FEAR OF CONSERVING

An Inquiry into How

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ABSTRACT

Most people recognize a present need to conserve fossil fuels -- even those who believe that limitless supplies of nuclear power may someday satiate society's unchecked gluttony for energy. There is, however, ample evidence that external observers are not pleased with the government's energy conservation program.

This report reviews some social and economic barriers obstructing efforts to save energy, offering suggestions on how they might be reduced through enhancing credibility and flow of information. Attention is given to economically advantageous conservation measures that can be implemented quickly with few adverse effects. Introduction of new technology is discussed with particular reference to renewable resources and the need for tighter management of demonstration projects.

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I. DIAGNOSIS AND DIALECTICS

Dashed Dreams In The U.S.

Addressing the General Assembly of the United Nations on December 8, 1953, U.S. President Dwight Eisenhower announced his 'Atoms for Peace' program to provide the world with cheap, clean nuclear energy in such abundant measure that utility bills would soon be obsolete. "A special purpose", Mr. Eisenhower said, "would be to provide abundant electrical energy in the power starved areas of the world".[1] Wags were soon calling the program 'Kilowatts for Hottentots'.

As we all know now, the United States was not able to deliver. Exactly twenty years after Mr. Eisenhower's proposal, the Shah of Iran announced that henceforth the price of his country's oil would be increased by 100%, to $11.57 a barrel. His Imperial Majesty told the world, in effect, that insofar as cheap and abundant energy was concerned the fiesta was over.[2] And so it was.

President Nixon answered the Arab oil embargo with 'Project Independence'. "Let us pledge", he urged his countrymen, "that by 1980 under Project Independence, we shall be able to meet America's energy needs from America's own resources".[3] Mr. Nixon also gave his views on energy conservation: "There are

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1 Numbered superscripts refer to notes at the back of the report referencing and sometimes amplifying quotations and factual information.

only seven percent (sic) of the people of the world living in the United States, and we use 30 percent of all the energy. That isn't bad; that's good. That means we are the richest, strongest people in the world. That is why we need so much energy, and may it always be that way".[4] The U.S. Congress rose to the challenge by passing more than 2,000 separate bills on energy in 1974.[5] The newly created U.S. Federal Energy Agency issued its 'Project Independence Blueprint' in November, 1974. Time magazine summarized the inescapable conclusion of the 500 page report in two words: "Mission Impossible".[6]

Finally, on January 30, 1977, after one of the worst mid-winter cold snaps on record, President Carter announced that his country was entering "a permanent very serious energy shortage" that would require a "comprehensive national energy policy in which conservation will be a major component".[7]

Meanwhile in Canada

In Canada the progression of official pronouncements on energy did not follow such a clearcut path from braggadocio to plea for conservation. An official chronology of the Government's thinking on energy matters up to June 1973 can be found in EMR's 'An Energy Policy for Canada'.[8] The document explains that in Canada "we have chosen not to be frugal in our use of energy, but to use it liberally to enable us to develop life styles similar in many ways to those of warmer, more densely

populated industrial countries".[9] The report concluded that "The use of energy, in amounts equal to any reasonable demand, is essential to the attainment of a high quality of life in Canada".[10]

The Arab oil embargo, which precipitated such profound disturbances in the United States, brought about lesser but still significant effects in Canada. EMR's forecasters headed back to their computers to rethink economic projections. In January, 1974 the First Ministers conferred on energy. Over the next several years the government initiated new policies on oil, petroleum and uranium, and generally revised its thinking on energy matters. The outcome of all this activity was published in April, 1976 in our version of Project Independence,[11] an EMR study called 'An Energy Strategy for Canada: Policies for Self-Reliance'.[12]

A number of the 1973 report's precepts were revamped. The new report cautiously allowed, for example, that "The assumption that energy use must grow at a high rate to provide a continuously increasing standard of living and quality of life must be critically examined".[13] Furthermore, it was explicitly recognized that "Along with measures to develop new supplies a strong and vigorous program directed at the <u>conservation of all forms of energy</u>, and oil in particular, is essential".[14]

The government had already moved to secure these ends. Early in 1974 an Office of Energy Conservation had been set up

in EMR. In February 1975 the Minister of EMR announced a five part energy conservation program of measures that would "be permanent policies, not contingency plans enacted in a crisis".[15] A year later the conservation program was extended by a package of nine new measures which EMR's press release said, would lead to "dramatic reductions in current levels of petroleum, natural gas and electrical power consumption".[16]

Critical Voices

In general, the government's plans for save energy were greeted by editorial scepticism. The Vancouver Province opined, for example, that "Government conservation programs have been a flop up to date".[17] The Toronto Star said that as far as energy conservation was concerned, "The government talks a good intention ... But so far it has done little more than pay lip service to the idea".[18] Dennis Schroeder wrote in Science Forum that government energy policy consisted of "nearly toothless conservation measures".[19] To round out the opposition, the Science Council[20] and the Organization for Economic Development[21] both weighed in with critical analyses.

Taking potshots at government programs that cope less than perfectly with intractable problems is good sport, of course. Yet, such programs will not be advanced by ducking behind a wall of defensiveness: students of the martial arts soon learn that the best defence is an effective counter attack. A

rich vein of ideas for saving energy may be uncovered, as we shall see, through scrupulous attention to past criticisms.

Since 'An Energy Strategy for Canada' was published the government reaffirmed its commitment to energy conservation. On December 29, 1976 the Minister of EMR said that "Conservation measures are the surest, quickest and most efficient way of making an on-going energy investment".[22] Our own Minister endorsed these ideas, saying that he expects the government to increase the priority for research in conservation and renewable energy sources.[23] Most of the Provinces have also implemented their own conservation programs (see Appendix I).

Despite counter-currents and reservations (which will be explored in subsequent sections), it is fair to say that the need for energy conservation is now generally accepted - in principle at least. The need for conservation in the long term has been set out in reports of the Science Council[24] and the 'Conserver Society Project'.[25] Conserving a unit of energy eliminates not only the cost of producing it but also associated environmental effects and reduces instabilities of a large throughput, especially if dependent on foreign supplies.

Conservation Defined

An economist uses the word 'conservation' to mean the practice of postponing the use of a resource that could be more

valuable in the future. This report uses the term 'energy conservation' in this broad sense: the resources in question being the non-renewable sources of energy - oil, gas, coal, uranium, thorium. The report seeks in particular, to pinpoint opportune measures for squeezing more well-being out of every pound of coal and every pint of oil - whether by preventing waste, increasing efficiency or through substitutions of technology, labour, capital, know-how or a renewable source such as sunlight.

Plumbers' Dilemma

Conservationists like to point out that if one can't keep the bathtub filled with hot water, a new plug might serve better than a bigger water heater. As ex-President Nixon told the notorious Watergate plumbers, the leaks must be plugged. Simple 'leak plugging' measures can often be implemented quickly, at small cost so as to remain effective indefinitely without further bother: putting more insulation in the attic is an excellent example.

Amory Lovins uses the term 'technical fix' to denote energy conservation measures that are economically advantageous and have no adverse effects on our life styles.[26] Besides the addition of more insulation the most obvious examples are more efficient furnaces, better car engines and turning off unnecessary lights. The most efficient way to stretch our energy

supplies is through conservation; the most efficient way to conservation is through technical fixes.

The doubling of insulation sales in Canada[27] last year proves that many Canadians are eager to save dollars by saving energy. They are receptive to technical fixes. Yet others, as a brief survey among MOSST colleagues will quickly reveal, have not put more insulation into their attics, even though they clearly appreciate the economic advantages. What's the matter? If technical fixes are so great, why don't people adopt them more readily? Why do editorialists call the government's energy conservation program 'lip service', 'a flop' and 'toothless'?[28]

The next section grapples with such questions in order to lay groundwork for proposals aimed at giving the government's energy conservation program a quick shot in the arm. In a conscious attempt to come up with fresh points of view, the ideas advanced are based mainly on reflections on the abundant literature; only secondarily on interviews within the Civil Service. The analysis makes no attempt to mesh with the current preoccupations of EMR's Office of Energy Conservation, except insofar as to abbreviate any consideration of matters that seem well in hand. Be warned that the discussion may seem one-sided: boosterism has no place in an analysis concentrating on imperfections in order to reduce them.

The analysis starts with illustrations of the formidable

obstacles impeding even the most seemingly straight-forward technical fixes. The ensuing discussion tries to show why some of the more facile energy saving suggestions can't get off the ground. The process brings out arguments to counter criticisms of specific conservation measures, as well as ideas for hurdling the barriers that obstruct good technical fixes.

Confusion

Ideas for technical fixes to save energy are everywhere. Bumper stickers exhort us to 'Save Hot Water, Shower with a Friend'. Connoisseurs of oriental cuisine point out that it takes less heat to cook small pieces rapidly than to grill a thick steak. EMR's popular booklet, '100 Ways to Save Energy and Money in the Home',[29] offers all kinds of ingeneous leak-plugging hints that anyone can take on his own initiative. The U.S. Department of Commerce puts out an 'Energy Conservation Handbook'[30] full of energy saving tips for industry and businesses. The 'energy crisis' has spawned dozens of new periodicals devoted to energy and hundreds of articles on conservation.[31]

Before getting on with specific proposals, it's worthwhile to speculate on why such a flood of good ideas for saving energy, often backed by irrefutable evidence of economic sense, has not met with better success.

First of all, some 'good' ideas just won't stand up

technically, despite the eminence of their proposers. For instance? Well, in 1974, boffins of the United Kingdom's Central Policy Review Staff suggested that one-half of the U.K.'s total energy requirements could be supplied by "a system of floating tanks located about a mile offshore, tethered to each other and to concrete blocks on the sea bed. The up and down motion caused by the waves would be used to drive a high pressure water pump with the resultant high pressure water being used to drive a turbine generator ... Wave generators could not be installed immediately and some development work would have to be undertaken, but the lead times would be comparatively short".[32] Some development work? How about horizontal forces due to 100-foot waves during winter storms? How would the pressure pulses be timed and synchronized?

Then of course, there are reasons why even technically sound ideas may be disparaged. Vested interests protect themselves when threatened. Consider, for example, the arguments advanced by Mr. Reeves Brown, chairman of the Gas Range Division of the Gas Appliance Manufacturers Association, against proposed efficiency standards for gas stoves. Mr. Brown opposed the standards, quite candidly, on the grounds that they "could result in a shift in the market to electric ranges".[33] Other protests against the proposed efficiency standards were more spirited: food industry representatives characterized a background report as being "peppered with

inaccuracies and self-serving justifications to support an improper conclusion".[34] And on and on.

What is more surprising, however, is that even the most ardent of conservationalists regularly ridicule each other's pet proposals. In Michigan cutting back on road salting has led to energy savings, less rust on cars, healthier trees; in Ottawa "salt's here to stay".[35] A measure seemingly as simple as turning off unnecessary lights leads to controversy. R. H. Patterson, teacher of electrical technology at Fellows High School in Pembroke, objects[36] to former Ontario Energy Minister Dennis Trimbell's call[37] for extinguishing office lights at night. He points out that drawing power during off-peak hours makes no extra demand on and increases the revenues of hydro facilities. Moreover, the lights heat the building and thus save oil. Patterson's analysis was backed up by Professor James Guillet of the University of Toronto.[38] On the other hand, Ontario Hydro lines up, albeit a bit lamely, behind Mr. Trimbell: a spokesperson said that owners of office towers "should be setting an example of encouraging the average home-owner to save".[39]

Bickering about the best way to save energy is not restricted to the letters to the editor columns. On August 4, 1976 the New York Times reported on a set of 19 Tax benefits for energy conservation projects that had been approved by the U.S. Senate. The report went on to quote Senator Edward

Kennedy's derision of these benefits as "a new set of loopholes for business and high income homeowners' that would 'save little or no fuel".[40]

To help us determine which energy saving measures could be implemented most readily, it will be helpful to seek the roots of such disagreements.

Is Energy Conservation Necessary?

Reporter: Would you like to comment on the energy ant?

Nuclear Regulatory Commission Chairman, William Anders:

Energy ant?

Reporter: That is the symbol, the Federal Energy Agency's symbol. The symbol of the national campaign to save energy. Generally to represent the agency the way Smokey the Bear represents ...

