Industry Canada Industrie Canada

# Distribution Network Automation and Control Sub-sector Analysis

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Prepared for Industry Canada by Insightrix Research Inc.



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# 1 INTRODUCTION

## 1.1 Background

The Energy and Environmental Industries Branch (EEIB) of Industry Canada contracted Insightrix Research in February 2006 to complete an analysis of the Distribution Network Automation and Control sub-sector of the Electric Power Industry in Canada. This analysis is designed to assist EEIB in understanding the sub-sector, its current performance in Canadian industry and identify its greatest opportunities for export. The results of this analysis are based on both primary and secondary research completed by the consultant. The report addresses all the research objectives outlined in the Terms of Reference as follows:

- An outline of the sub-sector; including number of companies in the sector, location and age of Canadian companies, number of employees, annual sales, and supply chains,
- An inventory of the products and services offered,
- An outline of current and near-future priority export markets, and
- Networking opportunities

## 1.2 Methodology

Insightrix Research developed a survey instrument to be used in completing the primary research with companies involved in the sub-sector. Representatives from EEIB reviewed the survey instrument and provided additional suggestions. A final draft, in both English and French, was prepared and the survey instrument programmed into the Insightrix online CATI (Computer Assisted Telephone Interviews) system.

EEIB provided to Insightrix Research an initial list of 107 company contacts. Additional names were provided by EEIB throughout data collection as well as additional contacts supplied through referrals by participating companies. In total, Insightrix attempted to contact 148 companies to inquire about their involvement in the Distribution Network Automation and Control sub-sector.

As the first point of contact, Insightrix Research prepared a letter in both official languages. The letter was reviewed by EEIB representatives, and sent to the list of companies supplied by EEIB. The letter, on Industry Canada letterhead, outlined the research project and informed the potential respondent that a representative from Insightrix Research would be contacting the organization to complete the research questionnaire with them. Starting March 1, 2006, Insightrix Research call centre staff initiated telephone contacts by inviting participants to reserve an interview time that would be most convenient. Senior Research Associates then interviewed the respondent at the requested appointment time. To maximize response rates, participants were also provided the opportunity to complete the questionnaire at their convenience via online or fax.

In-depth telephone interviews were completed by Senior Research Associates using our proprietary online contact management system. Participating companies were also offered the option to complete the research online at their convenience. Interviews were completed over the telephone and online. The survey information was collected from March 6 to March 28, 2006.

A total of 77 companies completed the survey of which 52 of the interviews were conducted by telephone and 25 were conducted online. Another 28 did not meet the qualification requirements and 7 refused to participate. Another 36 were not available and left in call back status. In total 1,445 attempts (ie. telephone contacts or email attempts).

Throughout and upon completion of the data collection, responses were verified based on secondary company research. Any outliers were identified and verified through follow-up calls to the participants. All open text boxes were cleaned and themed for analysis.

Sub-sector analysis was completed using companies directly involved in the production of distribution network automation and control products and services. Information collected from utilities is not included in the financial analysis as they do not contribute to the development of these products and services and are only a user. Nor do the utility companies surveyed represent any type of export initiative for these products and

services. Information from utilities is represented through the supply chain of the industry as well as input into the major issues and future direction of the sub-sector.

Research was completed by EEIB involving various discussions with companies that operate within the sub-sector. As a result of this research, EEIB provided to Insightrix an initial list of companies to contact. Throughout data collection, Insightrix Research completed additional research into other participating companies based on discussions and research with Industry Associations and input from participants. Extensive use of Internet searches and website information was used to provide additional company and industry information.

# 2 OVERVIEW

## 2.1 Types of Companies

The interviews revealed there are five different types of organizations within the sub-sector. Companies participating in the distribution network automation and control activities in Canada can be broken down into the following categories:

- Suppliers
    - Manufacturers of electrical components
- Developers
    - Research and development Engineers
    - Software developers
    - Information technology
    - Communication technology
    - Solution providers
    - SCADA system developers
- Manufacturers
    - Control products
    - Automation products
    - Meters
    - Measurement and testing products

- Sales agents/solution providers
- End-users
    - Utilities

Of the participating companies, 52 companies were involved in the development of these products and services and 37 were involved in the manufacturing of these products. Another 20 utilities were interviewed as well as 3 sales agents.

