PETER
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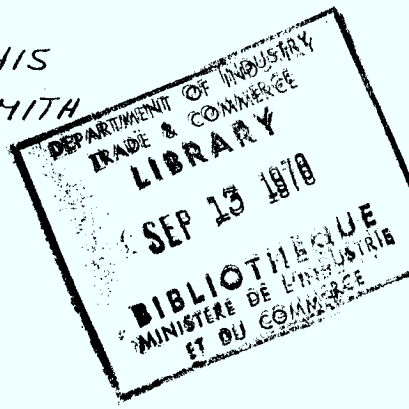
CONSULTING ENGINEERING IN CANADA

OVERVIEW AND PROSPECTS

A REPORT PREPARED FOR
DEPARTMENT OF INDUSTRY, TRADE AND COMMERCE
CONSTRUCTION AND CONSULTING SERVICES BRANCH
AND
ASSOCIATION OF CONSULTING ENGINEERS OF CANADA

APRIL, 1978



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BY

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TORONTO

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April 3, 1978

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Construction & Consulting
Services Branch,
Department of Industry, Trade
and Commerce,
Ottawa, Ontario

Mr. J. Heffernan,
President,
Association of Consulting
Engineers of Canada,
130 Albert Street,
Ottawa, Ontario

Dear Sirs,

We are pleased to submit our study on the consulting engineering industry in Canada which we have carried out under your joint auspices over the past 3 months. Before proceeding, we would first like to review the background of the study, to discuss our approach to the work and to outline the contents of the following report.

BACKGROUND OF THE STUDY

For many years, both consultants and government officials with an interest in the industry have been concerned about the lack of information on consulting engineering in Canada. In the late 60's Industry Trade and Commerce conducted a number of useful surveys of the consulting export business and our firm carried out a small study on the market and prospects for all professional services in Canada, which included examination of the engineering sector. But these and other earlier efforts lacked a solid information base on which to build their analyses. This shortcoming was overcome when Statistics Canada carried out a survey of the consulting engineering industry in 1974, providing the first comprehensive fact base on the industry.

Since the publication of the Statistics Canada survey in 1976, the ACEC and the Department have been discussing the possibility of an "in depth" study of the industry. With the formation of the Construction and Consulting Services Branch in late 1977, some funds were able to be made available to begin such an effort. A number of other management consulting firms, familiar with the industry were interviewed and we were fortunate enough to be selected.

OUR APPROACH

Within the budget and time available, we have gathered all known information and studies about the industry with the generous assistance of both Branch and ACEC personnel. The Statistics Canada survey results were carefully analysed and they form a critical ingredient to the analyses which follow.

In addition to facts, however, it was felt to be equally important to get the "feel" for the industry that can only come from talking to the people in it. Accordingly, we visited Vancouver, Edmonton, Regina, Winnipeg, Toronto, Montreal, Fredricton and Halifax and a Branch representative covered P.E.I. and Newfoundland on our behalf. The purpose of these visits was to interview senior people in firms both large and small, and to talk to them about their perspective on the business. Budget limitations did not allow visits to other important centres or more extensive interviewing in the cities visited. Nevertheless, we interviewed senior executive personnel from 60 firms chosen to include most of the major large firms, a sampling of smaller firms and ones offering a range of types of service.

From this work, we believe we have developed a good understanding of the industry and its problems, as well as what is needed to make it prosper. But one caution. This industry is a broad and complex one. Any study on it must seek to generalize and categorize in order to arrive at conclusions and recommendations. Some may not agree or see how their firms fit in to the picture we paint. All we ask is that all readers attempt to read the report as we have tried to write it - from the perspective of the industry as a whole.

OUTLINE OF THE REPORT

The following report contains a summary of conclusions and recommendations and four chapters, plus an appendix.

1. A perspective on the Industry briefly describes the industry, its place in the Canadian economy and the development of its domestic and international markets to date.

2. Future Prospects discusses the likely changes over the next 10 years in the 12 sectors of the Canadian market as well as the prospects for export consulting.

3. Firms and their Needs describes how the industry is structured, the needs and attitudes of the various types of firm and the problems they face.

4. Optimizing Prospects discusses the potential actions which could be taken to assist the industry in overcoming constraints and optimizing its performance.

In the Appendix, we list the names of all persons interviewed during the course of the study.

* * * * *

To conclude, we would like to thank the members of the Steering Committee for the study which included John Dawson and Max Smith from the Branch, and Joe Heffernan, Paul Beauchemin and Roger Pinault from ACEC. Their encouragement and constructive comments have been most helpful. In addition, William Chapman of I.T.C. undertook the interviews in Newfoundland and P.E.I. and was most helpful.

The complexity and diverse nature of the consulting engineering industry has meant that this has been a most challenging and interesting assignment for us. We hope that it will provide not only a better understanding of the industry, but also lead to further actions to overcome constraints and optimize its potentials.

Respectfully submitted,

Peter Barnard Associates

SUMMARY

CONCLUSIONS

1. Consulting engineering is a large industry which plays an important part in the Canadian economy. Total billings of $1.2 billion and employment of 40,000 people make consulting engineering a vital part of the service sector. With exports currently at $200 million it is the leading exporter within this sector and contributes directly and indirectly to further manufacturing exports of at least double this figure.

2. While overall growth rates have slowed, some sectors and regions in Canada remain strong. Despite strong long term growth, the industry has experienced highly varying real growth rates, from no growth to an astounding 19% in the early 1970's. Since then, growth has slowed to 3% with many sectors - including the 2 largest, buildings and municipal - declining. However, energy related sectors have continued to grow and, while work in most regions has stagnated or declined (particularly in Quebec and Atlantic provinces), the market in Alberta remains strong.

3. Slowdown domestically has spurred substantial growth in export consulting. With declining prospects at home, many firms have turned to, or increased, international marketing efforts. Main export fields are in forestry, plant process, mining & metallurgy and power, with the latter 3 showing particularly strong growth rates since the early 1960's. Also since that time, the United States has become the largest export market - accounting for almost 1/3 of total international billings.

4. Future prospects for the industry are closely tied to energy related projects and international work. Overall, we anticipate real growth rates for the industry to be from 4 to 8½% over the next 10 years, generally down from past growth rates. The buildings, municipal, transportation, mining, forestry, plant process and other smaller sectors are not expected

to exceed 2-3% growth, and all will have slower periods. On the other hand, power and petroleum & natural gas projects, as well as international assignments will grow strongly and account for 80-90% of the total industry's growth. While its growth could be inhibited by the strong energy market at home, international consulting could account for 30-45% of billings in 10 years (up from 17% now).

5. Prospects and needs differ between the 4 main types of firm in the industry. Like most service industries, consulting firms vary greatly in size, geographic coverage and scope of services offered. Depending on the type of firm, the outlook for the future is different, and so are the needs:

   - Large heavy engineering firms account for about half of the industry's billings and employment, provide a wide range of services domestically and are experienced exporters. These firms are expected to grow considerably, especially those with strong capabilities in the energy related sectors or with special expertise in the international market. Many are in the process of broadening their base of expertise and geographic representation by acquiring or joint venturing with other firms. To continue to grow in the future their main needs are to increase in size and financial resources to undertake increasingly large project management and design/construct projects both at home and abroad.

   - Medium-sized municipal/transportation firms account for 10% of the industry's billings and employment, provide primarily municipal and road/bridge services to government agencies and private developers, usually within one region of the country. Prospects for these firms are for slow growth (under 3%) due to the limited growth expectations of their main sectors. Many of these firms are now considering geographic expansion and/or broadening their services within their present regional base. Their needs are to broaden their domestic market through acquisition of new expertise, doing work now done by in-house engineers, or by increased overseas' business or expansions to the U.S.

- Local engineering firms including structural, electrical and mechanical services for buildings and small municipal/transportation firms, tend to be small, confined to particular cities and have little or no export experience. However, they account for a significant proportion of the industry billings (about one-third). Prospects for the future are not promising and these firms should experience little real growth. Their needs are to seek to market new services (energy conservation offers promise) and to acquire work now done by government engineers in-house.

- Other specialty firms includes a wide range of small and medium sized firms offering a particular expertise, usually across the country and internationally. Accounting for 10% of industry billings these firms are often owned by or affiliated with the large heavy engineering firms. Their prospects vary depending on their expertise, but those whose skills can be applied to petroleum and power projects should do well. Their needs are to broaden their domestic and foreign markets, and they may need some help in doing so.

6. Attitudes towards government and association assistance vary with the size of firm. Generally the larger firms have sufficient resources to market their services internationally and some have considerable operations in the U.S. These firms are cool to direct assistance by government for export development but favour various forms of tax relief and risk insurance to increase their competitiveness internationally. Also, while supporting existing levels of pressure on U.S.-based firms and their clients to contract more with Canadian firms, these firms are confident of their ability to obtain a growing amount of such work but fear reprisals in the U.S. if pressure on U.S. firms here is escalated. Smaller firms without such resources look to both government and ACEC for various forms of direct assistance for marketing their services overseas. All firms, regardless of size, would like to see more pressure on utilities, governments and industry to contract out more work, and reductions of U.S. regulations governing Canadian firms working there.

RECOMMENDATIONS

1. The Federal government should evaluate alternative actions for broadening the market for Canadian consulting engineers' services. More specifically these could include:

   a) encourage the development of export consulting and improving Canadian firms' competitive position internationally by offering personal tax relief while on overseas assignments and corporate tax deductions for export business development by established firms and continuing PEMD-type assistance to new and smaller exporters; by introducing a program of uncontrollable risks insurance; by extending EDC funding to cover feasibility studies and design-only contracts; and by negotiating reduced barriers to entering U.S. markets by Canadian consultants.

   b) increase contracting out by Federal, provincial and municipal agencies and utilities in the interests of increasing Canadian capabilities in the export field as well as broadening the market for consultants in slow growth or declining service areas.

   c) improve the penetration by Canadian firms into domestic markets traditionally served by foreign-based companies by pressuring clients and foreign firms to contract more with Canadian firms in the interest of developing export capability - however weigh potential actions carefully to avoid retaliatory raising of barriers to Canadian firms entering the U.S. market.

   d) reduce excessive competition for government contracts; a factor which is causing much needless work for engineers and reducing profitability and incentive to secure government contracts.

   e) rationalize Federal contracting procedures and, specifically, impractical attempts to specify profit margins as well as requirements for excessive disclosure of corporate financial affairs.

   f) discourage "buy provincial" policies which are tending to create barriers to free trade for consulting engineering within the country.

2. The ACEC should consider some new initiatives, which could include:

   a) provide assistance to firms entering or trying to expand in the export market by preparing a "do's and don'ts" or "how to" booklet, and by promoting the interchange of information with firms experienced in export work.

   b) develop a more pin-pointed program to encourage contracting-out which addresses specific high potential clients, while continuing to inform industry and government of member firms' capabilities.

   c) propose approaches to smoothing contracting procedures with government including ways of equitably awarding contracts without excessive competition, and a program to improve government contracting agencies' understanding of consulting engineers accounting and operating procedures.

   d) consider differentiating between the interests of large and small firms when developing certain industry programs since it is clear that in many areas interests are not common.

3. IT&C and ACEC should work together to reach agreement on a growth strategy for the industry, which would include setting objectives for the industry and providing the basis for evaluating the courses of action outlined above by carrying out detailed studies on

   - potential expansion of the consulting market if in-house engineering were contracted out, including expectations in specific sectors of consulting, key agencies and companies, detailed program for persuading them to contract-out.

   - full implications of export consulting, including effects on employment of Canadians, spin-off export of manufactured goods by sector of consulting service.

   - foreign competition/export to U.S. issue, including a review of border regulations affecting consultants in both countries, magnitude of Canadian consulting exports to U.S. compared to U.S. firms to Canada, practical rates of expansion of Canadian firms into large energy and petrochemical projects.

To provide for on-going monitoring of the industry's progress, the 1974 Statistics Canada survey should be repeated as soon as possible. Also small, easily completed surveys of specific subjects, such as export work, should be initiated.

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1. A PERSPECTIVE ON THE INDUSTRY

The consulting engineering industry provides a wide range of services to government and industry clients most commonly associated with the construction of capital projects. Its services include:

1. *Feasibility studies* to determine the economic viability or broader impact of a project.

2. *Planning and design development* which includes preparation of site development plans, preliminary layout of the facility, process studies, design standards and equipment requirements.

3. *Detailed design* involving all aspects of preparing final designs and drawings together with specifications for construction.

4. *Construction supervision* including the checking of construction work for conformity to drawings and specifications for the work.

5. *Project management* which involves representing the client and undertaking all or most of the administrative responsibilities of the project which can include not only (1) to (5) above, but also procurement of equipment and materials, management of construction and overall co-ordination of the project.

Some firms also provide a full *construction* service to clients who require turnkey or design/construct contracts. However, this type of service is normally considered to be part of the construction, as opposed to consulting engineering, industry.

Exhibit 1.1

THE 12 SECTORS OF CONSULTING ENGINEERS SERVICES

		FIELDS COVERED*
1.	MUNICIPAL	water supply, sewage disposal, waste disposal, roads and streets, traffic engineering, urban and regional planning
2.	BUILDINGS	acoustics, communications, electrical, elevators, escalators and moving sidewalks, heating, ventilating and air conditioning, illumination, mechanical, piping systems, refrigeration, structural
3.	PETROLEUM & NATURAL GAS	exploration, extraction and separation, pipelines, gas process plants, oil refineries
4.	POWER (Power Generation, Transmission and Distribution)	systems planning and operation, hydro power, thermal power, nuclear, transmission and distribution.
5.	MINING & METALLURGY	exploration, mine planning and production, mineral beneficiation, smelting, refining
6.	PLANT PROCESS	alum.fabricating, alum.smelting, automotive plants, breweries, cement plants, chemical plants, distilleries, feed and flour mills, fertilizer plants, food processing, foundries, glass and ceramics, industrial environmental control facilities, industrial power houses, metal working, misc.manufacturing plants, petrochemical plants, steel mills, textile mills, wood working
7.	TRANSPORTATION (Bridges, Tunnels, Highways and Railways)	bridges, tunnels, highways and expressways, railways, public transit, transportation studies
8.	FORESTRY, ETC. (Agriculture, Fisheries, Forestry, Forest Products)	agricultural engineering, fisheries, forestry, logging, sawmills, veneer and plywood, particleboard and waferboard mills, hard and soft board mills, pulp mills, paper mills
9.	DAMS & IRRIGATION	dams, irrigation, flood control
10.	AIR & SEAPORTS	airports, harbours, docks and jetties, dredging, river and coastal works, terminals and warehouses, transportation studies, oceanography and hydrography
11.	TELECOMMUNICATIONS	microwave, broadcasting, wire line transmission, telephone systems, supervisory control and data transmission
12.	MISCELLANEOUS	air and noise pollution control, arbitration and litigation, computer science and data processing, environmental impact studies, interior design, naval architecture, remote sensing and photogrammetry, soil mechanics

* *Categories used in Statistics Canada Consulting Engineering Services, 1974.*

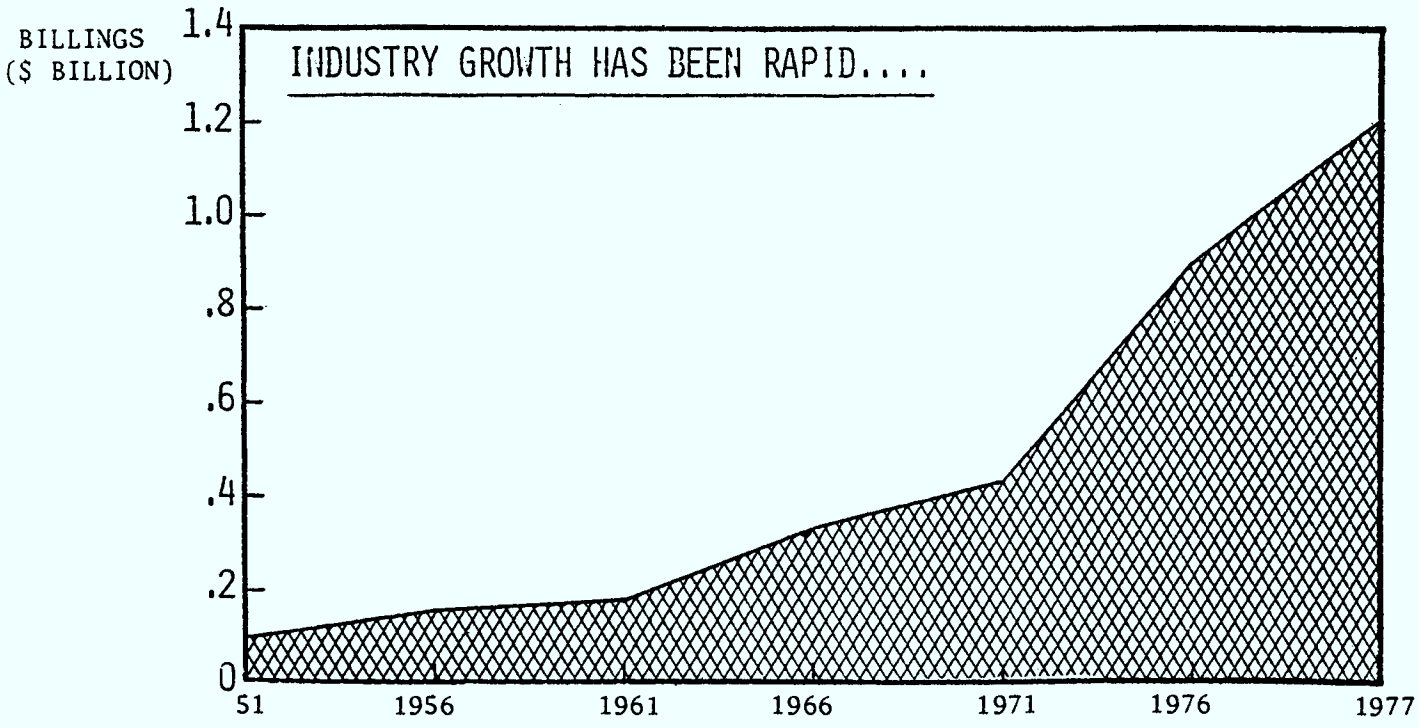
Consulting engineering is a large and important industry in Canada with many differences when compared to other service industries. Domestically, it has experienced strong growth over the past 15 to 20 years, although a recent slowdown is causing concern. In contrast, the export market, which has grown steadily since the late 1950's has increased substantially in the last few years.