Chairman Anders:

When I see an ant I step on it.[41]

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A 1975 survey found that only 8% of Canadians spontaneously mention energy conservation when queried about social concerns.[42] Many people who agree that 'waste should be eliminated' scoff at the 'band aid approach' of conservation. Some dismiss the concept of technical fixes out of hand, claiming that the approach may do more harm than good - distracting us, as it does, from the real issue which is, in the words of a recent page-high advertisement of the Canadian

Electrical Association, "an increasing need for ever larger generation and transmission facilities".[43] Let's run through the basis for such views.

Conventional Wisdom

The pre-energy crisis consensus of conventional wisdom held that a profligate use of energy was indispensable to modern life styles. The Chase Manhattan Bank encapsulated this point of view in its 1972 report 'Energy Outlook in the United States to 1985': "analysis of the use of energy levels reveals little scope for major reduction without harm to the nation's economy and its standard of living ... Conceivably the use of energy for such recreational purposes as vacations or travel and viewing of television might be reduced - but not without widespread economic and political repercussions. There are some minor uses of energy that could be regarded as strictly non-essential - but their elimination would not permit any significant savings".[44]

How have such views been modified by recent events? Listen to John G. Wigner, Chase Manhattan Vice President, speaking on December 21, 1976: "Conservation measures could slow U.S. economic recovery and growth since companies would pay for these measures from financial resources which normally would be used for other, more productive, purposes". Wigner predicted that proposed conservation standards would "short circuit financial

resources" so that "capital investments couldn't be made and jobs wouldn't exist".[45]

In his analysis of the Ford Foundation's 1974 report, 'Exploring Energy Choices'. the president of the Mobil Oil Corporation allowed that "waste of energy should be eliminated". He then diagnosed the source of waste as "government interference". "The safest course", he said, "(would be) to encourage the development of additional supplies".[46] As we shall see later, Mobil's advertising relentlessly cultivate these sentiments.[47]

Finally, as an example of technological optimism from Canada, consider AECL's sanguine expectations for nuclear energy. It has been asserted, for example, that due to the Candu reactor, "mankind can look forward to a world civilization of 10 to 20 billions, well-clothed, well-housed, well-fed, living in peace and harmony for thousands of generations".[48] Candu can do.

Thus, despite a superficial consensus on the need, powerful voices continue to diffuse calls for conservation.[134] An unfinished piece of business of our conservation program, then, is to dispel lingering doubts of people, in and out of government, who drag their feet, reasoning that energy conservation entails nothing more than optional inconvenience while awaiting future supplies. Such reasoning is often accompanied by a trace of condescension for conservationists who, after all, are

often "self-appointed nuclear kooks"[49] who impede progress and wax sentimental over baby seals.

It has already been noted that there seems to be a general consensus on the need for conservation in the long run. The supporting arguments have been convincingly laid out, both by articulate proponents of nuclear energy, such as Earl Cook[50] and Ralph Lapp[51], and by its opponents, such as Barry Commoner[52] and Amory Lovins.[53] These arguments can seldom persuade a putative champion of conservation who opposes a particular 'band-aid' measure that may cause him some personal inconvenience.

Thus a would-be promoter of conservation better sharpen his skills at rebutting both implied and, as we shall see, wholly rational counter-arguments. Before recapitulating the case for immediate technical fixes let's turn to the other factor which underpins anti-conservationist sentiments: 'waste is good for business'.

The Waste Society

"The services that help the most in load building are refrigeration, cooking and water heating ... but there is no magic wand that can be waived over the household to increase electric consumption ... to attain that goal electric heating and water heating must be vigorously pushed".

C. F. Greenwood, Commercial Director, Edison Electric Institute, 1933.[54]

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Ever since 1960 when Vance Packard started clucking his tongue at North American marketing practices in 'The Waste Makers'[55] we have been regularly sermonized about our decadent ways - to the point of tedium, even for some who sympathize. Unfortunately, some of the polemic has to be revived in order to discover whose ox is in for a goreing when inefficient energy use is cut back.

A year after the Arab oil embargo, General Motors Vice President Max Warden felt confident to reaffirm that "buying up to a bigger car is the fundamental concept of American life".[56] The manufacturer's astronomical advertising budgets aim to keep it that way. They probably will too, unless advertising can be controlled as, for example, is being done by the French Agency for Energy Conservation.[57]

In 1976, the General Motors Corporation reported record earnings of $2.9 billion. A New York Times analysis attributed this "robust performance" to the fact that "the American automobile industry has bounced back dramatically from the depths of the energy crisis in 1974". "In light of the public's continuing aversion", says the Times, "The Big Three are all having trouble selling smaller cars".[58]

Bigger cars earn bigger profits. Asked why Detroit did not push small cars. Henry Ford II replied, "Well you can't make a profit on a small car as large as you can on a large car, simply because the price you sell a large car for is a

lot more than the price you sell a small car for - so the profits have to be smaller".[59] A Cadillac Coupe de Ville costs only about $300 more to build than a Chevy Caprice, but it retails for $2,700 more - yielding a neat $2,400 extra profit per car.[60] Energy wasting options such as air conditioning and power steering return profits of 40 percent or more to the manufacturer. Of course, such options add weight and drain power, reinforcing the 'need' for big powerful cars.

The big car syndrome is just one example of the social and political forces which stopped patterns of energy consumption during the past generation. Utility rate structures encouraged extravagance. Mushrooming suburbs, aided by CMHC mortgages, spurred the demand for station wagons and second cars. Low gasoline prices and rapidly expanding highway systems favoured the private auto over other forms of transport. The story is well-known.

Profits in the auto industry generated capital for expansion, employment, higher wages and boosted the Gross National Product. The tab for social costs -- pollution, congestion, depletion of energy reserves -- remain. Buy now, pay later.

All this preconditioning has incubated a suspicion, at least implicit, that conservation portends sacrifices in life style or standard of living and, perhaps, foreclosure of

economic progress for the disadvantaged. These suspicions are justified, to some extent, even in the realm of technical fixes. Thus the most promotable conservation measures are ones that demonstrably nullify undesirable side-effects.

It is too much to hope that there remains, waiting to be discovered, a hoard of unimplemented, purely beneficial technical fixes. So the best new, short-term measures will have small, but clearly identified, disbenefits and, will be presented jointly with compensating measures. A compensating measure might be inherent. It could be argued, for example, that increased safety compensates for time lost while saving energy by driving slower. (Note, however, that this trade-off did not wash with U.S. truckers, who are still planning a mass protest against 'double nickle' -- that is, the 55 mile per hour speed limit).[61] Or the compensating measure might be external -- for example, a tax rebate on insulating materials to make up for the inconvenience of having to order and install it.

The Case for Conservation in the Short-Term

It has often been observed that the people of Sweden, who enjoy about the same standard of living as Canadians, consume a lot less energy in their pursuit of the good life. Sweden has a northern climate, per capita GNP, industrial mix and per capita industrial production similar to ours. Yet

Sweden creates each dollar of its GNP using only about 60% of the energy we use for the same job.[62]

We can learn valuable lessons for deploying our own energy resources from societies that manage to create similar economies from a substantially smaller energy input.

Before pursuing this point, let's confront some well-reasoned and responsible arguments showing that significant energy conservation will cause significant social disruptions.

It seems intuitively obvious, for example, that a massive switch to smaller cars that use less gas should lead to unemployment in the automobile, steel and petroleum industries. What's not intuitive, however, is what would happen to the money saved by the people who purchase the smaller and more efficient cars. Should this money be spent on goods or services that are energy intensive and labour extensive, the net effect could be increased unemployment without energy savings. In any event, there would be some transfer of jobs and energy between industries, possibly leading to hardships for individuals or whole industrial sectors.

A case study to do with recycling will illustrate. An analysis showed that less energy and more workers would be needed if beer and soft-drinks were delivered in refillable rather than throwaway containers.[63] Wonderful. Unfortunately, there is a hitch: the new jobs would be low paying, non-organ-

ized, gained at the expense of jobs lost in the high paying, highly organized can industry. Energy conservation would increase overall employment by decreasing high-wage jobs and increasing menial jobs. No wonder that organized labour joins the can and bottle makers in lobbying against compulsory returnables.

Thus, according to the principle presented in the previous section, recycling cans would not, by itself, be a good technical fix. To make it palatable recycling would have to be presented as part of a package including measures to protect jobs.

The important lesson in this example is that the value of a specific technical fix may not be apparent without extensive analysis. Technical details are the essence of technical fixes. Whether or not it would be sensible to reduce the speed of aircraft or the amount of salt used on roads will not be established on the basis of partisan, qualitative arguments. If it wants a reputation as a credible analyst, the Office of Energy Conservation will need (among other things) more consistency in its pronouncements and proposals. More on this later. For now, let's attempt to determine if the disadvantages of bottle recycling are typical of technical fixes.

It will be instructive to recapitulate the main points of an economic argument advanced by Schipper.[64] He explains that for each unit of goods or services produced, each sector

of the economy needs a certain amount of labour and energy as input. Generally, production of energy or raw materials demands little labour and much energy. In the service industries the situation turns out to be the other way around; high labour, low energy. Manufacturing industries tend to be intermediate. If in addition, we recognize that energy industries are more capital intensive than the economy as a whole, some general conclusions can be set forth.

As mentioned earlier, a measure to conserve energy generally involves substitution of capital, labour or know-how for a certain amount of energy. Consider, for example, a consumer replacing his refrigerator with a more efficient one. (Being well-versed in classical economics, he undoubtedly bought his new fridge because he knows that his total investment was less than the present value of the energy he will have saved over its expected lifetime). The new refrigerator probably has more insulation and used more labour in its design and manufacture than the one it's replacing. Since manufacturing is generally more labour intensive than utilities, spending more money on the efficient refrigerator should raise the total demand for skilled labour for each refrigerator sold. Moreover, this holds true even if the new refrigerator provides every bit of life style, including automatic defrosting, than the old one did.

Schipper points out that conservation measures initiated

at industrial plants usually involve the retention of consultants and employment of skilled staff to monitor and adjust equipment. He concludes that money saved on energy conservation will, in general, increase skilled employment.

Some of the non-economic arguments for conservation also apply in the short run. The use and harvesting of energy are among man's most polluting activities. Dark satanic mills and all that. A pound of coal or uranium conserved could mean one less miner suffering from cancer. Lots of pathos here. The point is that the environmental argument is probably too complex and too emotional to be useful in a discourse on quick fixes.[65] It's worth noting though that, despite the initial declerations of impossibility, the auto industry has managed to simultaneously increase gas mileage and reduce exhause emissions.[66]

Finally, it has often been convincingly argued that the prodigious costs of energy production can be moderated through conservation. The arguments are complex and need not be repeated here. But one anecdote may be worthwhile. At a Public Service Commission hearing concerning the application of the Union Electric Company to build a nuclear power plant in Missouri, Barry Commoner presented data showing that if air conditioners in the service area were replaced by more efficient ones, demand for electricity would be reduced by the equivalent of one nuclear plant -- at less cost. It is reported that the Commission treated Commoner's argument as "a joke".[67]

II. PRESCRIPTION AND PERSUASION

General Considerations

The lengthy discussions of the previous sections was necessary precisely because it is only too easy to prepare a long catalogue of 'technical fixes'. We could start, for example, with ideas already proposed by EMR; continue by sifting through the volumes of material gushing out of the U.S. Federal Energy Administration and supplement these with material from dozens of periodicals devoted to energy. As a matter of fact, the best ideas invariably turn up over and over in independent sources.

As an illustration of what's available, consider that the second conference on Industrial Energy Conservation held in Ottawa in March, 1976 produced six task force reports. The Pulp and Paper Task Force listed at least 51 separate conservation measures. Naturally, there were lots of suggestions for government action ('incentives' and more 'research' figured prominently).

Having a list of proposed technical fixes is, of course, not enough. It is also necessary to ensure that good ideas have not been overlooked; to separate the exploitable from the impractical; to rank proposals according to priority and then to begin putting them into practice. This, moreover, is still not enough. A mere nodding acquaintance with systems theory

shows that an effective system needs to 'close the loop' by means of a feedback signal -- derived in this case, from monitoring the efficacy of the energy saving measures put into practice. The weakest link in EMR's conservation program is its failure to appreciate this last particular. The best defence of a program against accusation of toothlessness or tokenism would be, first of all, to ensure that toothless or tokenistik it is not, and then to present documentation of a scrupulous assessment of its efficacy. We will elaborate this point later, in connection with specific measures.

