A LEGISLATIVE MODEL TO REGULATE SOLAR TECHNOLOGY

by

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This thesis develops and discusses a strategic model to regulate the solar technology industry, based upon the following arguments: 1) that solar technology will be a major source of energy in the future, 2) that the nature of the solar industry warrants it being regulated, 3) that existing energy legislation is not suitable to be extended to the solar technology industry, and 4) that a strategic model gleaned from the radio and television legislation can be adapted to regulate the hypothesized solar technology industry.

The amount of solar energy reaching the earth is massive. The only thing stopping it from being a ready source of supply is the conversion efficiencies of the devices needed to make it usable. As the economic and technical characteristics of the solar industry improve, it becomes more competitive with other sources. It is highly likely that these characteristics will improve to the point that solar technology will be one of the largest energy industries by the next century.

The solar technology industry is highly centralized. Major multinational corporations are very active in increasing their economic strength in this industry. Because Canada will probably face a market controlled by foreign multinational corporations importing goods into this country, any national involvement can only come via regulatory legislation. National involvement
will be needed because energy is fast becoming a major political issue. Thus, it is likely that for reasons of political sovereignty, Canada will have to regulate the solar technology industry.

The existing legislation is not suitable to do this for two reasons. The first is that although some of the legislation at a general level conceptually includes solar technology, none of it includes it in a comprehensive manner. The second is that the legislation for the energy sector is organized on an industry by industry basis. To structure legislation to cover this new industry, entirely new acts are needed which will follow the existing pattern and which will serve this one industry.

The most suitable model to do this is that which functions within the context of the radio and television legislation. This legislation has the characteristic of being strategic. This means there are different strategic approaches that government can take to regulate this industry. The value of this approach is that it is flexible, allows efficient policy formulation, and is still subject to public accountability.

The model formed is a combination of the strategic structure of the radio and television legislation and the conditions necessary to properly regulate the solar technology industry. This combination conceptually analyzed for validity and reliability and its positive and negative points are discussed with a view to evaluating its benefits to Canadian legislation.
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CHAPTER I

INTRODUCTION

The objective of this thesis is to develop a legislative model to regulate all aspects of solar technology. The purpose of the model is to protect Canadian sovereignty by inducing self-sufficiency in solar technology in the context of comprehensive energy planning. Thus several arguments will be presented in favour of solar energy regulation.

Regulation in this paper is viewed as serving the strategic purpose of forcing public responsibility and accountability, as opposed to the view that regulation is simply a means of exercising rigid central control. Regulation as a strategy may avoid the pitfall of repressive rules. The model therefore addresses the critical aspects of the industry and does not try to account for all details.

The argument in favour of the regulative system being presented here is that energy as a capital good (as opposed to energy including labour) is becoming a politically critical and scarce commodity in modern western economies. This condition is partly due to the fact that the energy sector is controlled by a very few large corporations, that are becoming more international and less responsible to national, much less regional government concerns. Political control at national or regional levels may thus become subservient to the needs of international corporations.
The development of a regulatory system will proceed by examining the factors that relate to the solar energy industry, isolating the critical ones requiring regulation, and proposing a structure that accounts for them. The format of this investigation will be to deal with a number of questions that are generated when regulation is considered. These questions are: What are the specific characteristics of the technology and the industry that justify its being regulated and have a bearing on what the regulatory model should comprise? What is the behaviour of a firm that is regulated? What is the nature of the oligopolistic firm? How do the conditions of regulated firms differ from those of unregulated oligopolies? What is the state of contemporary legislation which might affect the solar technology industry? How must it be revised to satisfy the requirements of the proposed model? And finally, what should the model be?

The analytic approach used in this thesis has two phases. The first, the information presentation and model building phase has two components. One is the presentation of information derived from investigating the conditions surrounding the solar technology industry. The other is the abstraction of an analogous model from the radio and television legislation, used because of similarities between the technical and political conditions of the two industries.
The second, the evaluative phase, has four components. First is to develop, on the basis of previously presented information, a concise argument for regulative legislation. Second, is to develop a system of objectives which the regulative system should fulfill. Third, is to adapt the regulative model of the radio and television industry to the solar technology industry. Last, is to evaluate whether or not the model fulfills the objectives of the second component.

The two critical factors in this approach are the validity of the analysis of the solar technology industry and the validity of the fit between the model controlling the radio and television industry and the solar technology industry. The validity of the former can only be judged against the comprehensiveness of the sources used and the accuracy with which these sources are presented. The validity of the latter is to be tested by the second phase of the analysis.
SOLAR TECHNOLOGY -
ITS POTENTIAL PRODUCTION AND USE

Solar Conversion Technology has the potential of becoming one of the major sources of primary energy. Solar energy falling upon the earth's surface annually is 28 times the world total supply of fossil fuels. In the temperate zones this is an average of above 1500 BTU's per square foot per day or 21 watt/meter second squared. This is approximately twice the energy needed to heat and cool an average house. In more global terms a major U.S. utility, by converting the energy received on one square mile of ground at a conversion rate of only 4%, could meet its demand to supply almost half a million customers.

The role of solar conversion technology is to capture this massive amount of energy and convert it into a secondary or usable energy source. There are three categories of solar energy conversion technology. They are photovoltaic, active thermal and passive thermal. Photovoltaic has a variation called photogalvanic which is at present embrionic and of little consequence to this thesis. The difference between the three forms is based upon technical differences in the collectors.
Passive Solar

Passive solar is by far the simplest of the three forms. It functions on the basis of direct, as opposed to converted or indirect, use of solar radiation. It gains its name from the fact that it does not actively convert the energy. This is opposed to active solar which may convert the energy many times before it is finally used. The uses of passive solar are limited to space heating and hot water heating. This limitation must not be seen negatively as these two uses account for a significant portion of the total energy consumption.

The concept of a passive solar system consists of the sun's radiation directly heating the air, or a solid mass, or water in a pipe, and by the natural process of convection the air or the water transports the energy either to the place it is used or to a storage facility for later circulation through the system. There are two problematic aspects to passive solar technology. They are the nature of the materials used and the architectural design of the building it is being fitted into. The natural absorptance and reflectance of materials used as well as the flow created by the design of the convection system are the factors that either make the system work or make it fail. The specific technical aspects can best be demonstrated by reference to some examples. Reference will be briefly made to solar stills and to a house built in Colorado.
Solar stills are devices to create distilled water by evaporation and condensation. In solar distillation the solar radiation travels through the glass or plastic that the still is made of and causes evaporation of water in a basin. The water vapour rises and is condensed on the plastic or glass which forms a temperature interface with the ambient air and runs down the glass surface to a collection basin. The important design considerations are the volume of the still, the slope of the glass or plastic, the adsorption and transmission qualities of the glass or plastic, the wettability of the glass or plastic and the deterioration rate of the glass or plastic. The last three factors are important when considering regulation of a technology as there are standards that can be assigned to these qualities.

Space heating in houses is one of the most important applications of passive solar technology. An excellent example is a house built in the Colorado Rockies. The basic concept behind this particular design is a convection passage way which circles the house. On the southern face there is a greenhouse through which the air rises as it is heated. The heated air goes up on the roof and moves down a space between the outside and the inside roofs, falls down the north wall to a crawl space under the floor, across storage rocks and then up again. The house is made of common materials and can accommodate any configuration of living space. This basic concept of convected air (or water)
with a solid mass storage is common to all passive solar space heating. Variations in design are related to aesthetics and relative material costs. Some, however, are more efficient than others. In this example temperatures of 64° F are maintained at an elevation of 7000 feet, with ambient temperatures below zero.  

A critical factor that denotes the success of these passive systems is the efficiency of the heat storage system. Many kinds of materials have been used, such as water, rock, or steel. Whatever the material, the two critical aspects are its mass per unit volume and its heat conductivity or the recoverability of the heat. One study at the jet propulsion lab in Pasadena found these aspects technically complicated by issues such as thermal shock problems and the emergence of multiple optimal operation strategies. Another study by Rockwell International investigated the use of inorganic oxide/hydroxides and found that chemical breakdown and reformation of compounds can function beneficially in the storage process. As passive solar technology develops it will become evident that more complex materials are necessary. As solar technology becomes more important to society these materials will have to be more subject to performance standards.

Active Solar and Photovoltaic

Photothermal and photovoltaic are both active high order solar conversion technologies. They are both indirect because
they convert solar radiation or photons into a different form which then becomes the form of energy used to heat or run things. For instance, photothermal-electric uses a liquid which gains its heat by passing through the collector's heat exchanger to become the primary source of energy. This liquid then heats water into steam driving a turbine to produce electricity which is the secondary energy source. This type of scheme also holds true for solar furnaces and other large scale installations, as well as photovoltaic collector systems. In the case of photovoltaic collector systems photons strike the photosensitive substance exciting the molecules to a higher quantum level, creating the primary source of energy. The excitation of the molecule is dissipated by heat production or electricity production. The electricity production becomes the secondary source which is then used.

Photothermal collectors can be divided into two categories. One is the flat plate collector, the other is the concentrator fitted or focusing collector. Flat plate collectors are comprised of a heat box which is covered by a transparent cover. The back of the heat box if made of a black material of some kind, that absorbs the radiation heating inside of the box. This heat is absorbed by a fluid that passes through tubes placed in this box. The heated fluid is then either stored in some thermal storage mass or is used directly to heat hot water or a room via a heat exchange. Focusing collectors have a
similar basic design but have added a focusing mechanism that concentrates the radiation onto a smaller area, giving higher temperatures. The concentrators can be made either of mirrors or lenses. Concentrators also serve to decrease the amount of radiation that is lost due to reflection. Very high concentrations of energy are gained in this way. In some large scale focusing collectors temperature levels are achieved that allow thermoelectric generation by steam turbines. In the case of solar furnaces, temperatures high enough to melt steel are produced.