## 2.2 Characteristics of Sub-sector

Through our data collection and research, 56 participating companies were identified as developing and/or producing distribution network automation and control products and services in Canada. The following describes the characters of the sub-sector.

- 32.1% of participating companies have been in operation for 11-20 years with the average age of participating company operations of 24 years (established in 1982).
- 78.2% of these companies are incorporated and privately held.
- 51.8% of companies that produce distribution network products and services have their head office located in the province of Ontario.
- 52 of the 56 companies that produce products and services in the sub-sector reported information on number of locations. In total, these companies have 201 total locations in Canada and abroad, 48.8% of the locations are in Canada and 49.8% are located in countries abroad.
- Companies indicated that 94.5% of the total locations are involved in providing distribution network automation and control products and services.
- Almost all of the 201 locations (96% of these locations) were involved in service. Service is generally defined as working with the customers to learn the product or system. A great deal of effort goes into training companies on how to use what is provided.
- 28.8% of companies have in total between 26 and 50 employees at all of their locations combined.

- Approximately 18% of total employees are involved in distribution network products and services.
- 87% of companies that produce products and services in the sub-sector selected "Utilities" as an industry they operate in. The next mentioned industry is "Mining, Oil and Gas". 76.4% of companies indicated that "utilities" is the main industry in which they operate. 7.3% of companies chose "Mining, Oil and Gas" as their main industry.
- 23.5% of participating companies operate within the "Measuring, Medical and Controlling Devices Manufacturing" sector of Professional, Scientific and Technical Services. 20% of companies operate within the "Computer Systems Design and Related Services" sector of Manufacturing.

In terms of annual sales/revenue, a total of 45 companies provided annual sales figures for 2005 (or most current year). The total revenue through the sale of distribution network automation and control products and services of these companies in their last fiscal year was $208,170,000 with an average per company of $4,626,056. 27.6% of participating company's total revenues is from the sale of distribution network automation and control products and services.

### 2.2.1 Main Issues

There are two main issues that were identified through the research process pertaining to human resource/personnel issues and challenges in competing in world markets.

With regards to personnel issues, there is a lack of qualified people to develop distribution network automation and control products and services. Based on the high technology used and the knowledge needed to operate in the sub-sector, finding highly qualified people is very difficult. Companies in this sub-sector experience a high turnover rate for engineers, the major profession needed to drive a high technological industry. As new technologies emerge, education institutions need to keep up with the high demand of qualified labour. It takes a large amount of resources to train people in the new technologies and that has not been a priority for funding in educational institutions.