A proposed measure to save energy qualifies as a technical fix only if its implementation can be justified on conventional economic grounds. 'Conventional economic grounds' is often taken to mean that the original investment is recouped in a reasonable pay-back period. For large businesses this reasonable period may be five, ten or fifteen years, depending on the size of the original investment: individuals, as a survey taken in connection with the Conserver Society studies unhappily showed, most often tend to consider zero time as the most reasonable pay-back period.[68] This would indicate that, to be generally effective, measures aimed at the individual need to be sweetened with immediate gain. A possible approach would be along the lines of "you lose out if you don't get it done before income tax time", that seems to work as an incentive for RRSP and RHOSP.

Some other points can be made about cost/benefit analyses. EMR's efforts of calculating and publicizing the economic benefits of various energy saving measures are certainly commendable. Great care must, however, be exercised in order not to lose credibility by underselling the hidden costs. For example, at a recent energy workshop in the U.S., a chemical plant manager criticized a Federal Energy Agency study indicating savings through returning condensates for boilers.[69] It seems that in this case the small amount of money saved through more efficient use of energy was lost because of the increased labour required for more frequent checks of the boiler water and other compensatory actions.

Let us not overlook convenience either. Convenience -- that is, the saving of time -- does have a specific value. Transport planners have to estimate value-of-time as a matter of course in determining levels of convenience to be provided at, say, airports. The borderline between 'leak plugging' and 'belt tightening' is often hard to discern. Turning off unneeded lights, driving more slowly or dressing more warmly represent undeniable, if minor, changes in life style. Sure it is wasteful to use electricity for resistance heating. But it is more convenient than individual oil heating, and that is worth something. Remember Hydro's old jingle: 'Live better electrically'? (See later under 'Utility Rates'.)

Finally, 'conventional economic grounds' usually means

that there should be a satisfactory return on the investment put into energy conservation. Moreover, this return should be competitive with returns available from other possible investments. And, of course, the required capital has to be available. Too often, one or more of these criteria fail to be satisfied by a claimed 'economically feasible' conservation measure.

In the following sections, these generalities will be finally brought to bear on the conservation program. It was clearly beyond the scope of this study to even begin to systematically investigate the thousands of proposed 'technical fixes'. Instead, the focus is mainly on how the barriers to the implementation of known energy conservation methods may be reduced. Specific items are brought up by way of illustration or when there are grounds to suppose that a promising measure may be by-passing the small army of federal employees and their consultants devoting their energy to conserving energy.[70]

Credibility

'An Energy Strategy for Canada' announced a specific conservation target: 'To reduce the average rate of growth of energy use in Canada, over the next ten years, to less than 3.5% per year'.[71] Unfortunately there is scant evidence of sanguine expectations for achieving this target. None of the report's own supply/demand scenarios explicitly include con-

servation measures because 'it is difficult to define precisely what conservation can contribute'. The Toronto Globe and Mail reported on February 1, 1977 that Imperial Oil Ltd. does not have great confidence either. In a brief to the National Energy Board, the company estimated that 'overall Canadian energy demand will grow by 4.1 percent a year between 1975 and 1995'.[72]

The same issue of the Globe reported, by the way, that Ontario's primary energy needs had increased by 7.9% in 1976.[73] On October 4, 1976 'Canadian News Facts' reported on the International Energy Agency's general assessment of energy conservation under the headline "Canada Accused of Wasting Resources".[74]

It may be possible that these are just preliminary indicators that will be reversed in ample time to meet the ten year goal. But performance on more specific programs has not been encouraging either. EMR's press release of February 1976 listed nine specific conservation measures to be implemented.[75] These were timely and appropriate a year ago. They are more so now. The press release said, for example: "A crash program ... will draft new guidelines for the desing, construction and operation of energy efficient buildings ... before the end of 1976". Shall we try for '77?

Undoubtedly, EMR would argue that splendid progress has been made on all points, when one considers the formidable obstacles. Equally undoubtedly, sceptics would reply something

along the lines of, "don't give me that bunk about setting up committees, give me some proof of how much energy you actually saved".

On January 20, 1977 the Ottawa Citizen ran a picture captioned, "Just after midnight the lights in Place de Ville burn like a beacon".[76] An EMR spokesperson "pleaded innocence" of wasting energy, explaining that the government merely rents space in these buildings.[77] Apparently he didn't read the part in '100 Ways to Save Energy' that explains how tenants should discuss conservation with their landlords.[78]

To summarize, government conservation programs lack credibility. The first remedy would be to insist on internal consistency. EMR could, for example, demonstrate belief in its own conservation targets by incorporating them into its demand forecasts explicitly.

Each announced energy saving measure should list specific near term goals (milestones). Criteria for evaluating effectiveness (ultimately, how much energy was saved at the cost of what) should be known at the outset. Progress reports should be published at preannounced times, whether the rest of the program is on schedule or not. When the U.S. Federal Energy Agency failed to meet the Congressionally mandated deadline for setting efficiency standards for major appliances (Nov. 12, 1976), the world knew about it and was able to form its own conclusions.[79]

Responsibility for monitoring some American energy conservation programs is being contracted out to private organizations under a 'decentralized management' plan. For example, the Oak Ridge National Laboratory has been given the responsibility for monitoring appliance programs.[80] A similar policy in Canada may bring about several salutory effects. First of all, the obvious increase in motivation for managers of any program that is evaluated at fixed times by an external agency. Secondly, reports of effectiveness will clearly be more credible if issued by a disinterested party. Contracts to report on specific items in the energy conservation program could be let to private companies under Make-or-Buy. (More on this later). Alternately, Statistics Canada could have the responsibility for an annual factual report on conservation.

Public Information

Building on one's strengths is always a good strategy. The Office of Energy Conservation's booklets of energy saving hints are, by all reports, a tremendous success. One American reviewer said, "'100 Ways' is far superior to anything yet produced for mass distribution by the United States government".[81]

This program is being followed up and could be expanded even more. ERDA is producing a flood of information that could be readily adopted to Canadian needs. For example, the U.S.

Government Printing Office issues a booklet which gives plant engineers step-by-step instructions on designing optimal insulation for tanks, vessels, pipes or ducts.[82]

Each energy saving suggestion advanced by a foreign agency could be examined to see if it could be adapted to Canadian conditions. It's worth emphasizing that adapting foreign measures isn't necessarily the same as adopting them whole cloth. For instance, a Canadian testing program would be needed to determine whether or not American gasoline mileage figures are indeed applicable under our more severe average climatic conditions.

The previous remarks about the need for objective ways to evaluate conservation measures can be applied directly to public information programs. EMR states that "surveys ... indicate that a great deal of interest has been generated" in its conservation program. "Moreover", it goes on, "preliminary evidence suggests that the people of Canada are beginning to think seriously about conservation.."[83] Surely this is a pretty lame evaluation of a program that included the distribution of at least two million documents. In discussing the government's conservation program with outsiders, one must steel himself against the recurrent jibe that any fuel shortage could be quickly solved by burning government energy studies.

How about a moratorium on platitudes? There are standard

techniques to gauge quantitatively the efficacy of advertising.[84] Perhaps arrangements could be made to employ some of these for the next mass distribution of information.

Utility Rates

The eccentric utility rate structures prevailing all over North America is often noted with bewilderment. A residential customer of Ottawa Hydro, for example, if left scratching his head over a rate which declines from 4.5 cents to 1.35 cents over the first 1,000 kilowatt-hours used, and then increases to 1.55 cents.[85] A little history may elucidate.

The concept of selling power as opposed to selling generating equipment came into being during the early 1900's. Central power generating facilities were necessary to supply electric power to homes. Power plants were too expensive to be built to supply single homes or even apartment blocks, but industrial users could, and often did, build their own. To secure this business industrial and commercial rates had to be set very low. And, indeed, they could be set low because power plant capacity had to be geared to peak residential load occurring on mid-winter evenings. Preferential off-peak rates induced industrial and commercial customers to abandon their own generating plants in favour of buying power from the central utilities. In 1912, for example, the Chicago

Edison Company, was residential power at twelve cents per kilowatt-hour while offering power to industrial customers at one-half of a cent per kilowatt-hour.[86]

Historically, utility rates have been set on the basis of a 'fair return' on investment, no matter how large. Thus new power plants could be built with large amounts of excess capacity. Existing customers paid for all capital costs; surplus capacity was then sold to new industrial users in huge blocks at cut-rate prices. Expansion was profitable and without financial risk. There was little incentive for increasing efficiency or technical innovation.

As a result, electric power is still sold on a declining block basis. There is no extra charge for peak usage, even though by now the maintenance of peak reserve has become very expensive.[87] Utility rates are often hidden in rents, so that individual tenants have little stake in conserving heat or electricity. Moreover, indexing of salaries and pensions according to GNP has the effect of negating attempts to reduce consumption through rate increases.

With regard to indexing, why not attempt to strengthen marketplace factors by removing the energy component of the GNP before indexing? Hints for correcting other discrepancies in utility pricing may be obtained by examining practices in other countries.

The French Agency for Energy Conservation requires new apartment buildings to bill tenants individually for heat and hot water. Individual meters must be installed in old buildings if requested by a majority of tenants.[88]

Utility rate reforms have been initiated in about one-half of the states in the U.S. Time of day rates, which have been used in parts of Europe for some time, are (or soon will be) in effect in California, Connecticut, Florida, Georgia, New Jersey, Vermont and Wisconsin. Flat rates are charged for natural gas in at least five states.[89]

'Lifeline' rates -- that is the right to a basic amount of energy for a low stable price -- emerged as a political issue in California in 1975. The concept was pioneered by the Citizens Action League of San Francisco who managed to enlist the support of key politicians to get the measure written into State law despite strong opposition. The idea received widespread popular support, perhaps because it benefits people in general rather than just giving a break to a group like the poor or senior citizens.[90] Lifeline rates are now in effect for electric service in five states and for gas in two.[91]

On January 12, 1977 FEA Administrator Frank Zarb introduced a proposal to encourage utilities to install insulation, automatic thermostats and furnace modifications in the homes of their customers wherever the cost would be less than the cost of gas saved. The utilities would be able to recover the

cost of this 'conservation gas' through a revised rate structure.[92] The U.S. Federal Power Commission estimated that this measure has a potential for saving 1.2 trillion cubic feet of gas.[93]

Advertising and Standards

Evidently, advertising of consumer products figures considerably in the public's disposition to reduce consumption. If not, why would American cigarette companies spend $360 million[94] a year persuading people to give themselves cancer with a particular brand name? Exploration of this subject is beyond the scope of this report. Before hazarding a few remarks, it may be worthwhile to speculate briefly about advertising that is specifically aimed at influencing the consumption of energy.

"Who knows maybe 'energy policy' will take over from 'free enterprise' as this year's favorite corporate advertising theme", said a recent item in the 'Business and Finance' section of the New York Times.[95] United Nuclear, Bethlehem Steel, Exxon, Mobil, The Canadian Electrical Association and Ontario Hydro have all come out with advertising messages centered on the consumption and production of energy (A selection is reproduced in Appendix II).

Some ads give a straightforward pitch for moral support of the sponsor's business: "Nuclear plants are already helping ..

We'll need more of them in the future", says United Nuclear, who bills itself, 'America's Largest Independent Producer of Uranium'.[96] Other ads seem equally straightforward in encouraging conservation without discernible ulterior motive: Exxon has a multi-colour two-page spread featuring nine conservation tips that could have come straight out of an EMR booklet.[97] Sometimes the same company seems to encourage consumption and urge conservation in different ads. What's going on here?

To get a preliminary inkling let's consider just one example. For the past year or so the Mobil Oil Corporation has been running a series of ads in mass circulation magazines.[98] Entitled 'Observations', the ads have a fairly simple format: some four and a half inches wide, full page high. Each ad looks something like a syndicated column, featuring four or five items of about a hundred words and sometimes a cartoon or a simple illustration.

Some of the ads have no apparent company related message, containing mildly humorous anecdotes ("Join the fun. Write your ideas on what public figures, past and present, you'd slot into TV roles".) Others clearly discuss Mobil's products ("Mobil 1 is synthesized, or built up, molecule by molecule from a chemical building block...").

There are items reminding us to take our kids for their measles shots, or to follow a sensible diet, or not to smoke so much -- and, oh yes, to conserve energy ("take it easy on the

gas pedal", "avoid unnecessary trips"). There are limits, of course ("unrealistic mileage mandates could limit production of big cars ... families need").

Now we're getting to the point. Some things you always wanted to know about energy, but were afraid to ask: "By 2076 solar energy, nuclear fusion and other exotic sources will brighten your world". But in the meantime its oil and gas, buddy. Unfortunately though, there's a shortage which, we learn, "is being caused by artificially low wellhead prices", "regulatory silliness", "dumb laws" and "political pollution". Get the message? If you don't, the humorous items, which invariably feature some form of officious bungling, might put you on the right track.