The primary problem to be considered when designing solar conversion devices is to increase collector efficiency. Presently efficiencies range between 20% to 50%. In one instance an efficiency of 60% has been attained. Investigators have utilized many factors to achieve this. For instance, designers have contemplated complex optical systems, analyzed absorption characteristics of absorbers, and have calculated thermal sensitivities and refraction indices of materials. From their analyses complex alloys have been produced which have been deposited as thin films using extremely difficult deposition techniques. Extremely delicate technical problems are solved requiring very expensive procedures. In short, solar conversion technology is highly technical, expensive and capital intensive. Solutions to problems related to it are complex and complicated.
Photovoltaic is a technology with similar problems. The photovoltaic response is created by photons striking a molecule and being absorbed by it. The molecule, however, is unstable and returns to a normal state by giving off an electron. The materials that are able to do this are limited in number. They are both organic and inorganic but all are very difficult to manufacture in the quantity and quality required to produce usable energy. The efficiency of the cells can be improved by various chemical and mechanical processes but these too are expensive and difficult to produce. In short, aspects of the production of photovoltaic conversion technology are also difficult to produce, complicated and expensive. Solar conversion technology is far beyond the competence of the average person, hence is the domain of a few highly trained individuals.

Why Regulate?

A characteristic of solar technology that makes it a candidate for regulation is its economic position relative to other sources of energy. As of 1975 solar technology was not very economic. The capital costs for photovoltaic for instance was $100.00 per watt. This compares to $150.00 - $300.00 per kilowatt for thermo-electric. These costs do not include running and maintenance costs which would slightly improve solar energy's relative long-term costs. New production methods are however bringing the costs of solar much lower and much more in
line with other sources. Photovoltaic efficiencies now range from 1 - 3% for Si, C, and 12 - 18% for Si (wafers). These efficiencies are still theoretically low. The theoretical upper limit for inorganic photovoltaic is 23% and much higher for organic. Photothermal on the other hand is expected to be able to attain efficiencies in the 70% range. If the two methods are combined and the photothermal part is run on the energy not used by the photovoltaic part even higher efficiencies are expected to be produced. As this research process progresses the average kilowatt cost of solar are going to decrease drastically.

While the cost of solar are decreasing the cost of other energy sources are increasing. The Science Council of Canada Report #27 suggests that there are no longer any economies of scale to be gained from traditional Canadian energy supplies.

Any demand increases will then be translated into price increases. Projection of demand increases show a 3.5% increase per year up until 2100 by which time it will become zero. In the mean time all projections indicate that both hydroelectric and hydrocarbon supplies are both going to increase in cost at the same rate. The Council predicts that the hydroelectric shortfall will be 20% and that by the year 2001 Canada will become dependent upon foreign oil supplies. The argument then is that solar technology will become a major supplier of energy when the costs of the traditional sources begin to get too high, adding impetus to the growth of the solar technology industry.
Added to this natural tendency of the relative costs of energy becoming more favourable toward solar is the encouragement of solar research by many governments, including the American and Canadian ones. In 1974 the U.S. Government passed legislation committing 600 million dollars of federal funds to the research and development of solar energy technology. A goal of this program is to make solar technology economic enough to be able to supply 10 - 30% of the nation's BTU input by the year 2000 and 50% by 2020. In Canada the Federal Government spent 4.4 million on solar technology research in 1977 and in 1979 the National Research Council spent four hundred thousand. There are numerous other examples spanning the globe from Australia, Japan, France, and Russia. The underlying reason for this effort is primarily political, as nations are becoming more concerned about their level of energy self-sufficiency. Nations that control their energy supplies have a positive bargaining position with nations that do not because now that non labour energy is more prevalent the ability of an economy to function relies upon securing it. Solar supplies are therefore seen as the method of gaining self-sufficiency but this will be so only if a nation is able to guarantee the amount of energy it is able to obtain from solar technology. In other words, it has to be able to guarantee a high standard of technical performance from its solar units at a competitive level with that of other nations. This can only be done by regulating the technology in
terms of both its production and use because of the oligopolistic structure. This need for regulation becomes even more critical if most of the technology is imported. From Canada's point of view this seems likely as the solar energy industry is oligopolistic: it is a highly technical industry that is centrally controlled outside the country and may be supplying a large percentage of the national energy demand.

The Structure of the Industry

Photothermal and photovoltaic are complex technologies. Unlike most other solar technologies, this is not so much in the use as in the production and more particularly in the research required for development. It is the highly capital intensive complexity of the research that is critical to the structure of the industry. The same applies to a lesser extent to production. Silicone wafers, for instance, require a production process that is as delicate and expensive as any other solid state material production. The advantage of pursuing this difficult problem is that there is a possibility of producing a source of energy with few maintenance costs and an extremely long life. Each research breakthrough comes closer to this goal but each step is laborious and small. Because of the slow accumulative progress only those who can finance expensive processes over long periods can stay in it long enough to reap any benefits. Therefore, the economics of development
drastically limit the number of corporations that can be involved and, equally important, those who can stay involved.

At the production level there are economies of scale which are equally highly capital intensive. This will further tend to limit the number of corporations involved in the solar technology industry. The active solar conversion technology industry is therefore the inevitable domain of a very few large scale corporations that can afford the development risks and the production costs.

It can therefore be argued that there is a natural tendency towards market concentration on the supply side of the solar energy market. To bolster this speculation there already seems to be ample evidence that the major energy corporations are going to be the controllers of solar technology. This argument is based upon their present activities within the energy sector.

David Howard Davis in "Energy Politics" argues that energy is a commodity highly related to both power and control in the economic and political senses, and that it is the nature of the energy sector that makes it so. He states that the physical characteristics of the fuel source allows the companies who control them to be of a certain size range.\(^2\) For example, in past decades coal mining was labour intensive, allowing small firms to operate mines. The newer fuel, oil, on the other hand, required a more advanced technology and a greater amount of
capital investment. This required larger, more powerful corporations to develop the resource. Recently, other factors such as geographic location and transportation methods have further promoted this concentration. Added to this is the fact that there are economies of scale in oil transportation; consequently even larger companies result. Generally, the major market forces in the energy sector are towards concentration. Seven of the fifteen largest multinational corporations are oil companies. There is a growing suspicion that these companies use their power to manipulate markets to gain even more control. Studies show that since 1955 there has been an increasing concentration of sellers in the energy sector. Coupled with this concentration is a massive increase in energy prices and profits. As these non-renewable high profit generating supplies become depleted and the demand for energy increases, the oil companies are putting more of the excess capital into the search for alternative supplies. As was pointed out previously, the search for these new sources of energy is expensive and success can come only to those with the capital to be able to take the long-term high risks. The present structure of the international economy is such that it is mainly the oil producers who are in a position to do so. These companies have already diversified into oil shale, coal and uranium, and there is strong evidence they are showing interest in solar.
The question arises as to why the oil companies' investment in solar guarantees they will control solar technology. The answer lies partly in the technical characteristics of the development of solar technology and partly in the structure of the research and development industry. Research and development (R & D) is no longer done by individuals cloistered in laboratories. It has become a highly organized activity designed to cause "the widespread introduction of new machines into society." To accomplish this the organization of the R & D activities must be of a high order. Questions of economics, efficiency, and other organizational goals guide R & D efforts. As a result, productivity with regards to R & D efforts has increased. Solar technology has technical requirements such that only the large corporations have the proper R & D organization to be successful. Therefore, when the combination of large corporations possessing excess capital and highly integrated R & D organizations join in developing a highly technical industry such as solar technology, it is likely that the concentration scenario suggested will develop. A random selection of published research articles show such names as Sandia Laboratories, Exxon and Rockwell International appearing as originators or as the source of funding. There is reason to believe that the supply side of the market will become more concentrated as the world becomes more dependent upon solar technology.
In Canada the existing policy towards solar technology does not seem to have noticed this concentration process and no national effort is being made to counter it. The present situation in solar technology is that the only significant research is being done by large foreign owned Canadian companies. Furthermore, the distributors of solar technology contribute to this concentration by distributing foreign products. A recent article on electric cars lists cars from Italy, the U.S.A., and other nations; but not Canada. In fact, an official of the Canadian Ministry of Energy is quoted as saying he has purchased an Italian car because there is no Canadian initiative in this area. The Canadian effort has been to try to enhance decentralizing characteristics which have in the previous discussion been shown to be non-competitive. For example, 390 million dollars of federal funds were funneled into a program to give small grants of up to tens of thousands of dollars to companies with successful solar designs. The grants were given after the companies had already made a capital outlay. A total of 30,000 grants were made. The result of this form of program is a watering down of the Canadian R & D effort to a non-competitive position, leaving Canadian industry vulnerable to the international market. This effort does not take advantage of any of the conditions previously outlined which favour large corporations. It is this fact that is pivotal to the need for a regulatory model for solar technology.
To summarize, there are political and technical reasons for regulating solar technology. The political reasons are derived from the need for nations to be energy self-sufficient. Contemporary events attest to the social difficulties that can result from not being energy self-sufficient. Self-sufficiency, when applied to solar technology, does not only mean having devices upon the nation's soil. Because of the complexity of the technology it means having some control over the technical standards covering the cost per unit of power as well as conversion efficiencies. Self-sufficiency requires access to replacement parts and control over capital stock turnover. Thus, when the technology is likely to be imported, then regulation is required. Once this political need for regulation is established the technical need becomes evident.
CHAPTER III

THE EXISTING LEGISLATION

The previous chapter argued that a regulative model for solar technology is necessary for political and economic reasons. It is also argued that positive benefits are likely to be gained by regulation. To be discussed is whether or not a regulatory model is currently in place within the existing legislation. If it is, then its adequacy must be considered. If it isn't, then one is required. In either case a thorough analysis of the legislation (both provincial and federal) covering the energy sector must be made. In doing so, two pertinent issues must be investigated. First, (given existing legislation) can a solar technology industry be regulated within the terms discussed previously? Second, what are the jurisdictional boundaries of the hypothetical new legislation?

Federal Legislation

A reading of the legislation covering the energy sector gives an ambiguous understanding of how it functions as a comprehensive regulatory system. A brief historical sketch can shed some light on why this is so. The legislation creating the National Energy Board in 1959 was initiated by the crisis surrounding the building of the Trans Canada Pipeline. The stimulus for the legislation was, 1) charges of profiteering...
in construction, 2) the political climate surrounding the change in federal government, and 3) a general concern about the uncertainty of future oil supplies. Because the legislation was generated by a crisis, its point of view only relates to the one industry involved in the crisis. During debate on the bill, this view was reinforced. One speaker noted that the various types of energy supply have very different characteristics requiring different types of legislation. For this reason he argued the bill should be limited in scope to the type of energy concerned. The result was a bill with wide-ranging, comprehensive intentions, in the sense that it refers to energy in generic terms but with very narrow terms of reference.

