

A REVIEW OF THE MARKET  
FOR ELECTRICAL AND  
ELECTRONIC SWITCHES

1973

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project report

A REVIEW OF THE MARKET  
FOR ELECTRICAL AND  
ELECTRONIC SWITCHES

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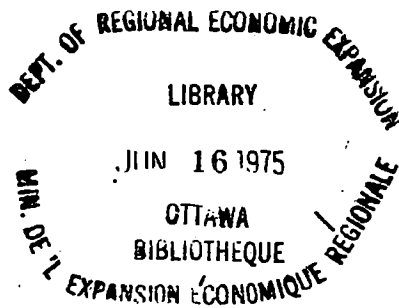
Department of Regional Economic Expansion,  
Industrial Development Branch,  
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PLEASE NOTE

This report has been edited, where necessary, to remove comments and data that are classed as confidential. In the interest of efficiency, this has been done by simply removing small sections of the report. As a consequence, there are some blank spots which, we hope, will not interfere with the readability of the report.

Department of Regional Economic Expansion

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## INTRODUCTION AND SUMMARY

### A. INTRODUCTION

This study examines the potential market for electrical and electronic switches in Canada.

The objective is to evaluate potential manufacturing opportunities. These can then be evaluated in greater detail by prospective entrepreneurs. In the context of this study, switches include: EHV (extra high voltage), disconnect switches and circuit breakers, distribution utility disconnect switches and circuit breakers, residential and industrial switches, motor vehicle and appliance switches, electronic switches and telephone switchboards.

### B. SUMMARY

The total market for electric and electronic switches was \$235 million in 1971.

Within the total market there are six main groupings, each with its own specific market characteristics. The groupings are:

<u>Item</u>	<u>Dollar Volume (1971)</u>	<u>Product Characteristics</u>
High Voltage	20 million	- specialized, custom-built
Power Distribution & Disconnect	22 million	- many product lines - custom-built
Residential & Industrial	8.5 million	- many product lines - high volume - low unit value
Electrical Appliance & Motor Vehicle	14 million	- many product lines - high volume - low unit cost
Electronic	12.5 million	- ultra high volume - low unit cost - many product lines
Telephone Switchboards	164 million	- complex - specialized

The principal data for all these types of switches are summarized in Appendix A.

The study is broken down into six main sections, each section dealing with one of the product groupings.



## II

### CONCLUSIONS

1. The market is split up into three general types of product:
  - ▶ telephone switchboards, which are custom-built and represent a closed market.
  - ▶ High unit cost, specialized, customized equipment used by major utilities. This field is dominated by large U.S. owned companies who carry out their basic research in the United States.
  - ▶ Low cost, high volume, mass produced switches. These switches are generally produced as part of a product line of wiring devices or other electrical equipment. A world wide market would be necessary to support a company making only these switches.
  
2. There is an opportunity for a Canadian manufacturer to produce residential and industrial switches and selected lines of electronic switches. However:
  - ▶ A manufacturer of residential and industrial switches must be prepared to manufacture related wiring devices. This is essential both to absorb the relatively high overhead and initial investment and also to offer a wide range of products to customers who prefer to buy from a limited number of sources.
  - ▶ A manufacturer of electronic switches should identify specific product lines and should base his marketing and production plans on North American and European demand -- not merely the Canadian market.
  
3. The product requirements of the power utilities - high reliability, research resources, and large scale customization - make it difficult for a small company to break into this market.

4. Motor vehicle and appliance switches are produced by captive or wholly - owned manufacturing plants. The potential risk to an entrepreneur would not justify his entering this field.
5. Telephone switchboards do not offer a reasonable opportunity. They demand a sophisticated research capability. They are currently produced by subsidiaries of the potential customer -- the telephone companies.

### III

## HIGH VOLTAGE SWITCHES AND SWITCHBOARDS

### A. COMMODITY DESCRIPTION

This commodity class consists of switches and circuit breakers capable of handling over 4,000 volts. They are used exclusively by the large power generating and transmission companies such as Ontario Hydro, Quebec Hydro, Churchill Falls Co. Ltd. and so forth.

Switches, by definition, are considered to be no-load disconnecting devices. Though they are capable of handling potentials of several kilovolts and currents of several thousand ampères, they are opened and closed under conditions when no current is flowing. Consequently, their construction is relatively simple. They consist primarily of a switch blade, contacts, a housing and supports. Larger units are motor-driven through a reduction gearing. Prices of typical switches in this category are:

5 KV -- \$1,000 - 1,500  
230 KV -- \$10,000  
500 KV -- \$15,000

Circuit breakers, by comparison are much more complex and costly. They are designed to open a circuit when a current is flowing. Consequently, the major feature of the design centres on handling the very large voltages that build up when the flow of current is interrupted. Two principal methods have been developed for controlling the arcing which results from these voltages. One method, favoured by U.S. manufacturers, consists of opening the circuit in an oil bath. This prevents the ionization that occurs if the switch opens in air. In the other type of breaker, favoured by European manufacturers, notably Brown-Boveri, the ionization is controlled by an air-blast.

In comparison with no-load disconnect switches, the cost of a typical 500 KV circuit breaker is \$260,000. Breakers capable of handling currents of up to 100,000 ampères cost as much as \$700,000, depending on the specific design requirements.

## B. THE MARKET

### 1. The Canadian Market

Through this study we have defined the Canadian market as consisting of domestic production plus imports. This is equivalent to the domestic market plus exports -- it represents the market immediately accessible to a Canadian manufacturer.

The total Canadian market, on this basis, is about \$20 million annually. Most of this purchase is for the high cost, low volume, custom-built circuit breaker. For example, discussions with Ontario Hydro indicated that in the next nine years they expect to buy only 175 switches -- having an aggregate value of just under \$2 million. The value of circuit breakers will be at least ten times that amount.