Know something else? "In Japan ... it requires only six years to bring a nuclear power plant from drawing board to operation, while in the U.S. it takes ten years". Know why? Well, "There's got to be some environmental give and take".

"TV gives the oil industry a bad shake", says another item, citing columnist Kevin Philips and promoting him to "media expert". There is no item quoting the New York Times article which found television coverage of energy issues 'tepid' because if it wasn't "it might alienate the big oil companies who spend so much on advertising on television".[99]

Thus when the series of ads is viewed in total, a dis-

cernible anti-conservation message emerges; even if individual ads are completely innocuous or seemingly in favour of conservation. If this analysis is correct, then there is a lot of effort and money working to undermine EMR's public relations efforts. It seems that this is one area which could benefit from some clear thinking.

Jean Syorta, director of France's Agency for Energy Conservation says, "One very effective tool for saving energy is the power to limit advertising. Right now advertising is forbidden by producers of energy unless they have government approval. And it is limited for producers of automobiles; they have to mention the official mileage of their vehicles whenever they talk about mileage, power acceleration, etc."[100]

The advertising of consumer goods that are lavish energy users is bound to hurt conservation efforts. After all, consumers are not likely to opt for purchasing efficient cars or appliances if advertising and marketing give apparent advantages to less efficient equipment. (Don't simmer this summer. Our compact, light-weight air conditioner needs no special wiring!)

Why should developers bear the extra cost of insulation and other energy conservation measures, if competitors can omit these, charge less and obscure the difference with advertising? In any event, real estate prices being what they are, energy efficiency plays a minor role in choosing a new

house. The obvious answer is to impose efficiency standards on buildings, furnaces, cars and appliances so that the marketplace can allocate the costs and savings associated with gains in efficiency.

In February 1976 the government announced its intentions to 'proceed with dispatch' on setting standards for improving the gas mileage of cars; 'a crash program' for new building codes; and 'an accelerated' appliance labelling program.[101] For various reasons none of these programs have saved us any energy yet.

In addition to the measures being investigated, inducements for saving energy may take the form of favourable interest rates on loans. A CMHC program to emphasize energy conservation in the granting of home improvement loans was part of the February '76 package. This program could be beefed up in various ways. The Seattle Trust and Savings Company offers a "one-half to three quarters percent advantage on interest rates for loans on homes, cars or boats that meet energy standards.[102] Could Canadian banks not offer something similar? CMHC already denies mortgage loans to inadequately insulated homes in airport noise areas. Perhaps this negative inducement could be extended in the interest of energy conservation.

Advanced Technology

On hearing the term 'technical fix', most people probably think of some cunning device or utensil using innovative technology and perhaps space age materials or computers. And indeed, there are opportunities for this type of technical fix in every energy using sector. Examples include: heat pumps, fluidized beds, new propulsion systems in transportation, electric ignition of gas water heaters, computer control of heating and cooling systems, asceptic packaging of foods to eliminate the need for refrigeration and a host of others.

'Thrifty technology' doesn't necessarily call for exotic devices however. Consider, for example, that cutting the weight of a day's edition of the Globe and Mail only a few percent by switching to thinner newsprint, could significantly reduce the energy needed for its transportation and, unfortunately in the absence of effective newsprint recycling, its disposal.

Radial tires reduce gas consumption from 3 to 10% depending on speed by reducing tire to pavement friction. Retrofitting radials on cars or trucks is clearly a technical fix that the government may be able to encourage.

An excellent technical fix to reduce the energy consumption of long-haul trucks is the fitting of aerodynamic

devices to reduce drag. Though based on extremely sophisticated aerodynamic analysis and wind tunnel testing, the actual devices are quite simple, consisting of deflectors on the cab roof or nose cones on the front of the trailer. More complicated devices to seal the gap between cab and trailer and to reduce turbulence on bottom surfaces can also be fitted. At present, only some 7 or 8% of large tractor trailers use aerodynamic add-ons even though the use of the simplest saves something like a gallon per hundred miles of highway travel. On large rigs this can represent a saving of some 1,000 gallons per year. At an installed cost of $400 to $500, the capital investment could be recouped in six months or so.[135]

There exists at least one or two original Canadian designs for add-on devices to reduce the drag of trucks. NRC has a very active research program in this area and is also developing even more efficient drag reducing ideas that can be incorporated in new designs. An immediate step that the federal government could take is to fit all its own trucks (Post Office, DND, etc.) with a Canadian designed device and to publicize this move.

The social and economic barriers already discussed in the preceding section also obstruct innovative technologies. Naturally, the measures proposed for expediting energy conservation in general, can be particularized to aid any specific technology. There are, however, certain unique facets to the

introduction of new hardware not found during implementation of new administrative procedures or regulations: need to demonstrate technical feasibility, for instance.

Regardless of specific technology, commissioning prototypes and demonstration projects and commercialization of successful research lead to similar problems. Thus these aspects of advanced technology in aid of conservation are particularly deserving of attention from our Ministry. They will be considered in more detail in the following section devoted to the most topical thrifty technology - exploitation of renewable energy sources.

III. RENEWABLE ENERGY SOURCES

Reporter: Can you think of any incident since the Luddites of the early 1800's, in which people have really tried to stop a technology from being developed?

Ralph Nader: The oil industry has been a Luddite for the solar industry ... (Solar energy) used to be considered a Buck Rogers joke. And suddenly, just from the slightest R and D and the slightest interest, enormous frontiers have been opened and ideas and realities and practicalities ...[103]

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"Solar power, wind and waves are not the answer to the energy predicament, at least in the short term ... I do worry about those who blithely and sometimes irresponsibly advocate decisions, or non-decisions, without any apparent thought for the consequences of breaking the energy connection that has been vital to man's existence".[104]

Robert Taylor
Chairman, Ontario Hydro.
February 1977.

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Introduction

It will surely take the purposeful mobilization of science and technology to preserve our fossil fuels through substitution of renewable resources. So that our Ministry has a special stake in putting these resources to better use. This is sufficiently important to justify a detailed examination, even though the general concepts discussed in the previous sections apply directly.

General Considerations

The only renewable source of energy not dependent on the sun is the rise and fall of ocean tides in response to the gravitational pull of the moon. Tidal power works: a 240 megawatt station has been operating on the Rance River in France since 1967.[105] It has been estimated that 2,000 megawatts of tidal power could be obtained by damming one of the many inner basins of the Bay of Fundy. A 1969 study judged the scheme uneconomical, but a current reappraisal may reverse this verdict. The president of the Nova Scotia Power Corporation believes that tidal power could now be produced at competitive cost to oil generated electricity. "This is definitely shaping up into a viable proposition", he says with the eloquence we have come to expect from our captains of industry.[106]

Other than the tides, all renewable sources of energy are activated by sunshine -- radiation from an inexhaustible fusion reactor, 93 million miles away. The use of solar energy is not affected by the law of diminishing returns: we may use as much of the sun's energy as we possibly can without fear of endangering future supplies or raising future prices. No environmental or health hazards either. Take that Reddy Kilowatt.[107]

Hydroelectric power, accounting for about 75% of Canada's electricity,[108] is driven by solar energy. Windmills, used to pump water in Babylon and China[109] some 4,000 years ago, can

also generate electricity. A thousand years ago the inhabitants of north-eastern Iran ground their grain using batteries of windmills turning on vertical shafts 'like a revolving door'.[110] The vertical shaft windmill has reappeared in modern times in form of the Darrieus wind turbine whose development was pioneered by P. South and R. Rangi of the National Research Council.[111] Hydro Quebec is installing an 80 foot diameter 200 kilowatt Darrieus unit to augment its power grid on the Magdalen Islands. In about six months it should be possible to determine whether or not this type of machine is sufficiently strong and reliable to qualify as a genuine technical fix.[112]

Many ingenious ways of using the sun to generate electricity have been proposed. The U.S. Federal Energy Agency is sponsoring research into centralized solar complexes based on large collectors in deserts or in outer space. Other investigations are looking into ways of extracting energy from the currents, waves or vertical temperature gradients in the oceans.[113] Unfortunately, none of these concepts offers any hope for quick technical fixes, as none has yet advanced past the planning of demonstration projects.

Of course the sun's energy can be exploited in less exotic ways too. Agriculture, forestry, hunting and fishing are ancient methods of harvesting solar energy captured by plants and animals. Over a hundred years ago a solar still

was used in Chile to extract fresh water from the sea.[114] Solar collectors for heating homes and water have been in common use in many countries for many years. These more mundane applications are, according to a large body of opinion, genuine technical fix candidates, ripe for immediate exploitation. In the remainder of this section the terms 'solar energy' and 'solar power' will refer to the interception of diffuse sunshine for this kind of application.

Solar Opportunities

Before making a judgement on the prospects for solar power, it's necessary to reflect on the deep polarization evidenced by the quotations introducing this section. Solar energy became a highly charged issue because its most fervent proponents are invariably equally fervent opponents of nuclear power. And vice versa. Thus, conceding a small point to the opposition would be to compromise the larger cause. Inflammatory over-statements flow from both sides, fast and loose.

There's no question that many able people laugh off solar energy as a 'Buck Rogers joke', a 'band-aid' that only obfuscates. On the other hand, we often find a déjà entendu, messianic quality to prognostics for solar power. After a moment's reflection you put your finger on it: the glittering solar futures are surprisingly similar to those claimed for nuclear power some twenty years ago.

Consider the case of advanced solar schizophrenia apparent in the U.S. Energy Research and Development Administration. Assistant Administrator R. L. Hirsch should be one of the most enthusiastic proselythizers of solar energy. Right? Don't bet on it. Dr. Hirsch (who, by the way, came to ERDA from the old Atomic Energy Commission and whose bibliography in 'American Men of Science' outlines a distinguished career at places like Atomics International and the Nuclear Propulsion Division of G.E.) is actually quite pessimistic about solar energy. In August 1976 he told a meeting of the International Solar Energy Society in Winnipeg that solar proponents do not 'understand projected energy costs', with the clear implication that if they did they wouldn't remain proponents.[115] So don't be surprised at occasional outbursts of disharmony at ERDA.

Despite the sceptics though, one thing's for sure: solar energy is no joke. It's here today. Fortissimo. A legion of researchers and civil servants are making a living exploiting solar energy. Texas Senator John Tower recently published an article titled "Our federal energy bureaucracy: a growth industry on the government scene".[116] Solar conferences are giving hotels good business.[117] Thousands of books and articles on solar energy stimulate the pulp and paper industry[118] -- a renewable resource industry in itself.

Aside from a multitude of research and demonstration pro-

jects, commercially profitable solar products are already being merchandised. Some ten thousand American swimming pools are heated by solar systems.[119] 'A-Z Solar Products' publishes a catalogue of solar products including a popcorn roaster and a cigarette lighter.[120]

In the last few years interest in solar energy has surged: a large body of information is now available in the United States about existing and potential solar technology.[121] But it's not so easy to extrapolate American experience to our harsher climate. One may suppose, for example, that the combination of longer, colder winters with less sunshine would shrink our possibilities for solar space heating. Not necessarily. The small percentage of our large heating bills that would be saved by exploiting what little winter sunshine we do have, is equivalent to a substantial amount of oil -- more, in fact, than the total heating requirements at many places further south.[122]

Solar Power in Canada

A number of studies have assessed opportunities for making better use of solar energy in Canada. For example, in 1975 Middleton and Associates of Toronto prepared a comprehensive study under the sponsorship of six government departments. The study concluded that renewable resources could account for two to four percent of Canadian energy requirements by 1990, but only "under a reasonable development program".[123]

Solar heating of space and water; small and medium sized windmills; pyrolysis; incineration with energy recovery; anaerobic digestion of organic wastes and wood furnaces were all predicted to become "technically and economically viable for certain applications well before 1900".

Naturally, there are a few odds and ends to be ironed out first. "Availability of high yield crops and suitable land, collection and delivery costs, environmental impact, nutrient depletion and threats to security posed by fire and other natural occurences must be determined in the Canadian context". A tall order, but that's not all. "Jurisdictional responsibility needs to be discussed and clarified at an early date".

Studies like Middleton's are extremely valuable for pointing out the possibilities. Not everything that's possible is probable, however. The preceding sections indicate why not. To get a particular proposal off the ground the "reasonable development program" has to be made explicit.