Other federal legislation has a similar characteristic. There are implications for a comprehensive regulatory model valid for all energy supply industries; but these fall far short of any comprehensive substance. There are six federal acts concerned with energy in a substantial way, each dealing with a different aspect of the energy sector. The divisions of authority negate the possibility of a comprehensive regulatory structure. For example, one act, "The Resources and Technical Surveys Act 1966-67," deals solely with the right of the Department of Energy, Mines and Resources to do technical surveys. Another example is "The Gas Inspection Act." It states the terms of reference for reading gas meters which are the devices
used to set charges for the use of gas. These acts are so narrowly focused that they are of little value in overall policy development.

An act that demonstrates the notion argued in the Pipeline debate, that each industry in the energy sector is in need of specific regulation, is the "Atomic Energy Control Act".  

This act demonstrates that one single energy industry is so complex and crucial that it requires its own legislation.

The remaining acts are more general, but they still retain the characteristic of relating primarily to one industry. The acts in question are "The Department of Energy, Mines and Resources Act", "The National Energy Board Act" and "The Export and Import Permits Act 1953-1954".

The act respecting the Department of Energy, Mines and Resources is a short one which authorizes the formation of the department. Only one of the five clauses in it is of any significance to solar technology. It is section four, which defines the duties of the minister:

"The duties, powers and functions of the Minister of Energy, Mines and Resources extend to and include all matters over which the Parliament of Canada has jurisdiction, not by law assigned to any other department, branch, or agency of the Government of Canada, relating to
(a) energy, including energy development from water
(b) mines and minerals and other non-renewable resources
(c) technical surveys within the meaning of the resources and technical surveys act relating to any matter other than a matter to which the powers, duties and functions of the minister of the environment extend by law."
What this means is that the federal minister responsible is the Minister of Energy, Mines and Resources and any new legislative structure must be built around that fact.

"The Export and Import Permits Act" has an interesting role that is of value to legislation regulating solar technology. It is an umbrella act that can be applied to any industry as required. It gives the Governor in Council, the authority to create lists of permissible imports or exports categorized either by area or by goods. It further provides that permits to import and export be granted, that regulations pertaining to the permits or lists be made and that offences or penalties be levied. The "National Energy Board Act" adopts these provisions and applies them to the import and export of energy by simply including some of these clauses. The import and export of gas, oil, and electricity is regulated under the specific provisions of the "Energy Board Act". The fact that the "Energy Board Act" has specific import and export provisions to fulfill the intent of the act, sets a precedent for legislation controlling solar technology to do the same. Thus, the role of "The Export and Import Permits Act" in a legislative model is to form an umbrella act that can be used specifically when needed.

The essence of the legislation is contained in clause (5a) which states its purpose as:
To ensure, in accordance with the need of Canada, the best possible supply and distribution of an article, that is scarce in world markets or is subject to governmental controls in the countries of origin or to allocation by intergovernmental arrangement.\(^\text{35}\)

The "National Energy Board Act" is the primary legislation governing the energy sector. It encompasses the largest portion of the energy sector, though from the point of view of solar technology, it has little effect. It is intended to cover the federal jurisdiction within the energy sector, and as such it focuses upon aspects that cross provincial or national boundaries. This translates into jurisdiction over oil and gas pipelines, electricity transmission lines, hauling gas and oil and the rates involved.\(^\text{36}\) The act calls for the establishment of a full-time board which has quasi-judicial powers with the rights and privileges of a Superior Court of Records.\(^\text{37}\) It must therefore follow the rules of that court. This means that its rules are fixed and that any appeal can only be made to the Federal Court of Appeals on matters of legal interpretation.\(^\text{38}\)

The board also has an all inclusive advisory function, which could possibly encompass solar technology. It is expected to research and to report upon the status of the energy sector both within and outside Canada.\(^\text{39}\) What the board does not have is a research capacity. It is only to report upon the research done by others. It is in instances such as this that the comprehensiveness of the energy legislation breaks
down. The specifics of the solar technology industry are such that a narrow advisory capacity is not sufficient to allow for the proper regulation of the industry. Thus, as with nuclear power, the industry needs further specific legislation, if a solar industry is to be coped with.

The Energy Board is also empowered to give licences and certificates dealing with all energy matters in its jurisdictions, to control prices of energy, and to control exports and imports of energy. As well as the previously mentioned powers, it is empowered to hold hearings as a quasi-judicial body.

Licences or certificates are issued by the board under a rigid set of conditions, including an exhaustive list of requirements and procedures. Significantly, the list includes impact analysis requirements and public hearing requirements. In theory the licencing power of the Energy Board is possibly applicable to solar technology regulations. However, the details of the licencing procedure are such that they could not be used for solar technology as they are. Solar technology therefore is not able to be subsumed under this legislation.

The ability of the Energy Board to control prices of energy is tantamount to being able to completely control the market, including price levels, price structure, and price determination methods. Included are conditions of how a tariff is filed for, methods of determining just and reasonable rates, powers to disallow past tariffs, rules against discrimination,
limitations on contracts, and conditions of operation. The level of detail of this section of the act is an important characteristic of this legislation. The point is clearly made that energy is of extreme significance to the nation. Also all of these characteristics apply to solar under a different jurisdictional context.

The difference between the powers of this act and those which should apply to solar technology are that this act regulates energy as a commodity in its own right, and an act to regulate solar technology would regulate the capital stock used to create the energy. Thus, an adaption must be made for this industry.

In summary, the existing federal legislation that regulates the energy sector lays down principles that could be applied to a model to regulate solar technology. The first is that each industry must be treated as a separate entity. There is little possibility of comprehensive legislation to cover all energy sources. The second is that the power to intervene into aspects of the market is required. Thirdly, the power to regulate imports and exports is necessary for the protection in the public interest of any industry dealing with energy. Lastly, the power to issue licences is necessary. Though the existing legislation follows these principles it is not directly applicable to the solar industry. Thus, at the federal level new legislation will be needed following the principles of the existing legislation.
B.C. Provincial Legislation

The provincial legislation is more narrowly oriented than the federal legislation. It deals specifically with energy supplies within the province and has a different degree of detail. To a large extent it functions in a similar manner in the sense that each act is specifically oriented to one industry. Also, most of it was formed under perceived crisis conditions, thus its value to the solar technology industry is more in the formulation of principles of regulation than in its potential as a regulatory device.

There are seven acts that apply to the energy sector within the province. They are: "The Power Act 1955", "The Power Development Act 1961", "The Power Measures Act 1964", "The British Columbia Hydro and Power Authority Act 1964", "The Power Measures Act 1966", "The Ministry of Mines and Petroleum Act 1973", and "The Energy Act 1973". As can be expected, given the motives behind energy legislation, almost all of the legislation pertains to hydro electric energy. B.C., of course, is rich in hydro electric and coal capacity but has little of the other forms of energy. For the sake of simplicity, the first act to be dealt with will be that not dealing with hydro electric power, and then the regulative principles involved in the hydro electric legislation will be investigated.

The "Ministry of Mines and Petroleum Resources Act" is not in substance an act that creates any regulatory structure.
It is an act which sets up the framework, not the content, for a regulatory structure. Section 6 of the act establishes its limits.

"The purpose and function of the ministry are, under the direction of the minister,
(a) to prepare and develop comprehensive policies respecting mineral resources and petroleum resources in the province, and to make reports and recommendations to the minister respecting the implementation of such policies;
(b) to initiate and carry out any investigation, survey, research, study, inquiry, or inventory respecting mineral and petroleum resources, and collect and circulate information acquired thereby;
(c) to administer all acts, and regulations assigned to the minister pursuant to section 5, and discharge such duties as may be assigned to the minister by the Lieutenant-Governor in Council; and
(d) to regulate all mining activity."

The details in the remainder of the act spell out the conditions of entering upon land and the method of becoming an assayer. Other than that no regulations are established. The primary contribution to regulative legislation comes from 6(d). This clause creates a framework for provincial government regulation of resources.

The six remaining acts comprise a series of steps by which the regulation of the electrical generation industry came under the control of the provincial government.

The first act, "The Power Act 1955", was passed to consolidate the electric generation facilities on Vancouver Island. It was done to capture the economies of scale in electrical generation and transmission. This allowed for more standardized
and reliable service for those on the island. It also firmly reinforces the validity of the principle of public regulation of energy supplies for political and economic reasons.

The Power Act created the "British Columbia Power Commission" that was to be an operating corporation. It had very broad powers, including the right to recommend expropriation of any real and personal property that it required in order to carry on its activities. In short, the Power Act established the principle that the stable supply of energy is of primary importance to the society and has priority over other considerations.

The second act, the "Power Development Act 1961" was the act which nationalized the British Columbia Electric Company Limited. This act was a further reaffirmation of the principle of regulating industries within the energy sector by the province. The purpose for the provincial government taking control of the B.C. Electric Company was to enable it to develop the Columbia River. The provincial government required control of this company as part of its negotiation strategy.

Of the remaining acts, two, the "Power Measures Act 1964" and the "Power Measures Act 1966", deal with the relationship of the two government-owned corporations, "B.C. Electric" and the "Power Corporation". They are in essence housekeeping legislation.
The five pieces of legislation thus far referred to set a context within which the regulation of solar technology can be considered. The aspects of that context are that governmental control of energy industries within the province is well-accepted, that governments can intervene in the energy sector for political reasons, and that the supply of energy to the citizens of the province is a matter of great importance.

The two remaining acts define the existing regulatory structure governing the energy sector within B.C. and as such could be of significance to the development of a legislative model to regulate solar technology.

The "British Columbia Hydro and Power Authority Act 1964" brings together the administrative control of hydro electric and other forms of power generation under the auspices of a crown corporation. It was designed to regulate the hydro electric and thermal electric capacity existing at the time of the act's inception. In order to be comprehensive, the drafters of the legislation included within some defined terms all aspects of the energy sector. The comprehensiveness does not in fact follow through to the operational terms in the act. For instance, power is defined as including:

"Energy, light, and heat however developed or provided, and includes electricity and natural, manufactured or mixed gas, or liquefied petroleum gas." 42

From the point of view of this thesis, power produced by solar conversion could be included, but it is not specifically
included. The broad base of this definition is not referred to in any of the functional terms.

