *de facto* avec les Etats-Unis ont vaincu le sentiment de nationalisme. En gros, le Canada continue d'exporter sa vision d'une Utopie technologique en dépit du fait que des sociétés moins contraintes aient déjà mal utilisé les fruits nucléaires de l'arbre de la connaissance. Une perte de vision n'a pu amorcer un changement de point de vue.

Un autre avenir possible au Canada est illustré dans le second scénario. Ici, le lecteur est caché à la Chambre des Communes lors d'un débat sur la nécessité de réduire l'approvisionnement en énergie des industries néfastes à l'environnement physique ou social. L'image du Canada qui émerge de ces discussions est celle d'un pays voué au sacrifice. La stabilité écologique est devenue l'objectif primordial du gouvernement. Ce résultat s'est fait au dépens d'une baisse dans le bien-être matériel, accompagné d'un nivellement de la société. Puisque le gouvernement interprète l'éventualité de richesse individuelle comme une menace pour l'environnement et les désavantages, les impôts ont enlevé ce stimulant. Le résultat fut que les vainqueurs éventuels de la course à la supériorité économique s'activèrent autre part. Cette atteinte au talent et au capital a causé un déclin des innovations et de la production industrielle en même temps qu'elle sapait la stabilité fiscale du Canada. Les règlements furent multipliés, l'immigration arrêtée et le contrôle des naissances rendu obligatoire en dépit de la menace pour la viabilité du gouvernement. A cause de cette divergence de philosophie la friction avec les Etats-Unis s'est accrue. La production en déclin empêche toute aide substantielle envers la communauté internationale. Ce scénario qui essaie d'éviter l'avenir en revenant au passé, a démontré que la connaissance scientifique est inexpressible. Une fois sorti, le génie ne peut être remis dans la bouteille.

Heureusement tels les retours en arrière dans la vie de Scrooge, ces scénarios ne sont que les reflets de ce qui arrivera. Cependant ils représentent dans l'esprit des auteurs les deux Utopies qui sont actuellement poussés en avant par des groupes de pression canadiens.

En face de répercussions non-prévues, l'adhésion doctrinaire à des philosophies démodées est le thème unificateur des deux scénarios. La recherche ou de croissance sans entrave ou de rigidité, déguisée en stabilité, peut finalement détruire sournoisement la qualité de la vie. Pour rester viable, une société doit constamment se préparer à s'adapter aux changement inattendus en maximisant ses choix. Le reste de ce rapport examine comment une telle flexibilité peut être élargie par la promotion des ressources d'énergie renouvelables et par la conservation. On démontre aussi que ce but peut être visé par le gouvernement canadien avec le minimum de sacrifices dans la croissance économique ou les libertés individuelles (Figure 1).

STRATÉGIES POTENTIELLES POUR MODELER LE FUTURE

Le Canada est en face de plusieurs avenirs. En partie, sa futurité sera formée par des "forces externes" telles que: conflit international, alignements politiques et fluctuations dans les prix mondiaux des commodités, sur lesquelles il n'exerce que peu ou aucun contrôle. Tandis qu'il est possible de mitiger l'impact de quelques unes de ces variables, aucun pays n'est complètement dégagé de leur influence. Néanmoins, il existe une latitude considérable dans les choix délibérés. Grâce à une prise de décision rationnelle fondée sur une base de ressources variées, des institutions démocratiques et une tradition de création et d'adoption d'innovations technologiques, on peut bien contrôler la qualité de la vie future. Les politiques gouvernementales sont un important déterminant, non seulement des alternatives pratiques offertes mais aussi des processus de sélection de l'avenir même.