Purchases of switches and circuit breakers is linked to the construction of power generating and transmission systems. Appendix B shows details of imports, exports and Canadian production for the past eight years.

### 2. Canadian Production

Canadian production has varied between \$8 and \$15 million. It now represents about 75% of the total Canadian market. This ratio has been essentially constant during the last eight years, even though there have been year-to-year fluctuations. For example, in 1968 Canadian production accounted for 84% of the market.

### 3. Imports

The average level of imports has remained almost constant over the last eight years. However, there have been significant year-to-year fluctuations. About 50% of these imports are from the U.S.A. with the remainder from Europe.

### 4. Exports

Exports, since 1966, have been level at about \$5 million.

5. Growth

The market for these switches tends to follow closely the growth of urban development. Hence, since the Economic Council of Canada forecasts a 40% growth in urban development by 1978, the total Canadian market is also expected to increase by 40% to about \$28 million.

C. CANADIAN PRODUCTION

1. Major Producers

Approximately 80% of Canadian production is supplied by four major producers. They are:

- ▶ Canadian General Electric Co. Ltd.
- ▶ I.T.E. Circuit Breaker Ltd.
- ▶ Kearney-National Ltd.
- ▶ McGraw-Edison Ltd.

2. Type of Production

Canadian production consists of the manufacture of custom designed equipment for the large power generating utilities. About 95% of these switches are designed and manufactured in Canada. They are produced by the Canadian subsidiaries of U.S.-owned companies.

D. COSTS

1. Production

Exact production costs are difficult to obtain since these switches are custom-designed and built. However, an approximate breakdown of costs is:

▶ Raw material	20%
▶ Labour	20%
▶ Overhead	25%
▶ Engineering	15%
▶ Transportation	Negligible
▶ Profit before taxes	20%

The manufacturing process normally depends on the use of general purpose machinery -- lathes, milling machines, boring mills, drills and so forth.

Material costs include a number of semi-fabricated items bought from outside sources. Typical of this category are cast aluminum housings with brass or bronze contacts, and insulators.

Because of the heavy dependence on general purpose machinery, a new manufacturing facility could be established for a total capital investment in plant and equipment of about \$500,000.

## 2. Tariffs

The import tariff for these switches is covered in import category 445-24-01 and is 17.5% on invoiced value.

The export duties to the U.S.A. are 8.5% and to Europe are 10%. With the entry of the U.K. to the European Common Market the export duties to the U.K. will be:

PRESENT	0%
1974	4%
1975	6%
1976	8%
July 1, 1977	10%

E. LOCATION

Location of the design and manufacturing of these categories of switches and circuit breakers is not a significant factor in determining the feasibility of greater Canadian participation.

1. Site Selection

A plant could be located in any major city provided there is a reasonable supply of skilled labour and engineering skills.

2. Transportation

Transportation costs are not a significant factor due to the relatively high value and low bulk of this commodity. For example, a 500 KV switch having a value of \$15,000 would weigh about 4,000 lbs. The cost of transporting such a switch for 2,000 miles by rail or road would seldom exceed \$400 -- less than 3% of the f. o. b. value. The cost of transporting circuit breakers would be even less, proportionately.

3. Regional Possibilities

The best regions in which to set up a new facility are those which are largely industrialized and possess a good supply of engineering skill and skilled labour.

F. STRENGTHS AND CONSTRAINTS

1. Strengths

- a) Tariffs provide a competitive advantage to the Canadian manufacturer.
- b) All research and design for Canadian production is done in Canada. Since there is no shortage of good electrical design engineers in Canada, a prospective manufacturer would have a large supply of engineering skill to draw from in setting up a new research and design facility.

## 2. Constraints

- a) The market is highly competitive. It is too small to allow any manufacturer to specialize. Hence all manufacturers must supply a full range of products to compete.
- b) The total investment required for a new manufacturer is high, at about \$500,000.
- c) High design and engineering capabilities are required which normally only the large manufacturers can afford.
- d) The breakeven volume is relatively high (about \$1 million annually or a 5% market share). See Appendix H.
- e) Customers purchase on the basis of reliability rather than cost. Hence a new manufacturer would need to produce a proven reputable and reliable product to compete. This is difficult for a new producer.

## G. CONCLUSIONS

We do not believe that these high voltage switches offer a profitable opportunity to a new Canadian entrepreneur. The principal reasons underlying this conclusion are:

- ▶ Customers buy on the basis of proven reliability and technological capabilities rather than on the basis of price. This suggests that any new manufacturing facility should be a subsidiary of a known producer.
- ▶ Most switches and circuit breakers are custom-designed for a specific application. This implies a specialized design and engineering capability. Normally only the larger companies can afford these capabilities.
- ▶ The market is highly competitive. Annual sales of switches number about 500. But, the number of orders for switches is much less than this. The combination of high breakeven volume and a small number of orders present a severe business risk for the small company.



## IV

### POWER DISTRIBUTION AND DISCONNECT SWITCHES

#### A. COMMODITY DESCRIPTION

This classification covers switches and circuit breakers capable of handling between 500 and 4,000 volts. They are used primarily by the local power distribution utilities.

The description of switches and breakers in this class is very similar to that presented in the previous chapter. The significant difference lies in the greater standardization of product and less custom building in the products described in this chapter.

#### B. MARKET

##### 1. Total Canadian Market

The Canadian market for these products (Canadian production plus imports) is approaching \$22 million annually. The cost of a typical installation ranges from about \$1,000 to \$50,000. This relatively small value allows for a much wider range of products than is the case with the more costly high voltage products discussed in Chapter III. About 50% of the market -- \$10 million approximately -- demands custom-built products. The balance are standard off-the-shelf items.

Market data is detailed in Appendix C.