The powers given by the act to the Hydro Authority could be assumed to include reference to solar conversion technology. Two of Hydro's powers are:

(a) "to generate, manufacture, distribute, and supply power", and
(b) "to develop power-sites, power projects, and power plants."\(^{43}\)

The twenty-three remaining powers are so heavily biased towards hydro electric and thermal electric that solar conversion is of little explicit significance.

One additional power could extend to solar conversion. Sec. 16(h) "to purchase, lease, or otherwise acquire and project, prolong and renew patents, patent rights, trademarks, designs, licences, franchises, concessions, and to use, exercise, develop, manufacture under grant licences or privileges in respect of those acquisitions and to experiment with, test, and improve any patents, rights, investments, discoveries, processes of information;"\(^{44}\)

In effect, it could be assumed that the corporation is given the authority to function as an agent of the crown in the electrical energy sector. Consequently, it is capable of controlling and hence regulating on the public's behalf solar technology within its jurisdiction.

One significant aspect of this act is that any industrial corporation that generates its own power does not come under the administrative authority of the crown corporation. Because
of this many solar conversion units will probably be outside
the jurisdiction of the crown corporation. Thus, the regula-
tion of the majority of solar conversion units, as well as the
technology itself, could not be accomplished by Hydro's author-
ity.

The remaining act, the "Energy Act of 1973", provides a
more comprehensive regulatory control over all the existing
energy production than any other act. Its purpose is primarily
to control coal, oil and gas supplies. A focal point of the
Energy Act from the point of view of solar conversion technology
is contained in the definitions of "energy resource" and "energy
utility". 45

An energy resource:

includes natural gas and oil, and all other
natural forms of petroleum and hydrocarbons both
gaseous and in liquid form, coal and all other
natural bituminous fuels, electrical power, and all
means of generation of electrical power and all
means by which energy is, or may be generated.

An energy utility:

means a person, including the lessee, trustee
receiver, or liquidator of such person, who owns, or
operates in the province equipment or facilities for
the production, generation, storage, transmission,
sale, delivery, or furnishing of gas, electricity,
steam or any other agency for the production of
light, heat, cold, or power to or for the public or
any corporation for compensation; but "energy
utility" does not include:

(i) a municipality in respect of services fur-
nished by the municipality within its own boundaries;
(ii) a person not otherwise an energy utility who furnishes the service or commodity only to himself, his employees or tenants when such service or commodity is not resold to or used by others;

(iii) any person not otherwise an energy utility who is engaged in the petroleum industry as herein-after defined or in the wellhead production of oil, natural gas or other natural petroleum substances;46

As with the previous act, solar energy could fit within this framework. However, much of the potential production of solar energy falls into categories not covered by this act. Consequently, much of the potential use of solar conversion technology is outside its jurisdiction.

The only other section of the Energy Act which has bearing upon solar conversion technology is in Part II which defines the energy management role of the Energy Commission. In summary, its role is to advise the Lieutenant-Governor in Council on all aspects of the energy sector, both national and international.47 The extent of this role includes "Quality and extent of probable and known energy resources", "measures...considered necessary...in the public interest...to promote discovery, conservation, and prudent use of energy resources", and "the exportation of energy...and the advisability of such exportation having regard to the public interest". Presumably it is within the role of the Energy Commission to advise the Lieutenant-Governor in Council on the need for legislation regarding solar conversion technology and the need for Hydro's
involvement. This role does not assign the Commission the responsibility for research and development, and therefore any work done in this area is presently the choice of Hydro.

The net result of this examination is that neither federal nor provincial legislation accounts for solar conversion technology in any real meaningful sense. Completely new legislation is required in order to properly regulate this technology.
CHAPTER IV

THE RADIO AND TELEVISION REGULATION MODEL:
AN ANALOGY

The prototype model which functions for radio and television is a valuable analogy for solar technology because the two technological forms have generic similarities and the political and administrative issues are closely related. This does not automatically mean that a simple one-to-one relationship exists which would make it possible to insert clauses pertaining to solar technology into the radio and television model. Though the similarities warrant the consideration of the use of this prototype, there are major differences between the two technological forms that would have to be accounted for. These will require changes in the details of the model. For instance, the radio and television model functions solely at the federal level. A solar technology regulatory model would have its main focus at a provincial level, but will have a component of federal legislation as well.

The regulatory structure which oversees the Canadian Broadcasting System can be categorized into two units. One is the technical jurisdiction which comes under the control of the Radio Act. The other is the political, economic or cultural jurisdiction which comes under the control of the Broadcast Act. The
structure that is described by these acts is the result of a long evolutionary process which has included struggles, conflicts and experiments in Canada, as well as in other nations. It is partially on the basis of this evolution that this regulatory structure has a value when applied to solar technology. For that reason it is necessary to present a concise historical overview.

**Technical Aspects**

The first issue that has led to the development of a regulatory structure in most nations has been the technical one. Like solar conversion technology, radio and television technology can best be described as a variety of energy conversion devices. Both radio and television transform light and sound into electromagnetic energy and back again. The electromagnetic radiation is the product of a complicated technology which produces an oscillating electric charge at a certain rate in cycles per second, known as the frequency. This charge generates electromagnetic radiation, known as the signal. This signal has spectral characteristics measured in cycles per second. The regulation of the technical aspects of radio and television focuses on the electromagnetic spectrum but in truth it is the actual hardware which is regulated. Similarly, solar technology is an energy conversion device, which converts radiant energy into another form that is more useful. It also has a
specific electromagnetic response characteristic. This response characteristic can be used in a similar way that the radio and television spectrum is used — as a device in regulating the hardware of solar technology.

The initial reason for regulating the generation of radio and television signals was that the possibility of signals interfering with one another was extremely high. To avert this, technical separation is required. This can be done in terms of frequency, in terms of time or in terms of distance. The need for this form of regulation was illustrated by the different experiences in three nations: Canada, Britain, and the United States. Right from the beginning both Canada and Britain closely controlled electromagnetic technology because of the fear of interference. In the United States, however, the attack on regulation was initially successful and a laissez faire situation existed. It was only a short time, however, before absolute chaos ensued, forcing the formation of the Federal Communications Commission to regulate the industry.

Political Aspects

The political issues in radio and television were intermingled with cultural issues. When radio and television were first developed, great hopes were placed in them. They were deemed to have great educational value, promising to make everyone aware and disseminate culture to all. Later the euphoria
changed to concern. It became evident that they could be propaganda tools misrepresenting education. They were shown to be agents of control of human behaviour.\(^{50}\) The use of the technology became a tool for political proselytization. In Canada the problem of a national identity and the need for programming to reflect the national culture was added to this list of concerns.\(^{51}\) This led to a policy that national identity should be a concern in the broadcast industry.\(^{52}\) Thus, the view that radio and television had a strong political component that necessitated regulation for the purposes of national protection developed.

**Economic Aspects**

The economic issues in the radio and television industry can be divided into macro- and micro-economic issues. The macro-economic issue is the oligopolistic market structure. The micro-economic issues are the existence of economies of scale, a concern for the resource allocation and a concern over capital stock renewal.

Historically the oligopolistic nature of the radio and television markets was related to financing broadcasting systems. In Britain a decision was made to keep the broadcast industry a state monopoly and finance it solely from a fee levied on receiver sets.\(^{53}\) In Canada and the United States the financing was done by advertising, which was the source of
the oligopolistic structure. The existence of advertising as the source of revenue meant that the larger the population viewing or listening, the more the advertiser was willing to pay for the ad. Large national market advertisers soon saw the benefit of widely dispersed ad campaigns as did radio and television owners. A tendency arose for one station owner to try to have as many stations as possible so that they could offer to an advertiser a wide market. From this centralization tendency the networks system was formed. Single station owners soon became disadvantaged, further increasing the tendency towards oligopoly.

Presently, in the United States 60 percent of the programming is done by networks representing national advertisers. There are however strict rules to attempt to control this tendency, stating how many stations can be owned by an individual, where in the country these can be owned, and to what extent networks can force programming choices upon the individual stations. The rules, though well intentioned, are of questionable affect.

In Canada these issues are controlled by the C.R.T.C., which can regulate the quality and quantity of advertising as well as the length, frequency and nature of advertising. The stronger regulations in Canada are more effective and attest to the value of regulation.
Radio and television productions have large economies of scale. Economies of scale are in existence when large-scale production decreases average costs. These economies have functioned within the radio and television industry right from the beginning. In 1926, for example, the C.N.R. found it economic to broadcast music to all its hotels and railway trains via a cable network from one central place. R.C.A., which had begun broadcasting as a way of selling sets, found it more lucrative in the network business and soon dispensed with the ownership of stations and went into it exclusively. Thus, R.C.A. formed the N.B.C.. Networks soon dominated the industry and today they control 60% of the broadcasting time.

The concern over resource allocation and a concern over capital stock renewal is a further issue in this industry. Because it is a restricted market with economies of scale, marginal pricing practices in radio and television cannot be used. Consequently, unregulated pricing procedures will not generate economically efficient price levels. In the long run economic gains will be greater, drawing more resources into the industry than should be as resource allocation is related to long-run gains.

It is within the context of long-term gains being a factor in resource allocation that protection of capital stock becomes an issue. For example, U.H.F. is an expensive television format to initiate. It requires higher towers and more power. At the
original initiation of the format capital stock is very expensive, requiring great expenditure. If a decision was made to initiate it and to phase out V.H.F., a major turn over in capital stock within the industry would take place. This could be accomplished because of the high returns to capital already mentioned. So a decision to allocate industrial resources towards the U.H.F. format away from the V.H.F. format could cause a strain on the industry due to capital replacement costs. Because the industry is controlled outside the nation, due to a lack of local manufacturing, this would cause an export of capital. For this reason the Canadian regulatory agency has, by its licencing procedures, taken control of the resource allocation within the industry. This allows for the protection of the national capital stock that is in the industry.

