TOWARDS THE ELECTRICAL ECONOMY

An Industrial Strategy for the Electrical Industry in the 1980's

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TOWARDS THE ELECTRICAL ECONOMY:

AN INDUSTRIAL STRATEGY FOR THE ELECTRICAL INDUSTRY IN THE 1980's

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PART ONE

THE STRATEGIC: FRAMEWORK LINKING ENERGY AND INDUSTRIAL POLICY

TOWARDS THE ELECTRICAL ECONOMY:
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INTRODUCTION

The electrical equipment manufacturing sector will occupy a more strategic position in Canada's industrial and social evolution as the world moves towards a more electricity-intensive future.

There are strong links between energy availability and price and the directions and pace of economic growth. The widespread availability and low cost of first coal and then oil fuelled the industrial revolution and contributed substantially to the spawning of the technologies that account for our present high level of material well-being.

It is now clear that the petroleum era is coming slowly to an end. The global community is responding to the imperatives of this situation by expanding efforts to bring on stream new sources and forms of energy supply.

It is less readily perceived that as the momentum of this "Energy Transition" picks up, oil-based technologies will be replaced as the source of future industrial growth by the technologies of the post-petroleum era. In simple terms, these technologies will be either gas or electricity-dependent. (Solar or renewable energy options produce much of their energy as either gas or electricity with the balance being a direct conversion to heat.) Each of these principal energy systems will lead to a unique stream of industrial development options. Thus, in the same degree to which electricity becomes a more dominant energy form, electricity dependent technologies and products appear destined to become the basis upon which the industrial systems of the future will be built.

Canada's ability to fully capture the potential for industrial development inherent in the movement towards a more electricity intensive future will depend almost entirely on the performance of the electrical manufacturing sector over the course of the coming decade.

Part One of this paper reviews the pressures bringing about these changes in the sources of industrial opportunity. It explains why electricity is expected to grow in importance first as an energy form and second as the motive force driving the dominant technologies of the future. It outlines, in the context of this movement towards "The Electrical Economy", possible elements of an electricity-driven industrial strategy in which a growing portion of Canadian industrial activity will rely on the existence of a strong electrical products manufacturing sector.

Paradoxically, the 1980's are expected to witness a slower rate of growth in the domestic market for electrical products than indicated by longer term trends. This is particularly the case for electricity generating and transmitting equipment. At the same time, competition in both the domestic and international markets is expected to toughen. Thus, while entering the 1980's with significant areas of strength, Canadian industry cannot stand pat if it is to meet the challenge which these changing circumstances imply.

Consequently, in Part Two, the paper outlines the factors constraining industry growth in the short and medium term. It sets out the elements of a broad policy thrust that will help overcome these constraints by encouraging the industry in a continuing process of specialization and consolidation to achieve more competitive production capabilities, stronger firms and a more progressive technological base. In the longer term, it is hoped that these initiatives will ensure the continued development of a manufacturing infrastructure capable of competing for an acceptable share of the opportunities implicit in the expected shift to more electricity- intensive industrial systems and life-styles.

A summary of the main points and key policy concerns is provided in Part Three.

It should be noted that the report deals with these issues from a national perspective. Given the diversity of energy and industrial systems across the country it would be surprising indeed if the analysis and prescriptions were found to apply uniformly in all regions. Nevertheless, it is hoped that the paper will serve as a useful starting point for a coordinated discussion of these important dimensions of industrial policy.

The position of electricity in the national or regional economies over the next decade will be largely determined by the mix of energy policies adopted by the federal and provincial governments. The discussion of energy policy issues in this paper is cast in the framework of the National Energy Program (NEP) announced by the Government of Canada in October 1980.

The NEP is primarily a strategy document for dealing with the questions of oil supply and price: it does not contain extensive analysis of electrical energy policy options. A full discussion of these issues must await completion of the government's nuclear power review. Consequently, the analysis of energy policy alternatives in this paper is not complete. As well, discussion is limited to non-nuclear development options.

The NEP does, however, establish price levels for oil and gas for the next decade thus providing a basis for comparing the relative competitiveness of electricity prices over time. An appraisal of these price relationships is found in Part Two in the section on "Electricity Demand and the Domestic Electrical Equipment Market".

PART ONE

THE STRATEGIC: FRAMEWORK LINKING ENERGY AND INDUSTRIAL POLICY

PART ONE

THE STRATEGIC FRAMEWORK: LINKING ENERGY AND INDUSTRIAL POLICY

1. THE CANADIAN ELECTRICAL INDUSTRY

The Canadian electrical industry manufactures products which generate, transmit, store and use electricity. The industry commonly is broken into six subsectors: industrial electrical equipment (i.e. power generation and transmission, plus heavy electrical industrial applications); wire and cable; major household appliances (refrigerators, stoves, etc.); small appliances; batteries; and miscellaneous products. A brief discussion of the past performance and prospects of each of these subsectors is contained in Annex A. For policy purposes, however, it is more convenient to think in terms of two subsectors: those that produce the equipment required to generate and distribute electricity and those that manufacture products that use electricity. Because of an overlap in both production technologies and company sourcing, heavy electrical industrial equipment is included in the generating and distribution grouping.

In relationship to other Canadian manufacturing sectors, the electrical industry, with shipments in 1979 of $3.9 billion, ranks in size behind automotive and machinery, and on par with clothing and textiles. As an employer, the industry is about the sixth largest with 70,000 employees. Canadian firms have also developed several areas of internationally recognized competence. Canada is a world leader in the production of hydraulic generators, turbines, long distance high voltage transmission lines, large motors and control systems, and variable speed coordinated drive systems.

The electrical sector has been an important part of the Canadian industrial fabric since the turn of the century. The first major power development began in 1904 when five, 7500 KW generating units were installed at Niagara Falls. In this same period, the mining and pulp and paper industries began construction of several hydro stations in northern Ontario. Large scale industrial applications of electricity quickly followed. For example, the first completely electrically operated steel mill in the world was built for The Steel Company of Canada in 1912. In 1913, the first reversing mine hoist to be built in Canada was installed.

Consumer products began to come into commercial production between the two World Wars. The manufacture of incandescent lamps started in 1920, and the first electric range, basically a Canadian invention, was built in 1921. Refrigerators followed in 1932 and electric washing machines in 1934.

The electrical industry has made particularly rapid progress in the last 30 years. In the period from the end of W.W. II until the mid 1970's, electricity demand grew at an average rate of approximately 6% per year. Electricity use now accounts for around 17% of total secondary energy consumption and 35% of primary consumption. In comparative terms, Canadians are large users of electricity. Despite its relatively small population, Canada has the fifth largest installed generating capacity and, until recently, led the industrialized world in the degree of national reliance on electricity measured as a percentage of primary energy consumption.

This strong emphasis on the role of electricity in energy planning created conditions favourable to the growth of a substantial domestic industry and conferred competitive advantage on Canadian manufacturers in many product lines.

Together with protective tariffs and other government incentives, the growth in electricity demand also helped shape the structure of the electrical manufacturing sector in Canada. This combination of factors created a sufficiently attractive investment climate to entice many Multi-National Eterprises (MNE's) to establish susidiary companys in Canada and allowed generally small scale, fragmented manufacturing plants and firms to cater exclusively to the domestic market and still prosper.

Despite these structural characteristics, the industry has been a mature, stable contributor to Canadian industrial and social development. The exploitation of hydro electric potential at Churchill Falls, Kitimat, the Columbia River and James Bay, and the development of the CANDU nuclear reactor are among the nation's most impressive engineering accomplishments. On a more subtle plane, the growing sophistication of end use applications of electricity has proven essential to the evolution of our modern society.

Electricity is the world's most flexible energy form. It can be adapted to meet almost all of society's energy needs. Its full range of potential applications remains to be tapped. Nevertheless, electricity use has now reached a point in Canada where, in addition to directly providing motive power, heat and light, it facilitates our ability to utilize most other energy forms. Oil burners, for example, require electric motors and are controlled by electric thermostats; gas powered automobiles require batteries. The availability and use of electricity is critical to the operation of present day society and the strategic role of electrical products in future industrial and social development is expected to grow.

A. Recent Industry Performance and Trends

Over the last several decades the output of the electrical sector has grown at slightly below GNP. In the last three years, in conditions of slower economic growth, the industry has surpassed previous performance levels (see Table 1). This trend is partly attributable to high rates of electrical utility construction,

productivity gains accompanying several private sector initatives to rationalize production and dramatic export growth in 1979 that appears to be due to the drop in the value of the Canadian dollar.

TABLE 1

ELECTRICAL SECTOR PERFORMANCE 1971-1979

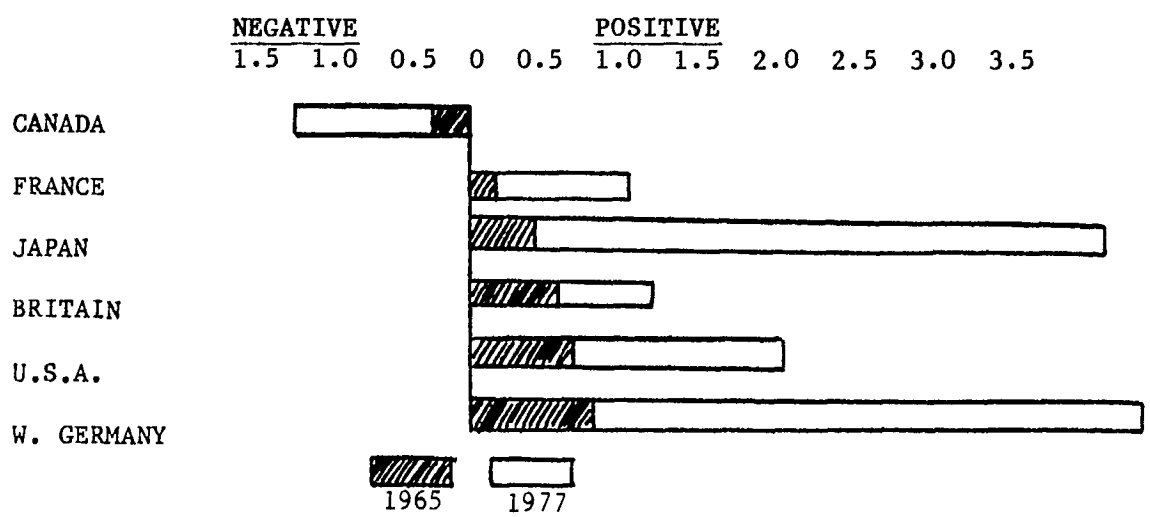
	$ Millions 1977 constant			Average Annual Growth Rate (AAGR) %		
	1971	1975	1979	1971-1975	1975-1979	1971-79
Domestic Market	3714	4312	4878	3.8	3.2	3.5
Shipments	3166	3480	3902	2.4	2.9	2.7
Exports	258	300	512	3.8	14.3	8.9
Imports	806	1132	1488	8.9	7.1	8.0
Shipments/Dom. Market (%)	85%	81.0	80.0			
Employees	70,900	76,800	69,400			

Despite this record of solid achievement, domestic market growth tended to outpace production in the 1970's. In real terms, Canada's trade deficit in electrical products doubled over the last seven years. Nor has the Canadian industry kept pace with other OECD producers. Canada's deteriorating trade balance contrasts sharply with the performance of its main competitors (Figure 1).

FIGURE 1

OECD PRODUCERS

TRADE BALANCES IN $ BILLIONS U.S. CURRENT



In the absence of appropriate private sector initiatives and effective policy intervention by governments, departmental forecasts anticipate a flattening of growth rates and a trade deficit of $1.5 billion by 1985. (Table 2)

TABLE 2

ELECTRICAL SECTOR FORECAST: 1979-85

	$ Millions 1977 constant		AAGR %
	1979	1985	1979-85
Domestic Market	4878	5927	3.3
Shipments	3902	4446	2.2
Shipments/ Dom. Market(%)	80%	75%	

A variety of factors can be identified which, in combination, account for these trends. These factors are the focus of the detailed policy initiatives discussed in Part Two. Briefly, however, and of central importance is a slow-down in the rate of growth of domestic electricity demand. This is seen as a short-term anomaly resulting from a combination of factors (slower economic growth, conservation efforts and pricing decisions that encourage gas consumption). Nevertheless, this hiatus in demand is expected to severely limit domestic market growth for the electricity generating and distribution industry throughout the 1980's and it could also curb the growth of output of consumer products. Moreover, this slowdown in demand comes at a time when the position of electricity in national energy planning is undergoing significant changes world-wide. Table 3 provides evidence suggesting that competitor countries are moving more rapidly than Canada to substitute electricity for other energy forms. Indeed, as will be discussed below, slower growth in electricity demand could rob Canadian industry of the past momentum provided by strong domestic incentives to use electricity. In contrast, foreign competitors could gain significant competitive advantages over Canadian suppliers as a result of ready access to larger and more rapidly growing domestic markets.

TABLE 3

Estimated Share of Total Primary Energy Consumption Allocated to Generation of Electricity

	Percentage		
	1970	1980	1990
Japan	34	37	39
E. Germany	24	29	31
W. Germany	27	36	42
USSR	25	31	38
Sweden	31	45	52
Italy	19	24	26
France	23	26	30
U.K.	28	31	36
USA	27	35	43
Canada	35	39	42

Source: Predicasts Inc. 1977

As well, in comparison with firms in competitor nations, the Canadian industry does not appear to be active enough in the area of technological innovation. Structural characteristics of the Canadian industry also militate against success. Competitive advantage is increasingly being conferred on large scale, technologically advanced corporations which produce and market electrical products on a world-wide basis. In contrast, the Canadian industry is generally smaller in scale, more fragmented, foreign controlled and domestically oriented.

International competition is also fierce and marked by restrictive trading practices on the part of both foreign governments and MNE's. This is particularly the case in situations involving the sale of power generation and distribution equipment. Competitor governments generally provide extensive market support for their national electrical "champions". Access to the domestic markets of other industrialized countries is severely limited: subsidized exports are common. Moreover, in addition to acting as agents for the attainment of the industrial development objectives of their home governments, the dominant MNE's frequently act in concert to control international market access. These international market traits contribute substantially to Canada's negative trade balance in heavy electrical equipment. Their significance could be enhanced as a result of the conclusion of the Multilateral Trade Negotiations (MTN) which leaves Canadian industry more exposed to the rigours of international competition.

Despite these problems, there are encouraging signs of a growing commitment across all sub-sectors of the industry in favour of product rationalization and export promotion. In the major appliance

sub-sector, for example, industry rationalization in the last few years has provided the base for a more competitive industry and the prospect of better export performance in the future. As discussed below, this type of initiative is critically important if Canada is to fully benefit from longer term opportunities for promoting electricity-based industrial development.

2. A NEW PERSPECTIVE ON INDUSTRIAL OPPORTUNITY

The past performance of the electrical industry is only a partial guide to its ability to contribute to continued national growth because of impending changes in the role of electricity. The world is being rapidly propelled towards an electrical future. Over the course of the next 50 years, or less, the global economy must shift from prime reliance on conventional oil and natural gas to greater reliance on a dramatically expanded capacity to generate supplies of electricity. Thus, the potential scale of electricity-based industrial opportunity is not captured by the projections in Table 3. Nor can a time horizon to 1985 serve to adequately define a set of government policy parameters. Policy intiatives aimed narrowly at tackling the type of constraints to sector growth listed above would address only a portion of the issues of relevance to the industry. An industrial strategy for the electrical sector should be cast in terms that reflect the significance of this "Energy Transition."

1) The Energy Transition

Despite recent fears to the contrary, there are encouraging signs that, over the long term, the global supply of energy can be expanded far beyond current levels - 10 to 15 times higher than the 1975 level according to a recent OECD report, with electricity taking on a growing strategic importance as the world's dominant energy form.* However, in the near term, energy supply is far less certain and long-term energy abundance will only follow a difficult transition period during which the change from oil and natural gas use must be made.

The transition is expected to be marked by steady increases in the real price of energy and a slower pace of economic growth. Price increases will likely taper off when new energy technologies are eventually put in place, but at levels perhaps two or three times present prices. The pressure for higher prices will vary between energy forms with oil and gas probably accelerating faster than electricity (hydro/nuclear). Thus, at some indeterminate point during the transition period, but thought to be quite close, a market advantage will likely be conferred on electricity. This will probably occur first on a regional basis and become more general over time. The rate of change will vary somewhat between countries in accordance with their domestic energy supply potentials.

The likelihood of social, political and economic instability will be greatly increased during this transition period because of global and regional energy imbalances, consequent inequities in the imposition of cost increases and tensions associated with the growing vulnerability of energy deficient countries to supply interuptions.

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* Interfutures OECD, Paris 1979.