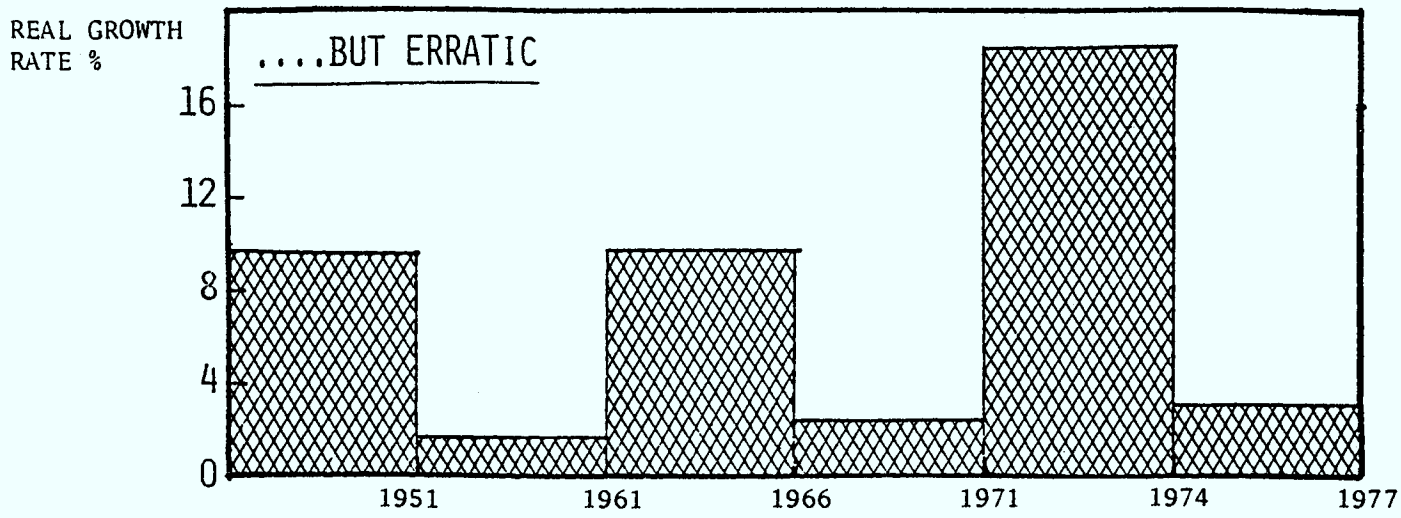
A LARGE AND IMPORTANT SERVICE INDUSTRY

The consulting engineering industry provides services to virtually every major segment of the Canadian economy. (Exhibit 1.1 lists its 12 sectors.) Clients include all levels of government and corporations of every size and description.

Employment approaching 40,000 with annual billings over $1 billion. Our estimate is that 1977 billings total $1.20 billion and employment is in the order of 39,500 people employed by 1,600 firms.[1] The employment is highly oriented to professional-technical personnel, with overall distribution being 29% professional engineers, 4% other non-engineering professionals, 46% technicians including draftsmen, and 21% administrative/clerical personnel.[2] Over the years, the industry has grown rapidly, but real growth rates over 5 year periods have been very erratic - from as high as 19% to as low as 1% (see Exhibit 1.2)

Exhibit 1.2


BILLINGS
($ BILLION)
INDUSTRY GROWTH HAS BEEN RAPID....
1.4
1.2
1.0
.8
.6
.4
.2
0
51
1956
1961
1966
1971
1976
1977


REAL GROWTH
RATE %
....BUT ERRATIC
16
12
8
4
0
1951
1961
1966
1971
1974
1977

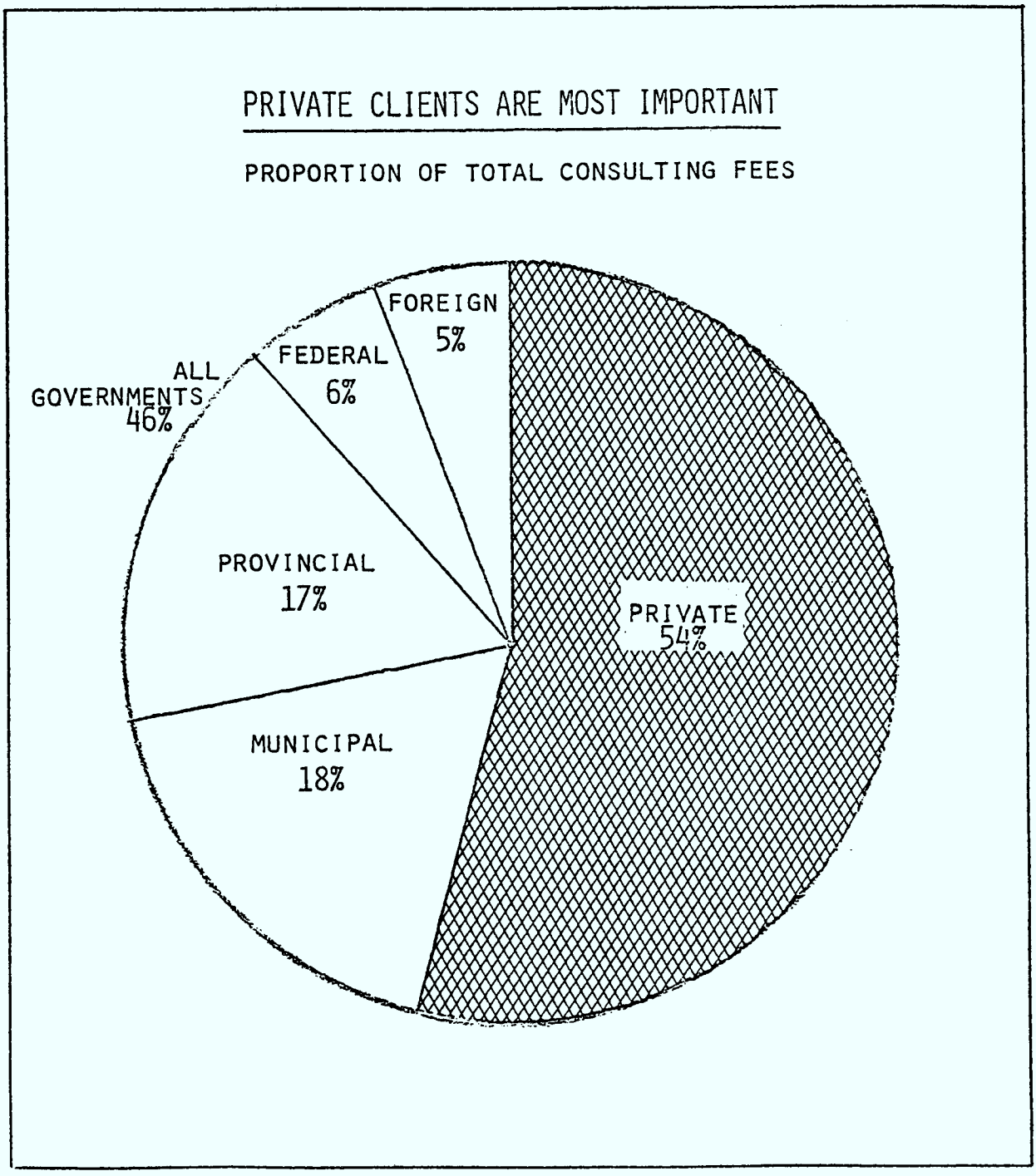
Consulting engineering in 1971 with $417 million of billing was second only to the $546 million of legal services purchased by business and government. Engineering services accounted for 17% of the total of $2.4 billion of service trade services purchased by management.[3] In 1971 the key service trades to management were:[3]

	% of Total
Lawyers	23
Consulting Engineers	17
Accountants	13
Architects	6
Advertising Agencies	4
Other (17 categories)	36

Private clients account for half of billings. Fee income is split 54/46 between non-government and government contracts. Of the government clients, Canadian governments represent 89%. Municipal and provincial agencies equally account for about 40% of government billings. The remaining 20% is divided almost equally between Federal government projects (12%) and foreign governments (11%). (Exhibit 1.3).[4]

An important factor in Canada's technical and economic development. In comparison to other services, consulting engineering has some unique characteristics, and in particular a more direct link to other industry sectors, and to trade:

Exhibit 1.3


PRIVATE CLIENTS ARE MOST IMPORTANT
PROPORTION OF TOTAL CONSULTING FEES
FOREIGN
5%
FEDERAL
6%
ALL
GOVERNMENTS
46%
PROVINCIAL
17%
MUNICIPAL
18%
PRIVATE
54%

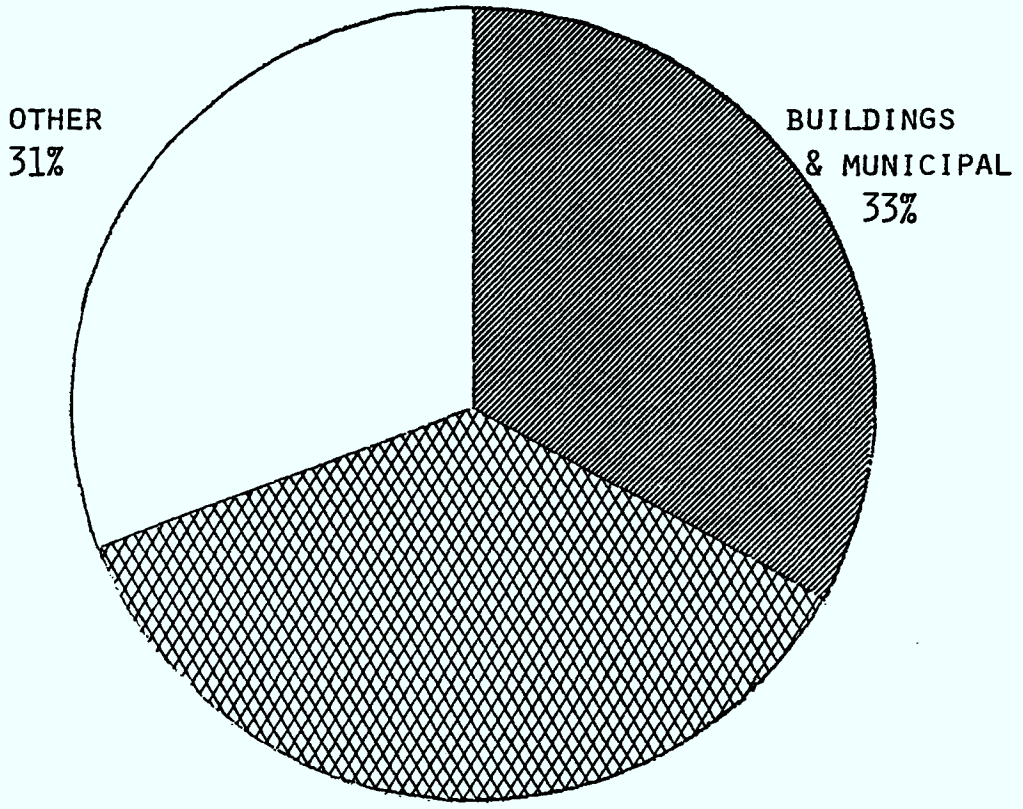
- Largest exporter of services. In 1977 consulting engineers billed $200 million for projects outside Canada.[5] Clients for this work include governments, private sector companies, international agencies and Canadian organizations such as the Canadian International Development Agency (CIDA) and the Export Development Corporation (EDC). It is estimated that engineering services account for 80% of consulting services exported from Canada.[6]

- Direct and indirect effects on manufacturing. Domestically, consulting engineers are in the role of specifying products and approving bidders lists of materials and equipment for projects they design. Thus their decisions are important to Canadian manufacturers. Equally, in international work, engineers' familiarity with Canadian products provides an important lead to export of Canadian manufactured products. In 1977, consulting engineering contracts outside of Canada are estimated to have led to manufacturing exports of $350 million.[7] It is estimated that the 1977 level of foreign fees exposed Canadians to a further $825 million of potential equipment sales.[8]

- Major facilitator of economic expansion. Consulting engineers provide many of the skills by which industry expands or rationalizes production. Engineers are also important factors in the efficiency by which the economy expands. First they affect the costs of expansion through the efficiency of designs they prepare and, dependent

Exhibit 1.4

SIX SECTORS ACCOUNT FOR 70% OF CONSULTING MARKET



on their responsibilities, during the construction phase as well. Second, consulting engineers serve as a manpower buffer during economic cycles. Most industries' investment cycles are sufficiently unpredictable that companies cannot afford to maintain large in-house staffs for design and construction supervision. The engineering firms supply that pool of talent and manpower that allows (or should allow) industry and government to staff only for regularly recurring work loads.

- Contributes to technological development and transfer. While consulting engineers engage in little "pure" research and development work, they are constantly seeking ways in which available products and processes can be used more efficiently. However, some firms are engaged in process-type R and D and all form an important link in the use of certain new technology since, ultimately, they must specify or agree to its use on a project.[9]

A few of 12 sectors account for bulk of billings. The industry provides a wide range of services which can be categorized into 12 basic sectors (see Exhibit 1.1 for definitions). The buildings and municipal sectors together account for over 1/3 of total billings. If to these are added the 4 largest "heavy engineering" sectors, the 6 account for over 2/3 of the consulting engineering market (Exhibit 1.4).

	1977 Fees[10]	
	($ Millions)	% of Total
Municipal	186	16%
Buildings	204	17
Petroleum & Natural Gas	115	10
Power	113	9
Mining & Metallurgy	109	9
Plant Process	97	8
Transportation	96	8
Forestry, etc.	88	7
Dams & Irrigation	35	3
Air & Seaports	30	3
Telecommunications	14	1
Miscellaneous	103	9
	1,190	

THE MARKET IN CANADA

While international work has been accounting for an increasing proportion of consulting engineers' business, the domestic market - that is work performed on projects in Canada - has been growing strongly over the years and continues to account for the bulk of the industry's business. The nature of services provided by firms in different parts of the country varies, as does both the growth rates in various sectors.

Recent downturn masks strong long term growth. Since 1974 the volume of domestic billings has shown no growth in real terms and has declined significantly in some sectors and Regions. The reasons are clear and not dissimilar to those behind earlier stagnations of the industry:

- there is excess capacity in many key sectors of the economy such as forestry, mining and steel so that little expansion is occurring
- population growth rates are declining with the result that investment in municipal infrastructure and school construction is down
- coincidentally, governments have entered a period of restraint and major capital projects have been curtailed.

As a result, non-residential construction volumes in Canada have shown no real growth ($1977):[11]

1975	$22,737,000
1976	21,811,000
1977	22,486,000

and consulting engineers' billings have shown a similar pattern.

Despite this relatively recent development, the long term picture has been one of strong domestic growth, but with a cyclical pattern of fast and slow growth rates and an extraordinary period of expansion in the early 1970's.

	Estimated Domestic Billings[12]	Average Annual Real Growth Rate	
1951	$ 96		
1956	152	9%	
1961	179	3%	
1966	288	6%	long term growth rate 6%
1971	367	1%	
1974	770	25%	
1977	990	0%	

There are many reasons for this long term growth

- Construction activity has grown substantially in real terms
- There have been numerous changes in technology which have spurred both public and private sector investment: new methods of exploration, extraction and refining in mineral, oil and gas fields; hydro, thermal and nuclear power; transportation advances in shipping (e.g. containerization), aircraft (wide bodies) and public transit; new industrial plant processes; sewage and water treatment technology ... the list is endless
- Public policy changes have raised standards and the proportion of billings devoted to studies as opposed to design work. Here examples include the area of environmental protection, energy conservation and recycling, urban renewal, environmental impact, and regional economic development.

The early 1970's saw a period of considerable increase in construction activity in Canada as both private and public sectors increased capital spending dramatically, and together placed high demands on the consulting engineering industry. This "over heated" economy was brought abruptly to a halt through the combined effects of the OPEC oil embargo, inflation, AIB-influenced restraint and other factors, and the consulting industry entered a period of decline.