Puisque l'énergie sera toujours un ingrédient essentiel, les politiques qui l'affectent sont un souci constant. Avec le déclin des sources d'énergie traditionnelles, les politiques liées aux alternatives deviennent plus importantes. Là où il n'y a pas de règles directionnelles, l'urgence de leur développement devient de plus en plus manifeste. Ceci est déjà vrai dans le cas des ressources d'énergie renouvelables et de la conservation. Pour formuler de nouvelles stratégies on doit absolument considérer les politiques

possibles et les fonctions des agences. Les gouvernements peuvent influencer le développement et l'utilisation de l'énergie de maintes manières. Celles-ci varient de la collecte de données et du parrainage des recherches, de l'imposition des taxes sur la production et la consommation à la propriété publique des moyens de production et de distribution (figure 2). On peut exercer une influence aux niveaux fédéral, provincial, et local mais à des degrés différents.

Dans le temps l'échelle et l'étendue de l'intervention du gouvernement dans les industries d'énergie au Canada ont augmenté graduellement. Maintenant ils ont un effet dans toutes les branches de ces industries. On peut grouper les politiques et les fonctions d'agence en six catégories:

(1) collecte des données et recherches
(2) planification et participation publique
(3) moyens de stimulation
(4) taxes, royalties et autres frais
(5) règlements
(6) propriété des moyens de production et/ou de distribution par le gouvernement.

Les stratégies citées ci-dessus représentent un niveau gouvernemental de contrôle et d'activité de plus en plus grand. Bien que il y ait eu probablement peu de cas où un mouvement s'est effectué de la catégorie (1) à la catégorie (6), l'effet général a été un mouvement dans cette direction. Les actions et les activités entreprises à chaque étape de l'intervention ont aussi été élargies. On a essayé avec des fortunes diverses, d'intégrer ces stratégies.

L'ANALYSE DES ALTERNATIVES

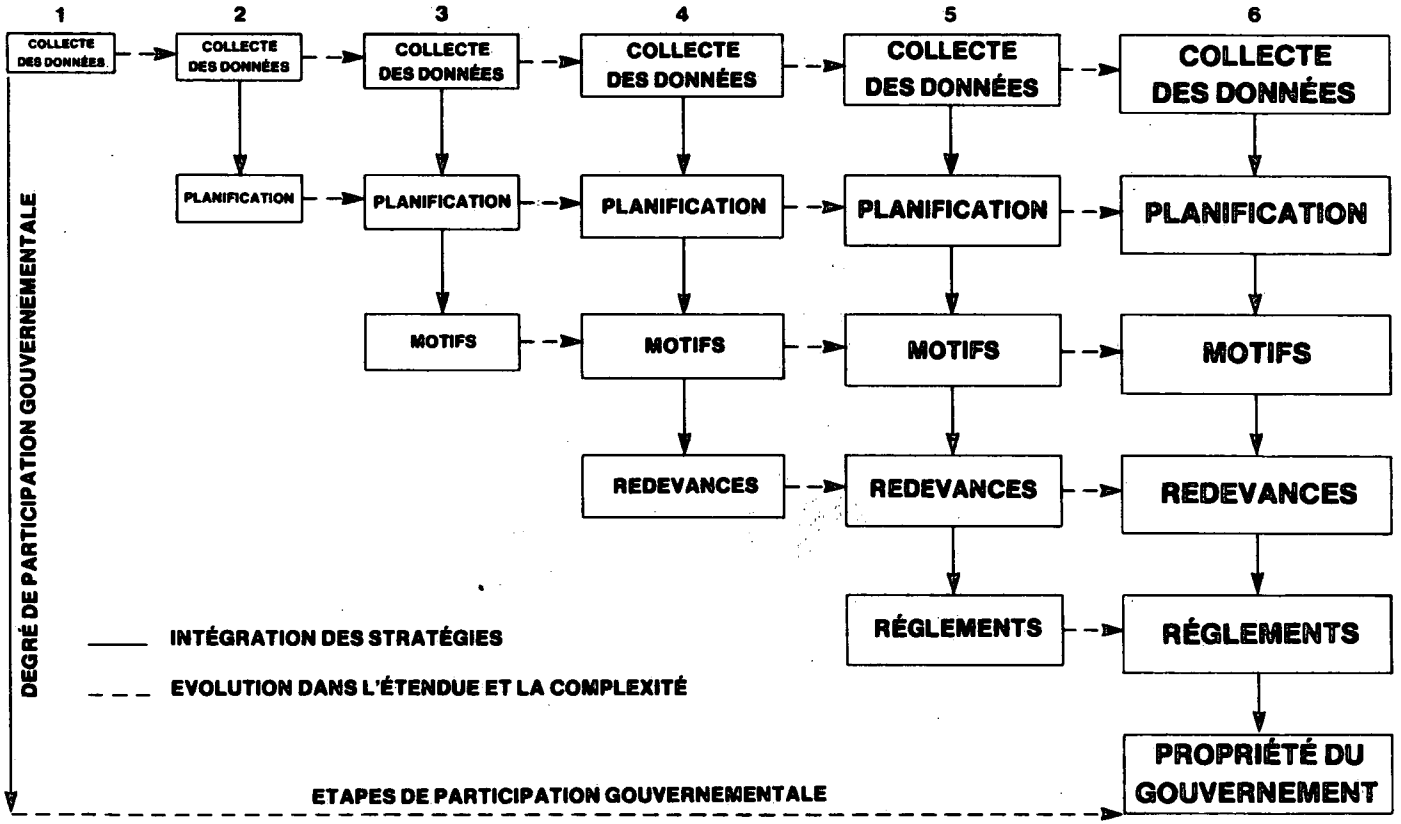
Des stratégies potentielles peuvent être réparties entre deux ensembles de critères:

(a) ceux qui mesurent les implications pour les trois objectifs majeurs du gouvernement discutés auparavant; c'est à dire, croissance économique, flexibilité et liberté individuelle; et

(b) ceux qui indiquent leur interrelations avec des systèmes tels que le milieu physique, l'organisation administrative et le cadre légal.

FIGURE 2

CHANGEMENTS DE L'ÉTENDUE ET DE L'ÉCHELLE DE L'INTERVENTION DU GOUVERNEMENT



ADAPTÉ DE CRAINE L.E., WATER MANAGEMENT INNOVATIONS IN ENGLAND, 1969

Le premier ensemble de répartition donne un panorama des grands buts publics; le second se concentre sur les contraintes institutionelles et politiques des stratégies politiques et de leurs effets spécifiques sur les différents secteurs de l'économique et du milieu physique. L'utilisation de ces critères représente un procédé d'utilisation en deux phases, la seconde étant une élaboration des problèmes soulevés dans la première.

On peut faire de telles évaluations en utilisant des matrices. La Figure 3 illustre l'application du premier ensemble de critères sous forme de matrice et la Figure 4 représente le deuxième ensemble. Aucune de ces matrices n'a l'intention d'être polyvalente. On pourrait ajouter d'autres stratégies et avoir une plus grande variété dans les contraintes et les impacts en question.

Il ne suffit pas de faire une simple liste des critères d'évaluation ou des stratégies. On doit attribuer à tous un rang relatif d'importance. On doit décider, par exemple, s'il vaut mieux avoir la liberté de mouvement que d'améliorer la balance du commerce (Figure 3). En plus, on doit prendre des décisions sur des points tels que l'importance relative de l'acceptabilité politique et de la stabilité environnementale (Figure 4). Tous les critères et les stratégies ne sont pas égaux et cette inégalité doit être reflétée par un système de coefficient. A la fin, ce mécanisme d'échelle doit être déterminé politiquement mais devrait être basé sur des fondations rationnelles.[12]

Un problème supplémentaire se pose pour mesurer les impacts des stratégies sur chaque paramètre représenté par le critère. Certains de ces impacts sont facilement mesurables. Par exemple, on peut mesurer les effets éventuels sur les revenus gouvernementaux de l'imposition d'une taxe sur l'essence, ou de l'impact probable d'une règlementation des effluents chauds dans l'eau. En général, on peut utiliser des mesures ordinales pour évaluer l'ampleur des effets sur les systèmes physiques, économiques, et environnementaux. Au contraire, les implications pour les dimensions sociales, politiques et institutionnelles sont beaucoup plus difficiles à quantifier avec précision et sont mieux représentées avec des mesures cardinales.[13]