The high degree of uncertainty created by these circumstances has made the objective of energy self-sufficiency a national imperative for most industrialized countries. Electricity fits neatly into this framework as most industrialized countries have the capacity to expand electricity supply while relying heavily on domestic resources.

ii) Linking Energy and Industrial Policy During the "Transition"

Energy has always been the elixir of growth. Historically its availability and price have conditioned the pace of economic and social development. Of equal importance, the forms in which energy is made available have largely determined the technologies upon which societies are based and thus have strongly influenced patterns of growth. It follows that the directions of future industrial growth will reflect changing patterns of energy supply. Thus, if electricity becomes the dominant energy form of the future, the ability to exploit opportunities for growth will fall disproportionately to those countries which most successfully adapt their industrial systems to the efficient use of electricity and which secure an international comparative advantage in manufacturing electricity consuming products.

This means that the electrical industry will become a more important source of industrial growth as the demand for its products increases. It will also be a more significant contributor to the efficiency and productivity of other sectors as it becomes a key supplier of advanced equipment and material inputs for most manufacturing processes. The sector could also become the focus of a much expanded R&D effort as it becomes a central actor in bringing about industrial and social innovation. Electricity price and supply issues will become basic determinants of international competitiveness and growing national commitments to domestic electricity generating and equipment supply industries could accentuate the present high degree of government participation in international electrical markets.

These points serve to emphasize that national industrial policy and energy policy must be tightly linked if Canada is to reap maximum economic and social benefit from the coming energy transition. If it is concluded that electricity-based technololgies should play a more strategic role in patterns of future economic growth, then energy policies must ensure the availability of relatively cheap electrical power while industrial policies should develop the capacity to manufacture the equipment required to generate and distribute electricity and the capacity to manufacture a growing range of electricity dependent consumer and industrial products. Both policy thrusts must be supportive of the goal of inducing greater reliance on electricity in industrial and social applications.

In an effort to give substance to the points raised above the following sections speculate on possible technological and product changes that could occur in the two main subsectors of the industry during the period of the energy transition.

a) Changes in Electrical Generation and Distribution During the Transition

Although the global transition to new patterns of energy dependence may take until well into the next century, the next ten to twenty years could be regarded as a period of transition in the development and testing of the technologies of electricity generation and distribution.

The immediate emphasis in most national plans to expand electricity supply has tended to concentrate on nuclear, hydro, and coal fired generation. In Canada, it is generally accepted that most economically exploitable, conventional hydro sites will be fully developed within twenty years time. It is also reasonable to assume that many of the social and environmental constraints to greater reliance on coal and nuclear energy will be amenable to technological "fixes" over this time frame. In a longer time horizon, coal gasification and nuclear fusion hold out the promise of clean energy abundance.

A number of non conventional electrical generation and distribution technologies being developed around the world may also be brought on stream much faster than earlier thought possible. These include:

- photovoltaics (the direct generation of electricity from sunlight using silicon catchment plates);
- low-head hydro (including river current);
- tidal and wave power;
- wind-powered generators;
- mini hydro generators (i.e. tapping small streams to derive power for farms, small towns etc.);
- magnetohydrodynamic generation or MHD (the use of ionized gas instead of mechanical motion to generate electricity);
- cryogenics (low temperature, high efficiency generation and transmission systems);
- fuel cell power plants (these plants convert the chemical energy of a fuel into electricity directly, with no combustion cycle and thus no air pollution);
- hydrogen/oxygen pipeline transmission systems (this involves using electricity to reduce water to its component gasses which are then piped to storage facilities at end-use locations for the eventual regeneration of electricity as needed or for direct use in gaseous form);

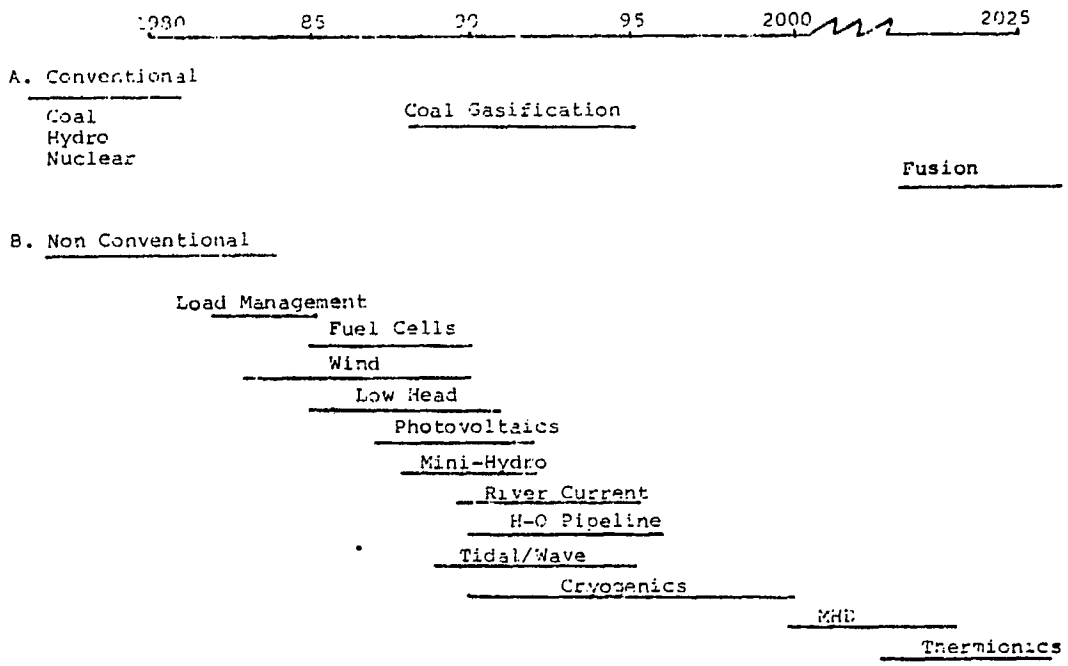
- thermionics (large, high temperature thermocouplings to convert heat to D.C. electric current).

Also of immediate interest is the potential for bringing about efficiency gains from the application of more effective load management techniques. Generally, this concept is limited to discussion of the merits of preferential pricing to encourage greater use of electricity in off-peak hours in the daily consumption cycle. There are social constraints to doing this as the hours of heavy energy consumption are dictated by patterns of work and social activity. Nevertheless, some gains are possible. These could become very significant as electricity using technologies evolve. For example, if electric vehicles are recharged in off-peak hours, it has been estimated that they could replace one third of the private gas powered cars now in use without creating a requirement for expanded base load generating capacity. Similarly, there is enormous potential to extract essentially "free" electricity from present generating and distribution systems by levelling load demand on a yearly basis. At present, electricity supply systems are designed to meet seasonal peaks in demand. In Canada, this occurs in mid-winter. Hybrid heating systems that rely on oil or gas to meet winter peaks and electricity to handle spring and fall requirements could utilize the excess generating capacity that exists during these periods and, in the process, substantially reduce the consumption of oil and gas for home heating. Total home heating costs might also be lowered.

Figure 2 indicates, in a rough way, the likely time frames in which the technologies discussed above might reasonably be expected to reach a point in their development where their widespread application becomes feasible. Subject to cost comparisons with available gas options, the introduction of non-conventional generating technologies, together with conventional hydro development and load levelling techniques, could possibly double present Canadianbase capacity in terms of useable electricity.

FIGURE 2

TIMEFRAMES FOR INTRODUCING NEW ELECTRICAL GENERATING AND DISTRIBUTION TECHNOLOGIES



b) Electricity Consuming Product Innovation During the Transition

The energy problem throughout the transition period is not limited to questions of supply. There is a further requirement to transform energy end use technologies to fit changing patterns of supply. As suggested above, this process is one of the main sources of industrial development potential associated with the energy transition. A high percentage of these opportunities will arise from the production and use of consumer products and industrial equipment that are electricity dependent. In this respect, five major areas of emerging opportunity can be identified:

- Redesign of Conventional Consumer Products

  Two technological thrusts are now affecting the engineering and design of most electrical products. The first, often in response to government legislation, involves efforts to improve

energy efficiency. The second results from the impact of the powerful new technology of microelectronics. The low cost, reliability, precision and intelligence of microelectronics devices will permit production and operating cost reductions much greater than heretofore achieved, reduced energy consumption, and greatly improved product performance. The primary use of microelectronics will be to replace electromechanical controls. Microelectronic devices are already beginning to appear in major and portable appliances and can be expected to play a larger role in all electric motor driven machinery, power system controls and grid management systems. The introduction of microelectronics into production systems will permit faster, more accurate, cheaper production with attendant implications for productivity and competitiveness.

- Space Heating

In many parts of the country, electric space heating could quickly become more cost affective as oil and gas prices rise. The concept of hybrid heating systems discussed above could help reduce the operating costs of home heating, although government programs may be needed to encourage the installation of the second heating system. The use of heat pumps, which can be up to ten times as efficient as furnaces, could also become more widespread.

- Transportation

A large portion of current, petroleum-based surface transportation vehicles could, theoretically, be replaced by electric powered vehicles (E.V.'s). As battery technology improves performance, urban E.V.'s will become fully cost competitive with the private automobile for short distance, medium speed travel. General Motors recently announced their intention to begin marketing an urban E.V. in 1985. If this initiative proves successful, the use of E.V.'s could grow rapidly thus creating entirely new market opportunities for equipment suppliers and service industries. Prototype electric powered mass transit systems are in the advanced stages of testing and could become a commonplace in most Canadian and foreign cities over the next two decades. Similarly, if a means can be found to meet the high initial capital costs, the operating efficiency of electric railways appears attractive.

- Electrification of Industrial Processes

If interfuel pricing changes enhance the appeal of electricity, the industrial use of electricity could increase as companies turn even more to electric powered equipment and industrial processing technologies.

- The Electronics or "New" Industrial Revolution

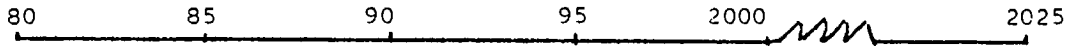
  In the longer term, the shift towards the electrical economy is synonymous with the full scale implementation of the electronics revolution on which the industrialized world now seems firmly embarked. The key to this "revolution" is the advent of a wide range of communications and computer technologies that facilitate the exchange and processing of information. In addition to contributing to the electrification of industrial processes described above, the impact of these new technologies is expected to be felt in practically all areas of social activity. For example, electronic banking, electronic mail, the use of electronic equipment to create a more automated office environment (the Office of the Future) and a wide range of electronic services in the home (eg. computer access to libraries, electronically assisted shopping) are all likely to be in widespread use by the turn of the century.

  While not part of the electrical industry per se, these electronic applications are electricity dependent. Moreover, they will strongly influence patterns of energy consumption. In time, they will also alter forms of social interaction and organization. Consequently, they are an integral and essential aspect of the shift towards an electrical future.

Figure 3 provides a rough guide to possible time frames during which a start might be made on the widespread introduction of these "new" consumer products.

FIGURE 3

THE EVOLUTION OF ELECTRICITY CONSUMING PRODUCTS DURING THE TRANSITION



1. Conventional Appliances
   - Energy Efficiency
   - Microelectronics Applications

2. Space Heating
   - Expansion of Conventional
   - Hybrid
   - Heat Pumps

3. Transportation
   - Urban E.V.'s
   - Electric Mass Transit
   - Electric R.R.'s

4. Industrial Processes
   - Conversion to electricity

5. "New" Industrial Revolution
   - Automated Office Equipment
   - Multi-function Work Stations
   - Elements of Electronic Home
   - Broad Social Restructuring

3. TOWARDS AN ELECTRICITY-DRIVEN INDUSTRIAL STRATEGY

The coming shifts in energy reliance have the effect of moving energy policy to the forefront in the formulation of national industrial strategies. Changing patterns of energy consumption are tantamount to the direct creation of industrial development opportunity.

The links between energy and industrial policy are most easily exploited in the energy supply and distribution industries. As recent experience shows, the extreme uncertainty respecting energy availability is pushing individual countries toward the adoption of strategies that promote greater self reliance or self sufficiency in terms of energy supply. These measures include the designation of industries that manufacture equipment essential to the generation and distribution of electricity (and the utilities themselves) as "strategic"sectors within the national economy. As a result, these governments provide their electrical industries with the maximum possible degree of protection and support in both domestic and international markets. The electrical sector has been singled out for such treatment because supplies of electricity can be relatively easily expanded, the entire industry may be placed firmly under national control, and it creates attractive manufacturing opportunities.

This tendency to exert national influence over energy supply industries might be regarded as the first phase in the implementation of a full electricity-driven industrial strategy. Many competitor countries have already exploited the industrial development potential of this phase and appear, in an unstructured way, to be moving on to a more complex second phase. This involves long term industrial restructuring to accomodated the shift to greater reliance on electricity. In simple terms, it means concentrating industrial development effort on the promotion of electrically dependent consumer products and industrial equipment. On a more sophisticated level, it implies motivating other industrial sectors, and society as a whole, to better understand the concept of "The Electrical Economy" and to develop the skills required to use electricity dependent technologies and products. A strong, innovative domestic electrical industry could prove indispensible in easing the energy adjustment problems of other industrial sectors.

Canada has been slow to join the fray. In the past, our efforts to draw on our relatively abundant hydro power potential and later the decision to develop nuclear power, almost automatically made Canadian manufacturers recognized world leaders in the production of a wide range of electrical generating equipment and consumer products. In the last few years, we appear to have lost some of the momentum generated by these earlier successes.

In part, this situation reflects Canada's almost unique position in the industrialized world that results from our continued abundance of fossil fuel options. Our incentive to "go electric" is not as compelling as it is in less energy rich countries. When judged narrowly from an energy supply perspective, this appears to place Canada in an enviable position. From a long-term industrial development perspective the situation is less favourable for it creates an aura of uncertainty about the future role of electricity. A deferral of the decision to "go electric", or a failure to maintain and enhance existing industrial capablilities within the sector, could move Canada out of the mainstream of technical and social change, result in a gradual loss of employment and impair the country's ability to capture a reasonable share of the growing market for electricity dependent products. Lacking a strong domestic industry to turn to, manufacturers in other sectors would have to rely on imported technology and products to facilitate shifts to electric power necessary to retain their competitive market position.

Recent electrical industry performance also reflects some shifting of ground in the sense that the rate of technological innovation and the ability to meet more diversified and aggressive international competition are becoming the touchstones of commercial success. In both respects, there are signs that Canadian industry is now responding to these imperatives for change. Nevertheless, the industry faces a tough challenge in the 1980's. The need to create an industrial capacity able to capture longer term growth opportunities from the development and application of electricity dependent technologies comes at a time when slower growth is forecast in the short term. This combination of circumstances places significant strains on private sector managers.

In light of these concerns, a decision by governments to make electricity based industrial activity a more important element in economic development could help bring domestic electrical firms successfully through the energy transition period and put Canadian industry generally in an advantageous position for the longer term.

The Province of Quebec, which intends to use preferential electricity pricing as a means of attracting industry, has already taken steps in this direction. Although hampered by a shortage of investment capital, the Province of Manitoba intends to follow a similar route. Most other provinces are rethinking the relative emphasis to be placed on electricity use, or the means by which electricity generation may be made less dependent on the burning of oil and gas.

In general, however, the problem of ensuring adequate supplies of energy tends to dominate strategic planning. This preoccupation with energy supply has seen effort being concentrated on the use of conventional generating and transmission technologies and the techniques of energy conservation. This approach must necessarily

account for the bulk of government effort as the gestation periods for major energy supply projects are such that decision-making time frames are critically short.

Neverthless, as the previous discussion suggests, there are potentially significant national advantages to be gained from linking energy policy more closely with industrial policy to ensure that both push towards common goals. In this respect, the time frames for industrial development decisions are equally short. As our energy future unfolds it is important that industry restructuring procede apace. Thus, in precisely the same degree to which it is reasonable to assume that the country is moving towards an electrical future, it is also reasonable to assume that the elements of an electricity-driven industrial policy should become pre-emminent. The main ingredients of such a policy could be structured around the following objectives:

i) Electricity Generation and Distribution Equipment

The survival of a domestic industrial capability to supply electrical generation and distribution equipment should be secured. Canadian industry should retain or develop a technological and manufacturing capability in a selected number of conventional and non-conventional generating and distribution technololgies.

ii) Electricity Consuming Products

Canadian manufacturers should be encouraged to exploit opportunities that appear to be emerging for the production of electricity dependent consumer products.

iii) Industrial Applications of Electricity-Based Technology

The substitution of energy efficient, electricity-using industrial equipment for oil and gas-based technologies should be promoted, and these substitution opportunities linked to the creation of a broader Canadian electrical equipment manufacturing capacity. The electrical industry itself should be encouraged to become a prime source of expertise in the resolution of energy adjustment problems facing other sectors.

iv) Export Orientation

More slowly growing domestic markets for electrical equipment and traditional consumer products in the 1980's make a stronger export orientation essential to continued technological evolution and growth of Canadian electrical manufacturing firms.