##### 2. Canadian Production

Canadian production since 1966 has fluctuated between \$16 and \$23 million with a yearly average of about \$20 million. This is shown in Appendix C. This represents about 95% of the total Canadian market.

3. Imports

Imports represent only about 5% of the current market. Since 1964 they have fluctuated between \$0.9 million and \$1.8 million. About 50% of the imports are from the U.S.A.

4. Exports

Exports over the last 8 years have remained stable at about \$1.5 million.

5. Growth

The consumption of these switches is dependent upon the growth of urban development. With the Economic Council of Canada predicting a 40% growth of urban development by 1978, the Canadian market should increase by 40% to about \$31 million in 1978.

C. CANADIAN PRODUCTION

1. Major Producers

Approximately 20 manufacturers account for about 85% of the current Canadian market. The major producers are:

- ▶ Canadian General Electric Co. Ltd.
- ▶ A.K. Porter Ltd.
- ▶ I.T.E. Circuit Breakers Ltd.
- ▶ Crouse-Hinds Co. Ltd.
- ▶ McGraw-Edison Co. Ltd.

## 2. Type of Production

Although all major manufacturers are subsidiaries of U.S. companies this sector of the electrical industry is Canadian-oriented. From our interviews we understand that virtually all design and research is done in Canada.

Production processes reflect the Canadian needs. Even though some 50% of the market is for standard products, there is insufficient volume for any high degree of automation. Production is largely centred around general purpose machinery with outside-sourced materials such as insulators being bought from specialized Canadian manufacturers.

## D. COSTS

### 1. Production

Exact production costs are difficult to obtain. However, we believe the cost breakdown to be:

▶ Raw material	20%
▶ Labour	15%
▶ Overhead	33%
▶ Engineering	10%
▶ Transportation	2%
▶ Profit before taxes	20%

A new manufacturing facility would require a capital investment of about \$200,000.

### 2. Tariffs

Import tariffs are covered in import category 445-24-01 and are 17.5% of invoiced value.

Export duties to the U.S.A. are 8.5% and to Europe are 10%. Tariffs to the U.K. are on a sliding scale because of their recent entry into the European Common Market; it is presently 0% but will be 10% by July 1, 1977.

E. LOCATION

1. Site Selection

A prospective manufacturer would need to locate in an area close to essential services, utilities, transportation, etc. He would also require a location near an area where skilled labour and engineering skills are available. Servicing could be carried out by setting up service branches near to the customers.

2. Transportation

Transportation costs are not a key factor due to the low volume, high unit cost of these switches.

3. Regional Possibilities

A new manufacturing facility should be located in a region where services, labour and engineering skills are available. Since transportation costs are low any large industrial area could be considered.

F. STRENGTHS AND CONSTRAINTS

1. Strengths

- a) Tariffs provide a competitive advantage.
- b) Custom-designed switches require high design and engineering skills. There is a good supply of electrical design engineers in Canada.

- c) The design and engineering requirements for unsophisticated equipment are not high.
- d) A relatively modest initial capital investment of \$200,000 would be sufficient to set up a manufacturing facility.

2. Constraints

- a) The market is already highly fragmented. 20 manufacturers are competing for a \$20 million market. Each manufacturer offers virtually a full range of switches and breakers in this size range. Consequently, assuming a manufacturer wished to capitalize on one sector of the market, the potential volume is small.
- b) The large number of manufacturers fighting for a share of a limited market results in severe price competition. This would make entry into this market financially risky, even if the new entry were able to get acceptance for his products.
- c) The 50% of the market representing complex, custom-designed and built equipment, requires a high level of design and engineering skills as well as production know-how. Unless the costs of these skills can be shared with other product lines (as in a large engineering firm), they would be too great for a new company to absorb.

G. CONCLUSIONS

We do not believe that these switches and circuit breakers offer a profitable opportunity to a Canadian entrepreneur.

- ▶ 20 manufacturers are already competing for a \$20 million market.
- ▶ The market is largely satisfied from Canadian production sources. There are no readily identified imports which a new plant could aim to displace.

- ▶ The major Canadian manufacturers are U.S.-owned. They have access to massive resources of capital and technology thus enabling them to withstand prolonged pressures on prices which might occur at the time of an economic downturn.

RESIDENTIAL AND INDUSTRIAL POWER SWITCHES

A. COMMODITY DESCRIPTION

These switches handle voltages from 115 volts to 500 volts. Residential switches include toggle switches and fuse panels and knife switches. Toggle switches find the greatest application for controlling individual lights in rooms, hallways and so forth. Fuse, or distribution panels, and knife switches control the main source of power to a residence or household.

Industrial power switches find their greatest use in connection with electric motors. Each electric motor normally needs at least one overload sensing device and a manual disconnect. In many instances a motor will have two or more such safety switches so that it can be controlled from a number of locations.

Another application for industrial power switches is in starter units which contain, in addition to switches, bus ducting, control panels, circuit breakers and distribution panels.

B. MARKET

1. Total Canadian Market

No reliable, published data exists on the size of this market. Consequently we have based our estimates on interviews with knowledgeable marketing personnel and on inferences drawn from the installation of machinery and electric motors.

Information supplied by Canadian manufacturers of these categories of switches suggests an annual market of about \$8.5 million consisting of:

Industrial heavy duty safety switches	-	\$4 million
Switches in motor control centres	-	\$2 million
Residential type switches	-	\$2.5 million

These figures are consistent with our estimate of the number of switches based on the value of machinery installed in recent years:

Year	Value of Machinery	Number of Machines	Number of Switches	Total Value of Industrial Switches
	(\$'000)	('000)	('000)	(\$'000)
1970	1,467	293	293	5,860
1969	1,377	275	275	5,500
1968	1,128	226	226	4,520
1967	1,119	224	224	4,480

In calculating this table, we have assumed an average machine value of \$5,000 and a switch value of \$20. If to these values we add the annual value of residential switches, estimated to be \$1,510,000 in 1970, we find that the total market is about \$7,370,000 (Appendix D).