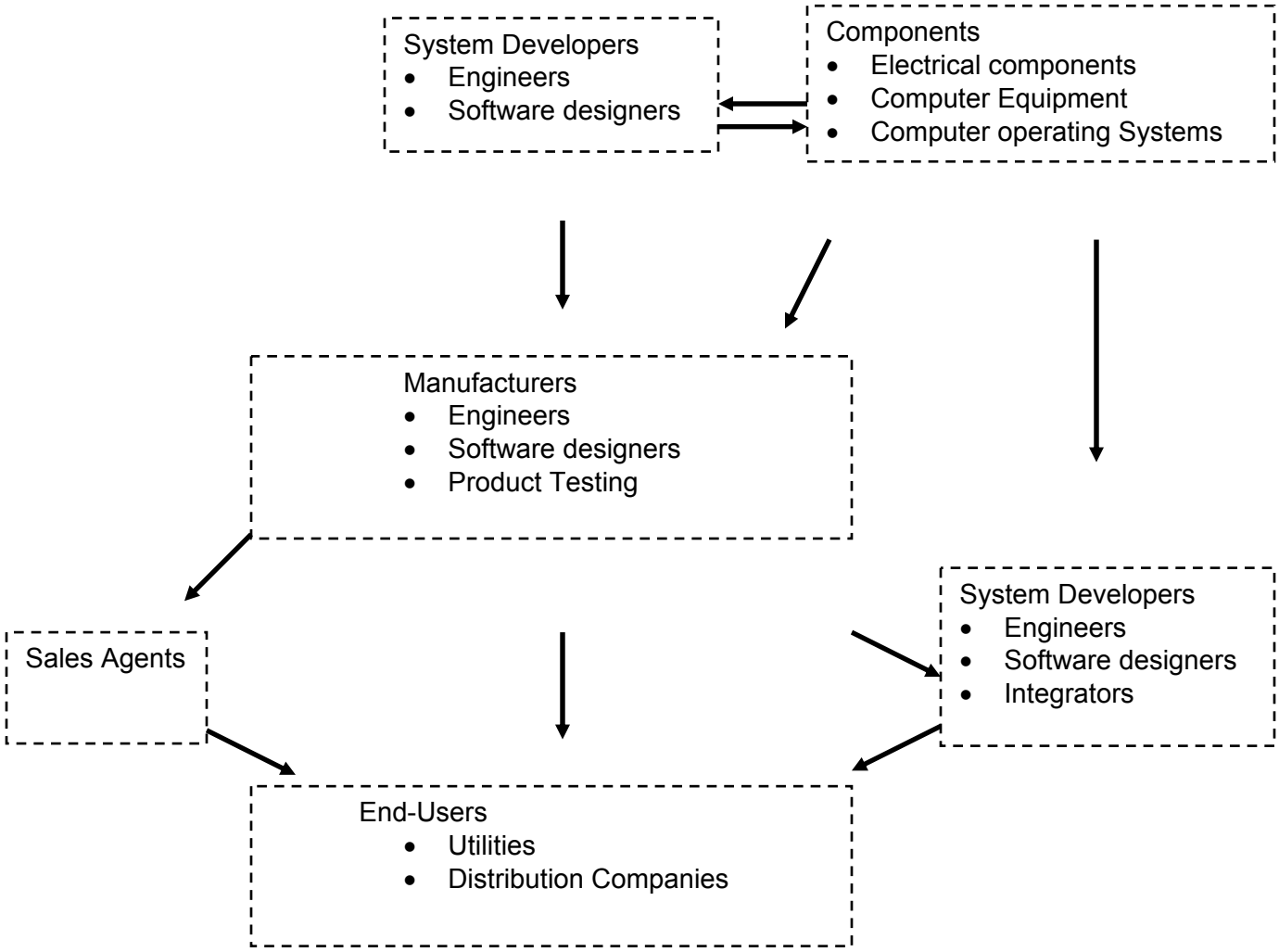
The research revealed that the sub-sector companies perceive themselves as operating in an international industry. Competition is strong as there a few very large companies that are primary suppliers to many of the end-users. It is very difficult for a smaller company to compete in the world market without developing partnerships, relationships and reputation. The change in the value of the Canadian dollar has caused manufacturers to increase efficiencies.

### 2.2.2 Industry Canada's Role

To deal with the issues identified, survey participants suggested ideas on Industry Canada's role in providing assistance. One suggestion is to provide more funding for education institutions to develop the programs needed to train electrical engineers in using new technologies. It is also felt that heavy investment is required to develop power labs and research facilities within education institutions to ensure qualified professionals can successfully operate in the industry.

## 2.3 Supply Chain

The relationship of company types described earlier is a broad classification of companies that participate within this sub-sector. Many of the companies provide total solutions for end-users and develop, manufacture, and sell these products and services in-house. Below is a general outline of the company types and their appearance in the supply chain.




Based on survey findings and in-depth interviews, the supply chain operates within the sub-sector in the following manner:

- 88.7% of companies that produce products or services in this sub-sector, sold directly to utilities (in Canada, US and internationally). 5.1% of producing companies sold directly to manufacturers and 6.2% to other customers. Some examples of "other customers" are independent power producers, system integrators and contractors.
- Companies are more likely to sell products and services directly to Utility companies in the US export markets and more likely to sell to manufacturers in foreign export markets. Canadian companies are more likely to sell to other Canadian companies such as sales agents, system integrators and consultants.
- Companies that participate in this sub-sector are involved in a variety of functions. System developers are involved throughout the process from development of new technologies to unique and specific systems required by end-users. Many original manufacturers use sales agents to distribute their products in other markets. These manufacturers also sell to integrators that build systems using their products and services.