In addition to these objectives which apply specifically to the electrical manufacturing sector, several related themes deserve active consideration:

v) Links to Energy Policy

Energy policy should secure an abundance of relatively cheap electric power and encourage the use of electricity.

vi) Links to the Electronics Revolution

The electrical sector strategy should be seen as complementary to the coming electronic revolution and the introduction of a diverse range of new, high technology electronics products, particularly in the communications field.

vii) Higher Value Added Uses for Fossil Fuels

As electricity using technologies and products replace oil and gas-based technologies, scarce supplies of fossil fuels should be increasingly preserved for use in higher value-added applications such as petrochemicals.

Canada is in a relatively strong position to reap the benefits of such a concerted policy thrust. The country has sufficient diversity and already established manufacturing strength within the electrical sector to provide a solid industrial base for "going electric." We have an abundance of the primary resources required to generate electricity and the technological potential to sustain an electrical future. Patterns of high technology, electricity dependent growth are admirably suited to the needs of a well educated labour force and an increasingly sophisticated urban population. It is also a course that allows the exercise of the greatest possible degree of national control over energy supply and industrial development.

As noted above, there are a number of factors that now act to undermine the performance of the Canadian electrical industry. These factors are also substantial obstacles to the achievement of such a broadly based policy thrust. In the sections that follow these factors are reviewed in order to identify the policy initiatives required to give substance to this strategy in the short and medium term.

PART TWO

POLICY OPTIONS

If the long-term set of objectives identified in Part One is to be achieved, it is essential that the electrical manufacturing industry emerge from the 1980's in a strong, internationally competitive position. Several factors, in combination, could act to seriously impair the industry's performance during this period. It is these issues that policy initiatives must address if government actions are to strengthen the industry. The following sections review five problem areas where government policy initiatives appear warranted. These factors are:

1. Electricity Demand and the Domestic Electrical Equipment Market;

2. Structural Weaknesses;

3. Technology;

4. Trade;

5. Procurement.

PART TWO

POLICY OPTIONS

1. ELECTRICITY DEMAND AND THE DOMESTIC ELECTRICAL EQUIPMENT MARKET

The rate at which the demand for electricity grows will be a prime determinant of the potential growth of the domestic market for electrical equipment and consumer products. As the following discussion illustrates, the growth in demand throughout the better part of the 1980's will likely be slow by historical standards.

It should be stressed that forecasting the growth of electricity consumption is an imprecise art as demand is strongly conditioned by the availability and price of competing energy sources. In the case of oil, there is considerable uncertainty about both supply and price. Gas, while abundant and cheap, is not yet available in all regions. As well, plans for meeting future electricity supply requirements must now, more than ever before, take into account a variety of non-economic concerns. Paramount among these, given Canada's heavy reliance on imported oil, is security of supply.

A. The Role of Electricity In the National Energy Program

The National Energy Program (NEP) establishes a variety of energy price relationships which, in combination with direct action programs, are designed to substantially reduce the extent of national reliance on oil by 1990. The price of electricity is forecast to increase more slowly than either oil or gas (i.e. 10.1% vs 14.4% for gas and 14.5% for oil). On a BTU equivalent basis, electricity will generally be a more attractive energy form than oil by the late 1980's. The movement to price parity with natural gas will take longer.

The effect of these pricing decisions on the competitive position of electricity relative to the price of oil and natural gas in residential applications is summarized in Figure 4*. The effect of regional variations in price are summarized in Figure 5.

These pricing scenarios lead to a forecast rate of growth for electricity demand to the year 2000 of approximately 3.3% per year. This compares with historical rates of growth of 6 to 7%. By 1990, however, electricity will account for roughly 24% of total end use

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* The same rough pricing ratios apply to industrial applications, while electricity is priced higher for commercial uses.

Figure 4. Comparative National Energy Price Forecasts 1980-1990 : Residential*

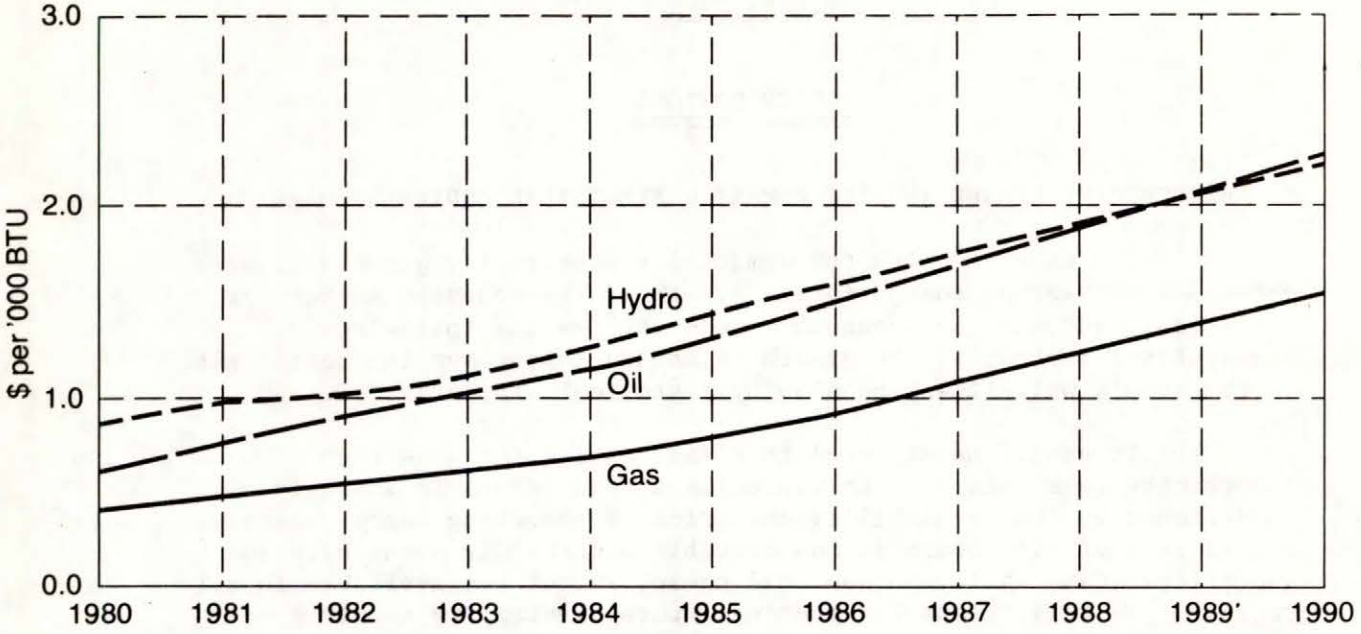
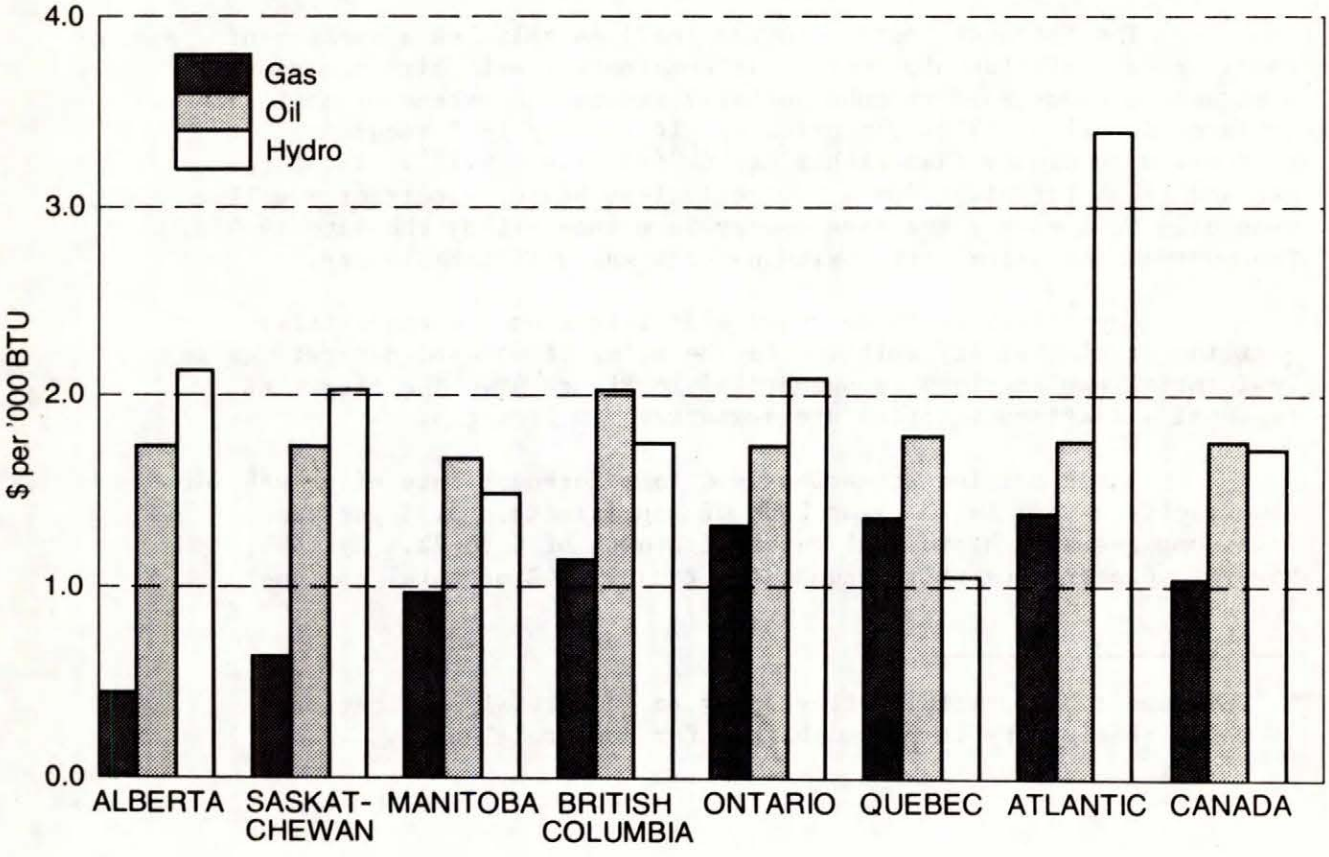


Figure 5. Comparative Regional Energy Price Forecasts 1990 : Residential*



* Estimates are based on price forecasts in the NEP assuming conversion efficiencies of 75% for both oil and gas.

consumption of energy (vs. 17% in 1978) and 44% of primary energy consumption.* Table 4 translates these demand forecasts into estimated requirements for additional electricity generation capacity between 1979-2000.

Table 4

Electricity Demand Forecast and Requirements for Additional Capacity 1979-2000 (Fig. in G.W.)*

	1979	1990			2000		
Region	Installed Capacity[1]	Required Capacity[2]	Capacity Avail. & Committed	Additional Requirements (Surplus)	Required Capacity[2]	Capacity Avail. & Committed	Additional Requirements (Surplus)
Atlantic	7.0	6.5	7.9	(1.4)	8.1	7.9	.2
Quebec	23.1	34.4	36.8	(2.4)	46.9	36.7	10.2
Ontario	25.7	31.0	31.2	(.2)	40.5	32.1	8.4
Manitoba	4.1	3.8	4.8	(1.0)	4.8	5.2	(.6)
Sask.	2.1	2.7	2.6	.9	3.8	2.6	1.2
Alberta	5.4	8.0	7.5	.5	11.8	7.5	4.3
B.C.	9.5	12.3	12.9	(.6)	17.1	13.0	4.1
Yukon/NWT	--	--	--	--	--	--	--
Totals	77.2	98.7	103.7	1.4	133.0	104.9	28.4

* Source: EMR

1 Electric Power in Canada EMR, 1979 (Forthcoming). Quebec figures include 4.9 G.W. of power from Churchill Falls as per existing agreements between the provinces of Quebec and Newfoundland.

2 Defined as peak demand augmented by system reserve requirements.

* The difference between end use or secondary energy consumption and primary consumption reflects the extent of energy loss in generation and transmission. In 1990, the forecast for total secondary energy demand is 6204 Tbtu's while end use demand for electricity is 1479 Tbtu's. Total primary energy supply is estimated at 10784 Tbtu's of which primary electricity accounts for 4754 Tbtu's. The latter figure is composed of 2939 Tbtu's hydro, 939 Tbtu's coal, 718 Tbtu's nuclear, 104 Tbtu's oil and 54 Tbtu's gas.

The EMR base case highlights the difficulties which slower growth in demand present for those portions of the Canadian electrical industry that supply generation and transmission equipment. Having commited themselves to an ambitious building program, many utilities now face the prospect of a lengthy period of overcapacity. The result, beginning in the early 1980's, is a dramatic decline in the growth of the domestic heavy electrical equipment market as the requirement for additional generating capacity is expected to drop off to a level well below that sustained in the 1970's. In terms of the growth of installed capacity, some 26.5 G.W. will be added in the 1980's and a further 29.3 G.W. in the 1990's. This compares with a capacity expansion of approximately 35 G.W. in the 1970's.

B. The Effects of Import Penetration

When allowance is made for import penetration, the actual market effect of this scenario is much more dramatic. Not only is the domestic market for generating and transmission equipment likely to decline during the 1980's but the share of this smaller market held by Canadian firms could be reduced.

In a rough way, the comparison made in Table 6 between utility purchases and shipments of industrial electrical equipment illustrates the declining domestic market share being captured by Canadian suppliers.

TABLE 6

Declining Market Share ($ Millions)

	1. Utility Investment	2. Industry Shipments	2 as % of 1
1971	748	535	72
1972	703	526	75
1973	927	604	65
1974	1,191	765	64
1975	1,474	912	62
1976	1,790	1,019	57
1977	1,968	1,081	55
1978	2,458	1,247	51

When this declining market share is projected forward in the context of the EMR base case scenario, the full effects of the more slowly growing domestic market can be seen (Table 7).

TABLE 7

Projected Canadian Share of Domestic Market

	Market Opportunity EMR Base Case (G.W.)	Estimated Canadian Share %	Estimated Canadian Share G.W.
1970-79	18.6 (1970-1975)	68	21.4
	15.8 (1976-1979)	55	
1980-90	26.5	40	10.6
1990-2000	29.3	40	11.7

The EMR scenarios are more cautious in their projections of electricity consumption than the forecasts of provincial utilities. Table 5 compares the EMR base case with present utility forecasts. As this table illustrates, the utilities foresee a requirement for an additional 43.3 G.W. of installed capacity over and above the EMR forecast by the year 2000. However, even if these higher estimates prevail, it is doubtful if they will lead to market opportunity for Canadian suppliers on a scale comparable to those of the 1970's if high rates of import penetration continue.

TABLE 5

Comparison of Forecast Growth Rates: Electricity Demand and Capacity Requirements 1980 - 2000*

Region	Per Annum Growth in Demand		Capacity Requirements in Yr. 2000 (GW)	
	EMR Base Case	Utility Forecasts	EMR Base Case	Utility Forecasts
Atlantic	2.3%	4.5%	8.0	10.9
Quebec	3.8%	6.4%	46.9	77.0
Ontario	2.8%	3.4%	40.5	39.6
Manitoba	2.6%	3.4%	4.8	6.0
Saskatchewan	3.0%	3.9%	3.8	4.9
Alberta	4.0%	5.8%	11.8	14.3
British Columbia	3.5%	5.9%	17.1	23.5
Totals	3.3%		132.9	176.2

* Utility forecasts compiled by EMR, May to July 1980.

In sum, barring deliberate energy pricing decisions that favour electricity, the die appears to be firmly cast. During the coming decade and perhaps beyond, the domestic market may not be adequate to sustain the heavy equipment subsector of the industry. The lower overall forecast rate of growth in electricity demand also indicates reduced demand for the products of other manufacturers within the electrical sector.

C. Energy Security

It is worth emphasizing that Canada presently relies on imported oil to meet approximately 25% of domestic energy consumption. Consequently, the one element that could totally overturn these assumptions concerning electricity demand is an interruption in the supply of imported oil. In such circumstances, conventional wisdom regarding economical and practical generation reserve levels could prove to be socially devastating. Thus concern over energy security might warrant some degree of "overbuilding" during the 1980's. It may be entirely appropriate, for example, for Canada to carry generation reserve during this period higher than the normal 20-25%. The cost effects of this form of contingency planning would have to be carefully evaluated as surplusses not absorbed would increase the domestic price of electricity. Equally, if the surplusses cannot be absorbed because of technological or distribution constraints they will not enhance overall energy security. Problems of this type could be offset by vigorous energy pricing policies that encourage the use of electricity consuming technologies. The alternative of exporting surplus electricity would have to be handled with care if sufficient flexibility is to be built into these arrangements to ensure that Canada is able to draw on its surplus power as needed to meet unexpected contingencies.