Exhibit 1.5

SECTORS HAVE GROWN AT DIFFERING RATES

AVERAGE ANNUAL REAL RATE OF GROWTH	THE 1960's 1961-71	EARLY 1970's 1971-77	LAST FEW YEARS 1974-77
SUBSTANTIAL GROWTH (OVER 10%)	MINING & METALLURGY	POWER DAMS & IRRIGATION	POWER PETROLEUM & NATURAL GAS
GOOD GROWTH (5 TO 10%)	POWER PLANT PROCESS MUNICIPAL PETROLEUM & NATURAL GAS BUILDINGS	MUNICIPAL FORESTRY, ETC. AIR AND SEA PORTS PETROLEUM & NATURAL GAS COMMUNICATION	
MODEST GROWTH (0 TO 5%)	COMMUNICATIONS TRANSPORTATION FORESTRY, ETC.	BUILDINGS PLANT PROCESS TRANSPORTATION	TRANSPORTATION TELECOMMUNICATIONS
NEGATIVE GROWTH	AIR AND SEA PORTS DAMS & IRRIGATION	MINING & METALLURGY	BUILDINGS MUNICIPAL MINING & METALLURGY PLANT PROCESS FORESTRY DAMS & IRRIGATION AIR & SEAPORTS

Growth has not been consistent for all sectors. It is when examining how the different sectors of consulting engineering have grown that the fundamental differences become apparent. Some sectors have enjoyed consistently high growth rates, others more modest, and still others great fluctuations (Exhibit 1.5). Those sectors exclusively related to large private sector projects (e.g. mining and metallurgy or plant process) show the greatest fluctuations, while at the opposite extreme, those dependent on continuing public sector business (e.g. municipal and transportation) show consistent growth patterns. Two sectors - power and petroleum & natural gas - have been in strong demand for the past 15 years and have even continued to grow over the past few years while most other sectors have experienced little or even negative growth.

Certain sectors strong in some regions. Our most recent data on the breakdown of fees by regional location of firms is the 1974 Statistics Canada Survey. It showed that, with minor exceptions, the building and municipal sectors are the largest services provided by firms in each of the major regions (Exhibit 1.6). However, due to particular local circumstances, some other sectors of service were strong, including

- petroleum & natural gas in Alberta due to the concentration of that sector's clients in the province
- forestry in B.C., principally because 2 of Canada's largest firms in that field are located in Vancouver and due to the presence of extensive forestry-related operations

Exhibit 1.6

BUILDINGS AND MUNICIPAL ARE MOST IMPORTANT SECTORS IN EACH REGION*

	FOREST	AIR & SEA	ROADS BRIDGES TUNNELS	BUIL-DINGS	PLANT PRO-DAMS	PLANT PRO-CESS	MINING & METAL-LURGY	MUN. SER-VICES	PETROL. & NAT. GAS	POWER	TELE-COMM.	MISC.
ATLANTIC	8	4	6	21	1	5	6	25	1	17	-	6
QUEBEC	8	4	12	24	7	9	4	16	1	8	1	7
ONTARIO	2	2	9	15	2	8	14	23	2	12	1	11
MAN./ SASK.	3	2	5	27	11	4	5	24	2	11	1	5
ALBERTA	1	1	3	16	1	5	3	14	38	7	-	10
B.C.	17	3	5	23	3	6	9	16	3	4	1	10

* *% Total billings by sector. Statistics Canada Consulting Engineering Services, 1974 includes only Canadian projects.*

- dams and irrigation in Manitoba and Saskatchewan as a result of the agricultural orientation of the local economy
- transportation in Quebec due to the extensive road building and subway activity there, together with the fact that the Provincial government has, in the past, contracted out much of its transportation work to consultants.

Other apparently strong sectors (e.g. mining in Ontario and power in the Atlantic provinces) are probably more due to the concentration of a few large projects in the survey year (1974) and cannot be regarded as typical.

Current situation varies considerably across the country. Our interviews with clients and engineering firms brought out some differences in both the recent past and the current outlook for the industry in different parts of Canada:

- Atlantic firms have suffered a severe decline in overall business since peak activity in 1975. Staff has reduced by 1/3, with the buildings sector particularly hard hit. Municipal and power work has been strong, although much of the latter is done by non-Atlantic firms.

- Quebec has also experienced a decline in recent years. There the industry grew rapidly in the early 1970's, spurred by high rates of building construction, road and airport work, industrial and power development, and the Olympics. However, staff peaked in 1975 at about 11,000 and is now down to about 9,500. Slowdowns in public sector spending and industrial expansion, virtual halting of building construction and growing provincial staff doing in-house engineering are all causes. Only the power sector and international work have been strong. The Quebec Association of Consulting Engineers is currently engaged in a major survey to demonstrate to the Provincial government the importance of the industry to Quebec's econony and the dramatic decline the industry has experienced.

- Ontario firms have experienced little overall growth in billings or staff in recent years. Power work has continued to be very strong and growing. In contrast, plant process, mining & metallurgy and building sectors have been very week. Increasingly, firms are turning to international work (some successfully, others not) to provide the basis for growth and diversification.

- Manitoba and Saskatchewan firms have experienced mixed fortunes over the past few years. Manitoba has been particularly hard hit by this year's virtual freeze on provincial government projects, as well as a general slowdown over the past few years, partly due to a declining agricultural economy. Saskatchewan appears

to have peaked somewhat later than the rest of Canada (probably 75/76) and maintained steady since then. In both provinces firms are anticipating an upturn soon.

- Alberta activity has been the strongest in Canada. Employment grew by 12% annually from 1970-74 and 5% from 1974 to 1977, although most firms have experienced a levelling off in the last year. Growth has been particularly strong in 3 sectors: petroleum & natural gas (spurred by projects like Syncrude), plant process design (encouraged by the Provincial government) and building (generated by the strong population growth in Calgary and Edmonton plus increased business activity). Expectations are for a renewed upturn considering the large number of petrochemical projects in the early planning stages and continued population growth.

- British Columbia, like other areas of Canada, experienced a boom in the early 1970's, largely the result of building and government financed projects, followed by a decline since 1974. Over the last few years, the building sector has declined dramatically with no growth in municipal and transportation. Work in the forest products and mining fields has been particularly slow due to the uncompetitiveness of Canadian industry in the international market. Exports in forestry, plant process, mining and seaports have helped the larger firms maintain volumes.

In general, concerns about the industry's future have led to a greater involvement in promotion by Provincial governments and by local associations. For example, both B.C. and Alberta governments have produced inventories and statistical summaries of their Province's firms for use by local agencies as well as for out-of-province promotion. Groups in the Quebec government are also studying the industry there.

INTERNATIONAL CONSULTING

Consulting work outside of Canada has become an increasingly important aspect of Canadian firms' activity. But there have been some important changes in the nature of foreign work over the years.

Export work has grown strongly, particularly in last few years. From a small base in the early 1960's, export consulting has grown to become an important segment of the Canadian industry's work.

	International % total billings
1964	5%
1974	9%
1977	17%

Real growth rates have been high, outpacing domestic growth rates by a wide margin, and since 1964 averaging 20% annually.

	International[13] Fee Income	Real Growth Rates International	Domestic
1951	$ 4 million		
1961	9		
1964	10		
1966	30	14	6
1971	50		
1974	80		
1977	200		

The reasons for the growth of export work in the last few years are easy to find. With the slowdown in the domestic market, firms have been forced to look elsewhere for work in order to maintain staff levels and expertise. Also, as firms have matured and expanded to their practical limits domestically (given the size of the market and extent of competition), principals have looked for new challenges. Both these factors have resulted in greatly increased business development efforts with many new firms marketing their services internationally, particularly in the last 2 or 3 years.

Services exported mainly those where domestic expertise is high. Canadian firms, quite naturally, compete most successfully in those fields of technology in which Canada is a world leader. As a result, the types of services exported differ somewhat in importance when compared to domestic markets:

	1977 Fee Income[14]	% of Total
Plant Process	$ 34	17
Mining & Metallurgy	33	17
Forestry, etc.	33	17
Power	29	15
Transportation	16	8
Municipal	10	5
Buildings	9	4
Air & Seaports	8	4
Petroleum & Natural Gas	7	3
Telecommunications	6	3
Dams & Irrigation	3	1
Miscellaneous	12	6
	$200	

Some of these services have always been major exports. For example, in 1964 forestry and power accounted for 60% of the total. However, some other sectors have been increasing in importance:

	International Billings				Average Annual Real Rate of Growth
	1964[15]		1977		
	$ millions	%	$ millions	%	
Forestry, etc.	4	40	34	17	12
Power	2	20	29	15	22
Mining & Metallurgy	1	10	33	17	23
Plant Process	1	10	34	17	23
Municipal	1	10	10	5	9
Other					
Transportation			16	8	
Buildings			9	4	
Air & Sea			8	4	
Petroleum & Natural Gas	1	10	7	60 3	29 35
Telecommunications			6	3	
Dams & Irrigation			3	1	
Miscellaneous			11	6	

United States has become largest export market. While in the 1960's international business was concentrated in the Latin American and Asian markets, since then work in the U.S. has grown strongly:

	% International Billings	
	1964[15]	1977[16]
United States	20%	32%
Latin America	32	21
Asia & Australia	28	21
Africa	12	16
Europe	8	10

In the U.S., 2 sectors account for 2/3 of billings: plant process design and forestry each account for about 1/3 of Canadian firms' business. Many firms also report a substantial increase in their business development efforts and are reporting good success in virtually all sectors.

There is also an important distinction with U.S. assignments - 75% of the billings are from work for private corporations, compared to only 28% elsewhere in the world.[16]

Elsewhere in the world, types of services vary, but public sector is main client. Consulting needs in countries outside of North America vary according to the stage of development of the local economy, the type of natural resources available and the priority of local governments. Thus it is not surprising that the types of services Canadian firms are successful at exporting varies in different parts of the world. However, in each area 2 or 3 types account for the bulk of exports:[16]

Area	% Total Non-U.S. Billings	Sector	% of Total
Latin America	25%	Power	25%
		Mining & Metallurgy	24% → 49%
Africa	24%	Power	24%
		Transportation	19%
		Miscellaneous	16% → 59%
Far East	16%	Power	32%
		Mining & Metallurgy	24%
		Transportation	11% → 67%
Middle East	14%	Municipal Services	28%
		Mining & Metallurgy	22%
		Transportation	11% → 61%
Europe	12%	Mining & Metallurgy	47%
		Petroleum & Nat. Gas	17% → 64%
Carribbean	6%	Transportation	32%
		Power	23%
		Plant Process	12% → 67%
Australia	3%	Forestry, etc.	75%
		Mining & Metallurgy	12% → 87%

As would be expected, foreign governments and international funding agencies such as CIDA, the World Bank and other multi-lateral agencies are the main sources of funds for export work outside of the U.S.

	Fee Income Outside U.S. % of Total [16]
International agencies*	43
Foreign companies	28
Foreign governments	24
Canadian companies	2
Other	3

* *Includes CIDA which in 1977 is estimated to have accounted for $63 million or 73% of international agency assignments and 32% of total international fees.*

However, the importance of these various sources varies between different parts of the world, largely due to the strength of the local economy and the priorities of the international funding agencies.

	% of Total Fee Income[16]			
	International Agencies	Foreign Governments	Private	Other
Latin America	37	30	34	-
Africa	68	22	9	-
Far East	60	5	31	5
Middle East	22	59	14	4
Europe	12	11	74	2
Carribbean	48	17	18	17
Australia	1	-	96	3

Finally, while CIDA and other international development agencies have increased their expenditures on consultants significantly, interviews with firms engaged in the industry indicate that foreign governments and private corporations are becoming more important clients.

EXPLANATORY NOTES

1. Figures estimated based upon the Statistics Canada Consulting Engineering Services, 1974; the Salary Survey conducted by Canadian Consulting Engineer and interviews with industry and association representatives.

2. Statistics Canada Consulting Engineering Services, 1974 derived from Table 3, p.10.

3. Statistics Canada 1971 Census of Canada Merchandising and Services Division, Service Trades Catalogue 97-745 Vol.IX February, 1977, p.4.

4. Derived from the Statistics Canada Consulting Engineering Services, 1974.

5. Figure estimated from industry interviews and I.T.C. estimates.

6. Estimated by Industry Trade and Commerce.

7. Based upon a ratio of $141.4 million of equipment and supplies to $80.4 million in foreign consulting fees as reported in Consulting Engineering Services, 1974 p.8. This ratio of 1:1.76 was applied to the estimated $200 million of foreign fees.

8. Based upon a ratio of a potential of $5.86 of supplies for every $1 of consulting service, as calculated from Department of Industry, Trade and Commerce Survey on Canada's Exports of Consulting Services May, 1974 p.4.

9. A survey currently in progress by ACEC indicates that of its members who responded a large number are engaged in R&D either under contract or in house, but the staff involved are not large.

10. The 1977 fees are estimates derived from a variety of data sources. The base was Consulting Engineering Services, 1974. These figures were updated based upon a review of the following information sources:

    - Statistics Canada, Construction in Canada 1975-77, Catalogue 64-201.
    - Statistics Canada, Private and Public Investment in Canada Outlook, Catalogue 61-205.

- Industry Trade and Commerce, Business Capital Investment Intentions Survey. November, 1977
- Southam Business Publications Ltd., Canadata 1978-1980 Forecast of Put in Place Construction.
- interviews with senior officials of consulting engineering firms

The following table documents the 1974 fee income by sector, the 1977 figure and the estimated real growth rate.

Sector	Fee Income Current $ millions		Average annual real growth rate
Domestic	1974	1977	
Municipal	144	175	- 2%
Buildings	173	195	- 5%
Petroleum & Natural Gas	64	108	10%
Power	48	83	11%
Mining & Metallurgy	60	76	- 1%
Plant Process	53	63	- 3%
Transportation	62	80	0%
Forestry, etc.	44	55	- 1%
Dams & Irrigation	28	32	- 4%
Air & Seaports	18	22	- 2%
Telecommunications	6	8	0%
Miscellaneous	71	92	0%
TOTAL DOMESTIC	770	990	0%
International	80	200	25%
TOTAL INDUSTRY	850	1,190	3%

In order to derive the total fee income picture, domestic and international, for each of the domestic sectors, the proportion of international fees by sector as reported in the 1974 Statistics Canada Survey were added to each domestic sector.

1977 Fee Income ($ millions)

	Domestic	International	Total
Municipal	176	10	186
Building	195	9	204
Petroleum & Natural Gas	108	7	115
Power	83	30	113
Mining & Metallurgy	76	33	109
Plant Process	63	34	97
Transportation	80	16	96
Forestry, etc.	55	33	88
Dams & Irrigation	32	3	35
Air & Seaports	22	8	30
Telecommunication	8	6	14
Miscellaneous	92	11	103
TOTAL	990	200	1,190

11. Statistics Canada Construction in Canada 1975-77 Catalogue 64-201, July, 1977.

12. These figures are estimates based upon various sources including: The Market and Prospects for Canadian Professional Services, Peter Barnard Associates May, 1973; historic time series of various types of construction activity developed from various issues of Construction in Canada. The 1971 figure is the 1971 Census, Service Trades figure of $417 million less an estimated $50 million of international fees and the 1974 figure is as reported in Consulting Engineering Services, 1974.

13. 1951, 1961, 1971 and 1977 estimates; 1964, 1966 based upon Industry, Trade and Commerce Survey on Canada's Exports of Consulting Services various years, 1974 as reported in Statistics Canada Consulting Engineering Services, 1974.

14. see footnote 10.