The last historical aspect related to the development of the Canadian radio and television system is the role of the C.B.C.. As a corporation it has a strategic place in the market that is unique. It functions as part of the regulatory system but was not intentionally developed as a component of it. It was developed due to various historical pressures which became formalized in legislation. In the early 1930's Canada opted for a dual system containing some public and some private stations. This was a compromise solution to the two opposing forces of the day. The value of this dual system is that it gives the potential of the best of both worlds. The state,
through its operation of the C.B.C., can directly act upon its policy towards broadcasting. An example of this is the existence of both a French and an English network regardless of market size. At the same time the private entrepreneurial energies are able to freely function through the non-public stations. Presently, C.B.C. owns 20 percent of all F.M. radio stations, 35 percent of all A.M. stations, 20 percent of all T.V. stations, 20 percent of all T.V. relay stations, and is affiliated to 60 percent of all independent T.V. stations. Of the two T.V. networks, C.B.C. is the largest and is also the only coast-to-coast radio network. This dominant market position gives the state a considerable amount of leverage in the market.

The Radio and Television Regulative Model

The preceding arguments show that major aspects of the radio and television industry are the same as those previously described for the solar technology industry. It is on the basis of this similarity that use can be made of the regulative model controlling the radio and television industry.

The radio and television legislative model is epitomized by its strategic quality. It is not simply a straightforward legislation package that is administered but a legislation package that possesses a complex structure which allow for strategic regulatory decisions to be made. In short, it is flexible and dynamic. A graphic representation of the model is as follows:
The positive value of this strategic approach is partly that it allows the regulatory system flexibility. By being flexible the system can respond effectively to changing conditions within the industry. If it were not flexible, changing conditions would necessitate a change in legislation. This would introduce a lag period and would create counter productive rigidity, ineffectiveness, and possibly confusion. If this were the result of regulation it would undermine the fact that the industry is being regulated for positive reasons, not negative ones.
The quality of the decision made using a strategic approach is a further factor. The information used to make the decision is more valid and more comprehensive. More than one group of professionals investigating an area for different reasons means they act as a check on each other. Also various actors inputting information into the decision making process from various points of view increases the scope of that information.

The strategic quality of the legislation is derived from the fact that it has two components. The first component involves direct statements of regulatory control made by both the Radio Act and the Broadcast Act. The second component involves the fact that there is a crossover between the sections of the act; a crossover which forms a checks and balance system and allows varying ways of accomplishing the same thing. This characteristic takes the form of clauses or powers under one section or jurisdiction which are repeated under another section or jurisdiction.

The direct component of the legislation functions thus: Generally, under the Radio Act permission is granted to possess radio and television equipment for the purpose of broadcasting. Under the Broadcast Act permission is granted to use radio and television equipment for the purposes of broadcasting. Within the Broadcast Act there are three additional levels of regulatory structure. Part One of the act serves the role of overall policy component. This part outlines
the context within which the industry is to be regulated. Part Two of the act states the regulatory function and powers of the C.R.T.C.. This body is very critical in the regulatory model as it has similar authority to the administrators of the Radio Act but a different orientation. Part Three of the Broadcast Act states the terms of incorporation of the C.B.C.. It is the Radio Act in parallel with both Part Two and Part Three of the Broadcast Act (as per the diagram) that forms the strategic quality of this legislation.

The pertinent clauses in both the Radio Act and the Broadcast Act that form the essence of the legislative relationship between the C.R.T.C. and the Radio Act are as follows:

Radio Act:

8-1 the minister—minister of communications—shall make such action as may be necessary to secure, by international regulation or otherwise, the right of her majesty in right of Canada in telecommunications matters and shall consult the Canadian radio-tele­vision and telecommunications commission with respect to all such matters, that, in his opinion, affect or concern broadcasting.

Broadcast Act:

15 Subject to this act and the Radio Act and any directions to the commission issued from time to time by the Governor in Council under the authority of this act the commission shall regulate and supervise all aspects of the Canadian broadcasting system with a view to implementing the broadcasting policy enunciated in section 3 of this act.

21-1 No broadcasting licence shall be issued amended or renewed pursuant to this part unless the minister of communications certifies to the commission that the applicant has satisfied the requirements of the
Radio Act and regulations thereunder and has been or will be issued a technical construction and operating certificate under that act with respect to the radio apparatus that the applicant would be entitled to operate under the broadcasting licence applied for or sought to be amended or renewed and any broadcasting licence issued amended or renewed in contradiction of this section is of no force or affect.

22-2 No broadcasting licence is of any force or effect during any period while the technical construction and operating certificate issued under the Radio Act with respect to the radio apparatus that the holder of the broadcasting licence is entitled to operate thereunder is suspended or revoked.

The pertinent clauses that form the essence of the relationship between the C.R.T.C. and the C.B.C. are as follows:

Broadcast Act:

17-2 The executive committee and the corporation shall, at the request of the corporation, consult with regard to any conditions that the executive committee propose to attach to any broadcasting licence issued or to be issued to the corporation.

17-3 If not withstanding the consultation provided for in subsection 2, the executive committee attaches any condition to a broadcasting licence described in subsection 2 that the corporation is satisfied would unreasonably impede the provision, through the corporation, of the national broadcasting service contemplated by section 3, the corporation may refer the condition to the minister for consideration and the minister, after consultation with the commission and the corporation may give to the executive committee a written directive with respect to the condition and the executive shall comply with such directive.

24-3 Where the commission, after affording to the corporation an opportunity to be heard in connection therewith, is satisfied that the corporation has violated or failed to comply with any condition of a broadcasting licence issued to it. The commission shall forward to the minister a report setting forth the circumstances of the alleged violation or failure the findings of the commission and any observations or
recommendations of the commission in connection therewith, and a copy of the report shall be laid by the minister before parliament within fifteen days after receipt thereof by aim, or if parliament is not then sitting, on any of the first fifteen days next thereafter that parliament is sitting.

39-3 The corporation is bound by part one and two.

When these three entities are taken as a unit, the government has a diverse set of routes it can use to implement policy regarding the communication industry. This gives it wide flexibility in terms of political, economic and social strategy, as well as policy.

Much of the strength of this legislation comes from the cross-over of authorities. Much of what the Minister of Communications can do under the Radio Act can also be done by the C.R.T.C. under the Broadcast Act. The major difference lies in the fact that under the Radio Act no public hearings are required, while under the Broadcast Act these hearings are required. Since the Radio Act has stronger legislation than the Broadcast Act, this cross-over ability allows the government to choose how heavy-handed it wishes to be. An example of this cross-over capacity is contained in the following clauses:

The Broadcast Act:

Section 16-1A

In furtherance of its objectives, the commission on the recommendation of the executive committee, may a. prescribe classes of broadcasting licences.
The Radio Act

Section 4-la

The minister may
a. prescribe classes of licences and of technical construction and operating certificates;

The same capability exists within other roles as well.

Regarding exemptions from the legislation section 17-1e of the Broadcast Act and 3-2 of the Radio Act both allow exemptions. Regarding the right to suspend or revoke licences, Sections 19-1 and 24-1 of the Broadcast Act and 4-1d and 4-2 of the Radio Act allow this right. There are other examples, but stating them would merely be redundant. The argument being made is that because the same regulations can be applied using more than one strategic mechanism, it is possible to regulate much more effectively and, if desired, more completely than if the legislation was applied by a simple application of some rule.

The last part of the regulatory structure is that which defines the role of the C.B.C.. The critical sections of the act are:

39-1 states:

The corporation is established for the purpose of providing the national broadcasting service contemplated by section 3, in accordance with the conditions of any licence or licences issued to 17 by commission and subject to any applicable regulations of the commission, and for that purpose the corporation has power to
## Diagram B

### Radio and Television Regulatory System

#### The Strategic Alternatives

A Representative List of Relative Powers

<table>
<thead>
<tr>
<th>Hard Line Strategy</th>
<th>Diplomatic Strategy</th>
<th>Exemplary Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Makes decisions behind closed doors.</td>
<td>Makes decisions after a public meeting.</td>
<td>Has commanding market position.</td>
</tr>
<tr>
<td>Influence by dictate.</td>
<td>Influence through negotiation.</td>
<td>Influence through competition.</td>
</tr>
</tbody>
</table>

- sets classes of licence
- make exceptions to the act
- sets equipment standards
- sets format regulation and industry capitalization levels
- has power to dictate without recourse
- sets classes of licence
- make exceptions to the act
- can contract for program content and composition
- can set terms of licence
- has power to dictate without recourse
- sets quality and quantity standards
- controls resource allocation by controlling market entry
- regulates ad prices by limiting ad time
f. with the approval of the minister, act as agent for or on behalf of any person in providing broadcasting service to any part of Canada not served by any other licensee

and

39-2 states:

The corporation may within the conditions of any licence or licences issued to it by the commission and subject to any applicable regulations of the commission, act as agent for or on behalf of any minister of the crown or as an agent of her majesty in right of Canada or of any province, in respect of any broadcasting operations that it may be directed by the Governor in Council to carry out, including the provision of an international service.

Thus, the C.B.C. has an exemplary role. It is the government-owned competitor in the market place. As such it can aid the regulatory process by example or by economic competition. To the extent that it has market control because of its market position it can affect the nature of the radio and television industry.

A summary of the regulative model that can be extracted from the radio and television legislation is that the model components allow for three grades of strategy. They are the hard line strategy, the diplomatic strategy and the exemplary strategy. The Radio Act serves as the hard line strategy. It is administrative in nature, with appeal only to the cabinet. The C.R.T.C., as embodied in Part Two of the Broadcast Act, functions through a diplomatic strategy. It must act in public.
Its decisions can be appealed and challenged, first to itself then the Supreme Court and cabinet. This strategy is like a negotiation process. Finally, the C.B.C., as embodied in Part Three of the Broadcast Act, has the function of an exemplary strategy. By setting standards throughout the industry it can pressure the industry into having certain characteristics.
CHAPTER V

A LEGISLATIVE MODEL TO REGULATE
THE SOLAR TECHNOLOGY INDUSTRY

The preceding discussion has outlined both the general characteristics of the strategic model in the radio and television legislation and the conditions surrounding the solar technology industry. This chapter develops a functional model from that discussion.

