

# **Global Thermoelectric Inc.**

Annual Information Form

For the Year Ended December 31, 2001

May 17, 2002

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## **THE CORPORATION**

Global Thermoelectric Inc. (the "Corporation") was originally incorporated as Global Thermoelectric Power Systems Ltd. on March 10, 1975 and was continued under the *Business Corporations Act* (Alberta) on December 30, 1983. On April 1, 1985 the Corporation amalgamated with its wholly owned subsidiary, Rigtronics Systems Ltd. By Articles of Amendment dated April 8, 1991, the Corporation changed its name to Global Thermoelectric Inc.

On September 17, 2001, the Corporation incorporated a Delaware company, Global Thermoelectric Corporation, a wholly-owned subsidiary. Global Thermoelectric Corporation markets and sells thermoelectric generators in the U.S. and has a sales office located in Houston, Texas.

The head office and registered office of the Corporation is located at 4908 – 52nd Street S.E. Calgary, Alberta T2B 3R2.

## **BUSINESS OF THE CORPORATION**

The Corporation is focused on the development and commercialization of solid oxide fuel cell ("SOFC") products. It is also engaged in the development, manufacture and sale of thermoelectric power generators for remote power applications.

Fuel cells combine hydrogen and oxygen electrochemically to produce electricity, heat and water. Hydrogen is obtained from hydrocarbon fuels such as natural gas, propane and gasoline. In the case of the Corporation's fuel cells, these hydrocarbon fuels can be used with minimal external "reforming" (see "How fuel cells work"). Utilizing electrochemical reactions to produce electricity results in a more efficient use of fuel while producing less environmentally harmful emissions such as nitrous oxides. In addition, the scalability of fuel cell designs for distributed or decentralized power production provides an economic alternative to large, capital intensive power generation facilities. The ability to capture and utilize the heat produced by the fuel cell also contributes to higher fuel efficiencies. These advantages are important with the advent of deregulation within the power industries of North America. Fuel cells can also be utilized in transportation applications as replacements or supplements to the internal combustion engine.

Thermoelectric generators produce electricity directly from heat and are utilized for remote power applications in the pipeline, oil and gas, and telecommunication industries. The Corporation believes that it has a dominant market share within the thermoelectric generator industry.

Prior to August 24, 2001, the Corporation manufactured air heaters for heating crew compartments and cargo bays of military vehicles. As part of the Corporation's strategy to focus exclusively on power generating technologies, this division was sold in 2001.

## **GENERAL DEVELOPMENT OF THE BUSINESS**

After being incorporated, the Corporation concentrated mainly on funded and contract research activities, and by 1993, the Corporation had refined its focus to the manufacture and sale of thermoelectric generators and air heaters for military vehicles.

In early 1997, as part of its ongoing effort to enhance its power generator product line, the Corporation researched available fuel cell technologies. In July 1997, the Corporation signed a Memorandum of Agreement with Forschungszentrum Jülich ("Jülich") for a worldwide non-exclusive licence to begin development of a commercially viable fuel cell product line. Jülich is a government funded research organization that has more than 4,500 employees, a budget of about \$380 million per year and concentrates on energy related matters including fusion and fuel cell research.

In April 1999, the Corporation reported a series of successes in its efforts to improve upon the fuel cell technology originally developed by Jülich. Increased power output was achieved while operating temperatures were lowered, allowing for the use of lower cost materials in the fuel cell stack assembly. On October 25, 2001, the Corporation announced that it had been released from all existing licensing obligations, including royalty payments to Jülich, for a payment of approximately \$68,000 to Jülich.

In April and August of 1999, the Corporation received two purchase orders for fuel cell stacks from Delphi Automotive Systems ("Delphi"), the world's largest supplier of automotive components, systems and modules. Delphi utilized the Corporation's fuel cells in their development project for transportation applications. The Corporation has since completed its work related to these purchase orders and is currently finalizing all outstanding items with Delphi.

On July 12, 1999, the Corporation secured a contract worth \$19 million, the largest in the Corporation's history, to supply the Gas Authority of India with thermoelectric generators and installation services in India.