15. Industry Trade and Commerce Survey - Overseas Activities of Canadian Consulting Engineering Firms, 1964

16. Based on 1974 distribution as reported in Statistics Canada, Consulting Engineering Services, 1974.

2. FUTURE PROSPECTS

The future of any industry as diverse as consulting engineering is difficult to predict. A thorough analysis would require projecting of virtually every sector of the Canadian economy, clearly an impossibility in a study of this nature. We have, however, examined the likely prospects for each sector based on our interviews with over 50 senior executives, historic growth patterns, and a review of existing forecasts and expenditure surveys. Also, we have made two key assumptions:

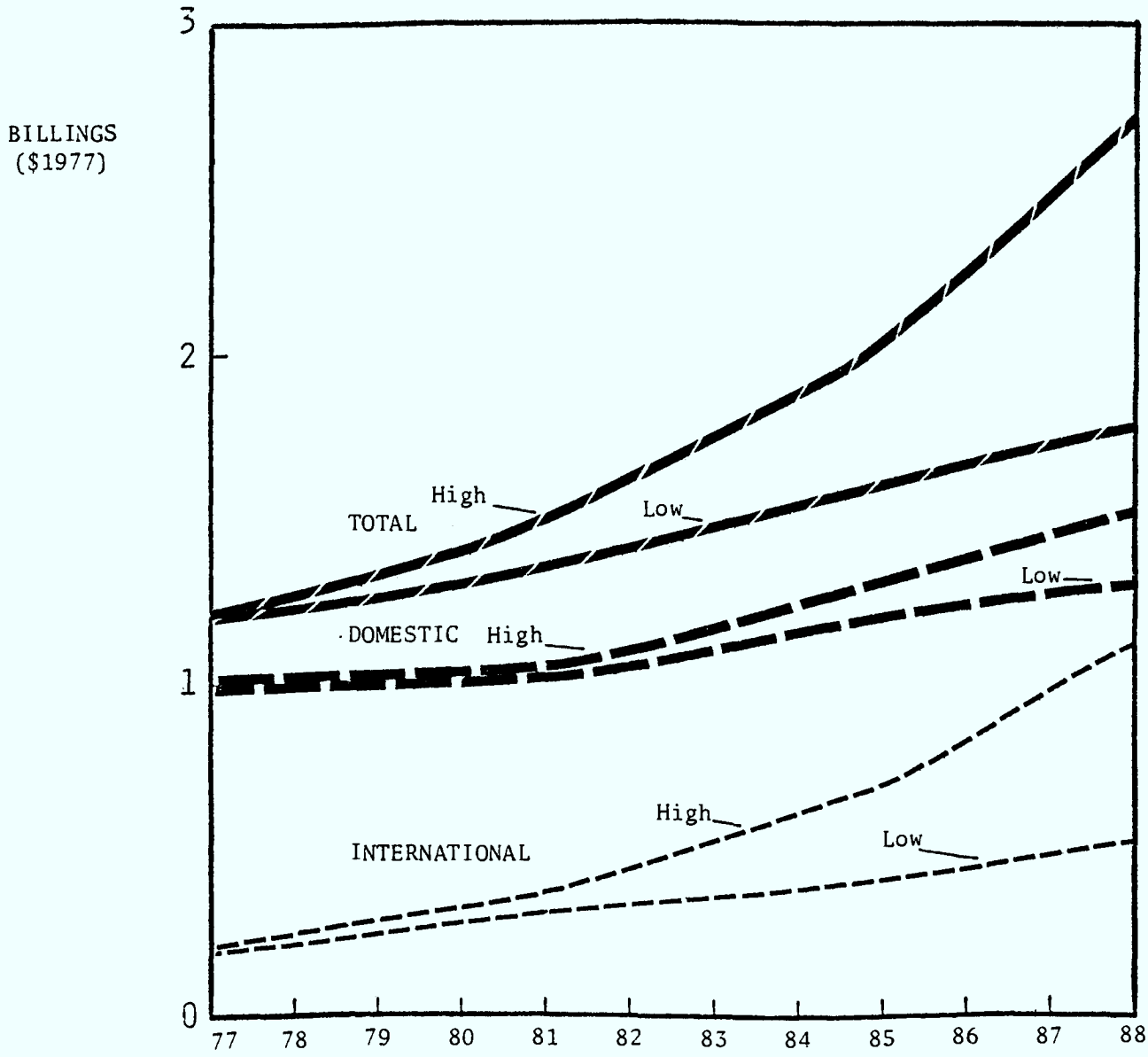
a) As predicted by most economists, the Canadian economy will return to its historic 4-6% growth rate; that is, the current slowdown will not continue beyond the next year or so. And,

b) there will be no significant changes from past trends in the industry's approach or in government policies towards the industry. In particular, we have assumed that there are no major shifts towards more contracting out of work now done in-house by governments and industry, no significant increases in government encouragement of export activites by the industry and no escallation in pressures against foreign-based firms operating in Canada.

With this as background, the outlook for the consulting engineering industry appears to be one of slower overall growth than that experienced over the past 15 or 20 years. While the outlook for international work is most promising,

Exhibit 2.1

IN 10 YEARS: A $2 BILLION+ INDUSTRY



the domestic market is in for a slow growth period. This outlook sets the stage for considering the steps which could be taken to improve the picture for the industry.

OVERALL OUTLOOK: SLOWER GROWTH

On average, the industry has grown at an annual rate of 6% since the early 1950's. Despite the negative growth domestically over the past few years, we do not foresee this continuing and anticipate that overall growth will average at least 4.0% over the next 10 years. Depending on developments in the international sector and with energy-related projects domestically, the top rate likely to be achieved would be 9%. Thus our projections indicate a $1.8 to $2.7 billion industry in 10 years (Exhibit 2.1). To summarize the main components:

Lower growth rates domestically. Our estimate is that the rate of domestic billings will only grow at 3% to 4% which is significantly less than the historic rates of 6% over the 1951-77 period. The slowest growth will occur over the 1977-81 period as Canada emerges from the current climate of economic and political uncertainties, excess capacity on depressed world markets in many industry sectors and cutbacks on government expenditure:[1]

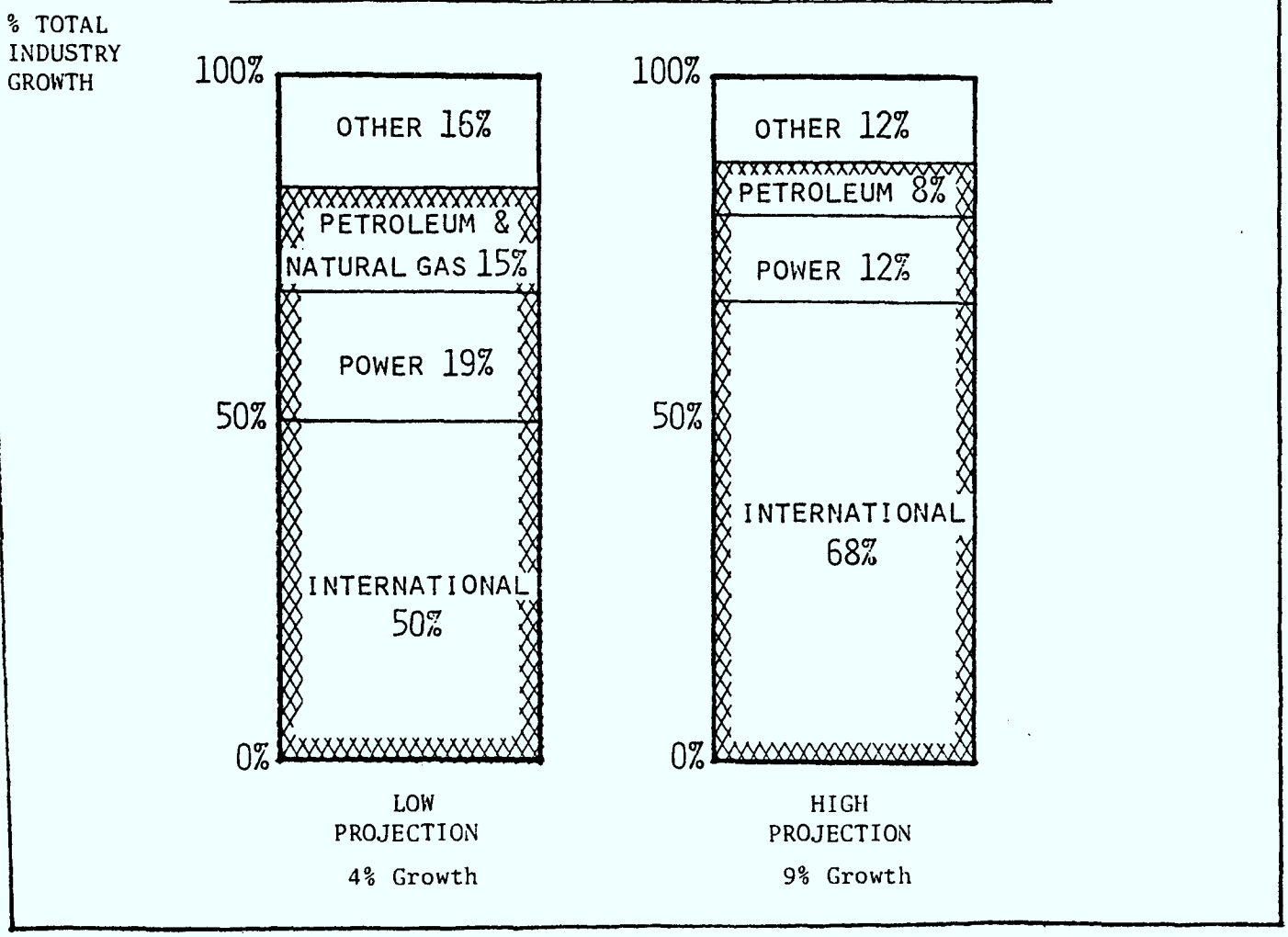
	Average Annual Growth	
	Low Forecast	High Forecast
1978-81	1%	2%
1981-85	4%	5%
1985-88	2%	3%

Thus by 1988 it is estimated that the domestic fees of the Canadian consulting industry will amount to $1,300-$1,500 million up from the $990 in 1977.

Continued strong growth in international fees. The key factor influencing the level of international business is the amount of effort that Canadian firms are willing to invest. However, it is questionable whether long term growth trends in international business can be maintained. Growth over the next 10 years in the 10 to 20% range seems to be a more likely scenario, the higher rate being achieved only if the larger firms in the industry continue strong international marketing efforts despite expected strong growth domestically in their specialties (energy-related projects). Even at the lower growth, foreign fees in 10 years could total $520 million or 28% of total industry fees, almost double the current 17%. If a 20% growth rate were achieved then international fees in 10 years could equal the current total fees of the industry, $1.2 billion.[2]

Exhibit 2.2

OVERALL GROWTH PROSPECTS FOR INDUSTRY DEPENDENT ON INTERNATIONAL AND ENERGY-RELATED WORK



Importance of energy-related and international work. When summarizing the growth prospects for the industry as a whole, it is hard to over-emphasize the importance of domestic business in the petroleum & natural gas and power fields, and in international work. In fact these 3 areas account for 80 to 90% of our projections for total industry growth (Exhibit 2.2). Clearly industry efforts and government policies concerning these areas will have a significant effect on the growth prospects for the entire consulting engineering industry.

FUTURE VARIES WIDELY BY SECTOR

Domestically, the consulting engineering industry will continue to grow, but at a rate less than the historical 5%-6%. The main reason for the slowing of growth is the reduced growth prospects for the two largest sectors - building and municipal. The slow growth in these two areas is, however, somewhat countered by strong growth prospects in the two energy related sectors: petroleum and natural gas, and power. Following is a brief discussion of the future prospects in each sector.[3]

1. BUILDINGS:

Prospects not promising. In 1977 this sector accounted for $195 million or 20% of domestic billings. Until recently, growth has been rapid at 5.5% annually for the 1961-71 period and 12% during the 1971-74 period. Since that time, this sector has been declining in real terms in the order of 3% per annum.

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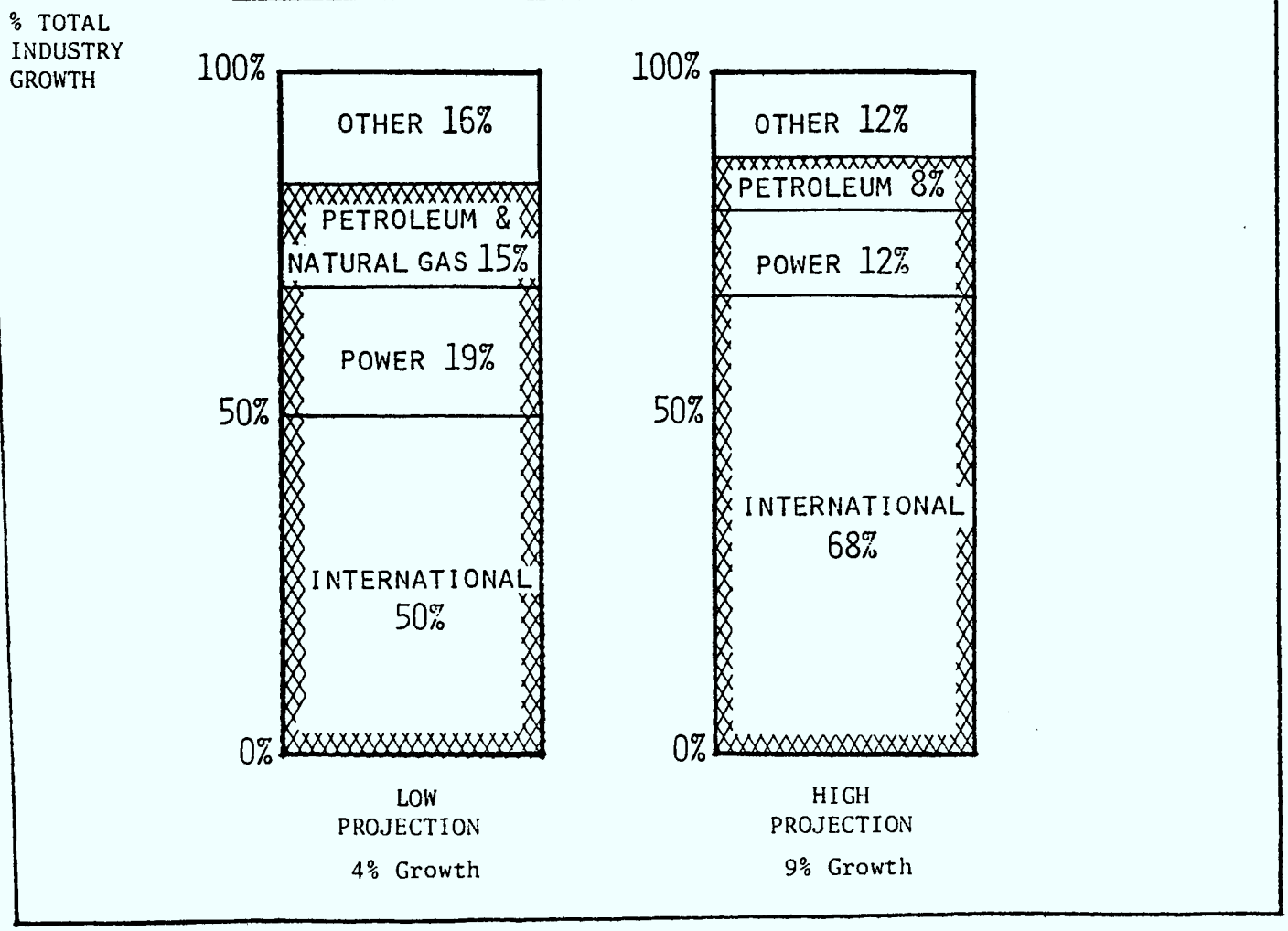

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To forecast future prospects for this sector, one needs to look at each of the major components of building construction that consulting engineers are normally involved in. These include:

	1977 Construction[4]	
	%	$ millions
Schools	17%	$ 44
Retail & Commercial	27	70
Apartments	24	61
Industrial	23	59
Other Institutional	9	25
		$259

Currently the outlook is not very promising for any of these sectors.

- school construction is influenced mainly by population growth which in most areas of the country will remain close to a 1% annual increase as compared to the 3% rate in the late fifties.[5] New schools will result more from redistribution of population than population growth. Governments are also curtailing expansion of post-secondary institutions.

- retail and commercial construction is also predominantly influenced by population growth. In addition, major retail expansion has recently taken place and most areas of the country currently report over capacity. The same situation exists with office and commercial space as well.

- apartment construction is dependent upon household growth which is anticipated to decline significantly in the mid-1980's. In the short term, rental economics and rent control are further restraining this sector.

- industrial expansion is primarily dependent upon economic growth. Over-capacity currently in many sectors plus low levels of economic growth will delay a resurgence in this type of construction activity. But eventually, this type of construction should keep pace with economic growth.

- other institutions are influenced by government policy. Current government belt tightening across Canada suggests decline in construction of this type.

Thus the overall outlook for the building sector is for further decline during 1978-79 followed by moderate real growth of 2-3% per annum resulting in an estimated $240-260 million of fee income in 1988.

2. MUNICIPAL:

Slow growth to 1985 followed by decline. Growth in this sector is dependent upon two key variables: government policy regarding municipal water and sewage standards and growth in urban areas which is related primarily to household growth. Examination of both of these factors suggests that growth in this sector will diminish in the 1980's. Generally, in Canada, most municipalities have water and sewage treatment facilities of high standards

and capacities. The exceptions are Quebec and some parts of Atlantic Canada. Household growth, the other key factor will also decline substantially in the late 1980's as the baby-boom population matures.

Average Annual Canadian[6] Household Growth	
1971-76	177,000
1976-81	196,000
1981-86	195,000
1986-91	136,000

Based on these two factors, plus short term construction forecasts, we estimate that this sector should experience modest real growth of 2%-3% to 1985 after which decline will commence. This is a significant reduction from the 16% average annual growth rate of the 1971-74 period and the 6.5% rate for the 1961-71 decade. It is a slight improvement over the annual declines of -2% reported recently. Thus, by 1988, this sector should account for $165-180 million or 12%-13% of domestic billings.

3. PETROLEUM & NATURAL GAS:

Energy needs will produce strong growth. This has been one of the most outstanding sectors recently. With the recent rapid escalation in the price of petroleum and natural gas, numerous new deposits have become economic. As a result, there has been a rapid increase in domestic consulting billings in this area estimated at 10% annually since 1974 (as compared to 6.5% during the 1960's and 3% during the early 1970's).