It is generally acknowledged that residential solar heating offers the largest and most immediate potential for using solar power. However an extensive follow up study of just this one aspect identified "dozens of institutional and social barriers" that "would have to be cured by new legislation".[124]

Even so, it's safe to guess that some problems will be

overlooked. R. Swartman reports on the failure in India of an ambitious plan to substitute solar cooking for cow-dung fires.[125] The cow-dung was in short supply and would have been better used as fertilizer. It seems that the solar alternative had no chance at all in face of a combined preference for eating at night and for the flavour of food cooked in the traditional way.

Well everyone knows that paper studies have their limitations and that any new technology needs shaking down. Prototypes are needed to verify proof of concept and to demonstrate operating reliability. Indeed, the government has used the demonstration project as its chief instrument for promoting solar energy. The 'Arc' in Prince Edward Island and 'Provident House' in Ontario have already demonstrated the technical feasibility of solar heating. NRC has a $230 thousand program to design 14 solar heated demonstration homes.[126] CMHC is also involved in a number of demonstration projects, including a 'mini-utility' to heat a group of houses in winter using solar heat stores in a large underground tank during the summer.[127]

In the United States a federal law stipulates that the Federal Energy Administration commission a "substantial number" of solar heating and cooling systems so as "to constitute a realistic and effective demonstration".[128] Twenty-eight new solar energy demonstration projects are planned for

fiscal 1977 including: residential and commercial heating and cooling, solar grain drying, supplementary solar heating of a large greenhouse and solar heating of large poultry and animal shelters.[129]

A combined list of American and Canadian solar energy demonstration projects would reveal a bewildering diversity of scope and purpose. Indeed so much so as to vex an attempt at rational classification. The vexation is not entirely in vain, however, for it immediately raises some reflections on where our Ministry might "develop policies for and advice on the application of scientific and technical resources in the formulation and development of public policy"[130] in solar energy.

A Policy for Demonstration Projects

"(ERDA has) accumulated an enormous number of things that are called demonstration projects and very, very few, if any, of them, are really the last step before commercialization".[131]

Robert Charpie,
President, Cabot Corporation.

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A project can become a self-perpetuating exercise in futility or, at best, a gratifying experience for the partici-

pants, if its objective is only to 'demonstrate'. A more meaningful objective would be to determine whether or not an attempt should be made to market a specific product. Such an objective demands a yes or no answer after a specified time. If no, the project ends. If yes, then obviously the project was well conceived and a commercial organization can take over. In either case, government participation is over after a period of time known at the outset.

About a year ago, the U.S. Federal Energy Administration, apparently arriving at similar conclusions, set up a task force on demonstration projects. During his recent preliminary report to the agency's General Advisory Committee, task force chairman Robert Charpie laid bare a philosophy remarkably akin to that underlying Make-or-Buy.[132] Charpie felt that the main objective of demonstration projects should be "to facilitate the successful development and commercialization of alternative energy technologies". He noted that very few projects could expect to become commercially successful. So that "systematic procedures" were needed for "precommercialization attrition" since "technical groups naturally tend to become advocates of their respective projects".

The task force felt that some of ERDA's demonstration projects were preempting areas that industry would have filled on its own. Other projects were in direct competition with the private sector. In Canada we have, of course, the addi-

tional problem of not wasting our comparatively pint-sized budget by duplicating American efforts.

While praising the technical competence of ERDA scientists, Charpie noted that none of them seemed to understand the 'commercial parameters' which, he claimed, had to have "equal footing with the technical parameters" in planning.

To overcome these problems the task force made a number of suggestions. Some of these are relevant to our solar demonstration projects and, taken as a group, could form a basis for a consistent Canadian policy for the transfer of newly developed energy technologies to the private sector.

The task force felt that it was important for the commercial organizations ultimately marketing products to take part in demonstrations. Charpie suggested that conflicts-of-interest inherent in this type of arrangement might be resolved according to precedents set in the American nuclear program. In our case, it would probably be advisable to steer clear of models patterned on AECL traditions.

The task force noted that patent policies should give "appropriate respect" to proprietary positions. It also suggested new procurement methods to take advantage of financial, technical and human resources available in industry. Specifically, it felt that unsolicited proposals should be "encouraged

and used as a major part of program and project planning". 'Program Opportunity Notices' needed wider circulation. More innovative proposals would emerge if the precise nature of government involvement could be suggested by the proposer. Moreover, a contractor would have more stake in the project's outcome if he was required to put in a disproportionate percentage of his own funds at the outset and earn it back at the end.

In this connection it's worth noting that the French government has a special demonstration project fund to encourage the introduction of new energy conserving technologies.[133] The government will share the cost of a commercial scale demonstration of any process that holds promise of yielding significant energy savings when applied on a national scale and has never before been used in France. Demonstration projects under this program have included the drying of skins by waste heat in tanneries and a new way of recuperating heat in steel mills.

In return for the French government's contribution, the recipient must submit to independent evaluation of the procedure's effectiveness and agree to let the results be publicized. At the end of a successful demonstration project a publicity meeting is held at the site for the interested professions and the press.

A general policy for demonstration projects might be

based on these ideas augmented by criteria outlined in the preceding section -- timely progress reports, standards for effectiveness, outside contractors for program monitoring and so on. Of course such a policy need not be limited to solar energy projects, but could apply to demonstrations of any new technology.

Old Newspapers

There lies, deeply buried in the tables of the International Energy Agency's first annual report, an embarrassing statistic for Canadians. Canada, the world's second largest producer of pulp and paper, has the most inefficient pulp and paper industry of all OECD countries.[136] It takes, for example, some 30% less energy to produce a ton of paper in Sweden than in Canada.

Could we do better? We certainly could. Bark and wood chips, normally cumbersome waste products, can be burned to generate steam and electricity.[137] A. Carlisle of DOE has outlined many other technical fixes based on more efficient utilization of forest products and forest industry wastes.[138] There is no need to review them here. Instead, a few comments about one particular forest product, newsprint, introduce a modest proposal -- one that seems so attuned to common sense that we dare to present it on the strength of purely an emotional appeal -- no facts or figures.

Recycling waste paper cuts the costs and the environmental damage of garbage disposal. It reduces the need for trucks and buzz-saws in the middle of Algonquin Park. It's also highly symbolic. A few years ago, neighbourhood recycling centers provided the means for a simple direct environmental action in which we could all participate. The City of Ottawa used to pick up bundles of old newspapers for recycling along with the garbage. Things soured. The bottom fell out of the old newspaper market. Mountains of old paper collect mildew in warehouses. We no longer see station wagons full of newspapers, kids and environmental enthusiasm on supermarket parking lots.

Henry Diamond, former Commissioner of Environmental Conservation for New York State, noted that tax laws, freight rates, the structure of the paper industry and years of investment and tax planning all favour the exploitation of virgin pulp.[139] He proposed two measures to make recycling more attractive: a disposal tax and stockpiling.

A disposal tax levied on paper products at time of manufacture could be scaled inversely to the percentage of recycled fibre. The proceeds of such a tax could be recycled as well, in the form of grants to help local recycling programs.

Diamond's second proposal was to dampen the wildly fluctuating demand by means of a stockpiling program. Stock-

piling presents a number of known problems, to be sure. And, as with bottle or can recycling, careful analysis may turn up even more.[140] But, at minimum, the case deserves an accounting for all external and internal costs and benefits.

Notwithstanding economic sophistry, surely the wanton disposal of billions of cans, bottles and newspapers outrages the common sense of anyone not blinded by a special interest. Surely it's not beyond our collective ingenuity to devise means of compensating those who would lose their jobs if we could stop such egregious waste. A national recycling program -- cans, bottles, newspapers or all of them -- launched simultaneously in all provinces would unite energy conservation with environmental protection and should find many enthusiastic supporters.

IV. PARTING REMARKS

Barry Commoner has explained how use and abuse of energy governs interactions among the environment, the economy and industrial production.[141] Since energy pervades so many aspects of our daily lives, it's no wonder that inspirations for conserving it are so abundant.

The preceding sections have not even circled the arena. Neither transportation nor industry nor agriculture received explicit attention. Yet, many of the best opportunities for conserving energy are within these sectors. In justification we may observe that each sector has a handmaiden department, devoted exclusively to its nourishment, joining EMR in concocting energy saving strategies.

A few months ago the staff of MOSST was surveyed to see whether it would be O.K. to remove some of the office lights in the interest of energy conservation. "Sure enough", said most at MOSST, "there's too much glare anyway". Time passed. The lights remained. They're still all there. One energy conservation measure was, however, implemented in our building. Little stickers with cryptic graphics now urge us to conserve energy by walking up stairs, flushing toilets more gently, and turning off lights. Ill-considered compliance with the last of these exhortations caused, on at least one occasion, no little consternation to an unobtrusive occupant of a washroom

cubicle.

The vagaries of the microcosmic energy conservation program in our building serve as a parable epitomizing the larger dilemma. There is no problem in knowing what to do or how to do it: no lack of well-intentioned, capable people. Yet, somehow, and there are always rational explanations, even the simplest and most acceptable measures often fizzle. It is for this reason that this report agonized so much over causes at the expense of cataloguing solutions.

NOTES

1 "The Atom for Progress and Peace", President Eisenhower's address before the U.N. General Assembly, December 8, 1953, U.S. Government Printing Office, Washington, D.C.

2 'The Energy Crisis', Facts on File, Vol. 33, No. 173, December 23-31, 1973, p. 1071.

To quote the Shah precisely:

"The industrial world will have to realize that the era of their terrific progress and even more terrific income and wealth based on cheap fuel is finished. They will have to find new sources of energy and tighten their belts".

3 Television address to the Nation, November 7, 1973.

4 Quoted by W. Rowland in 'Fueling Canada's Future', McMillan, 1974, p. 6.

5 Noted by Senator W. H. Ford in an address to Intersociety Workshop on Energy Conservation, Arlie House, Virginia, March 24, 1976.

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117 "The opening of "Energy Fair '76" at the Los Angeles Convention Center ... featured some interesting uses of solar power. Los Angeles Mayor Tom Bradley cut the first slice of a 'Sunshine Cake' with 200 solar-powered electric bulbs as candles. Coffee brewed by solar power was served ..." from "Energy Analects", Vol. 5, No. 40, October 8, 1976.

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128 Public Law 93-409 stipulates that: solar heating and cooling systems be installed in a substantial number of residential dwellings; in a sufficient number of different geographical areas, under varying climatic conditions to constitute a realistic and effective demonstration; plus a similar program to be conducted in the commercial sector on a variety of structures; including office buildings, factories, public and other non-residential buildings. The law also provides for the conduct of research and development with respect to solar heating and cooling technologies and development in support of solar heating and cooling systems for residential and commercial demonstration.

129 ERDA funding request for fiscal 1977. See, for example, Energy Users Reports, Reference File, Section 51.0997.

130 The reader will undoubtedly recognize this lyric line from 'The Ministry's Program Description' in the 1975-1976 Annual Report.

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134 Another contemporary example: Of 142 company presidents and vice presidents surveyed by the University of Georgia College of Business Administration, 30% said that the use of less energy was ineffective in solving the energy problem. Only 16% thought that it was highly effective. The same group attributed the energy problem mainly to excessive government regulation followed by price controls and environmental standards. Energy Research Reports, Vol. 2, No. 11, November 1976.

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APPENDIX I

Summary of Provincial Energy Conservation Programs*

QUEBEC/NEW BRUNSWICK

The importance of conservation has not yet fully dawned on either Quebec or New Brunswick judging from what little has been done so far. The inactivity is difficult to fathom considering the lack of hydrocarbon resources and the power generation problems plaguing the entire Atlantic region.

Word from the Quebec government is that there are other, more pressing problems facing the province at the moment and that a conservation program is still in the offing. Indeed, Hydro-Quebec is still basing its power plans on a projected demand growth of 7.75% annually, requiring as in the past a doubling of power capacity every 10 years. There are signs that the government has received its first rude awakening in recently appraising Hydro-Quebec capital requirements at $51 billion over the next 15 years. Natural resources minister Jean Cournoyer took a thinly disguised swipe at the utility for failing to examine ways of shaving the high demand. Despite all the uproar, no solid conservation blueprint has yet crystallized.

For its part, New Brunswick is concerned with acquainting people with the reality of higher energy prices. Emphasis is thrown toward switching from fossil fuel to nuclear power generation. One official even cited the Point Lepreau nuclear project as an example of provincial conservation action.

However, the province does not yet have a comprehensive energy cost management program. It is examining alternatives such as improving market conditions for pricing, advertising campaigns and legislative action. The province did draw up an energy contingency plan as a short-term reaction to the 1973 energy crisis, but as yet it has no long-term conservation strategy.