Les matrices d'évaluation décrites ci-dessus ne sont pas présentées comme des méthodologies définitives. Elles ont, cependant, des mérites certains qui comprennent la présentation de différents facteurs et d'alternatives qui sont à considérer. Même si elles sont incomplètes, elles peuvent stimuler l'analyste pour qu'il élabore une liste significative. Un autre avantage de ces matrices

FIGURE 3

Matrice d'évaluation des stratégies: Paramètres croissance-flexibilité-liberté

	Croissance économique				Flexibilité de la société			Liberté individuelle							
Composantes possibles de la stratégie de la gestion	Formation du capital	offre de la main d'oeuvre	expertise de la direction	innovation technologique et application	entretien des opérations existantes	stimulation de nouvelles alternatives	suppression du problème	Liberté	Propriété	Egalité	Religion	Discours	Assemblée	Intimité	Mobilité
Collecte des données et recherches															
planification															
moyens de stimulation															
frais															
règlements															
propriété gouvernementale															

FIGURE 4

Matrice d'évaluation des stratégies: Contraintes et impacts

Composantes possibles de la stratégie de la gestion	Contraintes et impacts												
	Légal			Economique			Admi-nistratif		Politique				
	constitutionnel	précédent	financier	emploi régional	redistribution des salaires	balance du commerce	complexité	coûts	relations fédéro-provinciales	acceptation par le public	fructification du temps	date de mise en application	impact sur le milieu
Collecte des données et recherches													
planification													
moyens de stimulation													
frais													
règlements													
propriété gouvernementale													

est de mettre en évidence le fait qu'il faut presque toujours faire des compromis. Peu de stratégies ont des implications entièrement favorables sur la liberté individuelle, la flexibilité et la croissance. De même, aucune n'est complètement dégagée de contraintes institutionnelles ou d'effets adverses sur certains aspects des relations économiques, sociales ou de l'environnement. Identifier ces compromis et mettre en balance les gains éventuels et les sacrifices avec une vision souhaitable de l'avenir, est un acte extrêmement important.

Une action efficace est nécessairement obligatoire et urgente. Le temps en avance diminue mais le besoin de réponse augmente. Les auteurs pensent que le gouvernement fédéral canadien doit montrer la direction et prendre une position ferme et non-équivoque sur le rôle essentiel que les ressources d'énergie non-renouvelables et la conservation devront jouer dans l'avenir du pays.

RECOMMANDATIONS

Les deux scénarios décrits auparavant examinent les implications d'une sur-promotion ou d'un retard volontaire de la croissance économique. Ces stratégies n'ont pas l'air d'offrir le meilleur avenir canadien possible. Les auteurs proposent une approche avec une philosophie différente, celle du progrès grâce à une efficacité accrue. Les recommandations qui suivent concordent avec cette troisième alternative. Ainsi, elles devraient aider à combler le fossé entre les demandes futures en énergie et la production interne des approvisionnements en pétrole et en gaz.

1. Une taxe sur la production de pétrole et de gaz naturel

Les grands élans de l'histoire se répètent. Les technologies comme les organismes florissent ou périssent. Déjà, à plusieurs occasions on a dû changer de grandes sources d'énergie. Au début de la révolution industrielle le bois a été remplacé par le charbon dont la suprématie à son tour a été abolie par le pétrole. Ces démonstrations du principe de Darwin, que seulement les plus forts survivent, ont été à la fois coûteuses et gênantes. Néanmoins elles ont aussi été nécessaires et productrices. Ainsi, la puissance et le prestige des nations individuelles et les alliances ont grandi ou décliné tandis que les technologies de l'époque se modifiaient selon certaines ressources de base particulières.

les besoins de la recherche et du développement et également solliciterait des propositions pour leur accomplissement. Après trois ans, des consultants indépendants évalueraient les résultats de ce comité et le feraient à intervalles réguliers.