2. Canadian Production, Imports and Exports

Virtually the entire Canadian market is satisfied from Canadian plants. Imports and exports are virtually negligible -- due, in large part, to tariffs and the relatively high transportation costs.

3. Growth

The market for these switches will depend primarily upon the growth of the economy -- especially the industrial sector. We therefore, expect the market to grow about 40% by 1978 to approximately \$12 million.

C. CANADIAN PRODUCTION

1. Major Producers

There are presently about 40 producers in Canada. About 50% of the market is produced by the following manufacturers:



- ▶ Allen-Bradley Canada Ltd.
- ▶ Canadian General Electric Co. Ltd.
- ▶ Crouse-Hinds Co. Ltd.
- ▶ Cutler-Hammer Co. Ltd.
- ▶ McGraw-Edison of Canada Ltd.
- ▶ Powerlite Devices Ltd.
- ▶ P & S Wiring Devices

2. Type of Production

The potential market available to any one producer is relatively small; the largest seven firms average only \$600,000 sales annually. Consequently, in order to be viable, all manufacturers of these classes of switches also produce a line of associated equipment such as circuit breakers, panel boards, boxes, motor starters and fuse panels.

All of these products call for relatively simple production equipment. Consequently, tooling and machinery requires a relatively low investment, is simple, easy to operate and maintain, and is versatile.

The incremental investment required for switch production is about \$100,000.

D. COSTS

1. Production

Based on a number of interviews we have estimated the breakdown of production costs to be:

▶ Raw material	35%
▶ Labour	15%
▶ Overhead	25%
▶ Transportation	5%
▶ Profit before taxes	20%

It should be noted that the profit shown is the average of the two product categories. In fact, the gross profit on industrial switches is almost 25 %, whereas that on residential devices is about 15%.

## 2. Tariffs

Import tariffs are covered in import category 445-24-01 and 17.5% on invoiced value.

Export duties to the U.S.A. are 8.5% and to Europe are 10%. The export tariffs to the U.K. are presently 0% but will rise to 10% by July 1, 1977.

## E. LOCATION

### 1. Site Selection

The major factors influencing the location of a plant are the costs of labour, raw materials and transportation. There is no need for skilled labour -- most of the production operations are repetitive requiring only semi-skilled labour.

The cost of labour must be considered in the light of wage rates and productivity. Some areas of the country have relatively low wages. But, the potential saving in wage costs is frequently offset by lower productivity.

## 2. Transportation

Transportation costs are significant for this type of product. They influence both the cost of raw materials and the cost of moving finished goods to market.

A typical switchbox having a value of \$20 would have to absorb transportation costs of up to \$1 for each 500 miles the plant was distant from the market.

Because of this high transportation cost, it is desirable that the plant be located close to the market. This criterion has led to most companies locating within 100 miles of Toronto. Of secondary importance is the need to minimize the cost of raw materials by locating near the source.

## 3. Regional Possibilities

The most promising regions are those in which construction and industrial development are growing most rapidly.

# F. STRENGTHS AND CONSTRAINTS

## 1. Strengths

- a) Tariffs are a source of competitive advantage.
- b) Almost all consumption is Canadian-produced at the present time.
- c) The total investment required to set up a new company is not large -- about \$100,000.
- d) Design and engineering requirements are not extensive.
- e) The machinery to produce these switches can be adapted readily to produce other associated equipment (e.g. wiring devices).

## 2. Constraints

- a) The market is extremely competitive with about 40 producers competing for a share of a \$8.5 million market.
- b) Industrial buyers and distributors prefer suppliers who produce a wide range of switches and wiring devices.

## G. CONCLUSIONS

This market offers an opportunity to the Canadian entrepreneur provided he combines the production with a complimentary line of wiring devices.

- ▶ The market is growing rapidly.
- ▶ The unit volume of the market is high; annual sales of switches in these categories approaches one million units annually.
- ▶ There is little need for extensive design and engineering capabilities since these switches are relatively unsophisticated, easy to design and easy to produce.
- ▶ Costs of entering this business are relatively low.

However, some caution is necessary. There is a premium on good management. The market is shared by 40 producers, but none has a dominant position. In order to be successful in this field, it is essential that there be very close control over costs, productivity and material utilization.

ELECTRICAL APPLIANCE AND MOTOR VEHICLE SWITCHESA. COMMODITY DESCRIPTION

This commodity classification consists of small control switches used on appliances and motor vehicles. On appliances they are invariably used in conjunction with a thermostat and relay to actuate the compressor motor whenever the temperature inside the refrigerator exceeds the desired level. There is usually one such switch per appliance. Motor vehicles, however, have several switches in this category. Lights, windshield wipers, heaters, air conditioners, etc. are frequently controlled by electric switches.

B. MARKET1. Total Canadian Market

The current Canadian market is estimated at \$14 million (Appendix E). The market represents sales of about 14 million switches, each having an average value of \$1.

This market is essentially controlled by the appliance and automobile manufacturers. Most of the production comes from their subsidiary plants. Where the switch manufacturers are nominally independent, their independence is largely fictitious; they are wholly dependent on their customers for product design, specifications, pricing and quality.

2. Imports and Exports

Although no data is published on imports and exports of these switches, our discussions have led to the conclusion that the Canadian manufacturers of appliances and vehicles buy 99% of their switches from Canadian manufacturers. The only export of switches takes place as part of an assembled vehicle under the automotive trade pact.

3. Growth

The growth of the market for these switches is dependent upon the growth of the appliance and motor vehicle industries. These are in-turn dependent upon the standard of living of the average person. Since the standard of living is levelling with costs rising, growth is expected to rise in conjunction with the cost of living. This will mean about a 20% growth by 1978 to around \$17 million.