On October 21, 1999 and November 22, 1999 the Corporation closed Special Warrant financings for gross proceeds of \$12.7 million and \$15.3 million, respectively. In total, 3.3 million Special Warrants were sold which were subsequently converted into an equivalent number of common shares of the Corporation for no additional consideration. Proceeds from these equity offerings were earmarked for additional fuel cell development, the establishment of a pilot scale manufacturing plant for fuel cells and fuel cell systems, and general corporate purposes.

On February 3, 2000, the Corporation announced that it had successfully tested a fuel cell system for residential power applications. The system incorporated improvements in the Corporation's fuel cell power output and system design.

On July 31, 2000, the Corporation entered into a strategic alliance with Enbridge Inc. for the supply of natural gas-fuelled fuel cell products suitable for the on-site supply of electric power and heating to homes. Under the terms of the alliance, the Corporation issued Cumulative Redeemable Convertible Preferred Shares, Series 2 for gross proceeds of \$25.0 million to fund further technology, design and product development work required to reach a commercial launch of the residential units. Enbridge has exclusive distribution rights in Canada to the resulting residential fuel cell products. Under the terms of a joint development agreement, Enbridge will provide input into product designs and assist with regulatory and certification issues related to the launch of commercial products.

On August 22, 2000, the Corporation closed an equity offering of 2,900,000 Special Warrants at \$34.50 each for net proceeds of \$94.6 million. The Special Warrants were converted into an equal number of common shares on September 25, 2000 for no additional consideration. Proceeds of this financing are being used to accelerate the Corporation's SOFC research and development program, including the manufacturing and testing of a broad spectrum of prototypes.

On December 14, 2000, the Company announced the official opening of its SOFC pilot production plant in Calgary, Alberta. The 32,000 ft<sup>2</sup> facility will enable the Corporation to develop volume-orientated production processes, including the utilization of existing manufacturing technologies adapted from the computer chip industry.

In February 2001, the Corporation relocated its head office and took occupancy of additional fuel cell research and development facilities (comprising 47,000 ft<sup>2</sup> of combined space) adjacent to its new pilot production plant. In January 2002, an additional 24,000 ft<sup>2</sup> of leased space was added to the research and development area.

Consistent with its strategy of focusing on power generating technologies, including both fuel cells and thermoelectric generators, the Corporation divested of its military heater division on August 24, 2001. In 2001, the Corporation recorded a gain on sale of the heater division of \$0.7 million on sales proceeds of \$2.1 million, reflecting the sale of the division's fixed assets, goodwill and inventory. The Corporation generated earnings from the accelerated completion of its contract with the U.S. military of \$0.4 million in 2001 prior to the disposition, compared to a net loss from this division of \$0.2 million in the previous calendar year. As part of the sale agreement, the Corporation may also receive additional payments from the purchaser based on heater sales over a five-year period should the purchaser be successful in obtaining a follow-on contract with the U.S. military at specified pricing levels. These additional payments could total an estimated \$2.6 million over the five-year period in the event that these conditions are met.

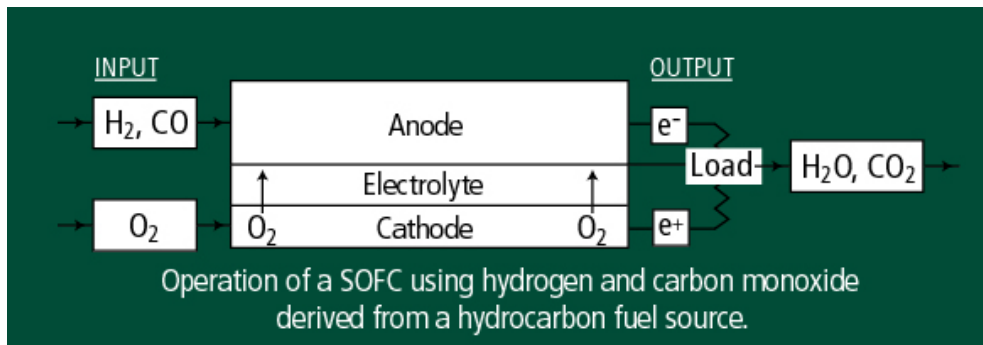
## **NARRATIVE DESCRIPTION OF THE BUSINESS**