- On recommande l'attribution de bénéfices financiers importants aux universités, gouvernements ou employés privés engagés dans la recherche pour leurs inventions. Les revenus additionnels engendrés par de tels projets devraient être utilisés pour aider à des recherches complémentaires futures.

- On recommande que la corporation de la Couronne organise un concours de concepts ou d'innovations qui entraineraient le développement ou l'adoption de technologies d'énergie inhabituelles ou de leur conservation.

- On recommande de dire aux agences traditionnelles fournissant des fonds telles que le Conseil national de la recherche et le Conseil des Arts de considérer favorablement toutes propositions de recherches dans les domaines des sources d'énergie non-habituelles.

7. Promotion de la coopération internationale

On réalise de plus en plus que les technologies basées sur le pétrole sont périmées. Donc la recherche vers les ressources inhabituelles est en plein essor, tel que le montre le "Project Independence" aux Etats-Unis d'Amérique. De nombreux pays vont bientôt faire des découvertes majeures et le Canada devrait examiner les possibilités de coopération avec ces derniers.

Recommandations

- On recommande que la corporation de la Couronne, responsable pour la recherche et les efforts de développement dans ces domaines au Canada établisse des séances d'informations avec les principales agences étrangères. Aussi elle devrait développer la liaison avec les corporation multi-nationales et les industries privées dans ce domaine.

- On recommande qu'au moins une ville dans chaque province soit choisie pour y installer et y tester un nombre important de technologies des sources d'énergie renouvelables et de leur conservation. La corporation de la Couronne dirigerait la construction et les éléments entrepris par une compagnie privée.

- On recommande que les municipalités reçoivent les revenus de la taxation des produits matériaux pour qu'elles achètent les journaux triés, les boîtes propres et aplaties, les bouteilles aux particuliers. Les paiements seraient sous la forme d'une réduction des tarifs pour ceux qui s'y conforment.

- On recommande que le coût de l'insulation thermique effectuée dans des maisons anciennes puisse être déduit des impôts fédéraux sur le revenu.

- On recommande que les propriétaires puissent déduire de leurs impôts fédéraux sur le revenu, le montant dont a diminué leurs dépenses d'électricité pour les appareils ménagers.

- On recommande que la corporation de la Couronne parraine des concours destinés à stimuler des idées pour conserver l'énergie. Idées qui auraient une utilité publique certaine.

6. Promotion de la recherche

Dans le système actuel, le gouvernement a un rôle relativement passif dans la répartition des fonds publics pour la recherche privée. En général, on publie qu'il y a des fonds, on recherche les demandes et ceux qui le méritent reçoivent de l'aide. Il n'y a aucune garantie que l'argent dépensé produira le meilleur profit possible. Quand le temps en avance est bref et qu'il y a un besoin de résultats socialement valables, ce système paraît plutôt inadéquat.

Recommandations

- On recommande que la corporation de la Couronne et les autres agences s'occupant de recherches sur le développement de ressources d'énergie renouvelables et de techniques de conservation établissent un comité de recherches à fond commun. Cet organisme détaillerait

ressources renouvelables et seraient équipées avec des infrastructures conservant l'énergie tels que des services de transports rapides ou des usines de recyclage ou de pyrolise. L'assistance fédérale serait aussi possible pour les municipalités souhaitant acheter des véhicules publics économisant l'énergie. On les aiderait à acheter des autobus électriques et des camions de ramassage d'ordures fonctionnant au méthane.

- On recommande que la corporation de la Couronne se charge de garantir un prix minimum pour les matériaux recyclés ramassés dans les municipalités.