C. CANADIAN PRODUCTION

1. Major Producers

The major producers of these switches are the subsidiary or branch plants of the major electrical appliance and motor vehicle manufacturers.

2. Type of Production

Production of these switches is a very high volume operation. The units are of simple construction and require only low investment in equipment and tooling of about \$20,000.

D. COSTS

1. Production

Exact production costs are not available. However, an estimated breakdown of costs follows:

▶ Raw material	30%
▶ Labour	10%
▶ Overhead	40%
▶ Transportation	Negligible
▶ Profit before taxes	20%

## 2. Tariffs

The import tariff for these switches is 12.5% and is covered in import classification numbers 438-06-01 and 438-42-01.

Export tariffs to the U.S.A. are 8.5% and to Europe are 10%. The export tariffs to the U.K. are presently 0% and will rise to 10% by July 1, 1977.

## E. LOCATION

### 1. Site Selection

Automotive and appliance manufacturers are concerned with both price and reliability of supply when they contract for component parts. Consequently, a prospective manufacturer would seek a location with:

- ▶ relatively low wage cost
- ▶ a tradition of good labour relations.

In addition he should seek a location with good transportation facilities to the automobile and appliance assembly plants.

Much of the manufacturing process is automated. Consequently, there is no need for advanced manufacturing, technical or engineering skills.

### 2. Transportation

Because of the low weight and small physical size of these switches, transportation costs are negligible when compared to the total cost of the product. A large number of switches can be shipped for a fairly low cost.

### 3. Regional Possibilities

Although most of the vehicle and appliance assembly plants are in Southern Ontario, there is no compelling reason for

the switch plant to be in the same area. In fact, under Federal and Provincial incentives it would be quite appropriate to manufacture these switches in regions with less industrial development.

## F. STRENGTHS AND CONSTRAINTS

### 1. Strengths

- a) Tariffs provide a source of competitive advantage. There is a 12.5% import tariff on switches coming into Canada.
- b) Design and engineering requirements are not high.
- c) Initial investment is relatively low.

### 2. Constraints

- a) The market is highly fragmented. Thus a prospective manufacturer would need to produce a wide product range to compete economically.
- b) The market is held closed by the major appliance and motor vehicle manufacturers. This makes it very difficult for a new manufacturer to break into the market.

## G. CONCLUSIONS

We do not recommend this as an attractive venture for a Canadian entrepreneur. Even though it is a relatively easy industry to enter requiring low capital investment, and few engineering skills, it has some major disadvantages. The more significant are:

- ▶ The manufacturer is wholly dependent on the automotive and appliance industries. These industries are U.S. dominated and increasingly look to the head office for all purchasing and sourcing decisions.



- ▶ Increasing rationalization of these industries leads to purchasing supplies from fewer, larger suppliers.
- ▶ The cost and time required for a small Canadian manufacturer to negotiate with U.S. head office buyers are prohibitive. They effectively discourage most Canadian manufacturers from competing in these industries.

## VII

### ELECTRONIC SWITCHES

#### A. COMMODITY DESCRIPTION

Electronic switches are defined as being used in electronic apparatus for very low power applications. There are literally, many thousands of different switches in this category. They include: rotary switches, wafer switches, slide switches, toggle switches and push-button switches. Two of the principal uses are in communication devices and electronic calculating machines.

#### B. MARKET

##### 1. Total Canadian Market

The total Canadian market is estimated at \$12.5 million in 1972. Data presented at a recent conference of the Electronic Industries Association (Appendix F) projects a growth to \$27 million by 1980 and \$37 million by 1985. Of all the switch market studies, this appears to offer the most exciting growth prospects.

##### 2. Canadian Production

No accurate data for Canadian production is available. However, through discussions with the major distributors and electronic associations, Canadian production is estimated at 5% of the total market or about \$0.6 million.

##### 3. Imports

Imports constitute about 95% of the Canadian market or \$11.9 million annually. These imports come from the U.S.A. or Japan.

4. Exports

There are virtually no exports of these switches from Canada.

C. CANADIAN PRODUCTION

1. Major Producers

There are only three major producers in Canada. They are:

- ▶ Centralab Canada Ltd.
- ▶ General Instrument of Canada Ltd.
- ▶ Potter and Brumfield.

All three are subsidiaries of U.S. companies. All are located within a 60 mile radius of Toronto: - at Ajax, Waterloo and Guelph respectively.

2. Type of Production

Canadian production is concentrated in a few lines of custom switches notably rotary type selector switches, relay type switches and push button switches, designed specially for the Canadian market.

Looking at the growth potential, domestically and overseas we believe that there is opportunity for a Canadian entrepreneur. Initially he would base his manufacturing on the domestic market. However, to succeed in the long term he should also identify a potential foreign market in order to achieve the economies of scale necessary to remain competitive.

D. COSTS

1. Production

Production of semi-conductor switches is relatively capital intensive. About \$500,000 investment is required primarily for sophisticated apparatus to weld leads on to electronic chips and for automatically controlled equipment to house the circuit in epoxy resin.

For small mechanically actuated electronic switches such as toggle, wafer and rotary switches, an investment of about \$100,000 is necessary. This covers stamping and punch presses, plastic extrusion and/or die casting equipment, together with the associated tooling.

Based on discussions with manufacturers we believe that the breakdown of production costs is:

▶ Raw Material	15%
▶ Labour	15%
▶ Overhead	40%
▶ Marketing and Sales	10%
▶ Profit before Taxes	20%

2. Tariffs

Import tariffs are 17.5% of invoiced value and are covered in import classification number 445-24-01.

Export duties to the U.S.A. are 8.5% and to Europe are 10%. Export duties to the U.K. are presently 0% but will rise to 10% by July 1, 1977.