New Brunswick's education ministry is one of the few departments with an energy conservation program. Aimed at saving more than $200,000 in the operation of provincial schools next year, the entire expense of implementing the practices is expected to be recovered in a single year. A detailed study has been made of 20 schools and the ways in which they waste energy. Major savings will come from an engineering study of heating and ventilation systems. Other areas of concern are ensuring that those who operate the building systems are fully qualified, and that new schools will be designed in a more energy-efficient manner. A training session will be held for operators after adjustments to a school's system. The energy analysis computer program developed by Ross F Meriwether and Associates of San Antonio, Texas will be used. When used by experienced designers the program can save 30-40% in energy requirements.

The Department of Public Works and Supply provides a bright spot in an otherwise bleak Quebec conservation picture. Public works minister William Tetly recently announced a program in which heat will be turned down and extra lights turned off in provincial government buildings, for expected savings of from $600,000 to $1 million per year.

Offices will be heated to not more than 21 deg C in winter and cooled to not less than 22 deg C in summer. Indoor parking gargages will no longer be air conditioned in summer, and in winter will be heated only to 7 deg C. Lights will be extinguished after working hours except in corridors, stairways and security posts, and plumbing will be modified to save more hot water.

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NEWFOUNDLAND

Newfoundland's energy conservation program has not yet received ministerial approval--the energy ministry has been preoccupied with dousing more immediate fires that have developed over offshore drilling and Labrador power. Right now it doesn't even have a minister due to John Crosbie's resignation. But authorities have something in the wind which will supposedly establish the government as a paragon of conservation. The theory is that Newfoundlanders will practise energy thrift only when the example has been set.

Thus, the plan calls for energy cutbacks in every government department. It sounds rather lofty. In reality, Newfoundlanders will have to derive their inspiration from the measures affected in the one building where most government departments are housed. One authority explained: "After all, Newfoundland is not a rich province."

The modest program that is supposed to incite elaborate public concern for energy will see thermostats lowered, minimum temperatures raised for air conditioning, exterior lights diminished, ventilation cut back and hot water temperatures dropped in government offices. The program will push investments in the public works area which will pay off in terms of conservation--insulation, storm windows, weather stripping and preventive maintenance.

Where the government does lease office space, present policies encourage use of minimal insulation leaving tenants to pay for heating bills. The government hopes to improve this situation.

The program would also encourage new vehicles to be smaller, with four or six cylinder engines, radial tires, catalytic converters and standard transmission. However, only one highway in the province is paved. In implementing such a policy government officials will have to bear in mind whether small cars would really stand up on some of the back roads.

The government also hopes to get statistics on the amounts of energy it is using--and, hopefully, saving.

NOVA SCOTIA

Nova Scotia has instituted a long-term energy conservation policy aimed at reducing annual energy growth to 3.5% from 4.2% by 1986. The move could significantly reduce expenditures on imported oil and on capital equipment for electrical generation. Equally important, it could make Ottawa more receptive to Nova Scotian requests for federal subsidies to cushion the impact of rising oil prices. Energy minister Alastair Gillespie gave Nova Scotia's lack of dedication to conservation as one reason for turning down previous requests.

If the present 4.2%/yr energy growth demand continues, the province would be consuming the equivalent of 75 million bbl of oil by 1986, 30 million more than at present. This would double the present $1 billion a year energy bill, assuming no further price increases and would mean that the province would have to invest an additional $1 billion in new electric power generation facilities. Power rates have already doubled in Nova Scotia and could rise by as much as 30% by year-end due to planned increases in the domestic price of oil.

Specific details of the new conservation policy have not been spelled out but action is expected on minimum insulation standards for new buildings, lighting, heating and cooling standards for commercial buildings, introduction of individual electricity meters in apartments, and a new vehicle registration fee structure to encourage fuel economy.

As well as its public conservation policy, the Nova Scotia Energy Council has programs of information dissemination and internal government action.

The information dissemination program consists of bi-monthly energy conservation pamphlets on topics such as home heating conservation and the automobile. The main purpose of this approach is to acquaint the public with possible savings that can be realized through realistic energy management and to complement the federal program. Other subjects for pamphlets include electric appliance uses, automobile gasoline consumption results and technical advice regarding insulation and retrofitting.

Media messages, designed to encourage public acceptance of conservation measures are also part of the program. A number of messages have been run in provincial newspapers aimed at showing new home builders the benefit of higher insulation levels.

A conservation data bank or information system is being designed to service all public requests as quickly and thoroughly as possible.

Internal government action includes a thorough examination and analysis of ways and means of conserving energy within government. Some of the areas identified include automobile size and weight, and lighting levels in buildings. The Department of Public Works is taking steps to familiarize itself with the Meriwether's Energy Systems Analysis. Any new provincial buildings will be designed with energy conservation as a priority.

PRINCE EDWARD ISLAND

The Energy Conservation Initiatives Committee, part of the province's Emergency Measures Organization, is the body in Prince Edward Island responsible for energy conservation. Chaired by Orin Simons, director of the Emergency Measures Organization, the group coordinates about 20 ministries and agencies involved in the program, develops initiatives in energy conservation, assesses the program's effectiveness, presents recommendations to the Executive Council, and acts as a clearing house for all energy conservation matters.

The government of PEI aims to take strong, effective action to ensure that the exponential rate of growth in energy consumption is moderated by increasing efficiency of use and remodelling the life styles of the people. This year, the areas of concentration are space conditioning and transportation projects which involve improving the efficiency of heating, ventilation, air conditioning, lighting and transportation practices.

The program is divided into three phases:

- Phase 1: high profile programs which bring the conservation ethic to the public attention through education and exemplary effort on the part of civil servants. Such programs can be implemented immediately since they are not particularly cost sensitive or politically untenable.
- Phase 2: Programs which must be initiated as soon as possible but which require study because of inherent costs or political implications. Implementation of these programs would be staged to maintain a continuing high profile for the overall energy conservation program.
- Phase 3: Low profile studies aimed at research and development of new or alternative energy sources, or of more efficient energy use in applications relevant to the province. In many cases, these programs require lengthy study and may or may not result in recommendations for action.

More than fifty initiatives have been approved as worthy of consideration by the committee and a number have received final Cabinet approval.

PEI's Department of Public Works is conducting a program of energy conservation and preventative maintenance for public buildings. The program is being carried out by a special task force within the department with the aim of reducing energy consumption by a minimum of 15%, representing an annual net saving in excess of half a million dollars. So far, the program has reduced lighting loads and set thermostats at 20 deg C (68 deg F) in several public buildings. New design criteria are being established, and one application is to the new St Eleanors School. Solar panels and windmills are being investigated to provide supplementary heat for domestic hot water at this school as well.

A public education program through the media is being conducted by Island Information Services, a provincial government agency. A coordinated series of feature stories and columns for local newspapers, television and radio commercials and utility bill stuffers are means of bringing the message to the public and making the public aware of how it can participate. About 30 road signs with the message "Slow down, save energy and live!" are part of the program. Cost of the program so far is $10,000.

These are just two of the many initiatives received by the committee and recommended for immediate implementation. Others include energy audit services for farms, residential and public buildings; adult and student energy conservation classes; a review of the criteria for automobile registration costs; removal of the 8% Provincial Sales Tax on insulation; reduction of speed limits on highways to a maximum 55 mph; and a survey of the civil service to assess the need for car pools, van pools, or an employee bus service.

ONTARIO

Ontario's Energy Management Program, announced early last year, has grown to include two new ministries, Correctional Services and Health, and 95 projects. The program, coordinated by the energy ministry, is aimed at reducing the province's overall energy bill by about $1 billion per year by 1980, and at cutting the growth rate in energy consumption in Ontario by one third. Two billion dollars were pumped into the program this year, compared with $1.9 million in 1975. Some of the latest developments in each of the 13 ministries are summarized below.

- One of the Ministry of Agriculture and Foods's new projects is studying greenhouse fuel usage, especially in vegetable and ornamental plant production.
- The Ministry of Colleges and Universities aims to improve thermal performance in post-secondary buildings through analysis and demonstration. The program emphasizes implementation of space conditioning, and 5-7% savings are anticipated through improved operating procedures alone.
- The Ministry of Consumer & Commercial Relations is developing a maximum-efficiency gas-fired residential furnace and water heater as part of its program of encouraging the construction sector to maintain a commitment to erecting energy-efficient buildings.
- The Ministry of Correctional Services is working on a space conditioning program, but details have not yet been announced.
- The Ministry of Education emphasizes space conditioning improvements as well. It also aims to expand school curriculum guidelines to include energy conservation courses, and to conduct "how to" seminars for school boards as well as operating and maintenance staff on better management of energy.
- The objective of the Ministry of Environment's program is to determine the net savings potential from the recycling of products and the reclamation of wastes. The ministry is also undertaking specific systems analyses regarding waste material recovery in terms of energy requirements to reconstitute materials such as plastics, aluminum, steel and glass.
- The Ministry of Energy's prime role is the policy development and management of the EMP. It provides energy information data and research results to the other ministries which in turn make them available to groups and individuals. It also convenes seminars and reproduces papers and reports. Some current projects include preparation of a solar information booklet, developing energy budgets for commercial and institutional buildings, and studying wood-based methanol and its use as a fuel in Ontario.

Ontario Hydro, which comes under energy ministry jurisdiction, has just embarked on a more vigorous conservation program including a stepped-up advertising campaign, labelling of all appliances outlining their power consumption and more stringent insulation standards within building codes. The program follows creation of a new conservation division headed by HK Wright.

- The Ministry of Government Services has achieved estimated savings of 15% to 40% during the past year in buildings through energy audit programs. By more efficient use of lighting, snow-melting systems, building maintenance, electrical systems, operating techniques in buildings, preventative maintenance and data collection, it expects savings of $500,000/yr.
- The Ministry of Health intends to analyse energy use in 11 provincial hospitals, anticipating a 10% saving in energy consumption through improved operating procedures alone. One project is the study of a solar heating application at the Public General Hospital in Chatham.
- The Ministry of Housing was allocated $100,000 by the EMP in late July for development and evaluation of energy-saving measures in existing and future Ontario Housing Corp units. (OHC currently manages over 73,000 public housing units.) Half of the funds will be used for studies to increase efficiency of machinery and equipment and the balance will be for the study and development of solar heating.
- Energy cost savings of 17% on the average have been identified by companies undertaking plant energy audits in cooperation with the Ministry of Industry and Tourism's "Energy Bus". The bus is a van equipped with demonstration devices, literature, qualified staff and a mini-computer to do on-the-spot energy audits.
- The Ministry of Natural Resources is participating in studies of waste heat from electrical generation stations for aquaculture and agriculture, and has also developed a remote sensing capability to detect heat loss from buildings.
- As part of the Ministry of Transportation & Communications program the Advisory Council of Energy Management in Truck and Vehicle Operations in Ontario produced a report with recommendations on energy conservation including use of radial tires, improved aero-dynamic design for future vehicles, improved preventative maintenance programs and driver education.

SASKATCHEWAN

Increasing the overall efficiency of energy use, reducing growth in demand and ensuring the best end-use of all types of energy are the threefold aims of Saskatchewan's energy conservation program. The program's structure consists of an overview committee chaired by the Energy Secretariat with representatives from all key government departments, agencies and Crown Corporations. The committee coordinates the work of five technical committees (Agriculture, Buildings, Industry, Information/education and Transportation) and ensures implementation of recommended programs. The technical committees draw upon existing expertise in various parts of government.

Reduction of energy use in public and private buildings has been pinpointed as the largest sector in which results can be achieved relatively quickly. Action taken to date includes insulation standards for all new government-owned or financed buildings; a model by-law regarding insulation standards for all heated/cooled structures in a municipality; acquisition of the Meriwether Energy Analysis computer program to analyze energy use in existing buildings; and a public relations campaign on the "wise use of energy" which includes distribution of over 30,000 pamphlets on home insulation. The Department of Education is currently re-drafting building standards for schools. HVAC equipment is being studied in hospitals and schools. Saskatchewan Housing Corp buildings must meet new insulation standards. Upgrading of thermal performance standards of existing buildings is being studied. The committee also advocates improving the National Building Code's thermal performance standards, and the adoption of a provincial building code to incorporate minimum thermal performance standards for all buildings.