The object of industrial policy initiatives for the heavy electrical equipment industry is not to ensure energy availability but to ensure that the capacity exists to build new generating facilities as they are needed. A phased program of utility construction involving the creation of some "overcapacity" could help ensure the survival of the heavy electrical subsector during the period of hiatus in domestic market growth. Thus, in addition to evaluating capacity requirements from the point of view of energy security and economic efficiency, this question might also be evaluated in terms of industrial development needs.

D. Policy Implications

In the longer term, it seems inevitable that electricity will play a more important role in meeting Canadian energy needs. Oil and gas prices are expected to rise more rapidly than the price of electricity. Sooner or later electricity appears certain to enjoy

significant cost advantages over both of these fuels. As well, when viewed in a long time horizon, electricity is expected to become the worlds dominant energy form. Thus, the anticipated slump in Canadian electricity demand is best viewed as a potentially short-lived anomaly.

Nevertheless, the electrical industry will face a tough short and medium term. There could be a rapid decline in the domestic market for generating and transmission equipment, a slower than desirable shift to new, high technology electrical products, stagnation and possibly decline across the entire spectrum of electrical equipment manufacturing, and a general loss of industrial development opportunity in the electrical and related sectors. Moreover, without conscious direction, Canada probably will get a slower start at making the transition to greater reliance on electricity. Such a course involves the risk of having to rely on imported goods and technology when the country is at last forced to make the transition as Canadian industry might well be too far behind technologically to regain its competitive position in electrical product markets.

In terms of the objectives set out in Part One for implementing an electricity-driven industrial strategy, slower growth in electricity demand robs the generating and distribution equipment suppliers of much of their traditional market and tends to undermine the capacity to develop manufacturing and technological infrastructures upon which to build a future electrical economy. To counteract these effects a variety of policy decisions would be required including the following:

i) Export Initiatives

The achievement of higher rates of growth within the electrical industry, and particularly the heavy equipment sub-sector, will require large increases in exports. The methods for achieving higher levels of export are discussed in the section on Trade.

ii) Domestic Market Initiatives

The industry could be stimulated to improve its cost competitiveness so that it can lower the current level of import penetration. Some of the steps that might be taken are discussed in the sections on Structural Weaknesses and Technology.

In conditions of slow growth in the domestic market it is even more important that Canadian supliers be protected from the unfair trading practices of foreign companies. Possible methods for doing this are discussed in the chapters on Trade and Procurement.

iii) Science and Technology

Technological activity within the industry needs to be enhanced to support the drive for competitiveness and to enable the industry to keep up with the world-wide movement towards the "electric economy". The Chapter on Technology offers some solutions to this problem.

iv) Contingency Planning

Consideration should be given to implementing an accelerated program of construction of electricity generating facilities. Implicit in this proposal is the notion of increasing electricity sales to the U.S.

v) Increasing Electricity Exports

At present there are over 100 transmission lines between Canada and the United States which are together capable of carrying more than 8000 megawatts (MW) of electricity. This amounts to 11% of the 71,000 MW total Canadian generating capability, but only 1.6% of the generating capability of the U.S.A. Foreign exchange earnings from these sales were approximately $729 million in 1979.

Due to existing and foreseeable delays in implementing the U.S. nuclear-fired and coal-fired electricity generation programs a shortfall in baseload electricty generating capacity could persist in the N.E. United States for a lengthy, though indefinite period of time. This creates the potential in the medium term for allowing a substantial increase in the export of Canadian electricity to the U.S.

While opportunities exist there are also many problems associated with the planning of Canadian electricity supply in ways that would allow increased exports to take place. These problems include: identifying specific market opportunities; meeting the narrow timeframe when opportunities exist, given the lead-times necessary for new power plant construction; the relative cost of Canadian us. U.S. electricity supplies; the adequacy of transmission lines; and the need to negotiate international agreements and guarantees. Nevertheless, a number of Canadian industry spokesmen believe that, with government assistance, exports could be increased.

vi) Linking Energy and Industrial Policy

The above proposals are defensive in nature. The objective is to preserve industrial options in the electrical sector until such time as the imperatives for change are more clearly defined. On the other hand, a reasonable expectation exists that electricity will become a more attractive energy form relative to oil and gas before the end of the decade. If this is the case, and bearing in mind the long lead times required to make a controlled shift in reliance on different

energy forms, there is a need to be sensitive to the long-term strategic position of electricity and related industrial options. The industrial development opportunities associated with a decision to "go electric" might be recognized in economic development strategies adopted by governments.

2. STRUCTURAL WEAKNESSES

The electrical sector has a number of structural weaknesses which adversely affect its ability to compete in Canada and abroad. These include small firm size, production volumes that are too small to capture scale economies, a high degree of foreign control and a low level of R & D activity. The significance of these weaknesses is becoming critical as international competition sharpens and domestic market growth for heavy industrial equipment slows.

These structural weaknesses are, in reality, part and parcel of the same problem. There are too many firms, producing similar products for essentially the same restricted markets. The roots of this situation are long. They stem from the original decisions of foreign companies to set up manufacturing facilities in Canada in order to produce for domestic consumption behind high tariff walls. Canadian owned firms, unwilling or unable to compete with MNE's, have tended to proliferate by concentrating on the production of specialized items and filling smaller gaps in the domestic and occasionally the export market.

Government policies have also tended to encourage and sustain fragmentation in the electrical industry. In the industrial equipment and wire and cable sub-sectors, fragmentation is encouraged by the procurement practices of some provincially-owned electric utilities. The operation of a number of federal and provincial regional development incentive programs may also have resulted in "counter productive" investment through encouraging the establishment of additional firms in the sector. Most often this investment involves new product facilities which displace or duplicate existing manufacturing capacity.

Of perhaps even greater importance is the straightforward consequence of small market size. This situation makes it unattractive for larger manufacturers to attempt to increase their market share by introducing production of efficient scale. For some electrical products, production of minimum efficient scale would imply volumes approaching the total domestic market.

In these circumstances, diversifying product lines can be a more attractive growth strategy for foreign-controlled firms than increasing their market share for specific products. Indeed, foreign-controlled firms tend to be more diversified than their Canadian-controlled counterparts. The pattern of diversification is such that it maximizes economies of firm size by spreading overhead costs across a wider range of sales. It is relatively easy for a foreign owned firm to do this if it can draw on the parent's technology, management services and marketing. Even if the subsidiary pays a prorated price for these services, the large scale facilities and international operations of the parent reduce the cost below that which would have to be paid by an independent firm.

The drawback in this pattern of business activity is that it tends to lead to fragmented production, a strong domestic market orientation and market sharing behaviour. In these circumstances, it is not surprising that many subsidiary firms do not export or compete directly with the parent. They lack the competitive strength to do so.

On the other hand, given the advantages of the parent-subsidiary relationship it is not surprising that many Canadian-controlled firms do not manufacture products which compete directly with foreign-controlled subsidiaries. This helps explain why they tend to concentrate on specialized niches in the domestic market, or highly specialized products at the old, standard end of the line where there is less R & D, innovation and product differentiation. It also helps explain why, as technological advance continues, foreign producers are more fully occupying the innovative, high growth, new product end of the industry.

A. Policy Implications

The operation of this manufacturing system over time has left Canada with a fragmented electrical sector dominated by MNE's who tend to replicate the mature product lines of their parents in relatively small plants for consumption within Canada. Canadian-owned firms tend to restrict production to single product lines to fill gaps in the market. Export success is increasingly limited to firms doing custom work in the heavy equipment sub-sector and manufacturers who have specialized plants to attain more competitive production runs. The rapid growth of imports in recent years suggests the process of specialization is not proceeding quickly enough. The overall result is that the Canadian industry is not well placed to take advantage of opportunities for further growth. International competition will likely continue to increase both as a result of the MTN and general over-capacity in the industry worldwide. This will add to pressures on Canadian firms to restructure. There is the danger however that some firms, faced with increased import competition and a slow growing domestic market, will simply exhaust their dwindling resources rather than devote new effort to restructuring, R & D and the pursuit of exports.

In order to turn this situation around, government initiatives might best be directed towards accelerating the pace at which both firm and product specialization take place. In terms of company activities this would mean encouraging mergers and acquisitions that reduce the number of firms or plants producing similar products. In terms of products, the objective would be to see greater concentration on larger scale production of selected product lines. For subsidiary companies this could mean rationalizing production, possibly on a North/South basis in the context of the parent company's global marketing strategies.

It should be stressed that this is a policy thrust aimed primarily at MNE's active in Canada and that any broad specialization initiatives by the industry could lead to the demise of some small Canadian-owned firms. This is particularly true in the small appliance and miscellaneous sub-sectors where the problem of small scale, fragmented production is most acute and where import penetration is greatest. It is possible that specific government initiatives might be of assistance to these Canadian-owned firms, but the further growth of established product lines in already stable markets will be hard to bring about.

The methods by which the federal government might influence this process are discussed below.

i) Adoption of Guiding Principle

The successful promotion of specialization measures would require the application of consistent government policies of encouragement and support. This implies the need for a clearly articulated statement of principle that underlines the government's commitment to achieving a more competitive industry.

The intent of adopting such a guiding principle would be to ensure that the collective impact of government decisions all tend to push in the same direction. For example, there are a number of existing federal policy instruments which could be applied on a case-by-case basis to bring about a restructuring of the industry. These include administrative intervention through competition legislation, the application of the Foreign Investment Review Act, program support through DREE, duty remission schemes and the various funded programs of ITC. The collective use of these levers to assist firms whose investment plans fit within a sector strategy could have a persuasive effect on corporate decisions. The use of administrative intervention of this type could also serve to discourage events which would further fragment the industry.

Even within the federal government the coordination of these instruments will be difficult. In many cases, it will require trade-offs with existing sectoral program or policy objectives. This approach will also require the cooperation and support of provincial governments and the labour movement, both of which may be unwilling to accept the plant closures and increased unemployment which may result from a restructuring of the industry into more competitive units.

ii) Company-Specific Negotiation

Specialization within the industry must be the product of private sector initiatives. Government encouragement will be effective only at the margin, tipping the balance in favour of or against an action contemplated by the private sector. This suggests that the

pursuit of specialization objectives will have to involve considerable government-industry consultation on a firm-by-firm basis. Indeed, part of the intent behind adopting the guiding principle would be to establish clearly a prime objective underlying government's ongoing dialogue with the industry.

iii) Product Mandates

Rationalization of Canadian production under the global umbrella of foreign MNE's might also, on a selective basis, be beneficial to Canadian industry. The few instances where a Canadian sub has been given a "world" product mandate by its parent have provided a much needed export window for Canadian industry. These initiatives will probably be most successful on a North-South basis. Strong federal government support for this approach together with provincial initiatives could be of considerable assistance to subsidiaries in their negotiations with their parent for wider product mandates and market autonomy.

iv) Major Projects Fund

The availability of government funding to encourage specialization might prove helpful in some instances. To some extent this capacity exists within established programs although in limited amounts and on hard terms (e.g. assistance for this purpose might be available through the Enterprise Development Program, but probably only in the form of loan guarantees). This gap in present programs could be offset by the provision of capital support for major projects.

3. TECHNOLOGY

The mature nature of the Canadian electrical industry is reflected in the relative stability of both the products it manufactures and its levels of output. With few exceptions the sector's product lines have remained unchanged in concept for anywhere from twenty to seventy or eighty years. The technologies in use have generally been of a type that is widely available and easily accessed. The result has been a stronger emphasis on engineering design than on basic technological innovation. This was not unwarranted. For some mass produced items continuing design refinements and advances in production technology are an important source of competitive strength and profitability. Some segments of the industry produce custom engineered equipment which requires substantial capabilities in development and engineering (D&E), rather than R & D. This work includes product development, design, adaptation and engineering to meet individual specifications. Applied research, in the sense of a truly innovative exploration of new product options or ways of doing things, has been minimal.

The industry has now reached a point in its aging process where, if it is to continue to grow, it must be technologically rejuvenated. In this respect there are a variety of technological breakthroughs on the horizon that could provide the seeds of the industry's rebirth. These new technologies and product applications were discussed in Part One. To a large extent these flow from the needs of the energy transition and the emergence of the new electricity based industrial revolution. The task, and it will prove difficult, is to induce Canada's fragmented, foreign dominated industrial structure to develop or apply these new technologies in Canada. In the process, other industries must be able to turn with confidence to the Canadian electrical industry for assistance in solving their energy adjustment problems.

The requirements of the future suggest a need for stronger initiatives in both R & D and D&E. In addition to the standard pressures for technological change (i.e., to lower production costs, improve product design and manufacture custom items) the rapid rise of energy prices since 1973 has stimulated existing industry R & D efforts to improve the efficiency of both electrical generating and transmission equipment and the products which consume energy. These efforts have led to greater experimentation with larger and higher capacity generators, higher voltage and direct current transmission systems which require new product development in switchgear, transformers, and wire and cable. Electricity consuming products such as appliances and machinery are also being redesigned and re-engineered to improve energy efficiency. Micro- electronics will play a major role in this process.

As discussed earlier, a number of frontier technologies are being developed around the world that may be brought on stream much faster than anticipated in response to the exigencies of the energy transition. At the generating and transmission stages a wide range of new technologies are emerging that are of particular relevance in a Canadian context because of the significant hydro electric potential that still awaits development.

Breakthroughs are also imminent in the transportation sector. All of the major international battery companies are involved in product development programs to produce a lightweight, high storage capacity battery which would power electric vehicles. Impressive effort is being expended worldwide on developing components such as drive systems that are specifically designed for use in electric vehicles and electrically powered mass transit systems.

Little is being done in Canada to develop these new frontier technologies. Even such prosaic devices as heat pumps which can be up to ten times as efficient as furnaces are not being exploited in any effective way.

The relative technological weakness of domestic firms raises some doubts about how effectively the companies will respond to these diverse pressures for change and the opportunities and challenges they present. Certainly past performance in R & D provides little ground for complacency.

The data on R & D performance by the industry are sparse; moreover there are major differences among the sub-sectors. Industry observers generally agree that the sub-sectors in which relatively more technological activity takes place in Canada include Industrial Electrical, and Wire and Cable. In the case of the first, it reflects the continuing need for D&E work on custom items. In the remaining sectors much less technological development is taking place with Small Appliances and Batteries doing virtually none. The consequences of this form of technological stagnation in the face of increased competition will become more serious if projections for slower market growth materialize.

The reasons for the low level of technological activity are largely market induced and are not unique to the sector. They include the small size and fragmentation of the domestic industry and market, the policies of foreign parent companies which restrict the independent performance of R & D and the risk inherent in R & D activity.

In theory, Canadian subsidiaries have an international pool of technology available to them through the parent as needs dictate. However, in practice this technology is not easily transferred if it entails a decision to also transfer manufacturing rights. Recent reductions in tariffs accentuate this reluctance. In the past technology was imported to permit manufacturing in Canada: it is now increasingly being imported in the product itself.

Some foreign-owned firms have responded positively to the internationalization of business, and the failings of the "miniature replica" approach by establishing a measure of intra-corporate specialization, whereby the Canadian subsidiary is given a mandate to develop and produce a portion of the firm's products for Canadian and export markets. Generally the award of a "world product mandate" also confers on the subsidiary full responsibility for subsequent product development. These efforts at corporate rationalization have led to the establishment or upgrading of D&E facilities in some Canadian firms, but have not been sufficient to bring about a level of technological activity which would be required of a competitive, fully independent company.

Two examples of Canadian subsidiaries which have product mandates and which illustrate this problem are Canadian General Electric in hydrogeneration and Westinghouse Canada in gas turbines. Despite the mandates for these products, neither company comes close to its parent in technological effort. In 1977, the General Electric Corp. made R & D expenditures totalling 2.6% of sales; for Canadian General Electric the figure was 0.7%. Westinghouse Electric Corp. is somewhat less R & D intensive, its 1977 figure being 2.1%. For Westinghouse Canada, R & D represented but 0.5% of sales.

There are, of course, reasons for these differences: the Canadian products are less technologically intensive; R & D may be more efficiently conducted in centralized facilities; the U.S. parents are involved in R & D in the military field; etc. Nevertheless, the weak position of Canadian electrical manufacturing firms is worrisome. It becomes even more so if government assistance programs are taken into account. In the U.S., for example, government support for R & D has reached 4% of sales for even the largest U.S. firms. Thus in the case of General Electric, total expenditures on R & D actually amounted to 6.6% of sales. Similar levels of R & D support by Canadian governments are unheard of.