The future prospects are very promising, but some concern is being expressed that many projects could be delayed. Currently there are $26.4[7] billion of projects proposed in this area. Many of these projects are enormous, such as the Alaska pipeline, the Polar Gas pipeline, two new Tar Sands projects, several oil recovery and petrochemical projects in Alberta, the LNG plant and pipeline in New Brunswick and the pipeline from Montreal to the Maritimes. Lack of financing, manpower and markets may however, delay many of these projects. However, real growth of 8-10% through the 1980's seems highly likely after a levelling in growth during the 1978-80 period. This rate of growth could however, increase significantly if Canadian firms are able to increase their market share of these types of assignment. By 1988 this sector will account for $200-230 of domestic consulting fees.

4. POWER:

A very optimistic outlook. Since 1974, this sector is estimated to have grown at 11% annually. Historically, it has always experienced rapid rates of growth, 9% for the 1961-71 period and 7% for the 1971-74 period. This sector has a very promising outlook as virtually every utility in Canada is engaged in major expansion or redesign. Electrical projects now in progress or firmly committed will add 25% to Canadian generating capacity by 1981 and 50% by 1986.[8] Power projects totalling $18.3 billion are now underway and a further $9 billion are pending. Two developments, the recent actions of Ontario Hydro to contract out more assignments and the increased capability of the industry in the nuclear field, have further strengthened prospects. Our interviews indicated

that firms are anticipating growth in the order of 7-8% plus the effects of the added Ontario Hydro assignments which together would mean a growth rate of about 10-12%. On the other hand, the DITC survey of expenditures indicates utilities to be planning expansion at a rate closer to 10-15%. Since it is based on actual client plans we have accepted the latter range over the short term to 1981 after which more moderate growth in the 8 to 10 range appears more likely. Thus, by 1988, billings in this sector could be from $200 to $270 million.

5. MINING & METALLURGY:

Recent decline continuing well into 1980's. After rapid growth in the sixties of 16%, this sector has recently entered a period of decline. It is felt by many in this sector, that it will take 4-5 years for the worldwide over-supply of many minerals to disappear. In addition, the high cost of expansion in Canada compared to other areas of the world will remain a continuing problem.

6. PLANT PROCESS:

Continuing decline, then modest growth. This sector which accounts for $63 million of billings has had steady growth in the 7% range. Current growth outlook for this sector is pessimistic as confidence among manufacturers is low. Forecasts of plant expansion and new construction suggest some short term decline of 1% annually. Over the long term, modest growth of 2%-4% seems probable, with billings reaching $75 to $85 million in 10 years time. Participants in the industry and the DITC business capital investment intentions survey further support this position.

7. TRANSPORTATION:

Only slight growth expected in this sector. Traditionally, this sector has seen slow but steady growth. Annual growth rates of 2%-3% are estimated for the 1961-74 period. Since that time, a slight decline has occurred in this type of billing.

Growth prospects are primarily dependent upon growth in government budgets and contracting out policies. Decline in urban freeway and highways should be counteracted by increases in public transit. Resource roads will also be needed for petroleum and natural gas and power projects. However, the short term prospects would seem to favour further slight decline followed by a resumption of historic 2%-3% rate of growth. Billings in 1988 could range from $75 to $95 million.

8. FORESTRY, ETC.

Domestic prospects not encouraging. This sector has had an erratic growth pattern, very strong in the early seventies, but virtually no growth in the 1960's. Since 1974 domestic consulting sectors have declined primarily due to the general low operating levels in the forest products industry, including excess capacity and high costs compared to general world markets.

The other two components of this sector, fisheries and agriculture, are comparatively small. Fisheries may however, receive a short term stimulation with the declaration of the 200 mile fishing limit.

Overall, further declines of 1%-2% are anticipated followed by a modest growth in the 2%-3% range. By 1988 the industry should account for $60-$70 million of fees. The DITC survey and interviews with industry further support this view.

9. DAMS & IRRIGATION:

No growth anticipated. This sector's growth has varied historically. Generally declining in the 1961-71 period followed by rapid growth in excess of 10% during the 1971-74 period, decline has occurred in the last 3 years.

Interviews with the industry did not uncover any major developments which would suggest growth in this sector. Most observers felt that billings were likely to stabilize at current rates; that is the trend of the past few years will continue. As a result, billings in 10 years time are expected to remain at the current $32 million figure.

10. AIR & SEA PORTS:

Prospects are primarily related to government capital budgets. Most of the engineering design in these sectors is undertaken in-house by various government agencies. Billings in this sector amount to only $22 million or 2% of consulting engineering billings compared to the 6% it represents of total construction activity. Most firms in this area see a continuation of the small level of work in sea related activity, but a significant decline is expected in the level of airport work as much as 50% from the 1974-75 peak. Without upgrading of current standards or a major increase in government capital budgets, this seems likely to occur. Billings in the $12 million range are anticipated in 1988.

Exhibit 2.3

POWER AND PETROLEUM & NATURAL GAS WILL BECOME INCREASINGLY IMPORTANT

	Domestic Consulting Fees ($ millions 1977)					
	1977		1988(low)		1988(high)	
	$	%	$	%	$	%
BUILDINGS	195	20	242	19	261	18
MUNICIPAL	176	18	167	13	181	12
PETROLEUM NATURAL GAS	108	11	200	15	232	16
POWER	83	8	204	16	269	18
MINING & TECHNOLOGY	76	8	58	4	62	4
PLANT PROCESS	63	6	74	6	86	6
TRANSPORTATION	80	8	87	7	96	6
FORESTRY, ETC.	55	6	61	5	68	5
DAMS & IRRIGATION	32	3	32	2	32	2
AIR & SEA PORTS	22	2	12	1	12	1
TELECOMMUNICATIONS	8	1	10	1	11	1
MISCELLANEOUS	92	9	157	12	173	12
TOTAL	990		1,304		1,483	

11. TELECOMMUNICATIONS.

This very small sector has modest growth prospects. The bulk of engineering in this sector is undertaken internally in a number of private and government corporations. Much of the billings by the industry relate more to technical overload for the industry and to separate design work. This sector could have a promising future. However, there is little potential of a change in the contracting-out procedures of the major participants in the industry. Thus modest growth of 2%-3% is anticipated with total billings of $10-11 million by 1988.

12. MISCELLANEOUS.

The unclassified sector of the industry should grow rapidly. This category represents $92 million of billings and its nature suggests that rapid growth could be anticipated as new sectors should emerge and develop quickly during periods of economic change. Real growth of 5%-6% seems possible for this category in future years.

Thus, to conclude, it is estimated that by 1988 the petroleum & natural gas and the power sector will have increased significantly their share of total domestic billings (Exhibit 2.3). Buildings and municipal services will experience the most significant declines. Other sectors will predominantly have maintained their current proportion of billings.

Exhibit 2.4

OTHER COUNTRIES PROVIDE GREATER EXPORT ASSISTANCE THAN CANADA

	FRANCE	GER-MANY	UK	JAPAN	ITALY	USA	CANADA
INSURANCE AGAINST CURRENCY FLUCTUATIONS	Yes	Yes	Yes	Yes	Yes	No	No
TAX REBATE ON EXPORTS	Yes	Yes	Yes	No	Yes	No	No
INDIRECT TAX INCENTIVES FOR EXPORTS	Yes	Yes	Yes	No	Yes	No	No
TAX EXEMPTIONS	Yes	Yes	Yes	No	Yes	No	No
INSURANCE AGAINST EXPORT LOSSES	Yes	Yes	Yes	Yes	No	No	Yes
DIRECT EXPORT TAX INCENTIVES	Yes	No	Yes	Yes	No	No	No
PARTIAL OR TOTAL EXEMPTION OF FOREIGN BRANCH INCOME	Yes	Yes	No	No	No	No	No
DEFERRAL OF EXPORT INCOME	Yes	Yes	No	Yes	No	Yes	Partly
SUMMARY OF EIGHT EXPORT INCENTIVES	8	6	6	5	4	1	1.5

Source: H. Peter Guttman, The International Consultant, McGraw-Hill New York, 1976, p.19. Canadian situation supplied by ACEC.

INTERNATIONAL PROSPECTS GOOD

Currently, the industry views the international market very optimistically and is continuing with strong business development efforts. However, there are questions whether historic growth rates can be maintained. Annual growth in foreign billings in the 10%-20% range seem more likely, led by advances in a few sectors. Although this growth will provide good opportunities to further development of expertise and profits for the industry, the benefit to the Canadian economy is likely to reduce.

Strong growth prospects, but influenced by domestic situation. Estimating the future growth in international billings is extremely difficult because the influences are many and complex. On the negative side, competition for Canadians is increasing both due to the emergence of new foreign competitors and because other governments are increasing the forms of assistance available to their consultants in obtaining foreign work. In many instances this assistance exceeds that available to Canadian firms (see Exhibit 2.4). Also, the extent of marketing efforts by Canadian firms are affected by domestic business conditions since, by and large, work in Canada is more profitable, more easily staffed, less risky and performed generally in a more familiar environment both technically and financially.

Against these factors, we must take other, more positive signs, into consideration. First, while totals are not known, the overall market is huge and presumably growing as increasing funds are devoted to work in under-developed countries. Canadian firms compete very favourable with their foreign competitors in several sectors, largely due to expertise built up from domestic work in the power and natural resource related fields. For example, Canadian firms are reported to secure more than their share of World Bank contracts. And finally, our discussions with firms across the country, including most of the major current exporters, have indicated a growing interest in export work amongst all but the smallest firms, and an expectation of export as an increasingly important source of billings.

Against these considerations, what are the future prospects for the export field? It seems unlikely that the recent real growth rates of about 25% can be maintained. For one thing, in 10 years time over 50% of Canadian consulting would be exported - a situation rivalling European countries such as Britain, France and Germany. This appears unrealistic in such a short time. Also a major export sector - power - is expected to show very strong growth and another domestic sector in which many firms in other sectors could become involved - petroleum and natural gas - is also expected to see substantial growth. Given its attractiveness relative to export work, domestic business will be the preferred direction of marketing efforts during strong market periods.

Thus, we estimate that growth in export of consulting engineering services will continue, but at lower real rates than in the past. Over the next 10 years, we feel that a range of 10% to 20% is likely. Even at this rate, by 1988 exports will have grown in importance and will then be accounting for from 30% to 50% of total industry billings.

Several sectors appear particularly promising. Virtually all of the large domestic sectors (with the exception of buildings) have good export potential. However, five sectors are particularly attractive.

- Municipal - many Canadian firms are increasing business development efforts in this area. Some have established successful client relationships in the Middle East and others are anticipating moves into the United States. Due to the high standards in Canada, firms here have technical expertise equal to competitors from any country, although large U.S. firms have an edge in securing the very big contracts abroad. Also, CIDA considers municipal engineering projects an area for priority funding.

- Forestry, etc. - Canada has a long history of international assignments and is considered to have a technical advantage. Competition comes mainly from U.S. firms (most Canadian firms have subsidiaries there too) and from European "package deal" manufacturers.

- Power - this also has been a very strong export historically and Canada is again recognized as having the necessary technical expertise to compete successfully in the huge international market, particularly in the hydro and nuclear fields. In response to rising petroleum & natural gas prices many foreign utilities are engaged in large redesign or expansion of electric power facilities. The factor that may limit foreign expansion is the strength of the industry domestically.

- Mining and metallurgy - world renowned expertise with certain minerals gives Canada a competitive advantage in this large market area as well. In the short term, current world-wide depressed mineral markets may limit expansion.

- Plant process - the level of Canadian expertise is high in many industrial processes, particularly steel. Demand for this type of service is growing rapidly in developing countries and in the U.S.

In the past, Canadian firms have been constrained internationally due to their inability to provide a full design/construct or turnkey package to clients wanting this type of service. During the 70's several large firms have been developing expertise in these areas or forming joint companies with contractors experienced in specific types of project. Continued progress in this area - particularly the ability to work as easily as a contractor as well as a consulting engineer - will be important for expansion in several international markets.

Implications for Canadian economy uncertain. The effects of growth in consulting exports on broader national concerns such as employment of Canadians, exports of manufactured goods (or non-engineering services) and taxation revenue are very hard to predict. The effects will depend on the type of service exported and the host country's policies and technical resources:

- Employment of Canadians – As U.S. firms are in Canada, so Canadian firms working overseas are also being increasingly pressured to set up local offices, employ local people and sub-contract to local engineering firms. While Canadian firms naturally resist this pressure, the main factor is the competence of the local engineers. This varies according to the nature of the project and the expertise required. Local skills develop first in the areas of generally lower technology such as certain aspects of building, transportation and municipal work. Local skills in more complex or less universal technology take longer to develop. Currently, international projects range from a high of 70-80% Canadian staff to a low of perhaps 5-10%. All firms interviewed expressed concerns over the difficulty of finding Canadians who were psychologically suited and interested in foreign assignments. With foreign pressures and local expertise growing, it is likely that the proportion of export work performed by Canadian staff (whether located here or abroad) will decrease.

- Exports of manufactured goods – By the nature of their funding terms, certain consulting projects such as those funded by CIDA and EDC lead directly to other exports. However, projects with other funding only lead to manufacturing exports through a relatively informal linkage. Here, the reasoning goes, Canadian consulting firms write specifications in ways which give Canadian manufacturers at least an equal chance at the contract. Also, through past relationships

engineers know the manufacturers and can be a source for advance information on prospective contracts. However, other factors come into play. Engineers are being increasingly required to specify locally manufactured goods whenever possible. Also, there have been complaints that Canadian manufacturers do not follow up leads provided by engineering firms, sometimes because of U.S. parent company policies. Thus future ties between consulting and manufacturing exports are likely to be increasingly related to Canadian government programs and policies.

As well, the nature of consulting projects in the future will affect manufacturing exports. The potential for exports is much greater for projects (like those in the power and forestry fields) which combine high contents of manufactured goods with indigenous Canadian expertise, than for projects in the road, dams or irrigation fields. Currently, we have estimated the "multiplier" (ratio of manufactured exports to consulting billings) to be 1.75[9] although firms reported the potential to be closer to 5.90.[10] A practical limit is probably in the order of 3 or 4 and that only attainable in equipment intensive "package deal" exports.

Therefore, whether or not a specific Canadian product is exported as a result of a consulting export depends: on the nature and price of competing products from other countries; special conditions imposed by the consulting contract both here and by the host country; and, by no means least, the degree of effort the Canadian manufacturer is prepared to make to secure the order.

- Taxation - What consulting firms list as export billings are not all necessarily taxed in Canada. Many have formed foreign subsidiaries which pay local taxes, with only the profits returning here for taxation. Some countries make it very difficult to bring any profits back to Canada. Also, many firms have established off-shore companies to decrease the tax burden. And finally, personal taxation paid by Canadian staff working abroad is dependent on the exemptions involved and the proportion of billings accounted for by such staff.

All these factors, but particularly the first two, have to be considered by the government in formulating policies.

GROWTH AFFECTED BY 3 POSSIBLE DEVELOPMENTS

The foregoing analysis of the prospects for both domestic and international consulting engineering markets assumed that there will be no major changes to drastically affect the size of the domestic market or in government policies towards the industries' export attitudes. Three types of action could affect future markets:

1. Increased assistance or programs for export could affect the size of the international consulting for which the Federal government is the client and hence effectively increase the size of the market for Canadian firms, increase overseas marketing activities by making greater financial assistance available, or otherwise improve Canadian firms' competitiveness abroad.

2. Greater contracting out by clients with in-house engineering staffs could have significant effects on domestic markets, particularly in the power, municipal, transportation and air and seaports sectors.

3. Reduced foreign competition in Canada could mean that Canadian firms could get significantly more work, that fewer engineers would be brought into Canada from outer countries or that less work would be performed outside the country.

These are 3 issues covered extensively during our interviews with firms across the country. While all are important to the future of the industry, viewpoints within the industry differ somewhat.

EXPLANATORY NOTES

1. Based upon the following estimated levels of domestic consulting engineering fees:

($ million 1977)

	1977	1980	1985	1988
low	990	1,023	1,207	1,304
high	990	1,044	1,319	1,483

2. Based upon the following estimated levels of foreign consulting engineering fees:

($ million 1977)

	1977	1980	1985	1988
low	200	266	389	517
high	200	346	717	1,239

3. The forecasts for each sector are based upon a synthesis of a number of data sources including:

   - detailed interviews with over 50 senior officials in the industry
   - Statistics Canada, Private and Public Investment in Canada Outlook, Catalogue 61-205.
   - Industry Trade and Commerce, Business Capital Investment Intentions Survey, November, 1977.
   - Industry Trade and Commerce, New Capital Expenditure Projects Starts and Proposals, January 23, 1978.
   - Southam Business Publications Ltd., Canadata 1978-80 Forecast of Put in Place Constructions.

4. Statistics Canada Construction in Canada, 1975-77, Catalogue 64-201

5. Statistics Canada Projections for Canada and the Provinces, 1972-2001, Catalogue 91-514.

6. Statistics Canada, Household and Family Projections for Canada and the Provinces to 2001, Catalogue 91-517.

7. Industry Trade and Commerce, New Capital Expenditure Projects Starts and Proposals, January 23, 1978 p.ii.

8. Foreign Investment Review Agency Review "Capital Investment Projects in Canada. Oil, Gas and Electric Power" Winter 1977-78 p.21.