Speed up in cities, slow down on highways

Saskatchewan's goals in the transportation sector are to shift passengers to more efficient vehicles, to reduce average highway speeds and to increase average urban speeds. Steps taken so far include recommendation of a 55 mph speed limit; discussion of a computer based synchronized traffic control system; an analysis by the government's Central Vehicle Agency of the costs/benefits of changing the present big car small car mix from the present 75/25% to 50/50%, 25/75% or 0/100%, encouragement of public transit use in urban areas; and evaluation of the increase in energy consumption if the federal government rail line abandonment proposals are effected. Areas under review include automobile licensing fees related to weight and mpg performance of vehicles; executive buses for civil servants; greater fiscal commitments to mass urban transit; expansion of inter-city mass transit; initiation of efforts to improve urban design; and use of fuel tax to promote more rational use of energy.

Saskatchewan is traditionally an agricultural province, and agriculture is especially vulnerable to increased costs and petroleum supply shortages. Historically, this sector has been very aware of the impact of fuel costs and has kept such costs to a minimum. The government will continue advising farmers in sizing of electrical equipment for optimum use of energy. It is also reviewing advantages of energy labelling of power equipment; and is researching the use of waste heat and solar energy for grain drying and greenhouse purposes.

The energy conservation program for industry includes advice on power factor correction, optimum sizing of equipment and a study of measures for large consumers. A mobile consultant/computer analysis service for industry is being examined, and the government is also considering incentives for industries which alter their fuel supply from a scarce resource like natural gas to a more plentiful one like coal.

The Saskatchewan program also focuses on information and education. One of the prime aims of this program is to introduce energy conservation ideas into school programs to lay the foundation for new perceptions and future attitudes about energy use. Several government departments have published energy conservation articles in their monthly newsletters, and the Public Service Commission is planning a series of information training seminars on energy conservation practices for government employees. Energy analysis competitions in schools and a comprehensive public information campaign are also being reviewed.

MANITOBA

Manitoba does not yet have a fully coordinated energy conservation program, although the Manitoba Energy Council is working on one which will encompass all end-use sectors and last from one to five years. However, several departments within the Manitoba government have set up energy conservation programs of their own.

The Department of Public Works has a program for building design and operation, which includes only government buildings. However, its scope is quite large since the department operates and maintains 400 buildings and complexes in the province--representing 7.5 million sq ft of space. The program is aimed at minimization of energy use and use of renewable energy sources (especially hydroelectric power) wherever possible. For new building designs, the program requests minimum window/wall ratios, improved insulation levels, automated air handling setbacks and controls, and high-efficiency lighting, heating and air conditioning systems. Energy analyses will be made on all new buildings with the aid of a computer for larger structures. The program also involves refitting of existing buildings. One technique use is coffered ceiling design, which can cut energy consumption for lighting purposes in half. The department will be starting two training programs for building occupants in September.

The Manitoba government is also replacing half of its 1,800 car fleet with smaller compact and sub-compact cars. Target date for this program is April, 1978. In addition, civil servants have been encouraged to cut down on the business mileage they put on their personal cars.

The Energy Management Division of the Department of Mines, Resources and Environmental Management is conducting a one-year, $100,000 pilot project to determine the feasibility of recycling motor oil. The study region for this project is Winnipeg and southwest Manitoba.

The restructuring of the current system of automobile registration fees announced in the 1976 Budget Address will provide an incentive for the use of smaller, lighter cars. The new system will take effect with the next registration year starting March 1, 1977. Registration charges will be based on weight instead of wheelbase size.

A public information program on conservation has been initiated under the auspices of the Manitoba Energy Council. To date this has involved a series of cartoons shown by Manitoba television stations as well as articles published in the Manitoba Business Review.

ALBERTA

Alberta's energy conservation policy differs from those of other provinces. Instead of using fewer resources, the Alberta approach is to find more of them. Top priorities in the Alberta program are 1) getting a better price for resource commodities, 2) searching for resources and 3) revision of resource legislation. Alberta's new coal policy and amendments to the Mines and Minerals Act are two recent indications of the thrust of Alberta's "conservation" policy. The aim of the program is to bring the investment climate for Alberta's resources up from its low point of a year year and a half ago--and so far it has been quite successful. Revamping of tenure legislation, adapting legislation to finding remaining reserves, and putting incentives into drilling regulations are some of the current projects.

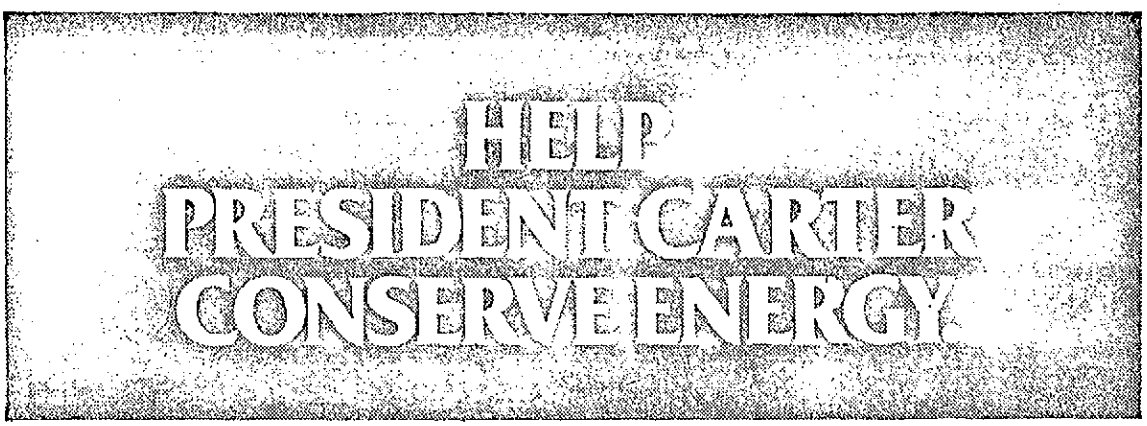
The public information programs stressed in other provinces have received little attention in Alberta. The energy department does distribute some pamphlets provided by the federal Office of Energy Conservation. And individual departments are working on projects such as the Department of Public Works' study of energy in buildings. But so far, these projects at the "end-use" level have not been coordinated.

The Energy Resources Conservation Board plays a large role in the Alberta program and a list of its main programs shows the nature of the Alberta energy conservation program. Some of the ERCB's programs are the following:

- A rural gas program aimed at making gas services available to 40,000 family farms and 42,000 individual households, involving installation of 40,000 additional miles of plastic pipe.
- Issuing of Industrial Development Permits to ensure that Alberta's hydrocarbon reserves are developed in an orderly fashion. The Board also issues Industrial Development Permits for use of coal except in power plants or where the annual quantity used is less than 250,000 short tons.
- Enhanced-recovery schemes for crude oil.
- Conservation of solution gas.
- Acting as an adviser to the energy department on drilling and geophysical incentives, royalty schedules, land tenure policies and oil-sand leasing, and assisting in development of government policy.

APPENDIX II

SOME EXAMPLES OF CORPORATE ADVERTISING RELATED TO ENERGY CONSERVATION



SPEND 5 DAYS, 4 NIGHTS AT THE WARM, WONDERFUL BOCA RATON HOTEL & CLUB.

Here's a beautiful, painless way to do your part in the nation's energy crisis. Turn off your heat, turn off your lights, put your car(s) in the garage and come on down to the goldenmost part of the Florida Gold Coast. To the Boca Raton Hotel & Club.

For helping out, we promise to pamper you with elegant service, fill you with excellent food, afford you the opportunity to play golf, tennis, swim, sail, fish or just bask in the warm sunshine.

We think every red-blooded American ought to try his darndest to tear himself away from all of that work and trudging around in the cold and call 800-327-0101 for a reservation now.

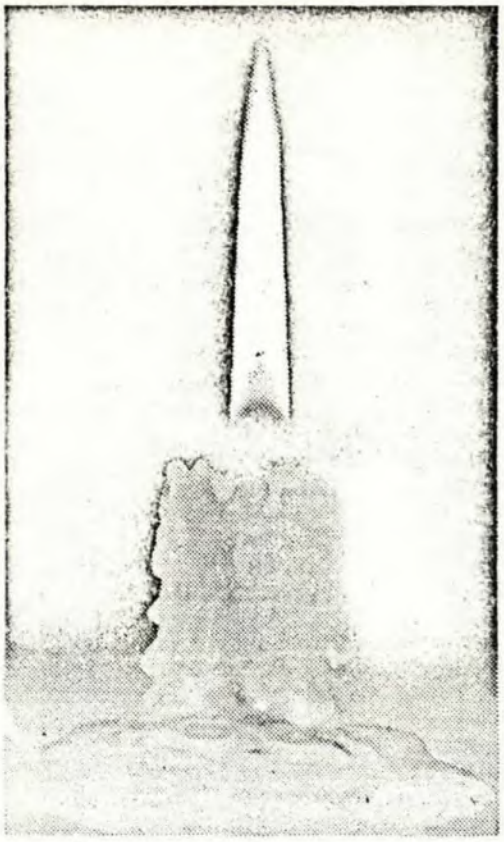
President Carter can use all the cooperation he can get.

BOCA RATON HOTEL & CLUB
We never forget that you're the guest.
Boca Raton, Florida 33432
800-327-0101

5 days, 4 nights from $440, including breakfast, dinner, all gratuities. Additional nights from $109.

Times Feb 20/77

power.



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But added to natural growth demands and the fact that in many parts of the country people are switching to electricity from other forms of energy, there is an increasing need for ever larger generation and transmission facilities.

Try to keep some of these facts in mind when your power bill goes up.

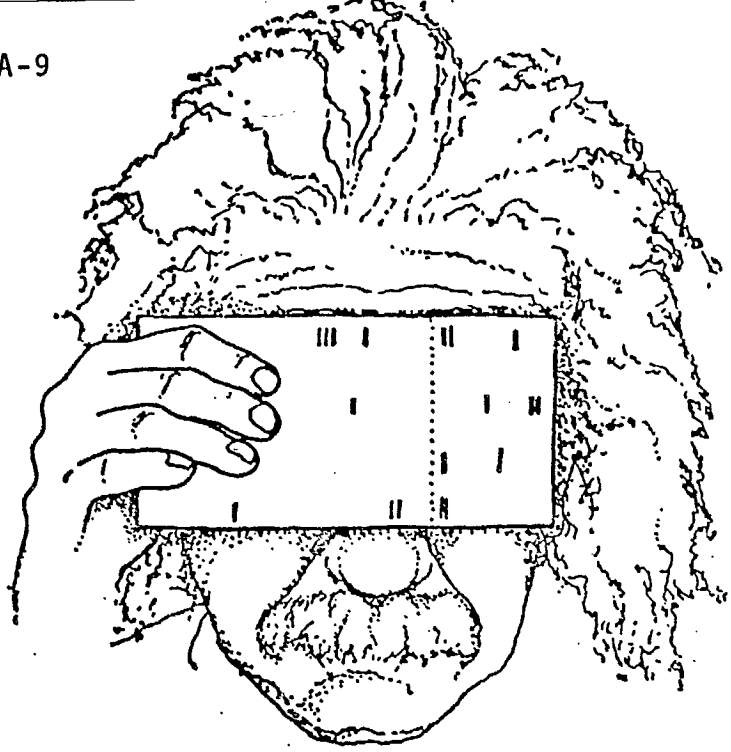
Remember, you're using more electricity and that requires more power stations. Together, the result is increased power rates.

It is not the intent of the power companies to grow blindly and meaninglessly, but to thoughtfully plan for the future power needs of the people of Canada so that we will all be able to enjoy the fruits of electrical technology tomorrow, and into the foreseeable future.

CANADIAN ELECTRICAL ASSOCIATION

Power for tomorrow

You don't have to be a nuclear physicist to understand an electric bill.



The numbers next to the $ sign are a lot higher today than a couple of years ago. And we can expect even bigger bills as prices increase for oil, coal, natural gas—the main sources for the energy we use.

That's why the world is turning to nuclear power as a practical alternative. Nuclear power can cut our future electricity costs and reduce dependence on those few countries that control oil production and prices. Thousands of American communities now enjoy power, light and heat from nuclear energy. By 1985, there will be at least 300 nuclear power plants in the U.S. and overseas.

Nuclear power is produced by reactors that run on uranium. After 3 or 4 years the fuel rods in a reactor are spent and taken out. They can be stored away. But they contain plutonium, as well as unburned uranium, and discarding them means losing forever a potential source of energy. However, there is a way to reprocess this material, to generate at least 50% additional electricity instead of simply throwing away this valuable resource.