There are some bright spots. In the wire and cable sector, the two largest Canadian-owned firms are deeply involved in fibre optics, a new transmission and distribution technology particularly suited to voice and data communications. The major electrical utilities, particularly Ontario Hydro and Hydro Quebec, do have strong research and systems design and development capabilities. Unfortunately, because this capability is separate from the producing companies it has not conferred as much benefit in terms of competitiveness as it might. In competitor countries the links between utilities and national manufacturers are close. In Canada, the technological capacity of Canadian utilities is often not transferred to Canadian manufacturing companies or the transfer is less effective in terms of conferring industrial benefit than is allowed by the vertically integrated systems in competitor countries. As well, the fact that the technologies are located in a number of utilities has inhibited the development of a full systems capability which could be

used to bid for turnkey projects both within Canada and abroad. A similar situation exists with respect to the nuclear industry. Finally, several large private consulting firms which are a major Canadian source of systems expertise have few working ties to either Canadian utilities or manufacturing enterprises.

This rather bleak picture of the technological capabilities of the Canadian heavy electrical equipment sector suggests that it will be hard pressed to generate acceptable growth rates in the future. When this capability is placed in the context of slower growth in electricity demand and fragmented industry structures discussed in previous sections the challenge becomes formidable. Slow growth in electrical consumption lessens the appeal of extending product mandates to produce in Canada for domestic consumption. Nor, as things stand, is there anything intrinsically more attractive about Canada as a place for MNE's to conduct R & D if the ultimate objective is to produce for export.

In these circumstances, it will be difficult to retain a competitive Canadian presence capable of winning a reasonable portion of the industrial benefits associated with the technological innovations being made within the electrical sector worldwide. Canada faces a serious risk of having the electrical industries of competing countries undergo a substantial technological transformation over the coming two decades while relatively stagnant Canadian-based manufacturers are passed by.

The following section discusses the limited range of options that might be drawn upon to improve Canadian prospects.

A. Policy Implications

It is doubtful that the electrical industry will be sufficiently responsive to across-the-board incentives and funding schemes to stimulate R & D activity if these measures are introduced in isolation. They may be necessary to help create an attractive investment climate in Canada but they are unlikely to lead by themselves to redirected and expanded industry efforts to develop new products and production processes. Effective sub-sector specific or company specific solutions must also be developed.

Aside from financial incentives, the key government effort in consumer product lines (major and small appliances) must be the use of suasion on a firm-by-firm basis. This applies equally to the heavy equipment sub-sector. However, here the problem is deeper as this sub-sector will be hard pressed to survive intact the expected hiatus in domestic market growth. Thus the primary objective should be to stimulate the restructuring and reorientation of this industry to make it an aggressive international exporter. In other words, technological activity can most usefully be discussed in the context of overall corporate planning. Thus, broad changes in corporate behaviour may have to be induced if technological effort is to be meaningful.

i) Horizontal Policy Options

To help put these points in perspective, it is instructive to consider the impact of the two current principal R & D incentives - the 10% R & D tax credit and the innovation assistance available under the Enterprise Development Program (EDP). While no rigorous proof has been developed concerning the effectiveness of these measures, industry comments and the limited use made of the EDP by the electrical sector suggest these measures have relatively little influence on decisions concerning technological effort. The definition of R & D for tax purposes as being "scientific" research has meant that a range of technological activities related closely to the commercial exploitation of an idea, process or product are not elegible for tax credit support. As noted above, this kind of activity is particularly important to the electrical industry. The EDP, while it can be used to support D & E work, provides assistance on a project basis, so that it places no onus on the company to establish a continuing program of directed technological activity.

In attempting to develop new measures that would truly stimulate R & D activity in Canada, the easiest starting point is the improvement of existing measures by making the grants program richer, increasing the tax credit and broadening its coverage of technological activities. Clearly, the industry will use whatever money is thrown at it by government to do more technological activity. But simply because of the size of most of these companies and the low levels of present expenditures, results will be a long time coming before being noticed at the sectoral level.

In order to achieve any near term impact, it will be necessary to use measures which will influence the decisions of Canadian subsidiaries and their parents. Foreign and Canadian corporate decision makers often are not aware of the implications and impact of tax and program measures, and even when they are, it is a difficult and slow process to change patterns of behaviour developed over decades of operation in Canada. Because the Canadian operations of foreign companies often represent only a small part of the parent's total activity, marginal changes in Canada's investment climate get correspondingly little immediate attention.

The conclusion this leads to is that improved incentives must be accompanied by other measures expressly aimed at changing corporate behaviour. There would appear to be two paths to follow. One would be general, punitive measures such as the application of withholding taxes on licencing fees, royalties, etc. or the levying of taxes on the importation of technology into Canada in cases where the firm is performing no R & D. This approach is untried and may be complex and difficult to administer. Moreover, such measures in an era of relatively low trade barriers might mean greater imports of sophisticated finished goods rather than their production or assembly

in Canada. In sum, while there is no guarantee that the inconvenience of these measures would be rewarded by greater R & D effort, they may have to be tried if the alternatives do not succeed.

ii) Company-specific Negotiation

The alternative is to pursue technology goals on a firm-by-firm basis by seeking to make common cause with Canadian managements in their attempts to win more autonomy and activity for the subsidiary. The attractiveness of this approach is that it coincides with a similar approach to attacking the problems of fragmentation and lack of exports.

A low head hydro demonstration project in Nova Scotia provides a recent example of how government support on a firm specific basis can be of immense assistance in improving the technological capability of Canadian industry. Both provincial and federal funds are being made available to help evaluate a new "Straflow" design of turbine developed by Sulzer Bros., Zurich, Switzerland. If successful, the application of this new technology could lead to significant reductions in the cost of constructing new, low head hydro developments in Canada between the years 1990-2010. The technology could also enhance the potential for bringing onstream a number of sites now considered uneconomic, including the important tidal power potential in the Bay of Fundy. The availability of government funding was also instrumental in allowing Sulzer and Dominion Bridge Company Ltd. to agree to establish a joint venture company in Lachine, Quebec to manufacture these turbines and other Sulzer high technology products.

For other sub-sectors, specific project or program initiatives could be formulated. One such initiative that illustrates how this approach might work is to enhance the Canadian R & D effort in the field of electric vehicle battery and drive systems. A project aimed at deriving a second stage electric vehicle using Canadian supply capabilities is already being implemented by Transport Canada. The provision of supplementary project funding for battery development would appear to be the simplest way of meeting this need for battery research.

iii) Technology Transfers

Mention was made earlier of the research and systems development capabilities of the major electrical utilities which, while contributing to Canada's abundant and stable electrical power services, have not resulted in a great deal of technology transfer to the electrical equipment manufacturing industry. Facilitation of improved technology transfer to increase the industrial utilization of this important resource would seem to be a worthy objective with promising longer-term benefits. However, the declining rate of new construction activity in Canada makes the domestic market an inadequate base upon which to reinforce these links. This also hampers the creation of a

full systems capability (i.e. drawing the utilities, Canadian consulting firms and manufacturing enterprise into a closer working relationship that would allow Canada to compete internationally for turnkey projects). Consequently a major government directed effort to establish an international marketing presence may be required. This would entail pulling together a national electricity generation systems capability. (See the following chapter on Trade for a fuller discussion of this option.)

iv) Demonstration Projects Program

The more rapid and widespread introduction of new, electricity dependent products might be encouraged by the establishment of a government funded demonstration program in which new technologies are given a high public profile. One such project could be the use of heat pumps to heat the Parliament Buildings. Other possible projects might include energy storage systems for load levelling or the use of fuel cells in the far North.

In summary, while general measures to enrich R & D support might have a beneficial effect on the R & D efforts of the electrical equipment manufacturers, by themselves they are unlikely to have enough of an impact on the overall R & D performance and technological capability of the sector. Their greatest effect would be on smaller companies and those whose growth is constrained by limited financial resources rather than by parental decision. The main thrust of government's efforts to enhance technological activity will rely heavily on company specific discussions aimed at expanding the product mandates of foreign-owned subsidiaries.

For maximum impact in this sector, improved R & D measures should be matched by other government measures which will modify the behaviour of the larger, foreign-owned manufacturers. Specialization measures to aid in this process have already been discussed. The following Chapter sets out complementary initiatives in the area of trade.

4. TRADE

Canadian export trade in the electrical sector has been weighted towards industrial equipment and major appliances. Growth in Canada's largest market for all electrical products, the USA, has slowed in recent years, although north-south corporate rationalization of product lines continues to offer some promise for further growth in this market. Other industrialized countries which are also electrical equipment producers have effectively closed their markets to foreigners. The developing countries present the greatest potential as per capita energy consumption in the Third World could grow at up to seven times the rate in North America.

Highlights of Canadian export activity are presented in Table 8. More detail on export potential is contained in Annex B.

TABLE 8

Market Distribution: 1978 Electrical Industry Exports

Exports ($ Millions) 1977 constant)

Market Area	Market Share (%)	Industrial Equipment	Major Appliances	Wire and Cable	Other	Total Exports
North America	57	67	47	26	74	214
Latin America	12	20	5	4	17	46
Middle East	11	5	16	17	2	40
Western Europe	10	6	9	1	21	37
Asia	4	2	-	4	10	16
Other	6	15	6	-	3	24
Total	100	115	83	52	127	377

Outside of the heavy equipment sub-sector, government appears best able to improve export opportunities through measures that enhance productivity, induce more rationalized manufacturing systems and promote continued technological development. Consequently, for most sub-sectors the success of trade initiatives will be strongly influenced by the success of efforts in these other areas. These policy initiatives are not simply complementary: progress in any one area may well be dependent on progress in all of the others. A coordinated, consistent approach is called for.

The specific issues and policy options discussed below apply primarily to the heavy electrical equipment sub-sector. Perhaps more than others the ability of this sub-sector to survive through the 1980's will depend increasingly on its ability to expand its export trade and to halt the erosion of its position within the Canadian domestic market. It is also the sub-sector most sensitive to government support measures.

The consolidation measures underway in the industry together with the devaluation of the Canadian dollar have improved the trade position of the major appliances subsector and raise the prospect of continued strong export performance. In the portable appliances field imports now account for roughly half of all domestic sales. Foreign manufacturers are dominant in personal care products. However, Canadian manufacturers continue to hold most the domestic market for basic kitchen appliances and are showing signs of renewed vigour in successfully identifying export opportunities.

A. The International Trading Environment for Heavy Electrical Equipment

The international electrical industry is increasingly concentrated in the hands of a small number of giant corporations. These corporations frequently operate in concert to control market access and often act as international agents for the attainment of the economic development objectives of their home governments. The primary suppliers of power plant equipment in Europe, Japan, and North America are now associated with one of a small number of transnational groupings (ASEA and Erickson (Sweden); Brown Boveri (Switzerland); AEG and Siemens (Germany); General Electric and Westinghouse (U.S.); Hitachi, Mitsubishi and Toshiba (Japan); Althson Atlantique (France).

Coupled with this concentration is the fact that many countries actively encourage or have permitted the formation of domestic export cartels within which domestic producers may associate to "regulate" exports. Historically, the first (and continuing) restrictions on sales were contained in licensing agreements. A 1948 report of the U.S. Federal Trade Commission, for example, stated that some of these agreements "virtually were international cartel agreements".

This sector is also marked by the formation of international market cartels within which national exporters themselves associate with exporters in other countries to regulate trade and production agreements with third countries. One international cartel worth comment is the International Electrical Association which has been documented to some degree in several reports published by the United Nations Committee on Trade and Development (UNCTAD). Its specific purposes, as set out in one agreement, are to allocate markets, fix prices, and "support cut-throat competition against a non-member competitor in any of the territory coming within (its) scope". The

size of the organization is not known, but it is believed that in 1967 there were at least 37 members involved in extensive collusion in at least nine major product groups of the heavy equipment industry. Canadian-based subsidiary firms are not members.

In drawing policy implications it is essential to realize that Canada is not competing exclusively with foreign companies. It is also in competition with foreign governments! Producer countries have looked upon the electric industry as a sine qua non of industrial development and as a central tool in the struggle for energy self sufficiency. As a matter of national policy they have decided to back the sector by every means at their disposal. For example, government owned electrical utilities are used as economic development policy instruments. Construction schedules, standards and specifications are geared as much as possible to suit the needs and peculiarities of their domestic electrical industries. Protective procurement policies virtually ensure national suppliers the full domestic market. These procurement policies often enable producers to marginally price goods and services when bidding internationally. Governments accept the resulting higher domestic prices and provide other direct support to their export cartels such as planning advice, market information and financial support including direct export financing, tax incentives and risk insurance.

With this support, the electrical industries of most producer countries have become heavily dependent on export trade. For Britain, Germany and France, exports have grown to between 25 and 40 percent of output.

As discussed in the previous chapter, the strong government supported links between utilities and domestic equipment manufacturers confer significant international strength on the "electrical champions" of foreign countries. The lower level of cooperation in Canada and consequent lack of an integrated project bidding and management capability is translated into a reduced international presence for Canadian industry.

At home the relative openess of the Canadian economy makes Canadian-based manufacturers particularly vulnerable to the effects of dumping and other pricing practices of foreign companies. Given the existence of global overcapacity and a slow growing domestic market in the 1980's these predatory pricing practices could become more prevalent and more injurious to Canadian suppliers.

Such an eventuality would not be without benefit in the form of lower capital costs for new power plant construction and thus potentially lower electricity costs. In this respect the acceptance of contract bids submitted by offshore suppliers at dumped prices help Canadian utilities meet their responsibilities to provide power at the lowest possible cost. However, it also places them in the position of condoning, through their procurement policies, unfair marketing practices which discriminate against Canadian industry.

The MTN has done little to alter these international sector traits. In a nutshell, Japan and Europe refused to lower non-tariff barriers. In response, Canada and the U.S. are standing pat on heavy electrical equipment tariffs, although the U.S. did make significant tariff concessions on wire, switchgear and breakers. There was little support from Third World countries for the elimination of NTB's. As these countries develop indigenous electrical manufacturing capability they generally move rapidly to introduce their own protective structures.

From a Canadian perspective, these facts serve to illustrate both the difficult international trading environment and the importance of the domestic market for Canadian suppliers.

B. Policy Implications

The combination of international market characteristics and domestic industry structures will make Canada's trade objectives for the electrical sector difficult to achieve. Markets in many industrialized countries are closed to Canadian goods and services. Competition in accessible markets will be tough. The fragmentation, decentralization, small scale and domestic market orientation of the Canadian industry mean starting from a limited export capability. The tendency for Canadian producers to concentrate on mature product lines together with low levels of technological R & D and innovative punch not only restrict exports but make it more difficult to remain competitive in Canada's own domestic market. The overwhelming degree of foreign ownership within the sector means that Canadian subsidiaries may end up competing with their parents unless product lines and market access have been rationalized within the MNE's to favour Canadian producers. Finally, the present lack of a systems bidding and project implementation capability in the power generation field almost precludes Canada bidding internationally on a turnkey basis.

With these constraining factors in mind, a three-pronged trade strategy is proposed below that is designed to:

- create wider markets and a major export capacity for the heavy electrical equipment sub-sector;
- improve the conditions under which private sector export initiatives are made; and
- halt the erosion in the share of Canada's domestic market held by Canadian-based manufacturers.

i) Increasing Heavy Electrical Equipment Exports

A successful export push in this sub-sector will require careful identification of both market and project opportunities, the creation of a specific Canadian capability to exploit these

opportunities and government involvement to help mould this new capacity.

The proposed market focus is Third World hydro electric generation and distribution projects. The capability, modelled on the organizational structure of MNE's, is an improved ability to bid internationally on a total systems basis. This would come about by linking the considerable design, planning and project management capabilities of Canadian utilities with the engineering, and supply potential of domestic equipment manufacturers. The role of government, once the establishment of such a capability is agreed to, would be to assist with project identification and the award of contracts. The principal government lever would be the use of development assistance funding either alone or supplemented by other export oriented programmes.

ii) Creating an International "Systems" Capability

The creation of a systems capability would require bringing the provincial utilities more actively into the international arena in cooperation with Canadian-based equipment manufacturers. Ideally a national consortium or quasi-independent consulting group could be structured with the authority to draw on the collective design and planning expertise of provincial utilities as project needs dictate and, through links with Canadian industry, with the capacity to take on turnkey projects. Since Hydro Quebec has already established its own international consulting facility such an arrangement may not be feasible. If this is the case, agreement in principle could be sought from all provincial utilities to cooperate in the implementation of projects brought forward by governments or industry.

iii) Other Export Initiatives

Although more limited in potential effectiveness, there are a variety of other steps the government might take to improve the conditions under which Canadian manufacturers compete for international business.

Of particular importance, the heavy degree of policy intervention by foreign governments in support of exports means that the Canadian government has an obligation at least to counterbalance some of these initiatives so that the Canadian industry's position in world markets is not dictated by the policy of foreign governments. In this respect, the programs and policy instruments which the government now has at its disposal do not appear to have enough impact on price to meet the challenge (these tools include EDP support and PEMD). Thus, there may well be scope for experimenting with export tax incentives and risk insurance. Direct export financing might also be considered to offset similar funding by competitors when bidding on contracts in third countries.