5. Stimuler l'intérêt public

Dans de nombreux domaines, l'aide financière et l'intérêt du gouvernement a montré une similarité avec la courbe (en cloche) d'intérêt du public. Lorsque les souvenirs collectifs d'un problème et de ses solutions possibles s'effacent, il arrive souvent la même chose aux espoirs de changements significatifs. Par conséquent, une agence ne doit pas seulement avoir une mission: elle doit aussi recevoir une aide de la part du public. Il ne suffit pas non plus que le public soit au courant du problème: il faut aussi qu'il s'attende à participer aux solutions.

Recommandations

- On recommande l'établissement d'un programme d'éducation continue et polyvalente, utilisant toutes les média possibles et atteignant tous les secteurs du grand public. Ce programme devrait insister sur la signification, l'adoption, l'utilité, et les possibilités des ressources d'énergie renouvelables et des techniques de conservation.

- On recommande que la corporation de la Couronne, en coopération avec les entreprises privées, établisse de nombreux projets de démonstration. On devrait les organiser sur une large échelle et montrer leur viabilité dans différents environnements géographiques. Ces projets pourraient comprendre la construction de compagnie-villes basées sur des sources d'énergie inhabituelles ou aider à la diffusion de moyens de transports non-conventionnels tels que des voitures à petits moteurs, électriques ou à biogaz.

Recommandations

- On recommande que pour assurer la coopération au niveau fédéral, on répartisse des allocations budgétaires selon l'activité et la preuve d'une promotion des sources d'énergie renouvelables et de leur conservation. Par exemple, on devrait demander au ministère de l'Agriculture de stimuler l'utilisation de biomasses et au ministère des Travaux Publics d'installer des pompes à chaleur dans tous les édifices publics. De même, la Société centrale d'hypothèques et de logements devrait obligatoirement encourager l'utilisation de l'énergie solaire pour le chauffage et des sources d'énergie renouvelables en même temps qu'une insulation thermique améliorée. D'autres organismes, tels que le ministère de l'Energie, des Mines et des Ressources pourraient établir des objectifs contre lesquels on jugerait ses résultats dans ce domaine.

- On recommande que les budgets des ministères qui s'y consacrent soient augmentés des sommes provenant des taxes additionnelles sur le pétrole et le gaz. On ne devrait pouvoir obtenir ces fonds que si on prouve qu'ils sont pour des projets sur l'énergie renouvelable et leur conservation.

- On recommande que les objectifs pour développer les sources d'énergie renouvelables et leur conservation soient établis pour chaque province tous les cinq ans par un comité indépendant. Des fonds gouvernementaux seraient disponibles pour compenser en partie les risques encourus en essayant de réaliser ces objectifs. Toute province atteignant son but à la date prévue recevrait un pourcentage fixe des revenus de la taxe sur le pétrole et le gaz naturel.

- On recommande qu'il y ait des bourses pour aider les municipalités à exploiter les ressources d'énergie renouvelables et les différentes technologies de conservation. Cette aide ne serait offerte que si ces organismes suppriment les règlements locaux (tels que les règlements de la construction des édifices) qui retardent l'adoption rapide de méthodes d'énergie inhabituelles. On offrirait une aide financière par exemple pour la construction de services dans les lotissements qui utiliseraient les technologies de

- On recommande d'offrir une réduction des impôts à l'industrie automobile sur une échelle inversement proportionnelle à l'efficacité des moteurs des voitures fabriquées.

- On recommande de lever un impôt (de déchets) sur les bouteilles, boîtes de conserves, journaux et revues produits ou importés au Canada. Les revenus de cet impôt devrait être utilisé pour aider à l'adoption du recyclage au niveau local.

- On recommande de garantir un marché pour les chauffages à énergie solaire, les moulins à vent et les pompes à chaleur. Ceci serait possible si le gouvernement fédéral en liaison avec les entreprises acceptait de rendre au moins une ville par province entièrement autonome au point de vue énergie. De plus, on devrait établir des projets de démonstration, consistant d'au moins plusieurs rues avec des maisons et des locaux industriels utilisant des ressources d'énergie inhabituelles.