Right now, there's only one facility in the entire U.S.—at Barnwell, South Carolina, built by our company in partnership with General Atomic—that is able to evaluate the benefits of reprocessing. At full operation, Barnwell will reprocess spent nuclear fuel from 50-60 reactors every year. This reusable fuel can provide the energy equivalent of almost 70 million tons of coal or nearly 300 million barrels of crude oil a year. That's a lot of energy that would be wasted without reprocessing.

Reprocessing provides another plus. By significantly reducing the amount of highly radioactive nuclear waste, the need for storage locations is lessened—an environmental as well as economic benefit.

But Barnwell is idle. It can't get started until the government clarifies its position on nuclear fuel recycling.

Barnwell can establish that effective safeguards can be maintained over the plutonium contained in spent fuel. In doing so, it will go a long way toward providing an answer to the problem of international nuclear arms proliferation.

Recent surveys show that a majority of Americans favor more nuclear power plants. Barnwell is the key to proving that reprocessing can help make nuclear power the choice of the future—an economical, safe and environmentally acceptable answer to America's need for electricity.

It doesn't take a degree in nuclear physics to make that choice. Barnwell and the American people are waiting.

Allied Chemical

For copies of this ad and information about how nuclear fuel reprocessing can help solve our energy problems, write to: Energy, Allied Chemical Corporation, P.O. Box 2245R, Morristown, N. J. 07960

The big freeze—it might have been worse

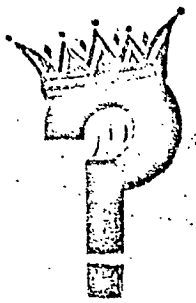
When parts of the country were running out of fuel during the coldest January on record, nuclear power provided up to 70% of the energy used in some of the hardest hit communities. In December—a more normal weather month—U.S. nuclear plants produced 15% more electric power than in any previous month, almost one eighth of the total electricity produced in America. Sixty nuclear plants contributed to this record. They averaged better than 70% of capacity, higher than oil or coal fired plants, and 17 of the nuclear plants operated at 90%. In sum, they did just what they were designed to—produce electricity reliably, economically, with no fuel delivery problems, no oil spills, no smoke plumes. Nuclear plants are already helping with the energy crisis, reducing our dependence on dwindling oil and gas. We'll need more of them in the future.

Please write for more information on this urgent and complex subject.

Keith A. Cunningham
President

United Nuclear Corporation
7700 Leesburg Pike, Falls Church, Virginia 22043

UNC **America's Largest Independent Producer of Uranium**



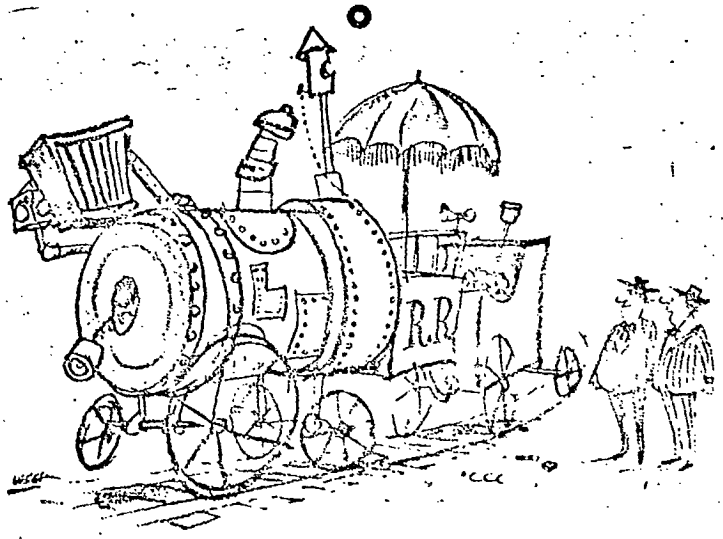
Toothless tyrant. A campaign against "corporate tyranny" has been launched in newspaper ads by a group calling itself the "Peoples Bicentennial Commission." While they level plenty of broad-brush anti-business charges, the ads' sponsors stop short of suggesting just what they'd like to see take the place of private corporations.

Specifically, they have accused "corporate monarchs" of fixing prices, dodging tax laws, manufacturing unemployment, manipulating our government, and undermining the governments of foreign countries.

Speaking only for Mobil, we'd say that if we are a "monarch," our crown is slightly askew.

How can we fix prices when the government does it for us? The oil industry is the last in the nation still under federal price controls. Dodge tax laws? Seems to us that our taxes keep going up, what with the end of the depletion allowance and the revision of the foreign tax rules—legislation passed by the very government we're supposed to be manipulating, and aimed only at our specific industry. And if we're so powerful overseas, how come sovereign governments keep nationalizing oil properties?

As for jobs, we think the record proves that a vigorous, growing economy, motivated by the opportunity to turn a fair profit, is the best vehicle there is for putting people to work.



"WAIT A GREAT DESIGN, SENATOR. LET'S TRY IT ON THE OIL COMPANIES."

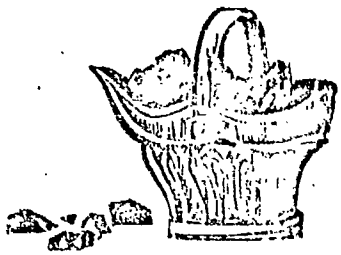
Wild goose place. There's a 770-acre sanctuary on the banks of Maryland's historic Patuxent River that's a winter haven for some 20,000 Canada geese, 5,000 wood ducks and hundreds of other feathered and fur-bearing fauna. Part of Maryland's open space program, it was purchased in 1974 for $747,000—$325,000 of which came via the Federal Government from offshore gas and oil drilling revenues.

All told, the offshore search for oil and gas has generated $1.4 billion since 1969 for conservation and recreation. That's one of the best uses we could imagine for the dollars we send to Washington.

We were saddened recently to hear of the death in London of Angela Baddeley, the actress who put such warmth and spirit into the role of Mrs. Bridges, the cook of *Upstairs, Downstairs,* with which we've long been associated on Public Broadcasting stations. She was 71, and had enjoyed a long and successful career. She will be remembered with fondness, and missed.

Mobil

Writes Gordon Tremaine of Maplewood, N.J.: "I've read that America has a 300-year supply of coal. If that is true, why is the U.S. short of energy?"

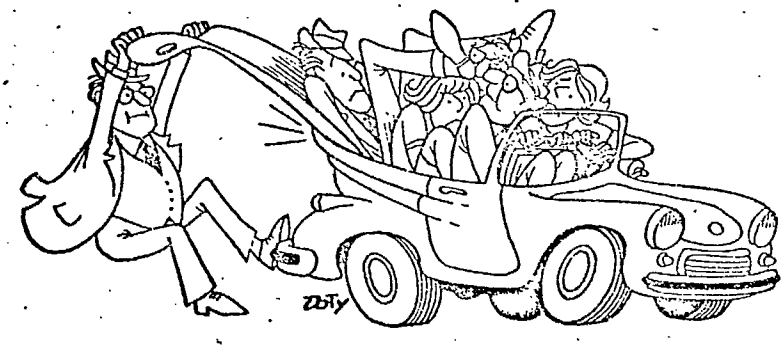


It's true, but... theoretically, America does have a 300-year coal supply at present rates of consumption. Trouble is, this is coal in the ground, still to be mined—so it's only *potential* energy. Actually, coal provides just 18 percent of the energy America uses, and boosting that share isn't going to be easy.

Needed: trade-offs. We think it's possible to use more coal right now without any environmental sacrifice of consequence. Low-sulfur western coal, for example, is clean-burning and should be put to work. But there's got to be some environmental give and take. It makes little sense for America to import foreign oil at a cost of $66 million a day when Americans are sitting on so much coal. It's something to think about.

More regulatory silliness. When a welfare client in Illinois dies, the Illinois Welfare Department routinely addresses a note to the deceased, telling him: "Your assistance benefits will be discontinued. Reason: It has been reported to our office that you expired." Well, you can't take it with you.

Tight squeeze. "How can you *fit* five people into a compact car," asked a commuter from Warren, Ohio, after "Observations" noted that a 5-rider car pool sharing a compact each day could save $502 yearly on a 10-mile commute. "If I sit up, I bump my head. If I slouch, my knees and legs are stiff when I get out," she wrote. "Who are those midgets you used for your survey?" We used government statistics, but your comment raises a valid question posed in a later column: that unrealistic mileage mandates could limit production of big cars some American families need.



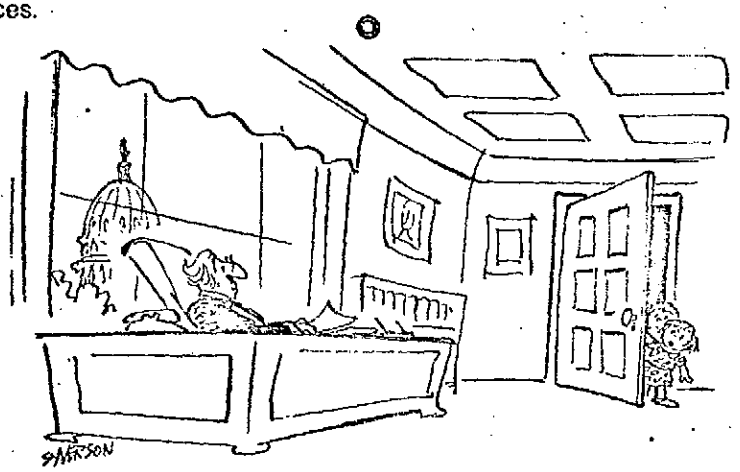
A quote we like. From 19th Century clergyman/author James Freeman Clarke: "A politician thinks of the next election; a statesman, of the next generation."

Items from Mobil's "Observations"

America, the vulnerable. If every American family were suddenly required to send $400 overseas, people would blow their stacks. Yet, that's just about what happened in 1974 when America's bill for foreign oil abruptly jumped to $26 billion from $9½ billion the previous year. That tab will rise to $35 billion by the end of next year, which means that every family will be sending a gift package of over $500 to foreign oil producing countries, according to Federal Energy Administration data.

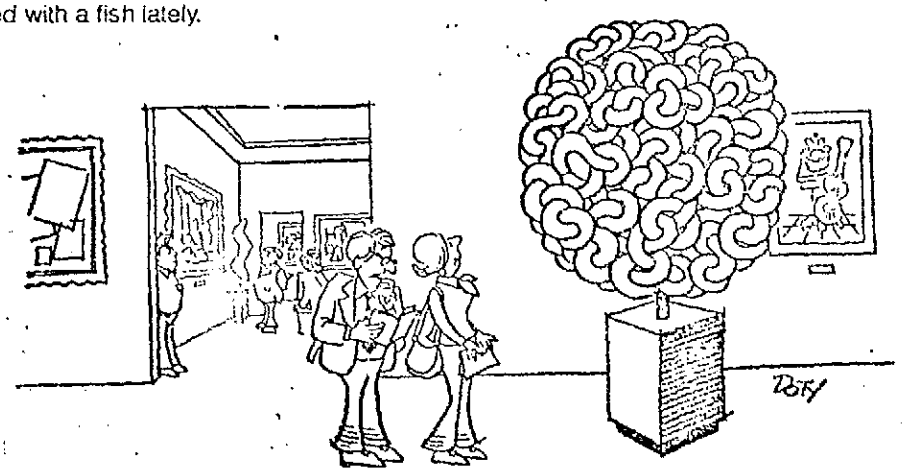
Are you concerned about it? You should be. And you should tell your elected officials. They're still holding up measures to step up the search for more oil and gas in this country, and to mine more of America's abundant coal—steps America must take now to control that costly foreign oil habit.

By 2076, solar energy, nuclear fusion and other exotic energy sources brighten your world. But you can improve the odds of living well until then if y conserve today's energy supplies. And support the search for more domestic oil and gas off America's coasts, plus the development of America's coal resources.



"CAN WE SEE WHERE YOU KEEP THE RED TAPE?"

Peaceful coexistence. How do sport fish and offshore oil wells get along? Swimmingly, according to the National Marine Fisheries Service. Citing experience in the Gulf of Mexico, the Service points out that platforms act as artificial reefs, providing shelter for the small organisms little fish feed on. The little fish, in turn, attract such spec[illegible]s as grouper, red snapper, and king mackerel, much to the delight of Gulf [illegible]rs. So next time someone hassles you about those offshore platforms, just ask him if he's checked with a fish lately.



IT'S EITHER "GORDIAN KNOT" OR "GOVERNMENT REGULATIONS"

Items from Mobil's "Observations"