Since the key impediments to export markets for Canadian heavy electrical equipment are foreign government procurement practices, Canada pressed for inclusion of electricity generating and transmission entities under the coverage of the recently negotiated GATT Agreement on Government Procurement. Although, as mentioned above, this did not prove negotiable, the agreement does envisage a renegotiation of entity coverage by 1984. This could prove to be of benefit to Canadian industry. In the meantime, there are indications that the USA may be interested in a supplemental arrangement consistent with the GATT Agreement which might cover Canadian, USA and possible some other countries' entities involved in the procurement of telecommunications, urban transit and electrical generation and transmission equipment. It is not clear what the precise scope of such a package might be. But, from the perspective of the Canadian industry, a Canada/USA reciprocal deal involving our respective government entities which purchase heavy electrical equipment would merit close consideration - even if the price of such an arrangement was the equal treatment of Canadian and USA bids by all provincial utilities. It remains, however, an open question whether provincial authorities would be prepared to commit themselves to non-discriminatory treatment of this sort.

On a separate but related front, Canadian industry could also benefit from the establishment - consistent with and enforceable under the GATT Agreement on Technical Barriers to Trade - of arrangements with other producer countries on the methods of testing and certifying products to conform with standards applicable in those countries. Some progress has been made in this respect with Japan, where an arrangement was concluded recently that will allow nine electrical products to be tested in Canada for conformance to Japanese standards, thus facilitating the export of these items to Japan. Similar arrangements negotiated with other countries and covering a wider range of products could enhance export potential.

In developing countries the problems and required actions are somewhat different. The customer is generally a governmental or quasi-governmental agency and there is a marked preference for government-to-government negotiation. Not only is it important to indicate government interest, but often the government can effectively intervene at a high level on behalf of both the buyer and the seller. Government interest might also make possible broader trading arrangements through its ability to offer bilateral aid or Canadian import concessions in exchange for improved market access.

iv) Protection of Domestic Markets

The Federal Government may be able to use border measures and preferential public procurement more effectively to limit predatory trading practices in Canada by foreigners.

The border measures include the application of anti-dumping duties, countervail and safeguards. If these measures are effective in promoting fair trading practices in the Canadian market the need for initiatives in the area of procurement policy may be reduced. However, as described above, many competitor countries use both border measures and procurement policies in a complementary manner to eliminate foreign competition in their heavy electrical equipment markets.

The following discussion concentrates on border measures. The question of procurement policy is reviewed in the next section.

It should be noted at the outset that legislative proposals respecting changes in Canadian border measures are now being prepared by the Federal Government. There will be ample opportunity for interested parties to make their views known prior to the final drafting and enactment of substantive changes in existing legislation. These issues are reviewed below to determine their general relevance for stopping predatory pricing practices and for halting the erosion of the position of Canadian suppliers in their home market.

- Anti-Dumping

A system for evaluating complaints and levying anti-dumping duties is now in place. As this system operates it is a dubious deterrent to continued dumping. To date no strong decisions have been handed down in which duties have actually been levied against heavy electrical equipment imported prior to the Anti-dumping Tribunals decision. Consequently the results, according to industry spokesmen, could discourage further effort.

The most recent decision of the Anti-Dumping Tribunal (February 29, 1980) respecting the dumping into Canada of alternating current generators originating in Japan provides rather ambiguous evidence to support this conclusion. The Tribunal found that the dumping of these turbines had not cause injury to the production of the goods in Canada. However, the finding was based on testimony of the provincial utility (B.C. Hydro) to the effect that the Canadian supplier (C.G.E.) was not successful for reasons other than price. Nevertheless, the Tribunal did state that further dumping of these goods by the Japanese is likely to cause material injury to Canadian suppliers. Thus, the decision provides a clear signal that anti-dumping duties will be levied if dumping continues from Japan. It should be stressed, however, that this finding applies only to dumping by Japanese suppliers. Future dumping from other sources would have to be assessed independently by the Tribunal before duties could be levied. Thus the potential deterrent effect of the Tribunal's judgement does not apply on a global basis.

Industry spokesmen believe the system has several additional weaknesses including the following:

- The main problem in securing the imposition of anti-dumping duties is not in proving that dumping is taking place but in proving that it causes injury to Canadian industry. Thus, to some extent, a company wishing to initiate an anti-dumping action must speak for the industry as a whole. The process is also time consuming and costly and imposes heavy demands on senior managers.

- The general intent of anti-dumping legislation is to prevent actions from happening again. Thus, complaints can only be lodged after tenders are submitted. Even if dumping is proven the contract may be lost. This is not a serious shortcoming for market transactions of a recurring nature or for product lines in which individual contracts are not a significant determinant of corporate viability. However, in the heavy electrical equipment sub-sector where extremely large, specialized contracts arise at infrequent intervals the loss of individual contracts could force companies out of production. In these cases, the anti-dumping remedy (i.e. the imposition of duties) may be applied too late to prevent the demise of Canadian companies.

- Under the present Act, there is some question as to who pays anti-dumping duties. Technically the "importer" is liable and the legislation prevents the "exporter" from underwriting these costs. However, in cases where the "importer" is a subsidiary company of the "exporter", the likely effectiveness of this provision is open to question.

- It is also possible that utilities may be able to avoid payment of anti-dumping duties because of contractual agreements with the "importer". Thus, there is little incentive within the system to encourage utilities to avoid selecting "dumped" bids;

Several changes will be considered in the near future to overcome many of these known difficulties with the anti-dumping system.

- Countervail and Safeguards

Countervailing duties may be levied to offset the effects of either direct or indirect export subsidies provided to companies by the government of the exporting county in cases where these subsidies can be shown to cause material injury to the industry of the importing country. These provisions have rarely been invoked in Canada.

Until recently, competitor countries have had more effective systems for discouraging subsidized imports into their home markets. This imbalance is already being corrected. The United States is now obliged under the new GATT Code On Subsidies and Countervailing Duties to incorporate an injury test in all its investigations. Also, the forthcoming proposals for revising existing Canadian legislation should provide additional measures for achieving more effective results.

Safeguards, which include the imposition of temporary surtaxes, the introduction of quotas and the outright prohibition of imports, may be applied by governments when it is felt that the national interest is best served by maintaining a domestic manufacturing presence in specific product lines.

When evaluating the merits of proposals for invoking border measures it must be borne in mind that international codes governing their use are intended to standardize the applications of these measures and recognize that dumping and subsidies may have harmfull effects. Thus, where injury can be shown, countermeasures are allowed. However, the prime objective of the codes is to control the unjustifiable use of these measures as impediments to international trade.

Given the particular set of problems facing the Canadian heavy electrical equipment industry in the 1980's, the application of safeguards is perhaps the more relevant policy instrument. If used, however, it is probable that Canada would have to compensate affected countries, thereby reducing the overall benefit to Canada. If this is the case, the need for Canadian industry to become a more successful exporter is all the more urgent.

The preparation of proposals for legislative changes to existing border measures and the opportunity for public discussion of these proposals will shed further light on these questions.

5. PROCUREMENT

With the notable exception of Canada, public procurement has been and continues to be a vital factor in the development and growth of the industrial electrical equipment industry in all OECD and Communist Bloc countries. In almost all of these countries, electricity supply is a monopoly of the central government. Purchasing by these publically owned utilities is used to support and even structure the electrical industry. The methods for doing this vary from country to country and include import restrictions, the use of standards and the provision of subsidies for domestic manufacturers. Commonly, the publically owned utilities work with manufacturers to satisfy the needs of both. This cooperation includes agreements on research and development, prices, production quotas and export assistance. Even in the U.S., as noted above, the impact of "Buy American" programs and other incentives effectively eliminate foreign competition from roughly half of that country's domestic market. Of equal importance, foreign governments actively use their control over domestic markets to subsidize the exports of electrical products from their home-based manufacturers. Measures such as these constitute formidable non-tariff barriers to Canadian exports while predatory export pricing means that Canada's relatively high import tariffs provide only minimal protection in the Canadian market. A partial comparison of these arrangements between countries is provided in Table 9.

Unlike most other countries, the supply of electricity in Canada is controlled by the provinces. In general, provincially-owned utilities are mandated to supply power to customers at the lowest possible cost. This implies buying equipment from the lowest bidder n regardless of where it is manufactured. In practice, however, premium procurement preferences have been used to influence investment location decisions with a view to creating local (i.e. provincial) employment growth. Utilities in Quebec and B.C. have explicit purchase preferences for local suppliers: a blanket "buy provincial" policy in Quebec and up to a 10% premium for local supply and up to a 5% premium for Canadian suppliers in B.C. Arrangements such as these have contributed to the proliferation of small plants serving individual provincial utilities. On the other hand, small margins of preference are of little consequence in protecting Canadian suppliers from dumping as dumped bids produce far more significant price differentials (30% is not uncommon).

The problem is compounded by the provincial practice of extending preferences on a product-by-product basis rather than a company basis. Hence it is not possible for a firm to rationalize the production of different pieces of equipment among plants in several provinces and still receive the benefits of provincial procurement provisions for all products.

TABLE 9

INTERNATIONAL PURCHASES OF GENERATING AND TRANSMISSION EQUIPMENT: SELECTED COUNTRIES

Country	Extent of Government Ownership	Purchases of Foreign Equipment
Austria	Government run under one holding company	If domestic unavailable
Belgium	Nationalized system	If domestic unavailable
Canada	90% public ownership through provincial governments	Extensive
England and Wales	Nationalized system	None
France	Nationalized system	None
West Germany	70% Federal ownership	None
Italy	Nationalized system	None
Japan	Government owned system	Prototypes only
Sweden	Over 50% public ownership	Limited
Switzerland	Municipal control	None
U.S.A.	70% federal or municipal ownership	50% of market open

Provinces which either have less formal "buy provincial" policies or no domestic industry tend to seek the lowest price through international tendering.

Domestic manufacturers of large scale items such as generators and turbines must limit production to one or two sites. Consequently, these domestically products receive little benefit from provincial procurement policies and must compete openly in the Canadian market. The net result of these measures, as set out in Tables 10 and 11, has been a steady loss of much of the Canadian manufacturer's share of the domestic market.

TABLE 10

SOURCE OF UTILITY GENERATOR PURCHASES (1965-1978)

	MEGAWATTS		PERCENTAGE	
	Domestic	Foreign	Domestic	Foreign
Ontario	6,152	5,712	52	48
Newfoundland	4,627	1,610	74	26
Quebec	4,938	1,582	76	24
B.C.	1,897	2,133	47	53
Alberta	401	2,133	16	84
Manitoba	396	1,382	22	78
New Brunswick	335	1,170	22	78
Canada	19,314	18,259	51	49

Source: Stats Can

TABLE 11

SOURCE OF UTILITY TURBINE PURCHASES (1965-1978)

	MEGAWATTS		PERCENTAGE	
	Domestic	Foreign	Domestic	Foreign
Ontario	7,737	4,085	65	35
Newfoundland	5,667	600	90	10
Quebec	4,983	1,744	74	26
B.C.	271	5,201	5	95
Alberta	515	2,317	18	82
Manitoba	1,335	553	71	29
New Brunswick	147	1,387	10	90
Canada	21,691	17,085	56	44

Source: Stats Can

A. Policy Implications

The active use of procurement policy would force Canada to walk a narrow line between promoting the objective of free trade and protecting the domestic industry against the predatory marketing practices of foreign governments. The electrical sector is one area where the principle can be sacrificed at little cost. Canada argued for the elimination of NTB's in this sector during the MTN without success. Nor is there any likelihood of immediate change being brought about. In these circumstances a "buy Canadian" policy for provincial utilities may be justified.

As described above, existing provincial procurement policies act to fragment Canadian industry and are thus ineffective instruments for developing an internationally competitive industrial capability. Consequently, a case could be made for changing and coordinating the procurement policies of provincial utilities in ways that promote the national needs of the heavy electrical equipment industry. Clearly this would require considerable discussion with the provinces.

Several supportive measures might also be considered including:

- The development of common specifications and standards by utilities to reduce costs and barriers to interprovincial trade.

- The establishment of premiums or transportation subsidies by Quebec and Ontario, where the bulk of industrial electrical manufacturing is located, to assist other provinces in meeting marginally higher costs of purchasing Canadian produced equipment.

As discussed earlier, the urgency of reaching agreement on procurement policy is heightened by the anticipated slowdown of power generation construction activity in Canada.

PART THREE

RECAPITULATION

PART THREE

Recapitulation

The international electrical industry is dominated by a small number of nationally-based, multinational corporations. It is marked by tough competition and strong trends conferring competitive advantage on the larger more technologically sophisticated producers. This situation prevails in a global context in which nation states are being pushed rapidly towards more electricity-intensive lifestyles. These pressures arise from the imperatives of the need to find alternatives to increasingly scarce and expensive fossil fuels.

The existence of a strong, internationally competitive electrical industry is essential if Canada is to reap an appropriate level of industrial benefit from this "Energy Transition". Thus, the paper argued in Part One that long term, national industrial development objectives should include:

- the enhancement of an industrial capability to supply electrical generation and distribution equipment, as well as a growing range of electricity consuming products,

- the application of electricity dependent technologies and industrial processes across other industrial sectors; and

- a strong export orientation for the electrical industry.

Related themes involve energy policies that support electricity use, complementary emphasis on electronics technologies and the diversion of scarce fossil fuels from primary energy consumption to higher value added applications. The collective pursuit of these objectives was referred to as an "Electricity-Driven Industrial Strategy".

The conclusion was reached that, in precisely the same degree to which it is reasonable to assume that the country is moving towards an electrical future, it is also reasonable to assume that an electricity-driven industrial strategy should become pre-emminent. Because of regional variations in energy dependence such a policy is unlikely to be uniformly applied in all provinces. However the provinces would have to cooperate if the full benefits of such a strategy are to accrue to the nation as a whole.

A review of recent performance and forecasts for the industry in the short and medium term identified several worrisome trends. If continued, these will lead to much slower growth rates throughout the 1980's and a marked worsening of the present negative balance of trade in electrical products.

In Part Two the paper identified the reasons for this situation and the main obstacles to be overcome if Canada is to develop a manufacturing infrastructure capable of competing for a more acceptable share of the opportunities implicit in the expected shift to more electricity-intensive industrial systems and lifestyles. The key problems areas are as follows:

Energy Policy and Price

These decisions will establish the frame-work in which the domestic demand for electricity and electrical products will grow. While a shift to greater reliance on electricity appears inevitable in the long term, forecast growth rates for electricity consumption in the 1980's may prove inadequate to support the strategic heavy electrical equipment supply industry and could curtail growth prospects across the entire electrical manufacturing sector.

Industry Structures

Competitive advantage is increasingly being conferred on large scale, technologically advanced corporations which produce and market electrical products on a world-wide basis. In contrast, most of the Canadian industry, which is small scale, fragmented, foreign controlled and domestically oriented, is operating at a disadvantage.

Technological Weakness

Despite several areas of strength, the Canadian industry is not as active in the area of technological innovation as firms in competitor countries. Consequently, as the pace of technological change quickens, Canadian R & D efforts must be considerably expanded if Canada is to reap industrial benefits from the transformations that are looming within the electrical sector.

Market Characteristics

Competitor governments generally provide extensive market support to their national electrical "champions". Access to their domestic markets is severely limited: subsidized exports are common. Moreover, in addition to acting as agents for the attainment of the industrial development objectives of their home governments, the dominant MNE's frequently act in concert to control international market access. These traits place Canadian industry in the position of being under seige in the open Canadian domestic market and not able to compete fairly in the home markets of many foreign firms.

Procurement Policy

Public procurement is the touchstone of the policy framework competitor governments use to confer advantage on their heavy electrical equipment manufacturers. Procurement practices in Canada often have the effect of fragmenting production and have done little to enhance the position of Canadian suppliers in either the domestic or international markets.

1. POLICY OPTIONS

Of central importance to the creation of a policy framework for the industry is acceptance of a perception of the future that sees the growing strategic importance of electricity not simply as an energy form but as the motive force driving the technologies of future industrial growth. In sum, it requires acceptance of the fact that the world and the nation are moving towards "The Electrical Economy".

In order to fully exploit the significant industrial development potential associated with the movement towards a more electricity-dependent future, consideration should be given to implementating an "Electricity-Driven Industrial Strategy". This would require a broad, coordinated policy thrust to push the industry toward a continuing process of rationalization and consolidation to achieve more competitive production capabilities, stronger firms and a more progressive technological base.

Within this policy framework it may be necessary for government to work on a company-specific basis in Canada and on a bilateral basis internationally to bring about desired changes in industry structures and market behaviour. Directed, government assisted export initiatives and technological change could be required.