- On recommande d'initier les négociations avec les provinces pour essayer de garantir le remboursement d'une part importante des taxes municipales sur les édifices utilisant des sources d'énergie inhabituelles. On effectuera aussi un remboursement à ceux qui utilisent de la chaleur produite par une autre source.

- On recommande que les permis pour développer ou exporter des ressources non-renouvelables supplémentaires soient contingentés selon les investissements effectués par les firmes concernées dans l'expansion de la technologie des ressources renouvelables et leur conservation.

4. Assurer une politique publique intégrée

La diversité et l'omniprésence du gouvernement ont souvent conduit à des conflits politiques. Trop souvent un objectif est promu aux frais du public par un niveau ou une branche du gouvernement en même temps que refusé énergiquement par un autre. Un exemple de ce conflit d'objectif est celui opposant le Québec appuyant le projet français d'une usine nucléaire d'enrichissement utilisant l'énergie hydro-électrique de la baie James et la préférence fédérale pour le système CANDU.[15]

d'Amérique la Suède, l'Israël et l'URSS dont la compétence bénéficierait au Canada. Aussi le rôle de la corporation serait de promouvoir les investissements privés dans le domaine de l'énergie renouvelable et de la conservation, en même temps que de développer auprès du public une prise de conscience de ses bénéfices potentiels.

3. La stimulation des investissements par les entreprises privées

Là où il n'y a pas de profits possibles, on ne trouve pas d'investissements privés. La mauvaise volonté des entreprises à investir de l'argent dans le développement des ressources d'énergie renouvelables reflète cette vérité banale. Bien que l'augmentation des prix de l'énergie conventionnelle améliore la concurrence vis-à-vis des sources d'énergie inhabituelles, cela n'est pas absolument nécessaire pour garantir leur développement privé rapide. A l'échelle mondiale, l'argent est devenu d'autant plus mobile et on recherche les plus grands profits possibles pour les capitaux. Si les entreprises privées doivent rapidement ouvrir les ressources d'énergie renouvelables au Canada, les profits de ce développement devraient au moins égaler ceux qui sont possibles autre part. Il faut donc un climat amical pour les investissements, climat dans lequel le potentiel des retours sur l'investissement n'est pas masqué par la rivalité et l'indécision des relations fédéro-provinciales.

Recommandations

- On recommande de réduire ou d'ôter les levées d'impôts lorsque cette structure d'impôts fédéraux freine la fabrication ou l'installation d'énergie renouvelable ou des technologies de conservation. Là où cette aide n'est pas suffisante pour garantir des investissements à grande échelle par les entreprises privées, on devrait offrir des subsides venant des revenus de la taxe sur la production du pétrole et du gaz. Réciproquement, on devrait faire payer des taxes additionnelles pour décourager l'habitude actuelle qui pousse au gaspillage de l'énergie ou au retard dans l'adoption des sources d'énergie inhabituelles. Plus précisement, dans le prochain budget fédéral, on recommande de supprimer toutes les taxes sur les matériaux de constructions utilisés dans des édifices dont l'insulation thermique dépasse les normes conventionnelles et tire au moins 50 pour cent de ses besoins énergétiques de ressources renouvelables inhabituelles.

Dans le domaine de l'énergie, les investissements financiers dans une ressource reflètent seulement l'état actuel de son développement plutôt que son importance inhérente. Ceci est péniblement évident dans le domaine des ressources d'énergie renouvelables et de la conservation. Les chercheurs peuvent également être contraints par le cadre institutionnel à l'intérieur duquel ils travaillent. Par conséquent, il n'y a, à cette date, aucun engagement pour promouvoir la recherche et le développement de sources d'énergie nouvelles ou de techniques pour réduire la demande en énergie. De même ce ne sont pas les dépenses suggérées par ceux qui travaillent dans ce domaine qui seront suffisantes pour apporter des changements significatifs dans le futur.[14]