E. LOCATION

1. Site Selection

Site location for the manufacture of electronic switches is not critical. The labour requirements are not high and there is no need for technical service to the customers. However since a prospective manufacturer should consider mass production, maintenance of the production machinery is essential. Hence one should either locate near to a supplier of spare parts or stock spare parts in inventory.

2. Transportation

Since these switches are very small and weigh very little, transportation costs are not significant.

3. Regional Possibilities

Presently all manufacturing facilities are in Southern Ontario. However it is highly likely that any industrial area in Canada would be suitable for a new production facility.

F. STRENGTHS AND CONSTRAINTS

1. Strengths

- a) Tariffs are a source of competitive advantage.
- b) The potential market for Canadian goods is large. From Appendix F, the world market was \$448 million in 1970. The Canadian market is expected to double by 1980.
- c) Capital investment for mechanical-type switches is low (about \$100,000).

2. Constraints

- a) The market is extremely fragmented. In order to

produce these switches competitively, mass production would be required. This would mean creating a large export market.

- b) Initial investment to produce semi-conductor switches is high (about \$500,000).

#### G. CONCLUSIONS

The Canadian market for electronic switches is expected to double to \$27 million by 1980. At the present time this market is served solely by U.S. interests. Ninety-five percent of the demand is satisfied by imports. The 5% produced in Canada comes from plants which are subsidiaries of U.S. organizations.

We believe that there is an opportunity here for the Canadian entrepreneur. The market is growing rapidly. It is virtually entirely dependent on imports and there is adequate tariff protection.

However, in order to be viable, a Canadian manufacturer should:

- ▶ Identify a product line or group of products with a reasonable potential domestically
- ▶ Build up sales volume by identifying markets in other countries especially the U.S.A., West Europe and Japan. (This is suggested in the belief that import restrictions into Japan will be gradually relaxed under pressure from her trading partners.)

## VIII

### TELEPHONE SWITCHBOARDS

#### A. COMMODITY DESCRIPTION

Telephone switchboards represent a major part of the investment in telephone exchanges. They are classified as "switches" in Statistics Canada data but are actually assemblies of relays, semi-conductors, harnesses, wiring and switches as well as the frame and mounting chassis. These switchboards or switching systems are used exclusively by the telephone companies.

#### B. MARKET

##### 1. Total Canadian Market

The Canadian market for switchboards amounts to about \$164 million annually. Of this, about 20% consists of switches as such.

All equipment in this category is designed and manufactured exclusively for the telephone companies. Furthermore, all design, assembly and much of the component manufacturing is performed by wholly-owned subsidiaries of the Canadian telephone companies. Details of the current market and growth trends are presented in Appendix G.

##### 2. Canadian Production

Canadian production has increased from \$100 million in 1964 to an average of about \$168 million. However, since 1967, production has fluctuated between \$177 million and \$162 million annually. These figures represent over 99% of the total market.

3. Imports

Imports over the last eight years have remained fairly stable at about \$0.6 million. As this represents less than 1% of the total market, it is not significant.

4. Exports

Exports between 1964 and 1967 had fluctuated between \$0.2 million and \$0.5 million. However, since 1968 exports have fluctuated between \$1.2 million and \$1.8 million with over 50% of the exports going to the U.S.A.

5. Growth

The market for telephone switchboards is expected to grow by about 50% by 1978. This follows the growth of urban development and the introduction of telephone service to new areas of Canada.

C. CANADIAN PRODUCTION

1. Major Producers

Approximately 98% of all Canadian production is supplied by two manufacturers.

2. Type of Production

Canadian production consists of the design and manufacture of these switches. All research and development is done in Canada. The two principal manufacturers occasionally import component switches from outside Canada. However, because of the strong pressure to standardize, most components are manufactured within the two major firms referred to above.



D. COSTS

1. Production

Exact production costs are not available. However, an approximate breakdown is listed below:

▶ Raw material	10%
▶ Labour	25%
▶ Overhead	30%
▶ Engineering	15%
▶ Transportation	Very low
▶ Profit before taxes	20%

2. Tariffs

The import tariffs on these switches is covered in import category number 445-08-01 and is 17.5% of invoiced value.

Export duties to the U.S.A. are 8.5% and to Europe are 10%. The duties to the U.K. are presently 0% but will rise to 10% by mid-1977.

E. LOCATION

1. Site Selection

The principal factor in selecting the location for a new manufacturing facility would be the availability of skilled labour. Increasingly, this work calls for skilled machining and assembly operations. A suitable site might typically be in a community which has developed similar skills in the maintenance and servicing of defence electronic systems.

2. Transportation

These products have unit cost and low bulk. Furthermore, they are produced for, essentially, a non-competitive market. Consequently, transportation cost is not a factor in determining plant location, selling price nor competitiveness.

3. Regional Possibilities

Since the prime requirement is skilled labour, a switchboard assembly operation could be located wherever such skills exist. Typically it could provide employment for people formally employed in defence establishments in or near the Halifax-Dartmouth area.

F. STRENGTHS AND CONSTRAINTS

1. Strengths

- a) Tariffs are a source of competitive advantage.
- b) Canada has a good reputation in this field. Design and technology expertise in Canada is one of the best in the world.
- c) The market is very large.

2. Constraints

- a) The market is held closed by the large consumers. The main manufacturers are subsidiaries of the large telephone companies.
- b) High design and technology skills are required to produce this product.
- c) Initial investment to produce these switches is very high.

G. CONCLUSIONS

1. The total market for switchboards is larger -- larger than for all other classes of switches -- and is growing rapidly.
2. These switches are very specialized requiring high design and engineering capabilities.
3. There are only two major producers, Automatic Electric Co. Ltd. and Northern Electric Co. Ltd., both of which are owned by the large telephone companies.
4. There is virtually no opportunity for a new manufacturer to break into this market. Dependency on two customers, both with extensive manufacturing capabilities, would present a great risk.
5. Although it would not be possible to attract a new manufacturer, it should be possible to persuade the existing producers to open manufacturing or assembly plants in the lesser developed regions such as the Atlantic provinces.