Specific steps to further refine and implement this concept could include the following:

A. Electrical Generation and Distribution Equipment

The keys to success in these manufacturing subsectors appear to lie in a combination of aggressive market initiatives, particularly on the export side, and a more determined innovative effort.

i) Export Drive

A successful export push is required to help sustain the heavy electrical equipment subsector until such time as domestic market growth picks up again. Simply put, if the industry is unable to sell at home because the market is temporarily stagnant, it has to sell abroad.

The creation of a total electrical systems bidding capability should be established by linking equipment manufacturers with utilities in some form of international, project design and management agency.

Other export initiatives might include: the selective, bilateral negotiation of tariff reductions (mainly with the U.S.) to encourage the N/S rationalization of production; the use of duty remission schemes to achieve the same purpose; bilateral cooperation in the determination of electrical standards; and bilateral negotiations to ease the effects of NTB's.

ii) Export of Electricity

To sustain domestic demand for the products of the heavy electrical equipment subsector in the 1980's, consideration should be given to a program of phased construction of electrical utilities with surplus electricity being sold to the United States.

This program could be tied to the development of a policy of energy security that involves the deliberate "overbuilding" of electricity generating facilities.

iii) Domestic Market Initiatives

To help halt the erosion in the share of the domestic market held by Canadian-based manufacturers there is a need for

a) more effective border measures and/or
b) greater provincial cooperation respecting the purchasing policies of utilities.

d) Technology Development

It is important that Canadian firms retain a high degree of innovative activity, particularly in so far as the development of non-conventional generating and distribution technologies are concerned. Governments and industry need to collaborate on the identification of a core group of such technologies and on the methods of ensuring that engineering and R & D activities oriented to the development of these technologies lead eventually to the establishment of domestic manufacturing capacity.

A key element in such discussions would be the identification of opportunities for specialized production of products for sale in world market. In the case of foreign owned subsidiary firms, this could entail negotiation with parent companies for the award of world product mandates.

B. Electricity Consuming Products

In the consumer products and industrial equipment areas, the central problem appears to be related to structural characteristics of the industry. There are too many companies producing similiar products for a domestic market that is too small by itself to allow producers to become fully competitive internationally. Thus more specialized production and a stronger export orientation are necessary.

i) Industry Specialization

The successful promotion of specialization measures would require the application of consistent government policies of encouragement and support. To ensure consistency in government decisions across departments a guiding principle should be adopted that clearly underlines the government's commitment to achieving a more specialized industry.

This principle would form the basis for firm-specific negotiations regarding consolidation of companies and product lines and the granting of world product mandates to Canadian-based subsidiaries of MNE's.

Negotiation of specialization objectives could be facilitated by the use of duty remission schemes. The market and procurement initiatives outlined above could be used by government as levers to achieve these ends. The ability to draw on a "Major Projects Fund" to support mergers and rationalization initiatives would also be desirable.

ii) Technology Development

A wide range of new, electricity-dependent consumer products is expected to emerge over the course of the next decade. The proposal below on "Innovation" covers the more exotic or longer term aspects of these product lines. There are immediate and necessary changes which the industry can and must make, however, if it is to remain competitive. These changes involve energy efficiency, the application of microelectronics and improved design.

C. General

Several government initiatives could apply to all sub-sectors of the industry. These include:

i) Linking Energy and Industrial Development Strategies

Given the growing synergy between energy policy and industrial development, these links might be made more explicit in the formulation of both energy and industrial development strategies.

ii) Technological Innovation

General, but limited benefit could be expected from across the board tax measures to encourage greater R&D. These measures would have to be supplemented by company-specific negotiations and could be highly sensitive to the rate of growth achieved by the sector. Thus, the degree of technological innovation will depend to a large extent on the success of market and rationalization initiatives.

An Electrical Technology Demonstration Program could prove useful in publicizing the attractions of new technologies.

ANNEXES

A. Sub-sector Performance and Prospects

B. Export Performance and Prospects

SUB-SECTOR PERFORMANCE and PROSPECTS

A. PAST PERFORMANCE

1. Electrical Industrial Equipment

This sector produces power machinery, switchgear, and distributing equipment other than wire and cable for the electric power utilities and industry. It is the largest sector with 32% of industry shipments. It services a market which has been relatively strong because of Canada's position as a leading world producer of electrical power. As shown in table 1, it has a better recent growth record than that of the industry as a whole.

TABLE 1

GROWTH IN 1977 CONSTANT $ MILLIONS

	1971	1973	1975	1977	1979	AAGR
Domestic Market	1173	1192	1391	1406	1687	4.6%
Shipments	908	901	1073	1081	1321	4.8%
Exports	76	76	114	100	178	11.2%
Imports	341	367	432	425	544	6.0%
Shipments/Dom. Market (%)	77%	76%	77%	77%	78%	
No. of Employees	27,300	27,600	29,300	28,500	25,000	

The product demand comes from the electric power utilities for generators, transformers, etc., and from other industrial sectors to meet their requirements for electric motors and control equipment. The supply field is dominated by two subsidiaries of U.S. corporations: Canadian General Electric Co. Ltd. and Westinghouse Canada Limited who together have approximately 40% of the market.

This subsector is the core sector in the industry: its domestic market has had the strongest growth next to Small Appliances; the growth in shipments has exceeded that of any other sector; export growth has exceeded that of imports, although this relationship is somewhat erratic and import penetration is significant.

A weakness of the Electrical Industrial Equipment Subsector has been its failure to gain more business from the electric utilities in Canada. Between 1971 and 1978, 50% of the generator and transformer needs of the utilities were satisfied by foreign countries. Table 2 shows the steady weakening in the relationship of sector shipments to the spending of utilities. Domestic utility purchases are the major market for this subsector.

TABLE 2

UTILITY SPENDING AND INDUSTRIAL EQUIPMENT SECTOR SHIPMENTS

$ MILLIONS CURRENT

	1 UTILITY INVESTMENT MACHINERY AND EQUIPMENT			2 INDUSTRIAL EQUIPMENT SECTOR SHIPMENTS	3 2 AS PER CENT OF 1
	New	Repairs	Total	Util. & Indus.	
1971	668	80	748	535	72
1972	619	84	703	526	75
1973	827	100	927	604	65
1974	1,054	137	1,191	765	64
1975	1,296	178	1,474	912	62
1976	1,574	216	1,790	1,019	57
1977	1,726	242	1,968	1,081	55
1978 prelim.	2,153	305	2,458	1,247	51

Many electric utilities in Canada tend to shop for equipment at the best price often ignoring in the process unfair pricing practices by foreign competition. Moreover, the advantage of plant locations in Ontario and Quebec is more obvious on a provincial rather than national basis. Generators and turbines are very heavy pieces of equipment with correspondingly high transportation costs. Thus plant location is one of the main reasons why utilities in Ontario, Quebec, and Newfoundland rely mostly on domestic producers, and those of Alberta and British Columbia on foreign producers. Moreover, an overcapacity in world production, particularly in West Germany and Japan, has caused problems for the Canadian producers who do not receive equivalent levels of domestic market protection government financial and export support as their competitors. Canadian-based manufacturers are increasingly at a disadvantage in both domestic and international markets as a direct result of the marginal pricing practices and subsidies used by foreign governments to stimulate export sales.

Canadian exports went mainly to the U.S.A. and South America, although some sales were made to India, Pakistan, New Zealand and even Sweden.

Capital investment was up 41% between 1972 and 1976 which was second only to Wire and Cable among the electrical sectors, but well below the 155% increase in the spending of the utilities. Employment figures appear to have peaked at the 1974 level with a noticeable reduction of 4,400 in 1978 as compared to 4,700 for the industry as a whole.

Canadian tariffs were generally 15% as compared to 7.5% for the United States.

2. Wire and Cable

The strength of the Wire and Cable Sub-sector (which accounted for 21% of industry shipments in 1978,) is due in large part to features which are particular to the sub-sector. It has a relatively large domestic market, has ready access to Canadian produced copper and aluminum, and has responded to the pressures of provincially-owned telecommunications and electrical power utilities by building production facilities in all but one province. (A consequence of these efforts has been plant fragmentation with its attendant production cost penalties.) The absence of a significant trade balance or deficit is due to the bulk weight, and low value of wire and cable which tends to keep production facilties close to markets. The performance of this sub-sector is presented in Table 3.

TABLE 3

GROWTH IN 1977 CONSTANT $ MILLIONS

	1971	1973	1975	1977	1979	AAGR
Domestic Market	676	791	784	700	869	3.2%
Shipments	704	787	760	678	864	2.6%
Exports	57	42	36	39	70	2.6%
Imports	29	46	60	61	75	12.6%
Shipments/Dom. Market (%)	104%	99%	97%	97%	99%	
No. of Employees	8,700	19,800	10,000	9,000	9,200	

Whereas the growth of the domestic market and production was lacklustre at 3.2% and 2.6% respectively, the trade deficit is negligible. The growth of imports has been small in relation to the market. Employment figures followed the industry trend of rising until 1974 and then falling off.

The expansion of the domestic market and of exports in 1978 are an indication that the effects of the mid-1970 slump have lessened. Should the 1979 results continue, the resulting 11% and 12% growth rates for the domestic market and shipments respectively will be remarkable for a sector which has no 'replacement' product market to speak of.

The two largest suppliers in the sector are Canadian-owned Northern Telecom Limited and Canada Wire and Cable Ltd. which together supply some 60% of the market.

Canadian tariffs ranged from 10 to 17½% as compared with 7½ to 8½% for the United States.

3. Major Appliances

Third in size among the sub-sectors, this industry produces the larger kitchen and laundry appliances. A significant re-structuring took place in 1977 that consolidated the sector somewhat and reduced foreign ownership. Canadian-owned GWS Limited formed a joint venture with Canadian General Electric Ltd. to acquire the production facilities of Westinghouse Canada Limited. The largest Canadian-based appliance company, CAMCO, was the result. There is evidence in Table 4 that this sector is strengthening.

TABLE 4

GROWTH IN 1977 CONSTANT $ MILLIONS

	1971	1973	1975	1977	1979	AAGR
Domestic Market	673	794	712	721	745	1.3%
Shipments	590	691	593	576	639	1.0%
Exports	49	70	54	68	111	10.8%
Imports	132	173	173	213	217	6.4%
Shipments/Dom. Market (%)	88%	87%	83%	80%	86%	
No. of Employees	11,900	13,500	11,800	11,200	10,800	

The first half of 1979 indicates a recovery in the domestic market back to the level of 1973-74, a continuing improvement in the trade deficit, and more strikingly, a strong upturn in exports. While business is generally tied to housing starts, the sector is also beginning to benefit from the domestic production of dishwashers and microwave ovens which hitherto have been big import items. The devaluation of the Canadian dollar is also helping export performance.

A characteristic of the sub-sector is consoldiation: the field is shared by a few large companies such as Camco, White, and now BFG-Admiral, and output is from relatively few large plants located mainly in Ontario and Quebec.

Microwave ovens and dishwashers have been behind the high growth rate of imports, and air-conditioners are behind the recent higher growth rate of exports and make up 50% of the total. International trade is limited by the effect of 'standards' adopted by various countries. This is particularly the case with electric ranges for which Canadian and European standards are quite different.

Appliance imports were subject to tariff rates of 15-20% as compared to exports to the U.S.A. which were subject to 5%.

4. Small Appliances

This sub-sector makes product lines such as kettles, toasters and blenders and imports a variety of new personal care products and kitchen gadgets which are added every year. The domestic market has the highest growth rate of all sectors because of the steady introduction of new products.

This sub-sector has the worst trade imbalance within the industry. The trade deficit and import figures have risen in excess of 11% on an annual average. By 1978 the sub-sector, with 8% of the industry's shipments, accounted for 28% of the sector trade deficit. The lopsidedness of exports to imports stands out in Table 5. By 1978 domestic production accounted for only one-half of domestic demand, down from two-thirds in 1971.

TABLE 5

GROWTH IN 1977 CONSTANT $ MILLIONS

	1971	1973	1975	1977	1979	AAGR 1971-79
Domestic Market	340	410	470	471	525	5.6%
Shipments	232	271	292	258	271	2.0%
Exports	6	14	22	13	17	13.9%
Imports	114	153	200	226	271	11.4%
Shipments/Dom. Markets (%)	68%	66%	62%	55%	52%	
No. of Employees	5,600	7,000	7,100	5,900	-	-

Against these trends, the post-MTN prospects of reduced tariffs would not, on the surface, augur well for the industry. An assessment of some of the industry's basic strengths, however, suggests that the capacity for a restructured, export oriented industry exists and may be attainable. Among other things, the sub-sector is financially healthy and has a number of aggressive, aware Canadian managers and firms with recognized expertise in some product areas. Efforts are just beginning to be made to more fully exploit opportunities. In sum, the industry offers scope for building a specialized Canadian presence in the market place for portable electrical appliances.

Canadian tariffs generally at 20% were four times as high as U.S.A. tariffs.

5. Lighting Fixtures and Miscellaneous Products

This sub-sector produces a diverse range of products from the following major groups; lighting fixtures, lamp bulbs, wiring devices, and conduit and fittings. Growth in the domestic market and shipments is below that for the industry. Overall, however, both the sizes of the domestic market and the volume of shipments have declined since 1976. Moreover, the trade deficit grew most of all. Separate figures are available for lighting fixtures and 'other'. Thus Table 6 is presented in two parts.

TABLE 6

GROWTH IN 1977 CONSTANT $ MILLIONS

Lighting Fixtures

	1971	1973	1975	1977	1979	AAGR
Domestic Market	175	200	222	213	231	3.4%
Shipments	159	173	188	174	189	2.2%
Exports	14	21	11	9	(12)	(1.9%)
Imports	30	48	45	48	54	7.1%
Shipments/Dom. Market (%)	91%	87%	85%	82%	82%	

Miscellaneous Products

Domestic Market	520	549	562	477	578	1.2%
Shipments	438	436	446	341	422	(0.2%)
Exports	46	57	55	59	102	10.4%
Imports	128	170	171	195	258	8.5%
Shipments/Dom. Market (%)	84%	79%	79%	71%	73%	
No. of Employees	14,700	15,000	15,700	13,300	16,300	

Lighting Fixture sales sagged in 1975 and have not recovered. Export growth is non-existent but the trade deficit is not getting worse because shipment shrinkage since 1974 has been no worse than that of the domestic market. In Miscellaneous Products both shipments and the domestic market have yet to return to the levels of 1972.

The import flow is mainly from the U.S.A. with an excess of 75% of lamps, bulbs, and lighting fixtures, and about 95% of wiring devices and conduit coming from that source. The export flow is about 55% to the U.S.A. with the remainder to Commonwealth countries, Western Europe, and to the Caribbean. Were it not for the favourable tariffs rates afforded Canadian producers, the trade deficits would have been higher yet. Lamp tariffs are 7.5% in Japan, 6.5% in the E.E.C. and 5% in the U.S.A. as compared with Canada's 15 to 17.5%. Much the same situation prevails for conduits and wiring devices.

Foreign ownership is high, particularly in lamps and bulbs where five foreign-owned subsidiaries dominate. Capital investment in Canada is minuscule at $2.1 million (1976). This was 1.6% of the total for the industry although shipments for the sub-sector were 15.8% of the total.

6. **Batteries**

This smallest of the sub-sectors has two distinct segments in dry batteries and wet batteries. The former has a broad market while the latter has a market tied to the automotive industry. Average annual growth rates are set out in Table 7.

TABLE 7

GROWTH IN 1977 CONSTANT $ MILLIONS

	1971	1973	1975	1977	1979	AAGR
Domestic Market	157	157	171	184	243	5.6%
Shipments	135	133	128	145	196	4.8%
Exports	10	7	8	14	22	10.4%
Imports	32	31	51	53	69	10.1%
Shipments/Dom. Market (%)	86%	85%	75%	79%	81%	
No. of Employees	2,700	2,600	2,800	3,000	3,000	

This sub-sector is in the doldrums with a high trade deficit in relation to the size of the domestic market. There has been steady (though slow) growth in the domestic market since 1975. However, imports have picked up most of this expansion at the expense of Canadian shipments. Because of the weight factor, production facilities are dispersed across Canada. Employment in the sub-sector was higher in 1978 than in 1971 - the solitary case of employment growth throughout the industry.

In the car batter market, American car makers put more U.S. made batteries into new cars than they did in the sixties. These enter Canada duty-free under the Auto-Pact. To offset this discouraging trend, Canadian producers steadily increased the growth of replacement batteries during the seventies. Battery export markets were mainly England and Sweden, and dry cells were sold to Venezuela.

The Canadian tariff rate on non-original batteries was 17.5%, with the exception of duty-free hearing aid batteries, and afforded the Canadian industry a good degree of protection in the domestic market.