### **Fuel Cells**

A fuel cell is an electrochemical device that produces electricity with negligible combustion and without the harmful air contaminants that combustion produces. Hydrogen fuel, which can be derived from natural gas, propane, methanol or gasoline, and oxygen from the air are combined in a fuel cell to produce electricity, with heat and water as the only significant by-products. A fuel cell is more efficient in producing electricity from a fuel than are combustion-based technologies. A fuel cell converts fuel directly into electrical energy through an electrochemical reaction and, in the case of the Corporation's fuel cells, operating efficiencies of about 35 to 45 percent may be possible. When heat from the fuel cell is utilized, operating efficiencies of up to 85 percent may be possible. As fuel cells operate with virtually no combustion, they do not produce the air-borne pollutants which are a major by-product of combustion-based sources of electricity.

### ***How fuel cells work***

The following diagram illustrates the operation of the Corporation's fuel cell membrane.



A solid oxide fuel cell ("SOFC") membrane consists of three main solid parts: anode, cathode, and an electrolyte. The anode and cathode are porous and allow only certain gases to pass through them. Between the two is an electrolyte (which conducts electricity) that will only allow oxygen ions to pass through from the cathode to the anode. The oxygen ion combines with hydrogen to form water, heat, and electricity, or with carbon monoxide to form carbon dioxide as well as electricity and heat. As the oxygen ion passes through the electrolyte, the resulting excess of electrons on the anode side completes an electrical circuit through an external load to the electron deficient cathode side for the production of a flow of electrons or electricity. Fuel cell membranes are layered on top of each other separated by interconnects to form a fuel cell stack. The Corporation is currently developing fuel cell stacks that comprise 5 to 18 fuel cell membranes.

### ***Fuel cell systems***

A fuel cell system encompasses various processes and components. Raw fuel is passed through a reformer, which releases the hydrogen from the fuel before it enters the fuel cell stack. In some types of fuel cell technologies (see "Fuel cell technology") this reforming process is a separate and equipment intensive process. In the Corporation's fuel cells, this reforming is inexpensive as the fuel cell itself contributes to the reforming process by virtue of its operating temperature. A less complicated and less costly external reforming process is therefore required in the Corporation's fuel cell system. The fuel cell stack, comprised of multiple fuel cell membranes, produces DC electricity which, depending on the application, is then used directly or converted to AC power by means of an inverter. To increase the efficiency of the fuel cell, heat can be captured from the stack through the utilization of a heat exchanger. As a result of operating in temperatures ranging from 600-750°C degrees, heat produced from the Corporation's fuel cell system is easily utilized compared to heat produced from certain other fuel cell technologies that operate at much lower temperatures.

### ***Fuel cell technology***

Fuel cells are typically classified by the electrolyte material they utilize. The following are the most known types:

*Alkaline fuel cells* were utilized as early as the 1960's by NASA in the Apollo program to power spacecraft electrical systems. As these fuel cells require pure hydrogen and pure oxygen (or air from which carbon dioxide has been removed) to operate, their applications are generally considered limited.

*Phosphoric acid fuel cells* are the most commercially developed fuel cells for stationary power applications. They are currently being deployed in a number of installations throughout Japan, Europe and the United States in mid to large stationary power applications and operate at temperatures of about 200°C. The corrosive nature of their electrolyte material and system complexity has negatively impacted their operating cost and life.

*Molten carbonate fuel cells* utilize a molten electrolyte and operate at about 650°C. They can be operated on internally reformed fuels, making them suitable for stationary power applications. These type of fuel cells are currently operating in various locations around the world, in large capacity installations.

*Proton exchange membrane ("PEM") fuel cells*, which are also referred to as polymer electrolyte membrane fuel cells, utilize a solid polymer (or plastic) electrolyte. These fuel cells have received a significant commercialization effort in the last three years by some of the largest companies in the fuel cell industry. They operate at relatively low temperatures, of around 80°C. Currently, this type of fuel cell is being utilized in urban buses on a trial basis and prototypes have been developed for residential co-generation, vehicle propulsion, and light industrial applications. However, sophisticated fuel reforming is required if hydrocarbon based fuels are to be utilized as PEM fuel cells require virtually pure hydrogen on which to operate.