- The established distribution channels are primarily used for market entry. Three types of distribution channels demonstrated most often in this sub-sector are:
    - Agents - Represent a company's sales force when the company is not large enough to support it on its own. Several patterns of distribution are used including intensive (a number of agents in one market), selective (a few agents in targeted markets), and inclusive (one agent exclusively for one market).
    - System Integrators - Develop relationships with manufacturers to use their products and services to develop system solutions. Integrators have a high knowledge of the products and services. They have the ability to make modifications and adjustments to offerings to develop systems specific to their clients' needs. The also provide much technical support throughout the development, installation and testing of the systems.
    - Vertical marketing System - Using corporate structure to develop marketing avenues for products and services. This is represented in the sub-sector by parent company involvement and support as well as sales distribution locations. Approximately 25% of the companies producing products and services belong to an enterprise with a parent company. 43% of the parent

company head offices are located outside Canada. Approximately 30% of Canadian companies producing products and services in the sub-sector have locations outside Canada (49% of total locations are located outside Canada).

### 2.3.1 Main Issues

As a result of the domestic versus international sales to end-users, producing Canadian companies of these products and service recognize how difficult it is to develop relationships with end-users domestically. Electric utilities throughout Canada regularly use international suppliers for their distribution network automation and control products and services.

### 2.3.2 Industry Canada's Role

A suggestion for Federal Government involvement to assist these producing companies is to foster a "Buy Canadian" mentality by offering incentives to end-users for the use of Canadian suppliers to stimulate the Canadian development of these products and services.

## 3 PRODUCT AND SERVICE OFFERINGS

Transmission networks have gained the greatest attention for automation and control products and services. This is due mainly to the ease of communication at the transmission level. Difficulties with communication at the distribution level are due primarily to the extensive number of facilities and distance between these facilities to maintain the distribution networks. Many of the technologies developed for transmission are being carried downstream to the distribution networks.

These products and services have also been implemented for use in distribution automation and control in other sectors or industries. As Canadian utilities combine

operations for electricity, water and oil and gas distribution, a driving force behind system development is a fully integrated utility generation and distribution system for service areas.

Below is a list of types of products and service offerings by companies that participate in the sub-sector for the use of electrical distribution network automation and control. The offerings are divided into three broad sub-categories of software, products and services.

- **Software** - Software applications underlie the development of electrical distribution network automation and control products and services. Newly developed software applications are used by service providers for product and/or system development.
    - Enterprise energy management software
    - Power Simulation
    - Control Systems
    - Remote Monitoring Systems
    - Infrared test and measurement equipment
    - Optical sensors
    - SCADA
    - Fiber Optics
    - GIS
    - Power System Analysis
    - Field Measurement

- **Products** - Products described below are used in distribution systems to assist in monitoring and control of the distribution networks. They are products installed at the sub-station level, in distribution theatres or down the distribution line to monitor and control voltage levels up to and including measurements for consumer monitoring and billing.
    - Metering equipment
    - Voltage regulators
    - Medium Voltage Soft Start
    - Switchgears
    - Electronic measuring devices

- Electrical testing equipment
- Data Loggers

- **Services** - Service providers participating in the sub-sector are made up of primarily Engineering professionals. These service providers research, design, and integrate distribution network automation and control systems using the software and products listed previously. Services described below can occur at all stages of production line and aid the industry in providing these services internally or as a consultant with participating companies.
  - Consulting services
  - Design Services
  - Sales agents
  - Upgrading
  - Protection and Control
  - Critical load support
  - High powered labs

### 3.1 Main Issues

This sub-sector is a complex sector in terms of the number and types of technologies produced as well as resulting integration issues.

**Regulation -** Uncertainty prevails in regulation of the sub-sector. Regulation affects pricing in most provinces in Canada, product standards and international regulation for exporting of Canadian products.