From the previous discussion it is possible to identify four critical aspects of the solar technology industry. First, is the research, development and manufacture of solar technological devices outside of Canada. These will be produced mainly by multinational corporations and imported. Further, they will, for the present, constitute the overwhelming majority of solar devices used in Canada. Second, is the research development and manufacture of solar technological devices within Canada. Third, is the use by individuals of solar devices. Last, is the collective use of solar devices to generate power for sale. For the present this will be the least common use, but with time it will drastically increase and in fact be the most significant use from the point of view of regulation.
The issue of regulation is the issue of how these aspects of the industry can be dealt with to preserve the political sovereignty of the nation. This necessitates discussion on why the political sovereignty needs to be preserved.

Where economic strength is a requirement for political health and independence, the source of that economic strength has the most critical of political characteristics. Throughout history various commodities have held this position: labour during the Roman times, precious metals during Renaissance times, coal and iron during the Industrial Revolution. Now this position is held by energy in all its forms. The world has moved away from labour intensive economies towards capital intensive economies. Non-human sources of energy have become the critical components of a healthy economy.

Securing this commodity, energy, at a cost that still allows the economy its comparative advantages is of great importance to a nation. Those nations with natural deposits are well-off; those without are not. Because natural occurring energy sources are dwindling, a greater and greater portion of the energy supplied will come from the original source - the sun. Technological development in the solar technology industry, coupled with rising prices in the non-renewable energy industry, will help accelerate this process. Solar, then, will become a major way of securing energy supplies.
Solar technology is a very high order technology. Its development requires that very large amounts of capital be invested in high risk research and development. Thus only large financially solvent corporations can get involved in this activity. Once the capital has been invested and a successful technical breakthrough is accomplished, a continuing advantage accrues to the investor. Further development becomes much safer. The result of this process is that a slow centralization of control within the industry takes place. Thus, the fact that the solar technology industry is a high order technology means world markets will inevitably become oligopolistic, meaning they will be controlled by multinational corporations. Canada, not yet having an active national industry, faces an imported goods market. Hence, internal regulation is necessary to stop external manipulation of the market.

It is also in the nature of the solar technology industry that it is capable of appropriating capital from other energy sources. It is not necessarily clear to a purchaser of energy that long term national advantage is gained when capital is consumed by one industry over another. Therefore, the purchaser maximizes his or her short term unplanned gains and, in the process, misallocates national resources. Regulation is needed then to guarantee proper resource allocation.

Another argument is that regulation is required because existing legislation is inadequate. The present legislation
is organized on an industry by industry basis. As such the solar technology industry was left out of the legislative considerations. Since it was left out, and since it is a definable industry, new legislation is needed, first to cover the ground missed and second, to be consistent with existing legislation.

Accepting then that a regulatory model is required, a set of objectives needs to be formed that will serve as a method of evaluating the model. These objectives should fulfill two requirements: one, a comprehensive or gestalt quality, and two, an analytic quality. From information presented in the previous chapters the following objectives can be described.

The objectives to be fulfilled by the creation of this model can be grouped around two general of comprehensive concepts: one, energy self-sufficiency and two, flexibility of use. The model should contribute to the nation's energy self-sufficiency, and should have a maximum of flexibility allowing the government to respond to changing conditions in the solar technology industry quickly and with ease.

The objectives that form the concept of self-sufficiency are: to protect politically the Canadian solar technology market from the strategic maneuvering of the international oligopolists; to develop a national research and development capability, as well as a production industry; and to enhance balanced comprehensive energy planning.
The first objective, "to protect politically the Canadian solar technology market", has three aspects to it. One is the protection of the solar capital stock by preventing it from being turned over. This means some guarantee that once the capital stock is in place it will not be replaced prematurely. Second is the control of the allocation of national resources into the industry. Third is the protection of industries using solar technology from oligopolistic manipulation, manipulation that would take place by corporations downgrading the efficiency of the imported technology, decreasing the comparative advantage of the national solar technology industry.

The second objective, "to develop a national industry", has two aspects: the necessity of creating a parts industry to maintain imported devices; and the development of a publicly owned research and development component.

The third objective, "to enhance balanced comprehensive energy planning", has three aspects: one, the development of an economic balance between the various sources of supply for energy; two, the creation of price regulation mechanisms which might include subsidies; and three, the possibility of municipal control over installations within its boundaries.

Those objectives that form the concept of flexibility are: to have the same basic regulative structure at all three levels of government; and to have more than one ongoing method of administering the comprehensive legislation.
The objective, "to have the same structure throughout the government levels", suggests that the federal, provincial and municipal components of the model have similar structures.

The objective, to have more than one administrative route, suggests that the government will be able to strategically choose the administrative style that will be most valuable in applying the necessary policy. It will not have to pass new legislation each time the policy changes.

The model that is designed to fulfill these objectives is derived from two sources. The source of its basic configuration is the model previously abstracted from the radio and television legislation. The second, the data presented in the second to fourth chapters, is the source of the content to fill this basic structure. By combining the two sources, a model is created to fulfill the objectives listed.

The model has components at all three levels of government, federal, provincial and municipal. At each level of government the basic three-pronged administrative structure of the radio and television model exists with of course variations to suit the needs of the level of government. The three components are the licencing component (hard line strategy), the regulative and planning component (the diplomatic strategy) and the crown agent (exemplary strategy). This horizontal configuration is broken down vertically into the federal,
<table>
<thead>
<tr>
<th>PART (I) LICENCING COMPONENT</th>
<th>PART (II) SOLAR TECHNOLOGY REGULATORY BOARD (FEDERAL)</th>
<th>PART (III) AGENT OF THE CROWN</th>
</tr>
</thead>
</table>
| Administered by the Energy Minister (appeal only to Cabinet) | Aspects 1) carry out analytic research  
- can advise minister  
- maintain high level of technical understanding  
- negotiate import agreements with importers  
- public hearings  
- require application to import be supported with documentation | - Apply persuasive pressure  
- Carry on R & D  
- Create production capability  
- Contract with solar technology regulatory board (federal) for capital stock maintenance  
- Act in such a way as to counteract reliance on imports  
- Actively trade internationally to keep up expertise  
- Maintain % of local sales volume |

**Aspects**

1) regulate technical standards  
2) set importation conditions and regulations (to protect capital stock)  
- surcharges  
- quotas  
- condition on importers  
- partial Canadian production

**Licences**

1) to produce - maintain technical standards within the province  
2) to use - planning energy consumption  
- a) domestic - simple stamp  
- b) industrial energy impact statement

**Terms of Reference**

- oversee allocation of resources going into solar  
- guarantee use consistent with use of other forms  
- research and advisory capacity  
- powers - set system requirements  
- set output of solar  
- set performance levels  
- set rates  
- set classes of users  
- stop resources being shifted from other areas  
- look for economies of scale within sector

**Solar Energy By-Laws**

- Building codes and zoning  
- Zone for light angles  
- Zone for land use restrictions over major installations, i.e. photothermal furnaces and photothermal electric generation plants

**MUNICIPAL SOLAR DEVELOPMENT AGENCY**

Two aspects

1) municipal development company  
- build and lease solar buildings  
2) municipally controlled solar generation plant

**MUNICIPAL Solar Energy By-Laws**

**FEDERAL Solar Technology Importation Act**

Parts I & II

**PROVINCIAL Solar Energy Regulation Act**

Parts I, II & III
provincial, and municipal levels on two bases: the constitutional divisions of power and the jurisdictional breakdown as stated by the existing legislation.

The licencing or administrative component functions at all three levels of government. At the federal and municipal levels it is the major component.

At the federal level all the regulative component including this one are under one act. The title of the act is "The Solar Technology Importation Act". It has two separate functioning parts and is structured and detailed in such a way that it functions in concert with the Energy Act and not in opposition to it. The act has its emphasis within the administrative or licencing component with the regulative and planning component being independent but still in a supportive role.

The administrative and licencing component or Part I of the act functions as it does in the Radio Act. It is administered by the Energy Minister who has the power to make decisions that can be appealed only to the cabinet. The powers of the minister under this act have two aspects. One is the powers to regulate the technical standards of the technology being imported and the other is to set importation conditions and regulations that are intended to protect the capital stock as well as Canada's economic sovereignty.

The aspect of the act which applies to regulating technical standards includes: efficiency standards of the designs;
efficiency standards of materials; technical materials and systems, such as refraction and reflection standards of surfaces; absorption rates; heat transfer rates; conversion factors; life expectancy and degradation rates; acceptable chemical makeup and absorption quality of fluids; system compatibility with other systems; system completeness; system flexibility; system size and output levels.

The aspect of the act which applies to the economic and political protection of the capital stock includes the setting of surcharges and quotas on individual items to keep their prices in a desirable position in relation to locally produced items. It also includes putting conditions on the variety of products imported by any corporation to stop product differentiation and to protect new Canadian products. Finally, it includes requiring the condition that importers of products maintain a Canadian manufacture site for parts. By placing surcharges and quotas upon individual items the minister will be able to regulate the price structure of the Canadian market. Thus, by setting pricing policies, market forces can be used to direct buying patterns. Similarly, by putting conditions on the variety of products being imported, the product mix of the economy can be regulated. Putting conditions on the manufacturing locations can force some of the "value added" to accrue to Canadian workers.
The legislation at the provincial level is entitled "The Solar Energy Regulation Act". It has three parts and is structured almost identically to that of the radio and television model, each of the three components having almost equal importance. As with the federal level legislation, the administrative and licencing component (also called Part I) functions directly under the provincial Minister of Energy with the same force as in the federal act. The act provides for three kinds of licences to be granted: one is to produce the technology, another is to use it, and a third to sell it.

The granting of a licence to produce the technology allows the government to set the same technological standards upon nationally produced products that it is able to set for imported products. The rationale for the legislation at both levels is the same. Since the degree to which solar sources supply energy is the degree to which other sources do not have to supply energy. To stop a drain on other sources of energy high standards must be maintained in the solar technology industry. This licencing requirement supplies the government leverage to intervene when and as it sees fit.