*Solid oxide fuel cells* utilize a hard ceramic material as an electrolyte and operate at temperatures between 600 and 1000°C. SOFCs, because of their operating temperatures, can operate on fuels such as natural gas, propane and methanol without the need for costly external reforming of their fuel. In addition, they can tolerate greater amounts of impurities, such as sulphur, which is often found in such fuels as natural gas. These impurities need to be virtually eliminated in PEM fuel cell systems to avoid serious degradation of fuel cell materials. In addition, SOFCs can utilize carbon monoxide in the fuel mixture without destroying the efficacy of the fuel cell membrane. Utilizing high quality heat produced by the fuel cell system for heating water and space heating significantly enhances the overall fuel efficiency of SOFCs. Conversely, higher operating temperatures in SOFCs, compared to PEM fuel cells, generally require longer warm up periods before electricity can be produced. The Corporation is currently developing and commercializing SOFCs.

### ***Fuel cell markets***

In general, fuel cells have applications in two distinct markets, stationary and portable power generation, and the transportation industry. Stationary power involves the generation of electrical power for residential, light industrial and large commercial purposes. In each of these areas, utilizing heat generated as a by-product of the fuel cell adds to their economic efficiency compared to conventional power sources. In the transportation industry, fuel cells are being developed for propulsion systems in automotive applications and also for auxiliary power alongside the internal combustion engine for enhanced fuel economy and reduced emissions.

### Stationary and residential power

The electrical power industry is currently being influenced by a number of factors that have encouraged fuel cell development.

#### Deregulation

The electrical utility industry throughout North America is currently in the process of being deregulated which has increased competition for more economic and scalable power generation solutions. In general, deregulation will give consumers the ability to choose their supplier of electrical power and the means by which it is generated. Currently, most electricity for mass consumption is produced by coal, oil and natural gas fired generators, hydroelectric facilities and nuclear power plants. Generating electricity from fossil fuels is relatively inefficient as much of the energy produced is lost in the form of heat. In addition, combustion of these fuels is an inherently less efficient method of producing electricity than the electrochemical reaction utilized by fuel cells. Further inefficiencies are encountered in conventional power generation due to extensive transmission and distribution infrastructures required where as much as 16% of electrical power may be lost. Distributed power generation utilizing fuel cells for residential power and heat applications overcomes these inefficiencies. Under a climate of deregulation, natural gas utilities also may have the opportunity to participate in distributed power applications as a number of fuel cell technologies have the ability to utilize natural gas as a source of hydrogen fuel. With a natural gas distribution network to residences and commercial sites, these gas utilities could increase the amount of natural gas sold to consumers utilizing their existing distribution infrastructure.

#### Increase in power consumption

Electricity consumption is increasing throughout North America and the world. The prolific growth in computer use is contributing to this consumption growth. Fuel cells are seen as a method of meeting this increased demand.

#### Increase dependence on reliability

Concern about the reliability of electrical power is increasing as a number of areas in Canada and the United States are experiencing shortages or "brown outs" during peak consumption periods. With the prospect of deregulation, existing utilities in regulated regions may be hesitant to commit to significant capital expenditures, the economics of which have yet to be determined. On-site fuel cell systems avoid the significant capital costs of centralized generating plants together with their associated transmission and distribution infrastructure.

The trend towards an information economy driven by the tremendous growth in internet use and the resultant economies that have emerged from this use, has created a need for an extremely reliable power supply. Interruptions to this supply are having more costly economic effects than ever before. The Corporation believes that power reliability may have to improve to 99.9999% from its estimated current reliability of 99.9%. Fuel cells may be the source of this improved reliability and a means to avoid the increasing shortages identified above.



### Increase in demand for remote power

The growth in rural and recreation homes that do not have access to power from an existing grid has created an increasing demand for remote power supplies. In addition, growth in the telecommunication industry has created an increasing need for power for remote telecommunication repeater stations for example. Fuel cells are seen as a potentially cost-effective and reliable source of power in the absence of access to existing power grids.