**Integration -** With the development of new technologies comes the need to integrate systems and communication of technology based products and services.

**Infrastructure -** The electrical utilities industry is a very established industry. With the high cost of infrastructure, it is very costly to update or change existing infrastructure. As the infrastructure of electrical utilities ages, there will be an increased need to deal with the changes.

**Technology -** Some common issues related to new technology development is the resources needed to educate everyone within the sub-sector on the new technology, its benefits and how to use and integrate within existing systems. This new sub-sector operates within a very established industry. End-users are utility companies that have been in existence for many years. It is difficult to change people's perceptions and introduce new technologies to such an old industry. Resistance to change is great.

### 3.2 Industry Canada's Role

The Federal Government could drive the industry by recognizing that Electric Utilities in Canada require automation and control of distribution networks today to anticipate problems of aging infrastructure and increase power demands for the future. The use of regulations has been identified as one area that the Federal Government could assist in this area (indicated by 72.4% of total participating companies). An example of this currently is required "Smart Meter" installation in Ontario by the provincial government.

Participating companies indicated less support for Federal Government involvement in developing standards for product development and standardization. As an internationally integrated industry, large industry associations provide these industry standards. Companies are less confident that the Federal Government has the required technical information to develop standards about products and services when associations with more direct experience are able to set high standards across borders. As an industry developing into the growth life stage, reputation and high quality is imperil for remaining a competitive participant in the industry. Companies involved in measurement devices are overall satisfied with Measurement Canada's involvement in measurement standards. One area for improvement identified by companies that do deal with Federal Government standards is the long wait times for product approvals.

# 4 RESEARCH AND DEVELOPMENT

Approximately 66% of total companies involved in the sub-sector (including Utilities) participate in research and development of distribution network automation and control products and services. Below is a description of the R&D activities within the sub-sector:

- The total revenue for participating companies is $752,975,000 and the average revenue per company is $4,626,056. The total research and development cost of companies producing distribution network automation and control products and services is $79,035,750. The average R&D expenditure per company is $1,796,267. The proportion of R&D expenditure represents 10.5% of total revenues.
- Utilities found it difficult to report what proportion of revenues was used for research and development of distribution network automation and control products and services. Most indicated that it would be less than 1% of the company's total revenues.
- The total amount of R&D expenditure in Canada is $217,703,790 and the average per company amount (including Utilities) is $2,914,022. This Canadian R&D expenditure represents 92.2% of the total R&D expenditure.
- Over the next 5 years, 46.3% of participating companies anticipate that their R&D expenses associated with Distribution Network Automation and Control products and services will stay the same. 46.2% believe they will increase and 7.5% anticipate a decrease.
- Based on company projections over the next 5 years, R&D is expected to increase by approximately $1,676,700 or an average of $119,764 for each company. This overall increase represents 0.6% of 2005 R&D expenditure including utilities and 1.0% increase without including utilities.

In terms of the products life cycle, many of the companies have surpassed the introduction stage and are moving towards growth as indicated by the low percentage of increase in R&D over the next 5 years. Companies that indicated a decrease in research and development specify that R&D is not expected to reduce, but as a

percentage of sales, will decrease. Sales are anticipated to increase for these products and services.

Currently, research and development is primarily funded through working capital. 77% of companies involved in research and development of these products and services (34 companies) use working capital as funding. Working capital represents 70% of research and development funding. 20.5% of companies receive government funding (primarily through R&D tax credits) but the amount contributed accounts for 4.6% of total research and development funding.

The Utilities in Canada participate in the development of this sub-sector through the **CEA (Canadian Electricity Association) Technologies Inc. (CEATI).** Participants (including Utilities, Independent Power Producers, Laboratories, Government and Universities) engage in focused closed door networking. When a common problem is brought to the attention of the group, participants are given the opportunity to address the issue by co-funding a related project, the results of which are owned by the participants in proportion to their contribution. Utilities can also bring their own projects to the table to solicit both technical and financial support. In addition, the Technology Watch program provides utilities with the opportunity to stay current on emerging technologies.