9. See Chapter 1 explanatory note 7.

10. See Chapter 1 explanatory note 8.

3. FIRMS & THEIR NEEDS

So far, we have reviewed the place of the consulting engineering industry in the economy and the breakdown of the industry in terms of the types of projects it undertakes. The next step is to examine the structure of the industry: the characteristics and distribution of firms, and how they relate to the various sectors of work discussed earlier. From this analysis, and our interviews across the country, it became clear that the needs and attitudes vary between different types of firms, but that in general there are 2 basic needs:

- the need for individual firms and the industry as a whole to grow in order to meet new challenges and to contribute to the Canadian economy
- the need to overcome some problems that are bothering a large number of firms

Resolution of these needs will provide the groundwork for a strategy for the industry.

A. STRUCTURE OF THE INDUSTRY

While the structure of the consulting engineering industry conforms to several common characteristics of service industries, it has several other features which are unique.

Industry oriented toward regions of economic development. As would be expected, both the 1,600 firms and industry billings are distributed more or less according to where the work has been - in Quebec and Ontario, and in the West. However, because of the concentration of a few large firms there, Quebec-based firms account relatively for a higher proportion of the industry's billings.[1]

Head Office Location	% Firms	% Billings
Atlantic	7	3
Quebec	17	32
Ontario	35	30
Manitoba/Saskatchewan	5	4
Alberta	20	16
B.C.	17	15

Majority of firms incorporated, Canadian owned. Of all firms in the industry, about 70% are employee-owned incorporated companies, while the remainder are individual proprietorships or partnerships. A full 98% are wholly Canadian owned and only 2 are public companies.[2] Of the 30 to 40 firms with any degree of foreign ownership the largest are subsidiaries of U.S. based design/construct firms mainly operating in the petroleum & natural gas, power and plant process fields.

Employment concentrated in a few large firms. As in most service industries, the average size of consulting engineering firms is small, the bulk having staffs of less than 15, with the overall average being only slightly higher.[2]

1 person	-	13% of all firms	} average 25 people
2 - 15	-	60%	
16 - 50	-	17%	
over 50	-	9%	

These statistics, however, hide the most important characteristic of the industry: a relatively few firms account for the bulk of total employment:[3]

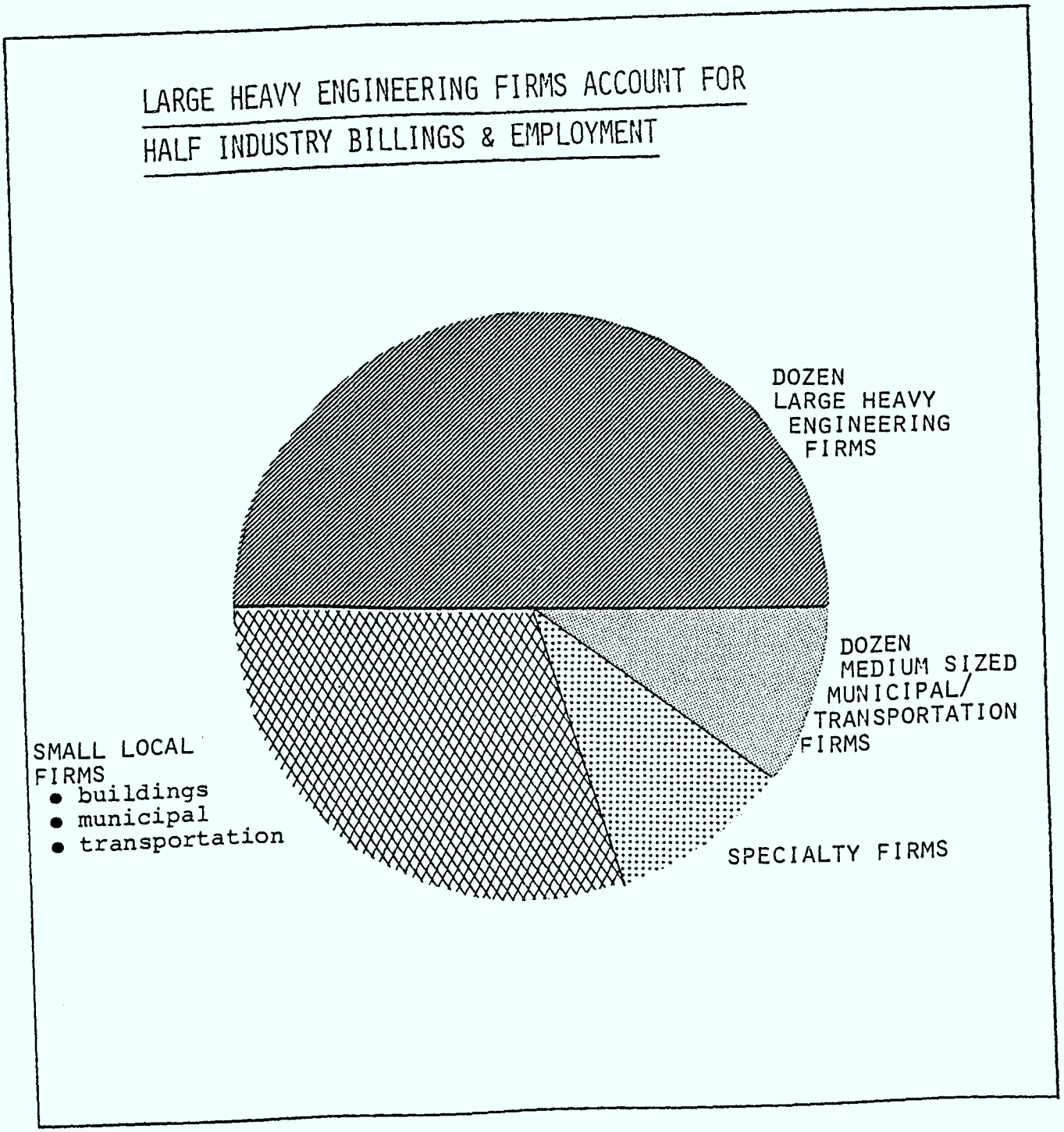
6 largest firms	-	30% of industry employment
next 6	-	14%
next 13	-	14%
remaining 1,575	-	42%

Thus, to fully understand the structure of the industry, it is necessary to examine the characteristics of the few larger firms and the types of business typical of the many small firms.

Industry structured into 4 main types of firm. Firms within each of these 4 categories offer similar types of service, tend to be similar in size, and have many other characteristics in common.

1. Large heavy engineering firms. There are a few large firms - perhaps a dozen in number - who offer a wide range of consulting services mainly in what could be called the heavy engineering fields: power, mining and metallurgy, petroleum & natural gas, forestry, plant process design, air & seaports, and telecommunications. In addition, many of these firms are also involved in all other sectors of consulting engineering, and provide the

Exhibit 3.1


LARGE HEAVY ENGINEERING FIRMS ACCOUNT FOR HALF INDUSTRY BILLINGS & EMPLOYMENT
DOZEN LARGE HEAVY ENGINEERING FIRMS
DOZEN MEDIUM SIZED MUNICIPAL/ TRANSPORTATION FIRMS
SPECIALTY FIRMS
SMALL LOCAL FIRMS
• buildings
• municipal
• transportation

full range of services from feasibility studies, through design to project management. Many are heavily into project management services, with staff devoted to that aspect of their work representing 20 to 30% of total employees.

Together, these firms, including their numerous subsidiaries and affiliates, probably account for about half of the industry's employment and billings (Exhibit 3.1). The smallest are in the 500 employee range while the largest firms have 2-3,000 employees, but counting subsidiaries the number can reach 5,000. Their services are provided across Canada (often through branch offices or subsidiaries) and they are experienced in export work, with offices or separate companies in the U.S. and overseas. Because of the nature of their principal services, they work mostly for private clients, utilities and various other quasi-public clients. But clearly, the development and growth of the overall industry is closely tied to the fortunes of these few firms.

2. Medium-sized municipal/transportation firms, while generally smaller than the heavy engineering firms, individually employ 200 to 800 people. Altogether there are 10 to 15 of this type of firm, accounting for about 10% of the industry. As the grouping implies, the bulk of their services fall into the municipal engineering and the highways, bridges, tunnels field. Individual firms usually provide services in both these fields (as well as in dams & irrigation and buildings), but one or the other usually predominates.

Land use planning and economic studies are non-engineering services frequently offered. Engineering services are primarily the traditional design and construction supervision, with few if any staff devoted to project management work. Beyond the types of services, these firms have some other important attributes:

- their business is usually concentrated within one geographic region. Few firms encompass more than 1 perhaps 2 provinces
- clients are mostly public sector - municipalities and provincial agencies constitute the bulk of the billings
- the firms have limited export experience - apart from the odd project, few have a sustained export program and none the extent of experience of the heavy engineering firms.

3. Local engineering firms include the large number of small firms who provide building engineering (structural, electrical and mechanical) and municipal or transportation engineering services within a limited geographic area, usually one city, urbanized area, or a more rural region. Their scope rarely extends beyond their local area and they have virtually no export experience. In sheer numbers they account for the bulk of firms in the country, but individual firms tend to be small (ranging from a single practitioner, to firms of 75-100 people, but averaging 10-20). Clients are both public and private sector, with the latter being principally developers. Overall, these types of firm account for about one third of the industry's billings and employment.

4. Specialty firms include a wide range of small and a few medium-sized firms who offer a particular service. Limitations on the market for such services requires that the firms market themselves across a broad geographic area, often nationally, as well as in the international field. Some offer services included in the "miscellaneous" category while others have expertise in particular aspects of heavy engineering including such areas as telecommunications, airport planning, special plant processes, forestry management, rail roads and many others. Many of these firms are affiliated with one of the large heavy engineering firms. Overall, the specialty firms account for approximately 10% of consulting engineering business.

As will be seen in the following section, the recent slowdown in the industry plus the diminished prospects for many sectors have caused many of the larger firms to seek new routes for growth. The result has been a number of acquisitions and/or geographic expansions which have seen these firms grow in size in spite of market conditions. Therefore, the current trend is towards a somewhat greater concentration in the structure of the industry amongst a relatively small number of firms.

B. THE NEED TO GROW

Our analysis of the future prospects of the industry and its various sectors, has produced a varying picture: some sectors will show good, even extraordinary growth while others will slow or even decline. What can be done

to encourage more growth, particularly in the sectors with clouded prospects? The needs and circumstances vary greatly between different types of firms. So do the opportunities available and the constraints.

LARGE HEAVY ENGINEERING FIRMS

Individually, many of the dozen or so large heavy engineering firms have reacted to the recent slowdown in business by taking steps to broaden their business base. In many instances they have gone the acquisition route, purchasing or acquiring interests in smaller firms to expand their base of expertise and also to provide a presence in other areas of the country. Joint ventures and sometimes corporations, have been established between these large firms and also between them and large foreign engineering firms or design/construct companies.

While some of this activity relates to specific large projects, some is also geared to permanent association with a view to securing types of work not previously available in type or scope to either participant, mostly in energy-related fields. In particular, these developments relate to the increasing importance of project management work and the move towards full design/construct capabilities for very large projects.

Collectively, the large heavy engineering firms have similar needs, but particularly in relationship to very large projects:

Overall need is to increase scope of markets and capabilities to undertake larger, more complete projects both at home and abroad. These firms continue to lose out to large U.S. based design/construct firms on very large petro chemical contracts (and to a lesser degree in the power and plant process design fields). While Canadian firms frequently get "a piece of the action" they have had difficulty securing the prime contracts. To be successful in this field, the firms need to be bigger, develop a track record of progressively more responsible roles in such contracts, broaden their design/construct capabilities and increase their financial resources and skills. But the critical need appears to be sheer size. The projects demand huge staffs, and clients greatly prefer single corporate responsibility to joint ventures.

Opportunities

A number of considerations augur well for the heavy engineering firm's growth and success in securing the large contracts:

- Acquisitions and associations between the firms - already well developed - should increase capabilities, scope of services and geographic presence in Canada, the U.S. and overseas.

- Strong growth in the domestic markets for power and petroleum & natural gas, and particularly the plans for many large projects in these areas should provide the vehicle for increasing Canadian firms capabilities.

- Existing reputation of Canadian firm's internationally in many sectors (especially in power and forestry areas as well as some aspects of mining & metallurgy, plant process and transportation work) should provide good access to markets overseas, but also in the U.S.

- Presence of substantial potential work now being carried out by clients in-house which could be contracted out; particularly by utilities, the Federal government (air & sea ports) and companies in the process design field.

Constraints

Other factors could hold the firms back:

- In the international market, the firms face a number of problems. While the recent devaluation of the Canadian dollar has improved the situation, higher wage costs compared to most competitors places Canadian firms at a disadvantage. Also, these firms are increasingly meeting demands in foreign countries similar to what U.S. firms are encountering here: requirements to employ local engineers and sub-contract to local firms. Finally, many foreign firms enjoy a competitive edge due to more favourable support from their governments than Canada provides (Exhibit 2.4).

- Attempts to broaden export markets in certain fields is restricted by the fact that key Canadian expertise is not in consulting firms but in large companies or government agencies. Railroad and telecommunication skills are two examples.

- Restrictions on access to the prime or major role on large petro-chemical (and some power and plant process) process work) due to:

  a) insufficient staff size

  b) lack of construction expertise

  c) client's relationship with or preference for U.S.-based design/construct firms or U.S. in-house design

  d) lower purchasing and expediting capability compared to large U.S.-based firms

  e) lack of a track record of similar projects or license to process technology

Firm's Attitudes

The large heavy engineering firms have been in business for a long time and are experienced exporters of their services. They understand the current market situation (having seen downturns before) and have a good "feel" for where growth will occur and the tactics for their firm to get its share. Also, there is a good measure of realism when viewing both the opportunities and the constraints. On the key questions facing their business, attitudes are relatively consistant:

- On assistance developing export work. The firms are cool to government doing their marketing for them. While some use the PEMD program, tax relief for overseas business development costs is preferred. To increase competitiveness overseas, the firms would like to see a program of insurance against uncontrollable risks (including currency fluctuations) to protect them from the substantial exposure to losses inherent in large foreign contracts. Finally, there were strong views that EDC funding should be extended to feasibility studies and design-only contracts.

- On U.S. firms working in Canada. Attitudes on this subject are affected by two considerations. First, most of the Canadian-owned heavy engineering firms do business in the U.S. and look on it as a major growth market. They are wary of reprisals there if pressure on U.S. firms here are escalated. Second, the largest heavy engineering firms have growing project management capabilities and are gearing up to compete with the large U.S. based firms, or in some instances setting up jointly held companies with them. As a result, Canadian-owned firms are confident of getting progressively more responsibility in the large projects of the future. Based on these considerations, the firms are generally supportive of current pressure to increase Canadian content on large petro chemical and other projects, but do not favour escallation of that pressure. Finally, it must be recognized that several consulting engineering firms, while U.S.-owned, employ large numbers of Canadians in Canada and some operate an extensive export practice overseas from their Canadian base.

- On in-house engineering. Firms strongly support pressures to encourage more contracting out. Since many of these firms embrace all sectors of consulting work they stand to gain more from increased contracting-out than single sector firms. A few clients are key: the 2 or 3 largest utilities, the Federal Ministry of Transport (air & sea ports), the railroads and several large petro-chemical or plant process companies.

MAJOR MUNICIPAL AND TRANSPORTATION FIRMS

Many of the dozen or so medium sized municipal/transportation firms have expanded or are considering expanding from their "home base" to other regions of the country. Some are also in the process of expanding the scope of their practices through acquisitions. And many, seeing the signs of an eventual slowdown in the municipal and transportation fields are actively pursuing international business including the U.S. Those who are not doing so are considering whether they should.

Collectively, as a sector of the consulting engineering industry, these firms have a similar need:

Overall need is to increase domestic markets and move into export work. If this sector is to grow marketing efforts overseas and perhaps to the U.S. will have to increase, and at a cost to the individual firms. New areas may have to be added to broaden the range of services to compete internationally. As well the sector could expand domestically if it could acquire work - particularly that now done in-house by its clients - that has not previously been available to consultants.

Opportunities

- Unlike other sectors which undergo great fluctuations, domestic markets for municipal and transportation services has been relatively stable and continuous, and this characteristic should continue in the future. As a result, this sector has a stable base from which to expand.
- While not nearly as extensive as the heavy engineering firms, a few firms have experience in export work. Also export demand for water, sewage and road services is expected to be strong as many agencies (including CIDA) concentrate on the provision of basic infrastructure services in the Third World.
- Many Canadian development companies have moved into the U.S. market and there are opportunities for municipal/transportation firms to follow their leads and establish new offices or acquire local firms. There, Canadian firms have some skills (particularly integrated land use planning and dealing with government agencies regulating housing development) which could prove superior to their U.S. counterparts in many areas.

- Provincial and municipal government agencies do substantial work in-house which could be contracted out. This is clearly possible since some agencies do contract out substantial proportions of their work while others put out relatively little. In particular, if certain key clients were to be persuaded to contract out more, it would have a major impact on these firms' total business. These include certain provincial ministries of highways and several large municipalities.