### Environmental concern and regulation

In Canada and the United States, environmental regulators have enacted legislation that requires a reduction in power plant emissions including sulphur and nitrogen oxides, which cause acid rain. The 1997 Kyoto Agreement will require reductions in greenhouse gas emissions in those countries that ratify their participation. Fuel cells emit much less carbon dioxide and negligible amounts of other greenhouse gases compared to conventional power generating facilities that rely on the combustion of fossil fuels.

### Transportation markets

The transportation sector is currently viewed as a major contributor to air pollution. In the United States, two thirds of petroleum consumption is attributable to transportation purposes. Reducing environmentally damaging emissions while achieving more efficient use of fossil fuels has been the objective of recent government regulations, particularly in the United States. Beginning in 2003, 10 percent of a manufacturer's new car sales in the State of California must be zero and low emission vehicles.

In addition to use as a primary propulsion device for automobiles and commercial vehicles, fuel cells can be utilized as auxiliary power alongside the conventional internal combustion engine in transportation applications. The efficiency of an internal combustion engine is limited by the laws of thermal dynamics and efficiency losses through the transfer of thermal energy to mechanical energy. In addition, recent innovations in automobile technology have resulted in higher electric power requirements, today generated via the internal combustion engine. Utilizing fuel cells, which are inherently more efficient while producing less harmful emissions, is seen as an alternative source of electricity for these applications.

### ***Fuel cell strategy***

The Corporation's primary objective is the commercialization of SOFC systems for residential and light industrial power applications. Remote power applications, where accessibility to conventional power supplies is limited, are viewed by the Corporation as the most likely immediate application of its fuel cell technologies.

The Corporation's fuel cell commercialization strategy involves three primary objectives. First, the Corporation intends to accelerate its technical development programs. The Corporation has made significant proprietary improvements to the SOFC technology as follows:

- The Corporation has developed new generation SOFC membranes that have demonstrated considerably improved power output per unit of area. At operating temperatures of 800°C the Corporation has improved power output by 386 percent compared to its initial fuel cell design. On April 30, 2002, the Corporation announced that it had received a Notice of Allowance from

the U.S. Patent and Trademark Office advising the Corporation that a patent is expected to be issued in respect to the Corporation's cell membrane composition, which has contributed significantly to the Corporation's improved power output.

- The Corporation's improved fuel cells and assemblies are capable of producing significant amounts of power at temperatures down to 650°C. This lower temperature capability allows fuel cell power systems to be assembled using the new generation membranes and common stainless steel alloys, rather than the expensive and difficult to machine exotic alloys that are generally required by higher temperature SOFC systems.
- The Corporation has also developed a new compressive system to seal around the edges of cell membranes to isolate the hydrogen and oxygen flow channels from one another. The Corporation believes that this innovative system will allow the cell stacks to handle vibration and thermal cycling better than other solid oxide systems which use glass seals that have a tendency to crack under such conditions. This system should open up new opportunities in applications where the unit must be cycled. A patent application has been filed on behalf of the Corporation to cover the new compressive sealing system.
- The Corporation has made advances in its cell membrane manufacturing processes by simultaneously co-firing all the layers of the cell membrane. This technique has enabled the Corporation to reduce manufacturing costs of its fuel cell membranes. In the summer of 2001, the Corporation demonstrated a production run of 1,000 cell membranes per week, up from 250 cells per week at the beginning of 2001.
- In 2001 the Corporation developed and successfully tested modular residential fuel cell systems that produced up to 2.0 kW of power. The systems were also thermally cycled (ie. they were shut down and re-started).

The Corporation actively seeks to protect its intellectual property being developed. It has filed 40 patent applications on 15 separate inventions. All employees and contractors supplying strategic services to the Corporation are required to sign confidentiality agreements governing their non-disclosure obligations.

The Corporation is currently producing fuel cell system prototypes for residential and remote power applications. The ceramic structure and composition of the fuel cell membrane facilitates the utilization of existing manufacturing techniques currently being employed in the computer chip industry. The Corporation believes that its ability to utilize existing manufacturing processes provides a significant competitive advantage in the pursuit of reduced fuel cell system manufacturing costs.