APPENDICES

Appendix A

SUMMARY TABLE

Description	High Voltage Switches and Switchboards	Power Distribution and Disconnect Switches	Residential and Industrial Power Switches	Electric Appliance and Motor Vehicle Switches	Electronic Switches	Telephone Switchboards
Current Production	\$15 million	\$20 million	\$2.45 million	\$10 million	\$ 0.6 million	\$165 million
Imports	\$ 5 million	\$1.5 million	\$0.05 million	\$ 2 million	\$11.9 million	\$0.6 million
Exports	\$4.5 million	\$1.5 million	Negligible	\$0.5 million	Very Low	\$1.5 million
Total Market	\$20 million	\$22 million	\$2.5 million	\$14 million	\$12.5 million	\$165 million
Trends: Production	Rising	Rising	Rising	Rising	Stable	Rising
Imports	Rising	Levelling	Stable	Rising	Rising	Stable
Exports	Stable	Stable	Declining	Stable	Stable	Stable
Closed Market	No	No	No	Yes	No	Yes
Number of Producers	4	20	Many	Many	Many	2
Volume	Low	Medium	High	High	Very High	Low
Cost	High	Medium	Low	Low	Low	High
Initial Investment	High	High	Medium	Medium	Low to High	High
Engineering and Design Skills	High	Medium	Low	Low	High	High
Number of Product Lines	Few	Medium	Many	Many	Very Many	Medium

Appendix B

IMPORT, EXPORT AND CANADIAN  
PRODUCTION DATA

(\$'000)

FOR HIGH VOLTAGE SWITCHES AND SWITCHBOARDS

Year	Exports		Imports		Canadian <sup>1</sup> Production
	Total	To U.S.	Total	From U.S.	
1971	4,426	944	5,013	2,555	15,384 <sup>2</sup>
1970	5,263	1,709	4,642	2,225	13,026
1969	4,948	2,134	3,331	1,395	10,106
1968	6,134	1,638	2,281	1,374	12,073
1967	5,293	1,688	5,950	1,728	15,232
1966	4,283	1,596	3,335	2,663	14,640
1965	4,244	1,081	3,467	2,988	10,920
1964	3,968	485	3,086	2,664	8,521

1. From Statistics Canada No. 43-207

2. Preliminary figures for 1971, Statistics Canada No. 43-207.

Appendix C.

IMPORT, EXPORT AND CANADIAN PRODUCTION DATA  
( \$'000)

FOR POWER DISTRIBUTION AND DISCONNECT SWITCHES

Year	Exports		Imports		Canadian <sup>1</sup> Production
	Total	To U.S.	Total	From U.S.	
1971	1,322	282	1,497	763	20,328 <sup>2</sup>
1970	1,572	510	1,386	664	23,373
1969	1,477	637	995	417	16,001
1968	1,832	489	681	410	18,569
1967	1,581	503	1,777	516	20,329
1966	1,279	477	996	795	21,126
1965	1,267	323	1,035	892	11,775
1964	1,185	145	922	795	10,949

1. Statistics Canada No. 43-207

2. Preliminary figures for 1971, Statistics Canada No. 43-207.

Appendix D

ESTIMATED MARKET FOR RESIDENTIAL  
AND INDUSTRIAL POWER SWITCHES  
( '000)

Year	1 Number of Dwellings	2 Number of Switches	3 Value of Machinery	4 Number of Machines	Number of Switches	Total <sup>5</sup> Switch Value
1970	151	151	\$1,467	293	293	\$7,370
1969	170	170	\$1,377	275	275	\$7,200
1968	162	162	\$1,128	226	226	\$6,140
1967	132	132	\$1,119	224	224	\$5,800

1. From Statistics Canada No. 64-002.
2. Based on 10 switches per dwelling.
3. From Statistics Canada No. 42-214.
4. Based on average machine price of \$5,000.
5. Based on average cost for dwelling switches of \$10 plus average cost for machinery switches of \$20.



Appendix E

ESTIMATED MARKET FOR ELECTRICAL  
APPLIANCE AND MOTOR VEHICLE SWITCHES

Year	1 Number of Appliances ( <sup>1</sup> 000)	Number of Switches	Number of Motor Vehicles ( <sup>1</sup> 000)	2 Number of Switches	Cost per Switch	Market (\$ <sup>1</sup> 000)
1970	1,727	1,727	1,376	12,384	\$1.00	14,111
1969	1,726	1,726	1,191	10,719	\$1.00	12,445
1968	1,355	1,355	1,326	11,934	\$1.00	13,289
1967	1,000	1,000	1,173	10,557	\$1.00	11,557
1966	1,607	1,607	952	8,568	\$1.00	10,175
1965	1,305	1,305	853	7,677	\$1.00	8,982

1. From Statistics Canada No. 43-203.

2. From Statistics Canada No. 42-002.

Appendix F\*

MARKET FOR ELECTRONIC SWITCHES  
(\$'000)

Area	1965	1970	1975	1980	1985
TOTAL	255	448	795	1,245	1,730
UNITED STATES	112	160	245	360	488
CANADA	6	10	16	27	37
WESTERN EUROPE	46	74	131	213	314
WEST GERMANY	12	21	39	67	100
FRANCE	5	12	21	34	51
ITALY	3	5	10	20	32
UNITED KINGDOM	15	22	39	56	79
ALL OTHER	11	14	22	36	52
FAR EAST	51	131	273	425	553
JAPAN	43	119	241	372	477
AUSTRALIA	2	4	7	10	15
INDIA	1	1	3	6	8
MAINLAND CHINA	2	3	6	14	25
ASIAN PRODUCTION CENTERS	2	4	16	23	28
LATIN AMERICA	4	6	8	16	28
MEXICO	1	2	2	4	7
BRAZIL	1	2	3	6	11
ARGENTINA	1	1	2	4	6
ALL OTHER	1	1	1	2	4
EASTERN EUROPE	2	3	6	14	25
MIDDLE EAST	1	1	3	5	8
AFRICA	1	1	2	3	5
FREE WORLD	218	380	672	1,035	1,408

\* From Proceedings, Electronic Industries Association, Vol. 11, Session 111, May 1972.