Constraints

- Most firms have limited export experience and have not yet met up with the complexities of dealing with a combination of foreign governments, world organizations and Canadian export aid agencies that a fully developed export practice requires.
- Canadian firms have few areas where they have a technical edge over foreign competition and are smaller than many U.S. and British firms. Unfortunately, in contrast to many areas in the heavy engineering sector, municipal/transportation projects do not require or allow for the development of high levels of expertise. As a result there is much competition from low wage rate countries (for example Korean and Taiwanese firms are successfully moving into the field) as well as strong demands from host countries to subcontract to local firms. The market overseas for Canadian firms could well evolve into CIDA/EDC backed projects, medium sized projects for governments or world agencies where price is not the major factor, or for foreign governments where firms can develop a long term, multi-project relationship.

- Like the heavy engineering firms, the municipal/ transportation firms suffer from higher wages and less government assistance than many of their international rivals.
- Despite relatively continuous, long term pressure on major government agencies to contract out, many firms believe that in-house engineering is actually on the increase. Perhaps attitudes of senior managerial levels in government have become entrenched on this issue.

Firm's Attitudes

In general, the attitudes of the larger firms in the municipal/transportation consulting business coincides with that of the large heavy engineering firms. However priorities differ.

- On assistance developing export work the preference is for personal tax relief to improve Canadian wage competitiveness and provisions for corporate tax deductions for overseas marketing costs instead of direct government subsidies. Because of their newness to the export field, and lack of representation in the major areas of the world, these firms do favour increased overseas intelligence by government for identification of potential projects. They would also like to know more about the forms of assistance that foreign governments make available to their consultants so that the Canadian firms have a better understanding of their competition.

- On U.S. firms working in Canada. While supporting government and association efforts to limit this practice, the municipal/transportation firms are rarely affected. They are, however, concerned about what they regard as excessive barriers at the border for Canadian firms working in the U.S., as well as the complex licensing requirements for engineers in each State. They feel that, if not free trade, at least arrangements for consultants working both ways across the border should be the same.

- On in-house engineering. These firms strongly favour increased pressure on Federal, provincial and municipal agencies to increase their contracting out. Here the key targets should be the provincial departments of highways and some of the largest municipalities. These firms were also concerned that consultants generally were receiving bad publicity in connection with government contracts, and that the public was not differentiating between engineering and other types of consultants. The over-riding concern, however, was that the cutting back of government consulting budgets would lead to more in-house engineering.

LOCAL ENGINEERING FIRMS

The firms which constitute the buildings field and the smaller municipal/transportation firms have similar needs and circumstances, even though they work in separate fields. Many are having difficulties adjusting to the shifts that have occurred in their markets. In particular, the building engineering firms are finding few alternative areas open to them for expansion. Together, these firms have a common need:

Overall need is to broaden the scope of the market, mainly in Canada. Individual firms' growth opportunities lie primarily in branching into new, related fields in their local areas or building on some special expertise developed in connection with past projects and marketing that skill farther afield. Major expansion geographically is difficult. While some small municipal firms have broadened their markets to include adjacent rural areas, few have successfully expanded to other provinces. Expansion of this nature by building engineering firms is even rarer, and very few firms have any export experience. Therefore, collectively the major need for this group of firms is to have more work available in their local market, and perhaps to expand into the export field. Again, there are some opportunities and constraints in achieving these needs.

Opportunities

- Federal and provincial governments do work which could be contracted out. In particular, the various departments of public works provide building design and renovation services in-house. Provincial highway departments as well as some municipal, county and regional governments do work which could be contracted out to small municipal/transportation firms.
- Some areas of new service could grow. In particular emphasis on energy conservation is likely to produce new markets for mechanical and electrical consultants. Also increased priorities on rural development and environmental concerns could improve small municipal firms' prospects.
- In the buildings area, Canadian firms have acknowledged expertise in structual engineering and in combined air-conditioning and heating systems. In both these areas firms could follow their developer clients to the U.S. or large construction firms overseas.

Constraints

- Firms have virtually no export experience, and because of their size, lack the resources to invest in the necessary marketing efforts. Also their type of expertise is ususlly the first to develop in under-developed countries.
- Domestically, there has been a growth in design/construct or turnkey practices for certain common building types that has tended to erode traditional consulting markets.

Firms' Attitudes

All firms interviewed in these sectors pointed to decreasing in-house engineering as the main emphasis of efforts to expand their markets. Again, decisions by relatively few of such government agencies could have a significant impact on their business.

These firms are not touched by the foreign competition issue. However, many are wondering about or actively pursuing international projects. Unlike the larger firms, they actively favour direct government assistance programs like PEMD, although many felt PEMD should pay for a greater proportion of overseas marketing costs. There was also the question of whether that program should be extended to cover marketing in the U.S. since there appear to be some export opportunities there. Finally, while their work in the U.S. is limited, these firms are aware of the problems concerning U.S. border restrictions and licensing requirements and feel that steps should be taken to reduce the barriers involved. Overall, however, the chances of these firms establishing an on-going practice outside of Canada are not promising considering their lack of resources and the fact that their expertise is generally available overseas, or in Canadian large heavy engineering firms already in the export market.

SPECIALTY FIRMS

These small and medium sized firms offer a very specialized service, usually in many regions domestically and internationally as well. Many were formed and matured when the particular service they are providing was in demand domestically. For some, this situation is continuing and prospects can be bright (for example for those related to the power or oil and natural gas fields), for others decline in domestic demand has created the need to market more overseas. As a group their needs are more related to a general broadening of their markets regardless of location.

Overall need is to broaden domestic and international markets. The diversity of these firms makes their needs difficult to categorize. Those who can, need to use their individual skill base to expand the scope of their services from the present narrow market segment to new fields, particularly those forecast to have brighter prospects. Others need to take a unique expertise developed in Canada and enter the world market. Still others can move into other parts of the country not previously served, often following their clients in so doing. But generally, this group of firms, many of whom are in slow growth fields domestically, need access to a wider market.

Opportunities

- Many firms have an expertise related to fields in which Canada is internationally recognized - telecommunications and forestry are but two of many examples. This should increase the chances of success of overseas marketing efforts.

- Large heavy engineering firms often need a specific expertise to round out a team for a large assignment, usually abroad but on occasion in Canada as well. Specialty firms can fill such a role.

- For some, there are large amounts of work performed in-house by major clients, including government (airport planning for example), other related agencies (such as railroads) and large private companies. Considering that these firms are generally small in size, even a slight increase in contracting-out can have a significant effect on the markets available to them.

Constraints

- The smallness of most firms means that resources are not available for extensive overseas marketing activities. Also, if their domestic markets are shaky, the base for such marketing activities may not be sound.

- For those firms formed to meet a specific, short-lived need in Canada, there may be little market for their specific types of service either here or abroad. Considerable adaptation and change may be necessary.

Firms' Attitudes

Most firms interviewed in this category favoured direct government assistance programs to help in their marketing efforts together with increased activities by Canadian government officials abroad to identify potential contracts in their fields. Some favoured improved terms for the PEMD program, particularly relating to increased expense allowances and charges for professional time during proposal preparation. Like the local engineering firms discussed earlier, all but the largest specialty firms lack the resources for broad scale overseas marketing efforts. They too look upon the U.S. as a potential market and would like to see reciprocal border regulations governing consulting engineering activities.

Few of the specialty firms are affected by competition from foreign-based firms and some even work closely with U.S. firms in related fields. However, specialty firms interviewed, strongly favour greater contracting-out by government and industry with large in-house engineering staffs. In this respect, these firms stand to benefit perhaps more from such changes than any other category of consulting engineers. However, being small, and the clients being in general, very large organizations, these firms have difficulty in gaining the confidence of the potential clients necessary to secure large contracts.

C. OVERCOMING CURRENT PROBLEMS

In addition to questions about expanding markets, and concerns about in-house engineering and foreign competition, a number of other problems arose repeatedly during our interviews with engineers across the country. There are five such problems, the first two of which were mentioned in virtually every interview:

1. High costs and risks of competing for government contracts. In the last few years competition for work has become extreme and governments appear to be encouraging wasteful and often counter-productive competition. While acknowledging the need for full and open competition in many instances, the firms point to two major deficiencies in the typical process:

   - Every firm is asked for a full proposal, with no short-listing procedures. As a result the competition forces firms to invest heavily in proposal preparation, even when there may be from 10 to 30 other competitors. Frequently the aggregate costs of all firms preparing proposals exceeds the contract value!
   - Projects fail to materialize after the winning proposal is selected, usually due to failure to get the necessary funds approved. Even when the consultants get approval to proceed it is often many months after submission of the proposal. Uncertainties in timing of project startup create scheduling problems within the consultant's office.

Clearly what is required are equitable short-listing procedures prior to requesting full proposals from a selected few firms. In the few instances where this is the practice firms are quite willing to accept the selection committee's decision. For the few that may not, they can be allowed to submit a full proposal, but knowing their chances are slim. To avoid the embarassment of failing to get the project started, governments should secure approval in principal for the project and an upset cost prior to requesting proposals.

As a final note many Western and Atlantic consultants complained of the high costs of travel to Ottawa when competing for Federal contracts and for general business development activities, such as visits to CIDA, EDC and IT&C.

2. Uninformed haggling over government contract details. There were many complaints regarding DSS's attempts to define and limit profit margins on Federal contracts. The concern was that Federal negotiators rarely understood the nature of typical accounting procedures used by consulting engineers or the distinction between costs of design versus study type work. As a result, there is a lack of understanding of markups and constant questionning of fees.

Firm's felt that what was needed was a better understanding of the industry, its accounting and billing practices by government personnel. Often it is found that the client ministries - rather than special contracting agencies - are better informed

about normal contracting procedures with consulting engineers. Greater involvement by the ultimate client would improve contract negotiations.

3. Growing concern over liability insurance. Rapid escalation in costs of this type of insurance plus reports of even higher rates in the U.S. are worrying many engineers. Also they regard as highly inequitable the fact that consultants are responsible long after contractor's liability has ceased. Clearly steps must be taken to ease this situation, but no-one interviewed was able to offer any suggestions.

4. Lowering profit margins for many firms. There are a number of causes. Anticipating continued growth, some did not adjust quickly enough to the post-1974 stagnation in the industry, and hired or held onto staff. Anti-Inflation Board and DSS contracting procedures are also limiting profits to lower-than-normal levels. Also firms generally find foreign work less profitable than domestic business, especially for those newly into the export field. And finally, with the traditional percent of construction cost contract, profits of many firms are getting squeezed between reducing or stabilizing construction costs, and rising salary levels.

5. Restriction on expansion due to "buy provincial" policies. Many firms expressed concerns over growing regionalism in Canada and how it restricts free trade in the consulting field. Some provincial governments have such policies and several are actively promoting their own firms for both local and export work.

EXPLANATORY NOTES

1. Based on the distribution as reported in Statistics Canada Consulting Engineering Services, 1974.

2. Statistics Canada, Consulting Engineering Services, 1974.

3. Estimate based upon Consulting Engineering Services, 1974, recent employment levels as reported in the ACEC Directory Consulting Engineers, Canada 1977-78 and interviews.

4. OPTIMIZING PROSPECTS

The preceding chapters have established an understanding of the background and prospects for the industry, and its needs. From that work, we have prepared a list of the various actions which could be considered both by the Branch and by ACEC. However, all the information and understanding to fully evaluate and reach agreement on which of the actions are most appropriate is not yet available. Thus the purpose of this chapter is to outline the possible actions and programs which both parties could undertake and to discuss the types of work which should be considered in order to complete the necessary evaluations.

A. POSSIBLE FEDERAL GOVERNMENT ACTIONS

Our studies of the industry and particularly our interviews with firms across the country have pointed out a number of areas where Federal government actions could have a significant benefit for the industry.

ENCOURAGING EXPORT CONSULTING

There are a large number of steps which the Federal government could take in this area, but on many there are differences of opinion within the industry on which are the most appropriate.

1. Tax Relief. Large consulting firms with considerable experience and proportions of their markets in the export field strongly favour changes in federal tax policies in two areas. Firstly, despite recent devaluations in the Canadian dollar, Canadian salary and benefit levels are not competitive with those of many other countries whose firms complete with ours for international work. Personal tax exemptions, when on overseas assignments, would improve our competitiveness and help to overcome the reticence of many Canadian engineers to leave the country on overseas assignments. Secondly, the larger firms favour corporate tax relief for business development activities connected with export work. While many are using the PEMD program, they would prefer after the fact tax relieve to up-front subsidies, mainly due to the red tape required when applying for assistance under such programs.

2. Government Subsidies. On the other hand, while smaller firms also favour personal tax relief when working on overseas assignments, their preference is for PEMD-type support for business development activities. Many expressed concerns that the PEMD program's allowances were insufficient to cover costs. The difference here, of course, is that the smaller firms do not have the resources to apply to overseas marketing programs and thus prefer the up-front support of the PEMD program.

3. EDC funding conditions. The priorities of the Export Development Corporation centre on the export of manufactured goods and while much work by consultants is funded under EDC programs, there are no provisions for funding consulting-only projects such as feasibility studies and preliminary design work. Many firms expressed the need to change these conditions citing numerous examples of projects in the feasibility stage which, if Canadian firms had been able to carry out the necessary preliminary studies, chances for obtaining not only the final design work but also orders for Canadian manufactured goods would have been greatly improved.

4. Risks insurance. Consulting firms working for foreign governments or private foreign clients face a number of areas of potential loss over which they have little or no control. The risks of non-payment by the client, despite the presence of a contract, are much greater on such work than on domestic projects or on those funded by national and multi-lateral agencies such as CIDA and

the World Bank. The EDC provides insurance against non-payment by the client. These include all forms and reasons for non-payment including insolvency of the buyer, the outbreak of war or revolutions and other causes which prevent the purchaser of services from paying the Canadian consultant. However, there are other risks which exporting consultants face which are not related to a default on the part of their client. These include devaluations or other types of currency changes and also the effects of inflation at home, but more importantly in the host country. A form of insurance against such risks would parallel that available to exporters from other countries and would allow Canadian firms to bid more competitively without having to make allowance for such risks within the contract price.

5. Link-ups with in-house expertise. Both within government and some private corporations there is expertise available which could contribute to securing more contracts by Canadian consultants. While some co-operation does exist, often the in-house expertise is not oriented or encouraged to associate with private concerns in such ventures. While ITC, through its Office of Overseas Projects is encouraging such link-ups, the possibility and general approaches to encouraging more of such co-operation should be examined.

6. U.S. regulations. There is a general concern that the border regulations governing Canadian firms exporting services to the U.S. are substantially higher than those affecting U.S. firms operating here. While firms with established business in the U.S. appear to have little difficulty, new firms attempting to enter the U.S. market are meeting with restrictions concerning the transmission of plans, the entry of personnel, and the obtaining of licenses to practice in particular States. The regulations affecting export of consulting services to the States could be reviewed and compared with Canada's regulations in an attempt to bring the two more in line.

INCREASING CONTRACTING-OUT

A second action that the Federal government could take is to encourage greater contracting-out to consultants of work now done by governments and industry. Such a program must consider who has to be persuade and what the rationale will be.

Opportunity greater with certain client groups. In the past, much effort has been devoted to encouraging such actions by Federal government departments. However, the opportunity appears to be even greater with other client groups such as provincial and municipal governments and private corporations. While more definitive information on this potential is needed, clearly the major client groups who could contract-out more are:

- utilities in all aspects of the power field
- provincial governments, mainly in the transportation related areas, and to a lesser extent, building design
- municipalities in municipal engineering fields such as trunk sewers and roads
- large private companies or quasi-government organizations such as the railroads, telecommunications and industrial process companies.

More contracting out is the main potential area of new growth for many types of firms, but particularly the municipal/transportation and specialty firms, heavy engineering firms in the power sector and, to a much lesser degree the building engineering firms.

The need for a rationale. The rationale for Federal government encouragement of more contracting out has to be carefully considered. Arguments about differences in productivity between the private and public sectors aside, the net effect of contracting out on overall employment in Canada is nil: jobs are merely shifted from one sector to the other. It has the effect of raising taxation revenues somewhat since increasing private sector volumes has an overall, though indirect, effect on company profit levels.

The main rationale for increasing contracting-out is that, in the fields with major export potential, it increases the competence and experience of Canadian firms. If this is the case, then the Federal government

must define its role vis-a-vis other levels of government, the utilities and the private sector and then formulate a program to encourage more contracting in the key export-related sectors. A second rationale is that if certain sectors and types of firm are to be maintained and grow, more work will have to be available to them through the contracting-out route. This approach could relate to the smaller, locally-oriented firms in the buildings and municipal/transportation fields as well as the specialty firms.

INCREASING CANADIAN CONTENT

As discussed in Chapter 3, efforts to reduce business done by foreign (mainly U.S.-based) firms in Canada and transfer it to domestic firms must be carefully considered. On the one hand a strong case for such actions can be made based on several rationales:

- greater domestic control over the development of large resource projects by having Canadian firms in charge
- greater and more responsible employment of Canadian engineers
- development of increased expertise by Canadian firms thereby broadening their potential export markets and generally increasing their competitiveness internationally.

Also, the total volume of work done by U.S.-based firms (mainly in the petrochemical, power and plant process fields) is high. While they employ a large number of Canadian engineers, estimates of the amount of consulting done by staff in the U.S. or brought to Canada for specific projects range as high as $200 million.