A rather significant change of ownership took place in 1974 when INCO Ltd. purchased the U.S. owned E.S.B. Corporation the parent of E.S.B. Canada Limited. Prior to this event, the sub-sector was over 95% controlled by foreign companies.

B. SUB-SECTOR FORECASTS

1. Electrical Industrial Equipment

TABLE 8

GROWTH IN 1977 CONSTANT $ MILLIONS

			Forecast	AAGR	
	1971	1979	1985	1971-79	1979-85
Domestic Market	1173	1687	2003	4.6%	2.9%
Shipments	908	1321	1559	4.8%	2.8%
Shipments/ Domestic Market	77%	78%	78%		

Clearly market growth for industrial products production and equipment for primary and secondary industries will depend heavily on the growth of Canadian industry generally. Competitive problems stemming from structural weaknesses will mean difficulty competing against imports and only moderate export success. As a result the trade deficit will rise and growth of production will be slower than that of the domestic market.

The larger portion of this sector's output is sold to electric power utilities and companies that produce power for their own use. Until 1974, demand for electricity grew at about 7% per annum. This rate has declined to about 4% to 5% in the face of higher electricity costs and introduction of electricity saving programs (in addition to the effects of economic recession and the relatively slow economic growth). Until recently, capacity was being added on the assumption of a continuation of 7% annual load growth, so that over-capacity will exist for the medium term. Accordingly, the investment plans to electric power utilities are being reviewed and in some cases sealed down. The utilities are now estimated by EMR to increase their total annual investments - in current dollars - from $6.6 billion in 1979 very gradually to only $7.4 billion in 1985 (i.e., a sharp decline in real terms). No breakdown is available as to how much of these amounts is expected to be used for heavy electrical power equipment, but the outlook does not inspire hope for vigorous growth in the next decade.

Fierce competition from European countries and Japan which have excess production capacity will continue. Powerful non-tariff barriers in these countries protect their domestic markets and make their national producers more competitive in export markets. The lower Canadian dollar exchange rate helps, but there likely will be spare capacity in Canada in many cases over the medium term.

The main strengths of the Canadian industry lie in such products as hydro generators, transformers, circuit breakers, long-distance transmission equipment and drive systems for industrial and marine applications. In all of these products the Canadian industry is generally internationally competitive and in some of them it has developed technology of the highest standards.

2. Wire and Cable

TABLE 9

GROWTH IN 1977 CONSTANT $ MILLIONS

	1971	1979	Forecast 1985	AAGR 1971-79	AAGR 1979-85
Domestic Market	676	869	928	3.2%	1.1%
Shipments	704	864	917	(0.2%)	1.0%
Shipments/ Domestic Market	104%	99%	99%		

The average annual rates of increase to 1985 for the apparent domestic market and for shipments have been estimated at 1.1% and 1.0%. Imports and exports are each below 9% of the domestic market, and are not expected to change significantly. The market upsurge of1978/79 is not expected to last and slackness in demand from the telecommunications field has already occurred.

In 1979, Canada agreed to tariff cuts of some 50% from levels of 10-17½%, and the United States to cuts of some 40% from levels of 7½-8½%. The changes are not expected to influence unduly either imports or exports.

Wire and Cable is a mature industry in a basically stable market, with fairly gradual changes from year to year. Technological change is generally slow. Import penetration is small; the industry easily satisfies more than 90% of domestic demand. This situation is expected to continue. The only possible exception is the entry of fibre optics, discussed below.

Residential construction is a good indicator of likely future developments. Such construction is expected to grow at an annual rate of less than 1% to 1985. On the other hand, copper and aluminum supplies are expected to tighten towards the mid-1980's thus placing Canadian producers in a more advantageous position both because they have access to domestic supplies and because of the less volatile producer price system.

The sub-sector faces important, long-term structural problems - old plant, fragmentation, small plant size - which affect the competitiveness and growth prospects of the industry. These are not expected to change in the medium term.

The one major source of potential change, fibre optics for communications, is not anticipated to have a major impact before 1985. Its main use will be for trunk lines which account for only a small portion of consumption. Its main impact will be to force wire and cable firms to decide whether they will stay with the resource based side of the industry or follow the telecommunications market.

3. Major Appliances

TABLE 10

GROWTH IN 1977 CONSTANT $ MILLIONS

			Forecast	AAGR	
	1971	1979	1985	1971-79	1979-85
Domestic Market	673	745	810	1.3%	1.4%
Shipments	590	639	691	1.0%	1.3%
Shipments/ Domestic Market	88%	86%	85%		

The sector performed very well in 1976-1977-1978 in a fairly weak domestic market. The above table shows a continuation of that performance. Growth is anticipated to come primarily from the "backing out" of some imports (most notably dishwashers and microwave ovens) and improved export prospects.

There are potential long term threats posed to the sector by:

1) increased competitiveness from the consolidated U.S. industry;

2) Japanese penetration of the North American market; and

3) the assumption that the Canadian dollar will strengthen.

On the other hand, the sector appears to have the following strengths:

1) consolidation which has already improved the scale of production;

2) prolonged tariff protection at the previous rate until the end of 1982, followed by cuts to a reasonable level by 1987 (i.e. 12½%);

3) competitive supply situation for materials, particularly steel and plastic;

4) the trend towards modularized or unit production processes which tends to reduce the scale advantages of the larger facilities in the U.S. and elsewhere.

Provided the sector takes full advantage of the current opportunities by continuing to make capital investments and aggressively pursuing export opportunities, particularly into the potentially high volume U.S. market, the Canadian major appliance industry can build itself into a strong internationally competitive sector which will be able to withstand the long term threats.

4. Small Appliances

TABLE 11

GROWTH IN 1977 CONSTANT $ MILLIONS

			Forecast	AAGR	
	1971	1979	1985	1971-79	1979-85
Domestic Market	340	525	770	5.6%	6.6%
Shipments	232	271	333	2.0%	3.5%
Shipments/ Domestic Market	68%	52%	43%		

The growth of the domestic market is projected at 6.6% per annum with shipments improving.

The MTN tarif changes will reduce Canadian tarrifs from a range between 17½ and 20% to 10% - 12½% whereas U.S. tarifs will drop to approximately 2½%.

With the exception of a few traditional products and portable appliances this is a sector in which cosmetic design, packaging, advertising and the ability to respond quickly to fickle market demands are important. Many new products have a short commercial life. Success depends upon getting a large volume of a product into distribution channels very quickly to catch the peak. The Canadian industry, fragmented and with a small market, finds it difficult to operate in such an environment.

There are, however, encouraging signs of export growth for Canadian products and of specialization initiatives within the industry combined with higher levels of capital investment.

5. Miscellaneous Products

TABLE 12

GROWTH IN 1977 CONSTANT $ MILLIONS

			Forecast	AAGR	
	1971	1979	1985	1971-79	1979-85
Domestic Market	695	809	911	1.9%	2.0%
Shipments	597	611	618	(.3%)	.2%
Shipments/ Domestic Market	86%	76%	68%		

Miscellaneous products is the only sector forecast to show a sizeable drop in production in 1985 from the 1971 volume.

Next to Small Appliances, this sector will have the worst trade performance in relation to its market size. While there has been success in exporting street lighting equipment to the Middle East, the whole lighting fixtures group could be hard put to remain in production in Canada because of fragmented, output and small production runs.

While production of small electric motors will increase moderately, no increase is forecast for industrial controls or for audio and welding equipment. Production of conduit and accessories and of wiring devices is expected to decline.

6. Batteries

TABLE 13

GROWTH IN 1977 CONSTANT $ MILLIONS

			Forecast	AAGR	
	1971	1979	1985	1971-79	1979-85
Domestic Market	157	243	285	5.6%	2.7%
Shipments	135	196	203	4.8%	.6%
Shipments/ Domestic Market	86%	81%	71%		

Domestic market growth will continue to be mediocre and growth of shipments could stagnate.

Wet batteries depend heavily upon the motor vehicles market in Canada. This is anticipated to grow at 3% annually through 1985. Given high transportation costs for the finished product, Canadian-based producers should continue to be the main supplier for Canadian-manufactured automobiles. As well, a duty remission program is assisting the export of some batteries. Some time after 1985 the electric car could be in mass production. Thus battery production and production facilities could change dramatically.

The outlook for the dry cell portion of the industry is less positive. Imports have made major inroads in the Canadian market and Canadian production is likely to continue to suffer from this problem. All major manufacturers supplement their Canadian production with imports from affiliates around the world. Continued Canadian production of limited product lines will depend upon achieving international cost competitiveness. The total dominance of MNE's in this industry, the weakness of the Canadian industry and the small size of the domestic market make it unlikely there will be any significant growth in dry cell production.

Under the 1979 MTN results, batteries for hearing aids continue to enter Canada duty-free and others will be subject to a tariff of 10.2% rather than 17½% as previously.

ANNEX B

EXPORT PERFORMANCE AND PROSPECTS

Canada's export trade has been heavily weighted to industrial equipment and major appliances. The prime market focus has been the U.S. The more rapidly developing countries of the Third World have become slightly more important in relative terms over the last decade but aside from industrial electrical equipment, exports to LDC's have not been significant. (Wire and cable exports to the Middle East are a possible exception to this trend).

a) Market Focus-

It is clear that the potential market for Canadian exports is made up of three distinct customers: the United States; countries which have an electrical industry, (the Producing Countries); and countries without an indigenous industrial capability (the Developing Countries).

i) United States

The U.S. is the largest market for all Canadian electrical products, but it is important to note that it is growing much more slowly than the industry's overall export growth. This is a reflection of both competition and the maturity of the market.

It is the market both psychologically and logistically easiest for Canadian industry to tackle because of familiarity and proximity. Standards are similar, there is a relative lack of protection and the utilities are largely privately owned. There has, however, been a disturbing trend towards more "Buy American" pressure at the Federal level and a proliferation of similar policies at the State and even the Municipal level that are squeezing foreign suppliers from an even larger portion of the U.S. market. It has been estimated that foreign suppliers may be excluded from approximately half the market in this sector.

Because of the large percentage of U.S. control of Canadian industry, its access to the U.S. market is often limited by the American parent. On the other hand, where U.S. controlled companies are permitted to export, the ability to use the parent's brand name and marketing program provide invaluable support.

North-South Rationalization of production presents opportunities as the continent moves toward freer trade. This is being encouraged by a number of means, notably Canada's move to reduce tariff rates for many industrial inputs, in order to reduce the costs to Canadian industry associated with importing these components.

ii) Producing Countries

All the protective measures enumerated earlier are used by the producing countries to form an impenetrable phalanx of barriers to imports into their domestic markets. An example of the result of this situation is the 1978 trade balance with Japan in this sector. Canada exported less than $2 million to Japan but imported over $97 million. The competitive strengths of the domestic industries in their own markets must also be acknowledged. Even with "fair" prices, it is often hard to compete in someone's own home market.

iii) Developing Countries

The Developing Countries are the area of major opportunity for the industry's exports. As a first step in infrastructure development an electrical generation and distribution network is necessary. This is followed immediately by a requirement for industrial equipment to use the electricity. This provides a growing market for the entire range of industrial electrical equipment and wire and cable. As GNP increases there is then an opportunity for exporting electric appliances.

This pattern has been apparent in the Middle East where over the past five years Canadian exports of industrial electrical equipment have gone from nothing to $5 million. Wire and cable increased by 40%, and major appliance exports tripled. It is likely that Latin America will see similar growth, with some of the major opportunities being in hydro generation where Canada is recognized as being competent. China is another area where large scale hydro development is scheduled over the next decade. Although the overall market remains a mystery, individual projects as high as $6 billion have been discussed. Canada has also had some success in exporting to the Pacific Rim countries.

The following discussion briefly reviews the prospects for increasing exports of the products of each sub-sector as well as market areas where increased sales may be possible.

b) Low Export-Potential Sub-Sectors

i) Batteries

In the car battery market, American car makers now put more U.S. made batteries into new cars than they did in the sixties. These enter Canada duty-free under the Auto-Pact. To offset this discouraging trend, Canadian producers have concentrated on the replacement battery market. Low volume battery export markets were mainly England and Sweden. Some dry cells, in which Canada is generally not competitive were sold to Venezuela.

The Canadian tariff rate on non-original batteries was 17.5%, with the exception of duty-free hearing aid batteries, and afforded the Canadian industry a good degree of protection in the domestic market. The introduction of electric vehicle batteries could significantly increase battery imports if Canada does not either develop its own battery technologies or arrange to manufacture them under license.

ii) Miscellaneous Products

Many of the products within this diverse sub-sector that are exported succeed on the basis of good design and aesthetics. Consequently there is little of a sector-specific nature that government can do to improve performance.

The import flow is mainly from the U.S.A. with in excess of 75% of lamps, bulbs, and lighting fixtures, and about 95% of wiring devices and conduit coming from this source. The export flow is about 55% to the U.S.A. with the remainder to Commonwealth countries, Western Europe, and to the Caribbean. Were it not for the favourable tariffs rates afforded Canadian producers, the trade deficits would have been higher yet. Lamp tariffs are 7.5% in Japan, 6.5% in the E.E.C., and 5% in the U.S.A. as compared with Canada's 15 to 17.5%. The same situation applies to conduits and wiring devices.

iii) Wire and Cable

Wire and Cable represents only 14% of Canada's exports in the Electrical Sector, with half of the $56 million exported going to the United States. Most of the rest goes to the Middle East, with some to Latin America. Over the past five years the importance of Latin America has decreased while exports to the Middle East have increased.

Wire and Cable is a little traded commodity with a high weight to price ratio. Because of its relatively straight- forward production technology it is one of the early industries to be established in developing countries. With the exception of some high voltage cable, which is somewhat more sophisticated, developing countries are able to move rapidly toward self sufficiency. Canadian industry has often taken advantage of this trend by becoming involved in the establishment of local industry.

There is little prospect for increasing exports, but the sector can be expected to maintain its current levels.

In general, improvements in the export performance of these sub-sectors will be dependent on efforts to rationalize domestic production, possibly on a North-South basis in consultation with parent companies. Thus, direct government assistance is premature. Policies aimed at promoting more specialized production, possibly through the application of duty remission schemes, and support for industrial design and innovation seem more appropriate. Specific policy options to achieve these objectives were discussed in the Chapter on Structural Weaknesses.

c) High Export Potential Sub-Sectors

i) Major Appliances

Major appliances accounted for 22% of Canada's exports in the Electrical Sector in 1978, with over half of the $91 million exported going to the United States. The remainder went to the Middle East, Western Europe, and Latin America, in descending order. This general pattern has been constant for the last five years, although the Middle East is becoming a more important market area.

Designs are relatively mature and production technology has become the determining factor in competitiveness. Consequently, it has been difficult for Canadian industry to compete internationally with foreign companies whose production runs are up to ten times the size. Nevertheless, the industry has been able to carve out market niches where it competes on the basis of quality.

Rationalization of the industry has extended to the point where, with an 85 cent dollar, the largest Canadian plants should be competitive in the United States once American tariffs are lowered to MTN rates. These tariff reductions will apply to air conditioners, refrigerators, washing machines, and electric ranges.

Rising standards of living in the Middle East may allow an expansion of exports to those areas both for very high priced specialty items and for some of the simpler appliances (e.g. wringer washers). New opportunities in Europe, initially for laundry equipment, may also emerge.

In general, however, improved export performance in this sub-sector will be strongly influenced by cost/price relationships. Thus, this sub-sector, like those exhibiting low export growth potential, will benefit less from government programs of direct assistance to export than from initiatives aimed at productivity gains.

ii) Industrial Electric Equipment

Despite the structural constraints to export that exist within this sub-sector, Canada has had commendable success exporting. In part this reflects the knowledge-intensive aspect of custom designed products. It is precisely this engineering capacity and the associated skilled labour component of the industry that is immediately vulnerable to a lower level of domestic demand. Thus, with the prospect of a stagnant of domestic market close at hand, a failure to sustain the sector through increased exports could see its rapid demise. Consequently, the incentive to increase exports from this sub-sector comes more from necessity than from the existence of obvious and accessible market opportunity.

The market potential is undoubtedly there. European and Japanese markets are likely to remain closed to Canadian exports. However, up to half of the very large U.S. market is likely to remain open to international competitive bidding. As well, the developing world, where per capita energy consumption is expected to increase at up to seven times the rate for industrialized countries, will offer enormous scope for exports for many years to come.

The task for Canadian industry is to organize to take full advantage of these market opportunities.

iii) Portable Appliances

The historically low level of exports from Canada together with improving access to foreign markets and a greater interest in pursuing export opportunities provide scope for improving export performance.

Some meaningful capital investment in rationalization measures and recent export market successes in the U.K., Germany and Australia point the way. The provision of government assistance in the area of market identification and follow-up, along with a review of the use of national electrical standards as non-tariff barriers to trade could prove helpful.

Canada

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