Recommandations

- On recommande que le gouvernement fédéral établisse une corporation de la Couronne pour stimuler les recherches sur les ressources d'énergie renouvelables et leur développement. Cette corporation devrait aussi encourager la conservation. Cet organisme pourrait être financé par les revenus tirés de la taxe sur la consommation du pétrole et du gaz naturel proposée ci-dessus. Le gouvernement pourrait fournir et acheter des actions et vendre des obligations au grand public. Plus tard, les fonds augmenteraient grâce aux brevets qui auraient réussi et aussi grâce à la vente de l'énergie produite par des équipements prêtés ou loués par le gouvernement.

- On recommande que cette corporation de la Couronne ait une indépendence considérable. Elle devrait pourtant s'engager à viser certains objectifs spécifiques. Ceux-ci clairement énumérés permettront d'évaluer les résultats. Afin d'assurer la coopération la plus large possible, on devrait examiner la possibilité d'une structure jointe fédéro-provinciale et coordonner les activités de la corporation avec celles des agences déjà actives dans ce domaine telles que le département de l'Energie, des Mines et des Ressources, le département de l'Environnement, le Conseil national de la recherche scientifique et la Société centrale d'hypothèques et de logement.

- On recommande que la corporation soit chargée de développer des programmes de collaboration de recherches et de développement au niveau international. On devrait solliciter certains pays comme les Etats Unis

Ce pays pénètre maintenant dans une telle période de transition. Avec les fluctuations internes de l'approvisionnement en gaz et en pétrole et l'importation d'énergie qui sont utilisées à la fois comme arme politique et sangsue économique, innover est devenu de plus en plus nécessaire. Selon l'opinion des auteurs, le rôle du gouvernement fédéral dans ce procédé devrait être celui d'un lubrifiant, garantissant le maximum de changements productifs avec le minimum de friction interne. Le principe conducteur de l'avenir devrait être celui d'une flexibilité accrue par le moyen d'une plus grande diversité dans l'approvisionnement en énergie.

Recommandation

- On recommande au gouvernement fédéral de lever une taxe additionnelle sur la consommation et l'exportation du pétrole et du gaz naturel. Les revenus de cette taxe seraient utilisés pour promouvoir l'adoption des techniques de conservation et l'utilisation des ressources d'énergie renouvelables. Ils ne devraient pas entrer dans les revenus généraux mais devraient être utilisés pour aider à la mise en oeuvre des recommandations ci-dessous.

  Si les taux des taxes étaient de 7 pour cent du prix courant de détail du pétrole et du gaz naturel, les revenus en 1975 se seraient élevés au moins à $500 millions. L'augmentation du prix de ces commodités entrainerait des revenus accrus de cette taxe.

2. L'établissement d'une corporation de la Couronne

L'inertie du passé est en grande partie maintenue par les institutions qui y puisent leur autorité présente. Ce conservatisme a des effets positifs et négatifs. En soumettant des idées nouvelles aux feux du passé, on évite les changements inutiles et rétrogrades. Le traditionalisme, cependant, peut être destructif lorsqu'il retarde des innovations avantageuses parce qu'elles menacent des principes existants et peut-être démodés.

Les ressources non-renouvelables sont la base de la force économique du Canada. La qualité de la vie de ses habitants est maintenue essentiellement par la découverte, l'exploitation et la consommation des minerais, du charbon, du pétrole et du gaz naturel. Ses institutions, bien sûr, reflètent et donc, encouragent cette tendance de même que le font l'expertise et les dépenses gouvernementales.

- On recommande qu'un nombre d'expériences jointes ou coopératives multinationales soient organisées avec ces pays lorsqu'on ne peut trouver les experts nécessaires au Canada. Sont particulièrement intéressants la technologie de récupération des effluents thermiques de la Suède, l'expérience de la maison solaire en Israël et l'innovation britannique permettant la production d'électricité à partir des fumées émises par les cheminées d'usines.[16]

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Date Due