Through additional development and commercialization of its technology, the Corporation intends to reinforce the advantages of SOFCs in applications where other fuel cell technologies have been better known. The Corporation believes that the ability to utilize high grade heat to improve fuel efficiency, and the avoidance of expensive external fuel reforming, makes the Corporation's SFOC technology better suited to smaller scale stationary power applications than other fuel cell technology. Currently, the Corporation is focusing its development and commercialization efforts on 1 to 25 kW applications.

The second element of the Corporation's fuel cell commercialization strategy is to secure additional strategic alliances and partnership relationships, both for distribution of its future products and for securing manufacturing and development expertise for its fuel cell system components.

On July 31, 2000, the Corporation entered into a strategic alliance with Enbridge Inc. ("Enbridge") to develop and distribute fuel cell products suitable for the on-site supply of electric power and heating to residential homes. Enbridge, a leader in energy transportation and distribution, owns and operates Canada's largest natural gas distribution company, Consumers Gas, with some 1.5 million customers.

Under the terms of this alliance, Enbridge invested \$25.0 million in Cumulative Redeemable Convertible Preferred Shares, Series 2 of the Corporation to fund further residential fuel cell commercialization. Enbridge is working with the Corporation to provide commercial input into the product design and development phase with respect to the residential market, and will have exclusive distribution rights for the resulting products in Canada. The Corporation retains control over the development process and owns the technology, designs, patents and trademarks.

From the Corporation's perspective, strategic alliances, such as the one with Enbridge, provide improved market access to the consumer. In addition, valuable market data can be obtained, a critical element in designing fuel cells for broad market acceptance. Finally, with Enbridge's significant equity investment, increased resources are available to accelerate the commercialization process, while creating a mutual interest in the ultimate success of the Corporation's strategic business plan.

On September 5, 2001, the Corporation signed a Memorandum of Understanding ("MOU") with Suburban Propane L.P. ("Suburban") of Whippany, New Jersey to establish a strategic alliance for developing and distributing SOFC power products in propane markets. Suburban is the U.S.'s third largest propane gas marketer serving approximately 750,000 residential, commercial, industrial and agricultural customers through more than 350 customer service centres in over 40 states.

The Corporation views propane users as early adopters of its products. These potential customers, for a variety of reasons but most often because of remote locations, have unstable or expensive electricity supply and the Corporation believes are more willing to access new technologies sooner than other customers.

Consistent with its focus on propane applications, on January 21, 2002 the Corporation was awarded a grant of up to US\$500,000 by the U.S. Propane Education and Research Council ("PERC"). This award will be used by the Corporation to develop a propane fuel processor, thereby allowing its fuel cell systems to extract hydrogen for their operation directly from propane. PERC was established in 1996 by the U.S. propane industry and is committed to a multi-year, multi-million dollar effort to improve consumer and employee safety, to fund research and development of new and more efficient propane equipment and to expand public awareness of propane and its many uses and environmental advantages. A key objective of PERC's technology strategy is to develop new end-use technologies to attract new customers and increase sales to the existing customer base. In this regard PERC has identified the development of a propane processor as a key enabling technology.

On February 19, 2002, the Corporation announced the signing of an MOU that would facilitate Superior Propane Inc. ("Superior Propane") joining the Corporation's alliance with Enbridge. By sublicensing certain distribution rights in Canada from Enbridge, Superior will be involved in targeting the early adopter market identified above. Superior Propane is Canada's largest and only national marketer of propane, propane appliances and related support services with over 300,000 customers.

As part of its North American initiative to develop additional distribution channels and partners, on October 10, 2001, the Corporation announced it had signed an MOU with Citizens Gas ("Citizens") of Indianapolis, Indiana. The MOU anticipates the creation of a project to modify the Corporation's SOFC

system for Citizens' specific market as well as engaging Citizens to distribute the Corporation's future products. Citizens is the sole natural gas distributor in Indianapolis, Indiana with over 262,000 residential, commercial and industrial customers. Citizens is a Public Charitable Trust established more than 100 years ago for the sole benefit of the residents of Marion County or Indianapolis.