The granting of a licence to use the technology also has the purpose of planning for energy consumption. It is not so much at the domestic level but at the industrial and commercial level that this would function. Domestic energy consumption is equal to only a small portion (23%) of the total energy demand.
The industrial and commercial consumption is much greater, so it is at industrial and commercial consumption that the legislation should be directed. Because of this fact the licences are divided into two categories. One is the domestic private consumer category, the other is the institutional and industrial category.

The domestic private consumer category requires a very simple set of bureaucratic procedures, that include registering the purchase and installation of solar units. These procedures are designed to keep a record of domestic solar use. This will allow more accurate planning in the energy sector.

The institutional and industrial category requires a more rigorous procedure. The process of receiving a licence is akin to receiving a building permit. The proper allocation of resources and the proper balancing of society's opportunity costs are the principals determining decision to grant or not grant a licence. The industrial and commercial user has to submit details of what energy systems they intend to use, how much they will get from solar and other sources, how all systems will interface and what levels of efficiency they will get. In short, they will have to file what amounts to an energy impact statement. The licence granted would be tantamount to them getting a licence for their entire energy system.

The legislation at the municipal level is termed "Solar Energy By-Law". It is for the purpose of performing administrative
or licencing duties. The power of the municipality to use this by-law to regulate solar technology comes from its jurisdiction over land use within its boundaries. In particular, it is with regards to the building code requirements and zoning requirements. The use of solar technology within a municipality will first of all have to meet building code conditions. This will necessitate the passing of a by-law to change the nature of the building code. This by-law will apply more to active thermal and passive thermal than to photovoltaic. The reason for the building code change is that performance of solar technology is related to construction characteristics and site orientation of the immediate collectors and the supporting structure. This requires building code changes to be regulated.

Zoning, of course, is a very significant issue within the municipality's jurisdiction. The municipality can zone for light angles to regulate the private consumer or zone for land use to regulate major installations such as photothermal furnaces or photothermal electrical generation plants.

The regulative and planning component also functions at all three levels of government. At the federal level the regulative and planning component is Part II of the act, termed the "Solar Technology Advisory Board". Like the C.R.T.C., under the Broadcast Act, it performs a negotiation-like function. Its role is two-fold. First is to carry out analytic research to advise the minister on what regulations to implement. Second
is to act as a negotiating body with importers. Its power is to grant to the importer a licence to import.

Its analytic role includes maintaining a high level of technical understanding with regards to the solar technology industry, the energy sector generally, and the economy. Proper evaluation requires that the board be well versed in all aspects of the energy problem. A part of this analytic role is a testing role to enable it to actually evaluate the specific items involved.

The board grants licences through the process of public hearings. If an importer wishes to enter the Canadian market it will have to make application to the Advisory Board to do so. It must be remembered that the concern is primarily with what will be large scale installations. Only a portion of the solar units will be small individual units, although importers importing these will still have to go through the same process.

The application to the board is in terms of a market analysis justifying the firm's desire to enter the market. It has to present its data and the technical specification of the technology it proposes to import. The board can challenge the firm's case and in the end apply conditions upon the firm's licence. The technical, economic and political terms of reference the board uses are similar to those used in the rigid licencing procedure. The procedure however is different and the result could possibly be different. Being granted an import licence by
the Advisory Board will not however mean the ministerial juris­
diction does not apply. The minister will still have the same
licencing rights, even though he or she may choose to apply
them in an uncritical manner.

It is at the provincial level that the regulative and
planning component functions most strongly. This is because
it is at the provincial government level that (according to
sections 91 and 92 of the B.N.A. Act) constitutional jurisdic­
tion over energy is vested. The component of legislation at
this level will also be Part II and will have a similar con­
figuration to that at the federal level. The characteristics
of the component at this governmental level are two. One is
to oversee the allocation of resources going into the solar
technology industry and the other is to guarantee that the use
of solar technology is consistent with the use of other forms
of energy.

The powers of this board have the force of a Superior Court
of Records. The reason for this is that it gives it quasi­
judicial authority and its decisions can be appealed only to
the Supreme Court of the province or cabinet. The specific
powers will include: setting system requirements, setting out­
put of solar systems, setting levels of performance, setting
rates and setting classes of users to accept those rates. It
also has a research capacity which allows it to advise the
government as well as supply itself with expertise.
Its power to set system requirements in effect gives it the power to make resource allocations. As the energy sector becomes more complicated, the systems which supply energy also become more complicated. By setting system requirements the board can balance how much energy is being supplied by solar, and how much by other sources. This allows it to balance total costs for energy and make sure that a shift towards solar is not taking resources away from other uses that in the long run will be less expensive. It could as well guarantee that resources are only committed when economies of scale or economies of system complexity can be gained. An example could be photovoltaic being allowed to be used only when it is used as a supplement to hydroelectric because of distribution economies in hydroelectric. Another example could be photothermal being allowed to be used only as a supplement to community district heating systems, again because of economies of scale that are gained from district heating. Given the complexity of proper energy planning, the ability to regulate, resource allocation is the only way to be assured of having the industry contribute to making the energy sector cost effective, hence aiding the cause of energy self-sufficiency.

It is with this same intention in mind that the board will be empowered to set output levels for the solar system being licenced and to set levels of performance. The ability to set output levels and to set the levels of performance allows far
more comprehensive planning of the energy system. This will aid the process of stopping energy supply from solar from competing with energy supplies from other sources and instead mix the uses of energy supplies more effectively.

Setting rates is a power that applies exclusively to those operations where energy generated by solar technology is being sold commercially. This power will give to the board control over the allotment of resources the users and producers of solar technology commit to the solar technology industry.

The purpose in being able to set classes of users is also directed to the issue of resource allocation. By prorating the users the board can distinguish a rate structure that makes it more advantageous for some users to use solar over others. If the rationale behind this is related to conditions in the entire energy sector, it can move resources from another industry into solar and vice versa.

Application to this board is made at a public meeting. At that time a full justification for the application has to be presented and subject to challenge. The application is subject to whatever restriction the board places on it when granting it.

The final component of the model is the exemplary component which is fulfilled by the agent of the crown in the form of a crown corporation. This component functions mostly at the level of the provincial government, though there is a minor
component at the municipal level. The reason for this is the jurisdictional arrangements between the governments. Energy as a resource is a provincial matter but by delegation has some focus at the municipal level. There is no component at the federal level because federal legislation only applies when provincial boundaries are crossed and in this case it does not happen.

The specific purpose for having an agent of the crown is to maintain a government position in an oligopolistic market and, by so doing, be able to apply persuasive pressure on the market. It also gives the government access to information about the industry which allows it to regulate the market more effectively.

The terms of reference of the provincial agent of the crown are: to carry on research and development as well as create a production capacity within the solar technology market; to create the capacity to maintain the existing capital stock within the province; to maintain a given percentage of the local B.C. market; and to trade on the international solar technology market.

As the agent of the crown this corporation is given the responsibility of aiding in the development of the nation's self-sufficiency in energy. Since it can be easily speculated that a large proportion of Canada's energy supplies will come from imported solar technology, it is then incumbent upon the agent of the crown to act in a way that counteracts the reliance on imports. Because of the major amount of capital required to do
this, it can only be done by a centralized research and development program followed by the development of a production capability.

The maintenance of the capital stock also is the crown agent's responsibility. The national regulatory body has the power to require that some production of the imported technology be done in Canada. This is to be done to capture value added and to guarantee that the maintenance capacity exists. Any contractual arrangements made by the importation board will accrue to the agent of the crown in the province where the installation is being placed. This is to avoid conflicts of interest with private firms and to help supply funds to carry on the research and development program. The crown agent is not however obligated to enter into losing ventures.

The requirement of the agent of the crown to be able to trade on the international market is a method of checking the corporation's performance. The purpose of the corporation's mandate is to protect the energy sector of the province. Once this protective legislation is in place it can become a cancerous repressive monolith if not kept in check. To avoid this, some method of evaluation is required. There is no better way to do so than to test its performance against the international oligopoly.

Lastly, the requirement to maintain a certain percentage of the B.C. sales volume is designed to have the crown agent
retain a direct influence upon the nature of the B.C. market. This market includes the sale of technology as well as the sale of energy. Just as it is desirable for the corporation to have a major share of the market, it is also desirable for it not to take on monopolistic proportions. For this reason, a percentage is set based on market analysis which will give it influence over the market but not repressive influence.

The agent of the crown functioning at the municipal level has two aspects. One is a municipally controlled development company, the other is a municipally controlled solar energy generation plant. For the municipality to promote the use of solar technology it may have to prove its use by a solar development of its own. Similarly, the economies of a centralized solar unit may be such that only by the municipality owning it can it function. The legislation is designed to allow this.

This then completes the meshing of the information presented on the solar technology industry with the legislative model used to regulate the radio and television industry. The next step in creating a regulative model for the solar technology industry is to compare this result to the objectives, and then to revise it if this is necessary.

First, let us consider the concept of self-sufficiency. The first of those objectives grouped around this concept is the political protection from international oligopolistic
### TABLE D

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Federal</th>
<th>Provincial</th>
<th>Municipal</th>
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<tbody>
<tr>
<td><strong>I. Self-sufficiency</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Politically protect solar market</td>
<td></td>
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</tr>
<tr>
<td>1. prevent capital stock turnover</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>2. control allocation of resources</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>3. stop oligoplistic manipulation</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>B. National R &amp; D and production capacity</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>1. parts industry</td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>2. public R &amp; D</td>
<td></td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>C. Enhance balanced energy planning</td>
<td></td>
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<tr>
<td>1. balance sources of supply</td>
<td>✓</td>
<td>✓</td>
<td></td>
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<tr>
<td>2. price regulation</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>3. municipal control of installations within boundaries</td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td><strong>II. Flexibility</strong></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>A. Have same structure at various levels of government</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>B. One or more ongoing methods of regulation</td>
<td>✓</td>
<td>✓</td>
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</table>
markets. This objective has a number of aspects to it, the first being to protect the capital stock by preventing capital stock turnover. This objective is primarily served by federal legislation. Both components, at this level, have characteristics that can prevent the turnover of the capital stock. The administrative licencing component can set technical and other conditions upon the importer by guaranteeing a set life span and by requiring Canadian production of replacement units. It can simply stop the import of units or set surcharges on units designed to force a turnover in the stock without adding technical improvements. The advisory board can accomplish similar results through its negotiation process. The conditions it sets upon the importer can be directed towards that same goal.