One of the main issues identified is cost or lack of funding for the development of products and services for distribution network automation and control products. Regulatory bodies and high level executives do not see the cost-benefit of automating and controlling distribution networks. There is very little force driving electrical distribution in this direction. Utilities mention that overall, the public is satisfied with the level of reliability they have in their power suppliers. There is no justification to increase rates to fund the development of improvements to a system that is not perceived as needing improvements. Participating companies are not satisfied with the level of research and development funding available to them.

As with most highly technology based industries, rapid and constant change in technologies is an issue to be dealt with in distribution network automation and control. As new technologies are developed, existing infrastructure needs to be adapted and

includes development on communications between new and existing products. As there is little communication capabilities between products, once an end-users develops a system, they are restricted in finding products to be included in the applications.

The sub-sector is characterized by constant customization of products and services to provide solutions using a hybrid of new and existing technologies, products and services. Research and development will continue to represent a high percentage of revenue for producing companies. Utilities have indicated that their low involvement in R&D will remain constant for the next 5 years.

### 4.1 Industry Canada's Role

The greatest need for Federal Government assistance has been identified in research and development of these products and services. As identified, companies feel there is a lack of support for R&D and are open to the Federal Government assisting in this area. An increase in funding for R&D will stimulate more research and development into automation and control products and services for the distribution networks and would decrease the cost of implementing automation and control. Companies feel the application process for R&D funding could be administered in a way that would make the process easier for interested companies. The application process (length of questionnaire to fill out and wait times) has hindered some companies from investigating the funding that may be available to them.

Another suggestion is to cultivate a formal relationship amongst Canadian Electric Utility companies and governments to pool resources for additional research and development funding initiatives.

One of the main issues raised is the lack of integration between supplier's different technology and communication protocols. The Federal Government could provide additional research into the "Best Practices" of Distribution Network Automation and Control. It has been suggested that additional research be completed to determine the best protocols for newly developed technology products and services currently utilized in the Distribution Network. Research completed in this sub-sector needs to be communicated to participating companies to ensure their product and service

development will operate within this standard protocol. This will assist Canadian companies in providing a competitive advantage to using Canadian based products and systems and ensure a level playing field for all interested Canadian companies. It is suggested that the Federal Government complete this research without assistance from industry representatives as results will be more readily available through Federal Government public access. Standardizing these protocols ensures that end-users are not bound to one large supplier for fully integrated distribution network automation and control systems. It will also promote Canadian capabilities to standardizing electrical distribution across the country and may be used as a marketing tool for development of these integrated systems in other markets.

# 5 EXPORTING

## 5.1 Current Markets

Three quarters of participating companies involved in the production of distribution network automation and control products and services are experienced with exporting their products. 23.5% of producers of distribution network automation and control products and services do not directly export these products and services but do so through partnerships or relationships with other companies or through the parent company. The main reason that companies are not currently active in international markets is the difficulty in finding local agents or distributors to work with in other countries. The following is additional information regarding current exporting activity:

- 47.1% of companies that do not currently conduct business in other countries intend to begin to do business internationally.
- The proportion of total revenues represents 29.3% domestic sales, 49.2% US export sales and 21.5% foreign export sales. Based on total revenues for the sale of distribution network automation and control products, the proportion of sales represents 42% domestic sales, 44.5% US export sales and 13.5% foreign export sales.
- The top ten current markets for export of companies that produce products and services in the sub-sector are:

- USA
- China
- Korea (South)
- Brazil
- India
- Australia
- Mexico
- UK
- New Zealand
- South America

- The majority of companies obtain business in international countries through a foreign agent (38.9%), direct sales (36.1%) or distributor (27.8%). Networking is also a necessary tool to developing international business through association memberships (16.7%) and foreign trade shows (11.1%).

## 5.2 Future Export Priorities

The United States is the largest current export market for this sub-sector and continues to entice other companies. When asked to rank order the importance of exporting to US, China, India and Brail, the top geographic market priority for respondent companies is the US followed by China. Brazil ranks 3rd amongst the four countries and India follows in 4th. The US is considered a favourable market for Canadian companies that produce goods or services in this sub-sector. Some of the reasons mentioned for this are the ease of market entry, similarities in culture, and accessibility for distribution and transportation.