On January 29, 2002, the Corporation announced that it had signed an MOU with Bonneville Power Administration ("Bonneville") to establish a strategic relationship for the purposes of developing, evaluating and distributing the Corporation's SOFC systems. Bonneville is also expected to purchase three of the Corporation's SOFC systems for an anticipated price of US\$240,000 in 2003 for field testing use. Bonneville is an agency of the U.S. Department of Energy based in Portland, Oregon. Bonneville sells about 46% of the electrical power consumed in the Northwestern U.S. To deliver that power, Bonneville owns and operates one of the largest high-voltage electrical transmission systems in the world. Bonneville's principal service territory includes the states of Oregon, Washington, Idaho and portions of Montana, California, Nevada, Utah and Wyoming. Bonneville has been supporting the development and advancement of new technologies, in particular fuel cells, to promote energy efficiency in its electricity markets.

The Corporation's approach with potential distribution partners is to structure collaboration around specific product groupings with a single set of deliverables and timelines to market. This approach allows the Corporation to maintain a high degree of continuity across its product portfolio and to reduce time to market, development risk and cost. The MOUs that have been signed are at various stages of progression towards establishing the working relationships that the Corporation is seeking.

To accelerate design and mass production capability for certain of the Corporation's SOFC system components, on December 14, 2001, the Corporation announced it had signed an MOU with Dana Corporation ("Dana") of Toledo, Ohio. The MOU contemplates that the two companies work together to enhance the performance and reduce the cost of certain elements of the Corporation's proprietary fuel cell systems. The Corporation expects design simplification and high-volume production processes to materially reduce the cost of producing SOFC products, while at the same time improving system reliability. Dana is one of the world's largest suppliers of components, modules and complete systems to global vehicle manufacturers and their related aftermarkets. Founded in 1904 and based in Toledo, Ohio, the company operates some 300 major facilities in 34 countries and employs approximately 75,000 people.

On December 12, 2001, the Corporation announced that it had signed a letter of intent with Advanced Energy Systems Ltd. ("AES") of Bentley, Australia whereby the two companies will cooperate in the development of power electronics and control technologies for the Corporation's SOFC products. Fuel cells produce direct current (DC). In order to be used in a residence, this DC voltage must be transformed into alternating current (AC), which is done by the AES inverter system. By providing up to US\$400,000 equity financing to AES, the Corporation and AES intend to work together to integrate the AES inverter system and the Corporation's microprocessor based fuel cell controls into a single, cost effective and efficient power electronics solution. In addition, this new electronics package will allow the fuel cell system to interface with the power grid. AES is a leading developer of power and communications technologies for industrial and renewable energy applications. AES's current inverter technology has one of the highest conversion efficiencies (in excess of 90%) and offers an integrated system with grid parallel capability. AES is a public company listed on the Australian Stock Exchange.

The Corporation continues its efforts to secure similar strategic alliances in other jurisdictions around the world, with an initial focus on U.S. markets.

The third element of the Corporation's fuel cell commercialization strategy involves its thermoelectric generator division. The Corporation believes that a considerable amount of its current technology and expertise in thermoelectric generators should prove valuable in designing fuel cells for remote power applications. The Corporation has expertise in gas fuel systems, control electronics, high temperature insulation and in material properties. The Corporation also has a marketing and distribution network that has sold generators into more than 47 countries around the world. The Corporation plans to expand its current generator business and leverage its sales and distribution network to sell fuel cell-based remote power systems.

### ***Competition***

The Corporation's competition in the fuel cell industry can be categorized into two areas: conventional power technologies and improvements thereto; and other fuel cell commercialization companies.

The Corporation intends to address stationary fuel cell power generation markets in the 1 to 25 kW range such as residential, light industrial and remote power applications. In addition to centralized power producers, major competitors in this segment include suppliers of diesel and natural-gas fuelled generators that produce electricity with internal combustion engines or turbines. The Corporation believes that it has competitive advantages due to the higher efficiencies inherent in its SOFC technologies. In addition, the Corporation's fuel cell systems should operate more quietly than conventional distributed generating equipment and should produce less harmful emissions.