On the other hand, there are arguments against Canadian content rules. During our interviews, we have been told that the large pools of staff resident in these firms are necessary to meet the deadlines on very large projects. These U.S.-based firms have specific expertise and experience with similar projects which are valued by their Canadian clients. And they are subcontracting increasing amounts of work to Canadian firms. Also it must be remembered that Canadian content policies benefit, in the main, the large heavy engineering firms who also have interests in developing more work in the U.S. As our interviews with these firms indicated, they fear reprisals there if pressures here are escalated. Finally, some of the U.S.-based firms are exporting from Canada, thus contributing to the total export market.

All these considerations must be weighed when assessing alternative courses of action with the objective of increasing Canadian content on large projects. Obviously the approach must be evolutionary in nature. However, a starting point for any such policies should be a greater understanding of the extent of the situation: how much engineering is being imported, on what types of project and what proportion could be responsibly undertaken by Canadian firms.

OTHER CONCERNS

Some of the other concerns raised by consulting engineers and discussed in Chapter 3 could be overcome through appropriate government actions:

- Excessive competition for government contracts. ITC could have an input on Federal contracting policies and seek to make available to other levels of government procedures acceptable to the industry. These procedures could be initiated by ACEC or drawn up jointly by ACEC and the Branch. ITC should also consider measures to reduce Atlantic and Western consultants costs of competing on projects where the clients are Ottawa-based.

- Government contract details. Similarly, ITC, together with ACEC could develop a program to make contracting agencies such as DSS better aware of consulting engineers' accounting procedures to reduce misunderstandings over markups and fees. A joint ACEC-ITC effort to smooth contracting procedures with the Federal government would be of considerable benefit to the industry and, overall, improve productivity and performance. Since Federal procedures have a way of filtering down to other levels of government, such actions would reduce problems elsewhere.

- "Buy Provincial" policies. Growing regionalism is a concern to many Canadians, not just the consulting engineers. However, the barriers to securing business in other provinces are hampering the expansion of many firms in slow growth regions and must be having an effect on overall productivity and efficiency. ITC is well aware of this problem but actions specifically in respect of the consulting engineers could be considered.

Finally, while not a problem, as such, the Branch has raised a concern about accessibility by consulting engineers to Federal R and D support programs. Although some firms undertake non-sponsored in-house research, little time is devoted to it. Views expressed during our interviews favoured greater contracted research from the Federal government rather than programs in which a proponents ideas could be funded.

B. POSSIBLE ACEC ACTIONS

ACEC should liaise closely with ITC during consideration of the above Federal government actions. However, there are a number of initiatives which ACEC could consider as part of its own program of assistance to its member firms.

1. Assistance to firms new to the export field. There are a large number of small and medium sized firms now considering or beginning to pursue overseas work. Many have relatively little knowledge of how to go about such a move or of the many potential pitfalls involved. ACEC, perhaps in conjunction with ITC, could consider taking two steps:

   - Prepare a "do's and don'ts" or "how to" booklet for the new consulting exporter which could reduce the uncertainties and some of the chances of making a major mistake. The booklet could include such topics as available export assistance programs and other Federal services to exporters, major export clients and their priorities, contracting problems in foreign countries, risks and liabilities, staffing and benefits.

   - Promote through seminars or direct meetings, the interchange of information between the large heavy engineering firms with considerable experience in exporting of consulting services and the firms newer to the field. In many instances these firms are not in competition and yet the one has valuable information, often about particular countries and the problems working there. For example, a firm carrying out forestry related projects internationally could be very helpful in counselling a municipal engineering firm on how to deal with a particular foreign government, how to arrange for the best

accommodation for staff sent out from Canada and a myriad of other details about such work - even leads to possible projects. There is a certain camaraderie amongst consulting engineers even though in quite different fields which should make such interchanges quite feasible.

2. Pin-pointed program to encourage contracting-out. To date, most efforts to reduce in-house engineering have been directed at the Federal government or at governments in general. What this study has emphasized is that the Federal government is not the industry's largest public sector client and that there are certain other clients where the potential for contracting-out is great.

   Therefore, it would appear that now is the time to begin the "rifle shot" approach. Examine the output of specific ministries, agencies, or companies, develop evidence on what proportion could be contracted-out, prove the efficiencies involved and make the case. Given the current cost cutting mood in many governments across the country, joint industry-government task forces could be established and, perhaps through an impartial third party, individual or firm, examine the potential for contracting-out in more detail.

   To back up these more pin-pointed efforts, ACEC should continue to inform government and industry of the capabilities of Canadian consulting engineering firms.

3. Smoothing government contracting procedures. In response to concerns about excessive competition required for government contracts and about haggling over markups and fees, ACEC could prepare two documents that could be submitted to the appropriate government agencies.

   - A recommended procedure for identifying and listing suitable consultants for a given project, equitable shortlisting procedures, guidelines for proposal requests, selection criteria and so on. Many central government agencies have prepared or are preparing such procedures and few, if any, deal adequately with the excessive competition problem.

   - An outline of consulting engineers' procedures and approaches to determining markups and fees with a view to informing government contracting agencies about the nature of these practices and to persuading them to adopt the recommendations as a standard procedure.

4. Differentiating between large and small firms' interests. From both our interviews and analyses, it is clear that in many matters the interests and attitudes of large and small firms in ACEC do not coincide. In general, the large firms have the resources to expand, are experienced exporters and are faced with different pressures and needs than the smaller firms. We found the large firms pushing for a laissez-faire approach to the industry whereas the smaller firms look to more government pro-

grams and support. Also, many of the large firms complain about their relatively small voting power within ACEC when compared to their share of dues.

These considerations point to the need to review how ACEC can be best structured to maximize benefits to both large and small firms. The future of the industry depends on both and a means must be found to reconcile their differing viewpoints.

5. Other possible actions. A number of other subjects have arisen during the course of this study that merit further consideration by ACEC. Questions about liability insurance premiums and lowering profit margins have been subjects of ACEC concern for some time and we have no further suggestions beyond what ACEC is already doing. However, there are a couple of other areas that the Association could consider:

   - Liaison with engineering schools to inform them of the expected future demands for graduates as well as the fields in which the needs will be greatest.

   - Liaison with other professional societies to help counteract the negative image of consultants in government. In many respects consulting engineers are suffering from public impressions of waste on excessive studies by other types of consultants hired by government agencies. The result is that consulting budgets are one of the first to be cut

during periods of austerity and the engineers suffer with the rest. A program pointing out the benefits of consultants in general might be in order.

C. JOINT ACTIONS

The preceding has, in effect, been a "shopping list" of potential actions by ITC and ACEC identified during the course of this study. As we have pointed out some conflict with one another, and others would not have full backing by all ACEC members. How do we proceed, evaluate these and develop possible solutions which have the support of both the Federal government and the consulting engineering industry? We would recommend a 4 step program:

1. Reach agreement on objectives for the industry. These should include objectives for overall growth of the industry (both domestic and export), employment (number, quality, stability and removing constraints on supply), spin-off effects (again domestically and from export consulting) and Canadian content. Such objectives should be both realistic and measurable in order to provide a basis for future evaluation.

2. Decide on the general tactics to be employed. These could include areas and degrees of government involvement, how such involvement would differ with different types of consulting firms or in different markets, the role of government (Federal, provincial, municipal) and of the ACEC and its provincial affiliates.

3. Develop the information base for evaluation of alternative actions. Before rational conclusions can be reached on what actions and programs should be initiated by either the Federal government or ACEC, some detailed studies should be initiated. Their purpose would be to provide much needed information on the 3 principal directions for encouraging growth of the Canadian industry:

   - Implications of export consulting. For government to evaluate fully various possible export assistance programs, it needs to understand the implications in terms of job creation for Canadians both here and abroad, spin-off exports (and potential exports) from consulting engineering work, and the broader effects on the Canadian economy. As discussed earlier, these implications will vary with different types of project and with the host country for the project. Thus some general idea of the scope of the international market for the types of service accounting for the bulk of Canadian consulting exports is also needed. This would not only indicate the importance of export work to the potential growth of

the industry but also the implications in terms of government objectives. Such a study would form the basis for an export strategy for the industry.

- Contracting-out potential. Next is needed an understanding of the effects of greater contracting-out on the industry and on the client organizations. First a list should be prepared of organizations known to have substantial in-house engineering capability. It should then be reviewed in terms of the sectors of the industry which could be most affected by contracting-out. Next, preferably with the co-operation of the organization concerned, available information and their operations could be reviewed for a sample of the organizations. Comparisons could be made with similar organizations who contract-out extensibely. In this manner conclusions could be drawn on the amoung of work which could be contracted-out and the consulting sectors most directly affected. At the same time the effects on overall employment and other implications of interest to government could also be assessed. With this information in hand, the subject of contracting out can be assessed and a program established consistent with the agreed upon objectives for the industry.

- U.S. export/import situation. Few issues arouse such concern, and confusion. Some detailed study would help clarify the situation and allow rational policies to be adopted which are again, consistent with the objectives for the industry. First, with respect to the import of services from the U.S., a better understanding is needed of how much there is, and on what types of projects and where. The extent of employment of Canadians and sub-contracting to local firms by U.S.-based firms should also be reviewed. Clients and Canadian firms could be interviewed on the issue with respect to the capabilities of Canadian firms and the relative merits of potential further government actions in the area. Second, the reverse problem should also be examined - the difficulties faced by Canadian firms working in the U.S. This work would review respective border and state licensing regulations and estimate the amoung of Canadian consulting exports ot the U.S., their nature, geographic location and effects on employment of Canadians. Finally, the balance of these two examinations could lead to a program which would be both realistic and in the best interests of the country and the industry.

4. Evaluate alternatives and prepare program. The above studies, together with this one will provide the information on which to evaluate the alternative courses of action by both ITC and ACEC. From this would come the recommended actions and programs for achieving the objectives set for the industry. These programs would specify what is to be done, the roles of the various parties involved and the timing of specific steps.

5. Provide for on-going monitoring of the industry. While the Statistics Canada survey and this study have provided the beginnings of a good general information base for the industry, it will be important to obtain up-to-date information from time to time. This should be done in 2 ways.

   - Informal surveys of the industry could be undertaken by ACEC or the Construction and Consulting Services Branch through mail-out questionnaires similar to those circulated by the late 60's and early 70's by DITC. We would emphasize that such surveys should be kept as short as possible and concentrate on key information such as staffing sizes, domestic and international billings, and types of project.

   - Another Statistics Canada survey of the industry should be undertaken as soon as possible since next year will be 5 years since the date of the last survey. A

comprehensive survey of this nature should be repeated at intervals in order to develop a picture of the industry's development over time.

APPENDIX

INDIVIDUALS AND FIRMS INTERVIEWED DURING STUDY

Mr. M. Stade, Aviation Planning Services Ltd., Montreal

Mr. John Cooper, Cooper, Tanner & Associates Ltd., Vancouver

Mr. B.E. Roth, Construction Industry Development Council, Ottawa

Mr. Henry Bent, MacLaren Atlantic Ltd., Fredericton

Mr. J.R. O'Brien, Associated Engineering Services Ltd., Edmonton

Mr. Dale Blair, Industry, Trade & Commerce, St. Johns*

Mr. E.S. Reid, Reid Collins & Associates Ltd., Vancouver

Mr. L. Wright, Mr. H. Wright, Wright Engineers Ltd., Vancouver

Mr. J.A. Relph, Business Development & Tourism, Alberta

Mr. H.C. Rynard, Acres Consulting Services Ltd., Toronto

Mr. W. Weinstein, Fenco Consultants Ltd., Toronto

Mr. A.O. Werlen, Export Development Corporation, Ottawa

Mr. D.T. Matheson, Donald T. Matheson Engineering Ltd., Halifax

Mr. Larry Butler, Teshmont Consultants Ltd., Winnipeg

Mr. J.S. Kendrick, Sandwell & Co. Ltd., Vancouver

Mr. H. Sabier, Keith Consulting Engineers, Regina

Mr. I.N. Scrimgeour, E.S.C. Limited, Fredericton

Mr. Paul Beauchemin, Beauchemin-Beaton-Lapointe Inc., Montreal

Mr. R. Parsons, Newfoundland Design Consultants, St. Johns*

Mr. Rene Martineau, Martineau Vallee et Associes, Montreal

Mr. C.A. Dagenais, Le Groupe, SNC., Montreal

Mr. John B. Morgan, Allsopp-Morgan Engineering Ltd., Vancouver

Mr. R. Dubas, R.M. Hardy & Associates Ltd., Edmonton

Mr. R.J. Genereux, R.J. Genereux & Associates Ltd., Regina

Mr. M.G. Williams, Nova Scotia Consulting Engineers Association, Halifax

Mr. W.J. Patrick, Advisory Committee on Industrial Benefits, Industry, Trade & Commerce, Ottawa

Mr. D. Danylkiw, Plantel Company, Montreal

Mr. Marcel Desrochers, Association des Ingénieurs - Conseils du Quebec, Montreal

Mr. Bruce Pardy, Project Management & Design, St. Johns*

Mr. B. Hamm, Nova Scotia Dept. of Highways, Halifax

Mr. L. McClare, New Brunswick Dept. of Commerce & Development, Fredericton

Mr. Art Fennell & Mr. R. Bing-Wo, Association of Consulting Engineers of Saskatchewan, Regina

Mr. John Godsland & Mr. W. Bonnell, The Shawinigan Engineering Co. Ltd., Montreal

Mr. T. Whelan, Deputy Minister, Department of Public Works, Newfoundland, St. Johns*

Dr. G.G. Hatch & Mr. T.S. Gamble, Hatch Associates Ltd., Toronto

Mr. D. Redfern, The Proctor & Redfern Group, Toronto

Mr. Eric Grey, Baine Johnstone, St. Johns*

Mr. J.R. Dean, A.D.I. Ltd., Fredericton

Mr. C.D. Carter, Nova Scotia Dept. of Environment, Halifax

Mr. J.R.D. Kaulbach, Canadian-British Consultants Ltd., Halifax

Mr. E.L. Mercer, Robert Halsall & Associates Ltd., Toronto

Mr. Frank Petrie, Overseas Projects Branch, Industry, Trade & Commerce, Ottawa

Mr. K.A. McLennan, Marshall Macklin Monaghan Ltd., Toronto

Mr. C. Burgoyne, Burgoyne & Wagner, Winnipeg

Ms. Jeanette M. McTaggard, Industry Trade & Commerce, Halifax

Mr. R. Keily, DeLeuw Cather Canada, St. Johns*

Mr. P.M. Gillham, Whitman, Benn & Associates Ltd., Halifax

Mr. Warren McIntyre, Underwood McLellan & Associates Ltd., Vancouver

Mr. T.A. Simons, I.R. Robinson, D.J. Watts, J. Reeve, R. Dewar, H.A. Simons (International) Ltd., Vancouver

Mr. P.C. Fortier, Canatom Ltee, Montreal

Mr. M.C. Sutherland-Brown, Canadian International Development Agency, Ottawa

Mr. Martin Holden, Willis, Cunliffe, Tait, Victoria

Mr. Robert Paul, Bechtel Canada Ltd., Toronto

Mr. A. McDougall, Sir William Halcrow & Partners (B.C.) Ltd., Vancouver

Mr. Tom Rose, Project Planning and Engineering Associates, St. Johns*

Mr. I.F.B. McBride, McBride Regan Sorenson Ltd., Edmonton

Mr. J.E. Snowball, McKenzie, Snowball, Skalbania & Associates Ltd., Vancouver

Mr. J. Power, Association of Professional Engineers of Newfoundland, St. Johns*

Mr. R.E. Wright, Industry Trade & Commerce, Charlottetown*

Mr. R.C. Doyle, Cook, Pickering & Doyle Ltd., Vancouver

Mr. Bernard Lamarre, Lalonde, Valois, Lamarre, Valois & Associés, (Lavalin Inc.) Montreal

Mr. Ivan Finlay, Alberta Association of Professional Engineers, Geologists and Geophysists, Edmonton

Mr. Dennis Loader, B.C. Ministry of Economic Development, Vancouver

Mr. D. Champion, Association of Professional Engineers of Prince Edward Island, Charlottetown*

Mr. J.D. Kern, J.D. Kern & Company Ltd., Vancouver

Mr. Garth Jenkins, Department of Public Works of Prince Edward Island, Charlottetown*

Mr. J.K.C. Mulherin, Mr. Marsh Howard, Montreal Engineering Co. Ltd., Montreal

Mr. W. Hanuschak, Wm. Hanuschak & Associates Ltd., Winnipeg

Mr. Frank K. Spragins, former Chairman, Syncrude Canada Ltd., Edmonton

Mr. T. Richardson, Canadian British Consultants Ltd., Charlottetown*

Mr. Fred White, W.L. Wardrop & Associates Ltd., Winnipeg

Mr. D. Mears, Mr. Ron Kennedy, Stanley Associates Engineering Ltd., Edmonton

Mr. Ross Reed, Consulting Engineers of Ontario, Toronto

Mr. T.J.G. Simms, Interprovincial Engineering Ltd., Halifax

Mr. Alf Hennessey, Architect, Charlottetown*

Mr. P.M. Butler, Angus, Butler Engineering Ltd., Edmonton

Mr. R.C. Hale, Professional Project Engineering Ltd., Halifax

Mr. J.J. Heffernan, M.M. Dillon Ltd., Toronto

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* *interviewed by Industry, Trade & Commerce representative.*

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