Appendix G

IMPORT, EXPORT AND CANADIAN  
PRODUCTION DATA

(\$'000)

FOR TELEPHONE SWITCHBOARDS

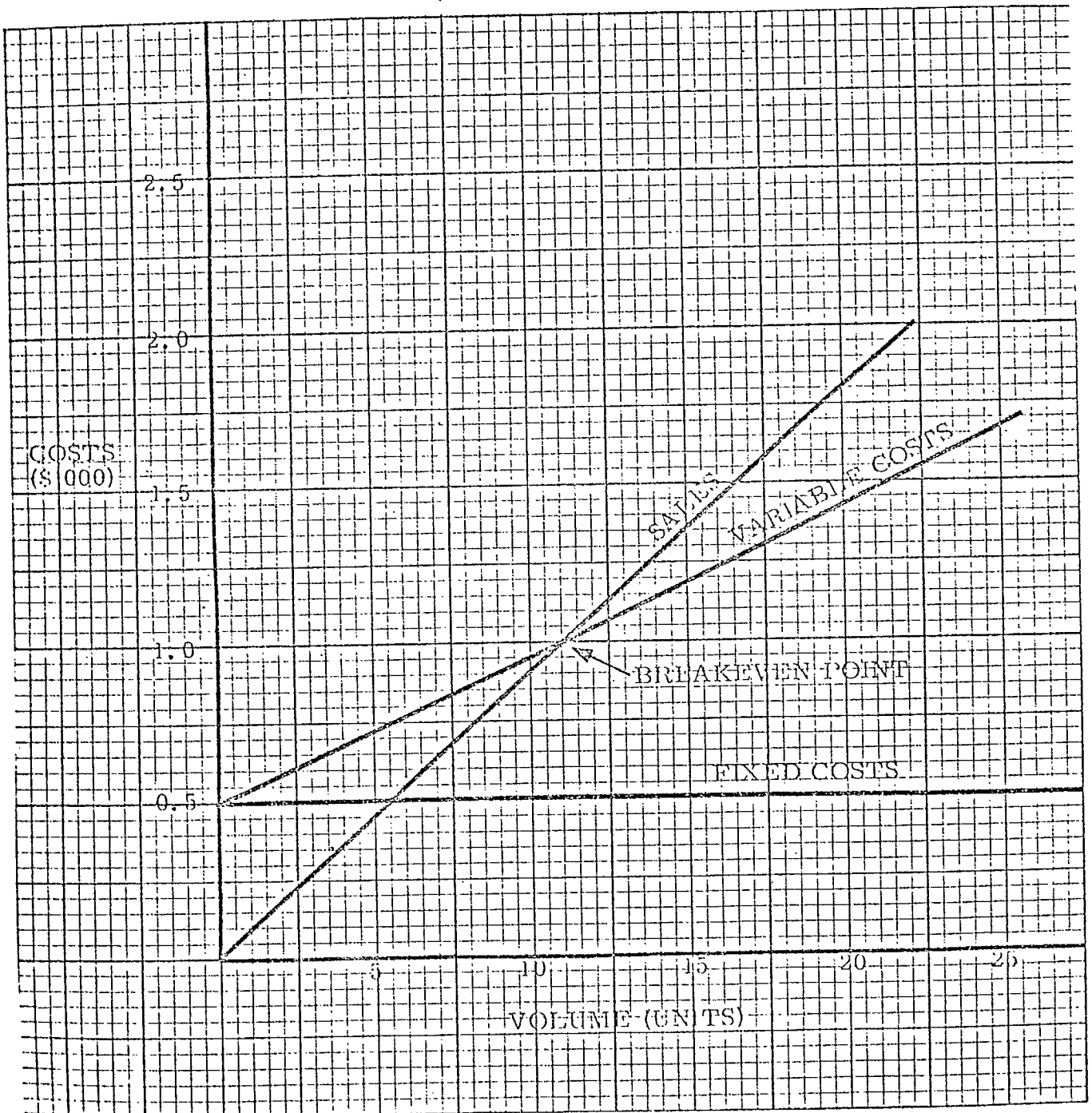
Year	Exports		Imports		Canadian <sup>1</sup> Production
	Total	To U.S.	Total	From U.S.	
1971	1,483	917	661	467	163,000 <sup>2</sup>
1970	1,806	945	616	448	162,514
1969	1,455	737	566	405	164,256
1968	1,246	742	541	337	173,281
1967	504	322	648	439	177,413
1966	295	189	509	335	127,988
1965	387	163	403	274	107,054
1964	290	144	378	240	99,862

1. From Statistics Canada No. 43-206.

2. Preliminary figures for 1971, Statistics Canada No. 43-206.

Appendix H

BREAKEVEN COSTS FOR  
HIGH VOLTAGE SWITCHES



TK 2821 S7 Author/Auteur	Stevenson & Kellogg, Ltd.		
Title/Titre	A review of the market for electrical and electronic switches. 1973		
Date	Borrower <i>Emprunteur</i>	Room <i>Pièce</i>	Telephone <i>Téléphone</i>
0133-34,3 (10/70) 7530-21-029-4581			

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