Below is additional information on future export priorities for participating companies in this sub-sector:

- 36.4% of companies that contribute to distribution network automation and control products and services indicated that in the last 2 years, their exports had grown marginally. 51.5% of these companies indicated that over the next 2

years, the value of their exports of these products and services will grow significantly.

- There is no significant change expected over the next two years in the proportion of sales to utilities, manufacturers and other customers in either domestic or export sales.

### 5.3 Trade Missions

The survey asked participants their past experience with Federal Government led trade missions. 34% of companies producing products and services for the sub-sector have been on Federal Government led trade missions. Another 60% of companies have not. In total, 70.6% of respondent companies that have participated in a Federal Government led trade mission found it somewhat useful. Companies that found the trade missions not useful at all felt that way because they did not see direct results or increase in sales based on the trade mission.

### 5.4 Main Issues

The main problem that companies experience when exporting distribution network automation and control products and services is developing a brand identity or market penetration. Canadian companies find it very difficult to develop credibility and reputation in foreign markets. Another issue is language difficulties; for both business communications as well as software code translation. Other issues mentioned are:

- Competitive prices,
- Lack of staff,
- Cost of market entry

These issues affect smaller companies to the greatest extent as they do not have the resources to devote to exporting initiatives.

### 5.5 Industry Canada's Role

One of the main objectives of the research project was to identify exporting opportunities for participating companies to be provided to Team Canada representatives to assist in marketing Canadian distribution network automation and control products abroad. 68.3% of participating companies indicated that the Federal Government should have involvement with this task. As a high degree of participating companies already are engaged in exporting activities, the need for assistance is less than other areas affecting the sub-sector. Over half of participating producers expect that their exports of these products and services will grow significantly over the next two years.

# 6 NETWORKING OPPORTUNITIES

During the interviewing process it was identified by survey participants a high level of interest and appreciation in current and potential networking opportunities.

## 6.1 Current Participation

Companies participating in the sub-sector have a high level of involvement in networking within the sub-sector. 74% of companies attended tradeshows in 2005. The tradeshows included various associations with the most mentioned being IEEE and DistribuTECH. 84.8% of producing companies participated in all trade shows mentioned as an exhibitor compared to 64.3% of utilities that attended as just an attendee. Trade shows are a useful networking opportunity utilized by many people in the sub-sector. End-users also show a high level of involvement in developing networks to stay current on industry happenings.

## 6.2 Future Opportunities

Overall the companies surveyed in the sub-sector are very interested in future networking opportunities. 66% of producing companies of products and services in the sub-sector are interested in participating in a trade show with Industry Canada exhibit and workshops to discuss barriers and opportunities with other companies in the sub-sector. 12% of companies do not wish to participate in any activities suggested.

Utilities also expressed an interest in becoming involved in networking opportunities primarily through the workshops to discuss barriers and opportunities.

In addition, 42.2% of companies are planning future export strategies into the United States. 56% of companies are interested in participating in networking meetings into the US. The areas identified for possible cities or states are locations that have deregulated electric power distribution (such as California), recent disaster areas (New Orleans, South Carolina) and locations close to Ontario (such as New York for ease of exporting).

### 6.3 Industry Canada's Role

The sub-sector is seen as international as a large percentage of business is generated by large multi-national corporations and established distribution channels. One suggestion for Industry Canada to foster networking opportunities internationally is providing a database of approved foreign suppliers. As companies enter into new geographic markets, large investment of resources is needed to research the market and companies to include in the distribution channel. The Federal Government could provide more information on international markets to reduce the resources that are required of participating companies. As labour inputs are high and availability of resources are low, this would be seen as a competitive advantage to Canadian companies within this sub-sector.

## 7 CONCLUSION

Overall, the Electric Power Distribution Network Automation and Control sub-sector is seen as an area for continued growth and possibility. The Federal Government can become an integral part of this development by beginning on the road to interconnecting power production throughout the Canadian provinces. The Federal Government should take demonstration of what has occurred in Canada and use this information as a marketing tool into other geographic locations around the world.