To a lesser extent the provincial legislation fulfills this objective. The energy impact statement will require statements about life span of the capital stock and other such characteristics. By doing so it also can be used to control the capital stock turnover.

The second aspect of this objective is the proper allocation of resources. This aspect is fulfilled partially by the federal legislation, but more completely by the first two components of the provincial legislation. The proper allocation of resources essentially means using resources where they are most beneficial to the society. In terms of energy this means the most efficient use of the energy supplies. At the federal
level, the advisory board will aid in fulfilling this objective. The fact that an energy impact statement has to be filed means a thorough economic analysis will be compiled. The effects will be a resource allocation analysis.

The strong legislation exists at the provincial level. At this level the decision to use or not to use is made. Based on extensive and comprehensive analysis, the provincial licencing component and the advisory board will decide which project will be undertaken and which will not. By doing this they will be allotting resources into or away from the solar technology industry. The crown corporation can be used when the allocation problem is due to a lack of interest.

The third aspect of this objective is the protection against oligopolistic manipulation of an industry's comparative advantage. This is accomplished by two parts of the model. The first is the administrative and licencing component at the federal level. This component can guarantee the efficiency standards of the technology being imported. Thus, it can guarantee a high quality. The second part of the model is the agent of the crown at the provincial level. By its involvement in the international market it will have access to the standards of the world. Thus, it will be producing to these standards. By doing this it will guarantee production of high efficiency technology for the Canadian market.
The second objective of those grouped around the concept of self-sufficiency is the development of a national research and development and production sector. This objective is fulfilled by the model through legislation at both the federal and provincial levels. It is within the powers of the federal licencing component to require that production of units or parts be done in Canada. This fact will allow a guarantee of the existence of a viable production industry. The role of the provincial crown corporation will also be to try to directly fulfill this objective. Since a production industry will accrue to this corporation, it will already have a base upon which to build itself. Since economies of scale and access to capital are the critical factors in this industry, both are being supplied within the context of the model.

The third objective of those grouped around the concept of self-sufficiency is to allow for comprehensive energy planning. The first aspect of this objective is to allow for an economic balance between energy sources. This aspect is primarily fulfilled by the legislation at the provincial level with some support from the other levels. The requirement within both levels of legislation for an energy impact statement will include a statement of the interrelationships between energy sources. This statement will generate a fair degree of analysis about this issue and be the basis of a decision. At the municipal level, the legislation is weak in fulfilling this objective,
but will be partially fulfilled through the use of the building code, zoning requirements and any project embarked upon by the municipality.

The second aspect of this objective is the introduction of regulative pricing mechanisms. All parts of the model can have some effect upon the fulfillment of this objective but it is primarily the provincial regulative planning component and the federal administrative and licencing component that will be the most useful. The provincial component clearly has the power to fulfill specifically this objective. The federal administrators can, by levying surcharges, also affect the pricing structure. All other parts of the model will have spinoff effects which will act as pricing mechanisms, but they will be peripheral.

The last aspect of this objective is that there be some degree of municipal control. This objective is directly and precisely satisfied by the legislation pertaining to the municipal level. The by-laws and the municipal corporation give the municipality a significant degree of control over the regulation of solar technology within its jurisdiction.

The final concept to be considered is that of the flexibility of the model. This concept has two objectives grouped around it. The first is that the model should have more than one ongoing administrative structure that could be used. The second is that it should have the same basic structure at all levels of government.
The first objective is fulfilled by the use of the radio and television model as an analogy. In the form for solar technology the three components function separately and, in fact, seem at times to be in conflict. The conflict is only apparent, however, because in the legislation it can be simply stated which components hold precedence. In the model there is a difference in method in each component, even if the content overlaps. This means that the government can choose which component it will stress in its regulatory strategy and therefore get the appropriate results.

The second objective is also fulfilled by the final version of the model. Each level of government clearly has either two or three components to its legislation. This characteristic allows some change in focus between levels of government, but not as much as between components.

In conclusion, it can be said that the model that was developed more than satisfied the objectives it was meant to satisfy.
CHAPTER VI

CONCLUSIONS

In conclusion comment is required on the general value of
the strategic approach, and on its limitations.

The strategic approach can be seen as a synthesis of the
corporate and democratic philisophic outlooks.

The corporate outlook, as represented by Nietzsche and
others, stressed running society efficiently. Quick, firm de-
cision-making was important, as was the ability to respond im-
mediately to changing conditions.

The democratic outlook stresses consultation with all. In
this view the best decision was the decision arrived at by uni-
versal agreement. Every person had the right to be heard and to
be a part of the decision.

The strategic approach combines these tendencies, allowing
as much consultation as needed to respond quickly to changing
conditions, and yet arrive efficiently at a decision.

In the model proposed, the democratic aspect is partially
satisfied by the decision-makers being answerable indirectly to
the people through their elected officials. The efficiency as-
pect is partially satisfied by the fact that the decisions are
being made by people who are knowledgeable in the field. Thus
neither time nor energy is wasted but decision-makers are being
held accountable.
In addition the strategic approach accounts for a wide variety of opinions from almost all possible sources and jurisdictions. Similar decisions being made by various groups at all three governmental levels allows for a "checks and balances system".

The groups represented by each of the squares of the model will all tend to see the industry differently. As each group has input most of the possible varieties of opinion can be accounted for. At the same time this opinion will be expressed by knowledgeable and politically sensitive people. Thus the opposing opinions will likely be concise, accurate and valid, balancing each other.

A further positive characteristic is that the government can decide how much or how little discussion it feels is necessary in reaching a decision. If it feels a policy will receive almost universal acceptance, or if it simply wishes no discussion, it can focus the decision-making tendency on the hard line strategy. If, however, informed public debate is a political necessity it can use the diplomatic strategy. If both of these are impractical, and an educational strategy is required it can use the exemplary strategy. The positive value of the ability to do all this is that the choice of strategies is a democratically motivated political choice that does not required drawn out legislative activity and can be put in motion quickly using highly informed and reliable individuals.
This positive view of the strategic approach must be tempered by comment on its limitation. The first limitation is that the model is based upon an uncertain scenario. The scenario is predicated upon four assumptions: that energy is going to be the singly most important international political issue of the future; that energy self-sufficiency is the most viable policy; that solar energy is going to play a major part in the attainment of self-sufficiency; and that international oligopoly will control the solar technology industry. The evidence in favour of this scenario is strong. However there is always a possibility the scenario is incorrect. All that is necessary to severely interfere with the model is that one of the assumptions prove to be incorrect. If this were to be true then the value of the model would have to be questioned.

A second limitation is the uncertainty of the size and nature of the bureaucracy. It may be that a large complicated bureaucracy will be needed to handle the complexity of the solar technology industry. If this were the case there may not be any net gain from regulating the industry. The costs of regulating may be greater than the costs of not regulating.

This also holds for the role the bureaucracy plays. In all political activity the theoretical power structure and the actual power structure are seldom the same due to individual strengths and weaknesses of the actors. Individuals could manipulate each of the regulatory bodies into being more or less
powerful than intended. In either case the intent of the model would be undermined. If this were to happen the costs of regulating may again be greater than the costs of not regulating.

A third limitation is the requirement that three levels of government be involved. All of the seven components are able to stand independently from the rest and survive. But if the objectives of the model are to be satisfied an absolute minimum of one federal and one provincial component must be in existence.

Even so for a reasonable possibility that the objectives will be met the hard line and diplomatic components for the federal and provincial levels will have to be in place. This requires intergovernmental cooperation to a degree that is seldom witnessed in Canada. The likelihood of such cooperation is not remote, but is definitely uncertain.

A fourth limitation is that the resources of some parts of the country may not be able to support the capital outlay required to set up the exemplary component at the provincial level. Unfortunately it is these areas that stand to gain the most from this legislation. These are the areas where resources are so limited that their misallocation is critical. In this situation the model takes on the character of a device designed to make certain that those who have wealth keep it, while those who haven't continue to do without. This is certainly not the intent of the model, and would be an unfortunate result of
implementing it. The solution to this negative effect is however outside the scope of this model and must be left to chance.

A fifth limitation is the uncertainty of how other industries within the energy sector are going to affect the solar technology industry. The intent of the model is to contribute to comprehensive energy planning, but the model only encompasses a small portion of the entire sector. Other industries are regulated to greater or lesser degrees. Yet unless regulation of these industries is coordinated with regulation of the solar technology industry, both systems may function at cross purposes. If this were to happen it would drastically decrease the effectiveness of the solar technology regulatory system.

A last limitation is that the complexity of the regulatory structure designed to create flexibility could create confusion, and render the structure useless. As was stated in another context the theoretical and the real power structures seldom coincide. Power struggles between groups within the regulatory structure could lead to groups working at cross purposes. This could be manifested as uncertainty on the part of groups as to what their powers and authority are, and conflicting pressures upon the industry due to groups struggling against each other for dominance. In either of these cases effective regulation would cease. In all likelihood the industry would find itself
operating under the burden of repressive regulation, the exact thing the strategic approach was meant to avoid.

In conclusion, though these limitations are possible, real world limitations, there is a characteristic of the real world which lessens their disruptiveness. That is that humans are adaptable. If society sees value in retaining this model, ways will be found of either adapting the behaviour that is interfering with its effectiveness, or adapting the model. The model presented is in fact only a prototype. It is not known how many permutations it has. Thus it is likely that its limitations, though serious, will not be critical.
FOOTNOTES

6. "Don't Build a House Till You've Looked at This". p. 100.
9. "Storage of Solar Energy by Inorganic Oxide/Hydroxides".
13. Ibid. p. 528.
18. Ibid. p. 337.
26. Capital stock turnover is the period of time it takes for the capital stock to be entirely replaced by new equipment.
34. Statutes of Canada. E-17.
36. Canadian Statutes.
42. British Columbia Statutes. Chapter 7. Section 2.
43. British Columbia Statutes. Chapter 7. Section 14-1(1) & (b).
44. British Columbia Statutes. Chapter 7: Section 16.
46. Ibid.
50. Radio and Television Communication. p. 79.
54. Radio and Television Communication. p. 36.
57. Telecommunication for Canada. p. 159.
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