The prospect of fuel cell commercialization has spawned a wide range of entrants into the fuel cell industry. The major competitors include, but are not limited to, Acumentrics Corporation, Anuvu Incorporated, Astris Energi Inc., Avista Corporation, Ballard Power System Inc., Ceramtec, Inc., Cellex Power Products Inc., Ceramic Fuel Cell Limited, Chubu Electric Co., Ltd., Cummins Power Generation, DCH Technology, Inc., Dais-Analytic Corporation, Delphi Automotive Systems, Energy Partners, L.C., Energy Vision Inc., FuelCell Energy, Inc., Fuel Cell Technologies Ltd., Fuji Electric Co., Ltd., GE Corporation, General Motors Corporation, H Power Corporation, Hitachi Electric Co., Ltd., Hydrogenics Corporation, IdaTech Corporation, International Fuel Cell, Manhattan Scientifics, Inc., Matsushita Electric Co., Ltd., McDermott Technology Inc., Mitsubishi Electric Corporation, Mitsubishi Electric Industrial Co., Ltd., Company, NexTech Materials, Ltd., NuVera Fuel Cells, Inc., Plug Power Inc., Proton Energy Systems, Inc., Rolls-Royce, Sanyo Electric Co., Ltd., Siemens-Westinghouse Power Corporation, Sulzer Hexis AG, Toshiba Corporation, Tokyo Gas Co., Ltd., United Technologies Corporation, ZeTek Power Plc. and ZTEK Corporation.

The Corporation believes that the inherent benefits of its SOFC technology and its commitment to accelerated development and commercialization should provide competitive advantages as compared to other fuel cell companies.

### **Thermoelectric Generators**

The Corporation's first product line was the manufacture and sale of thermoelectric generators based on technology obtained from the Minnesota Mining and Manufacturing Company. Thermoelectric generation involves the direct conversion of heat energy to DC electric power. The Corporation has developed these thermoelectric generators ("TEGs") into a line of sophisticated products incorporating solid state controls, automatic startup and shutdown, and options such as inverters to supply AC current.

TEGs are used as a source of electrical power in remote areas. Applications include providing power for pipeline cathodic protection systems, telecommunications and remote monitoring systems. The Corporation sells TEGs into both the domestic and international markets. To date, sales have been made to customers in more than 47 countries.

In July 1999, the Corporation received a \$19.0 million order to supply turnkey remote power systems for a pipeline being built for the Gas Authority of India Limited ("GAIL"). This order was the largest in the Corporation's history, and involved 304 thermoelectric generators over 65 sites along a 1,200 kilometre pipeline in India. As of December 31, 2001, the Corporation had completed all of its commitments under this order, and GAIL had approved all but \$2.0 million (representing a 10% holdback amount) of the contract total for payment. The Corporation is currently in discussions with GAIL for payment of this holdback. At issue were perceived delays in the completion of the Corporation's commitments, due to delays in the construction of the pipeline itself. The Corporation currently believes, although no assurance can be given, that a majority of this amount will be collected by the third quarter of 2002.

### ***Description***

The Corporation offers seven models of stand-alone thermoelectric generators ranging in power output from 15 to 550 watts. Each model is supplied in three or four versions, depending on options such as desired output voltage, automatic shutdown and whether fuelled by propane or natural gas.

### ***Thermoelectric Technology***

A thermoelectric generator converts heat directly into electricity. As heat moves from a gas burner through a thermoelectric module, it causes an electric current to flow.

The heart of the Corporation's thermoelectric generators is a hermetically sealed thermoelectric module or "thermopile" that contains an array of lead-tin-telluride semiconductor elements. The durable module provides a chemically stable environment for the thermoelectric materials ensuring a long service life. On one side of the thermopile, a gas burner is installed, while the opposite side is kept cool by aluminium cooling fins or a heat pipe assembly. An operating generator maintains a temperature of approximately 540°C on the hot side and 140°C on the cold side. Without the use of moving parts, the heat flow through the thermopile creates steady DC electricity.

### ***Application***

The Corporation's thermoelectric generators are a reliable source of DC power and have a wide range of applications. The generators are easily handled and simple to install and, because they have no moving parts, maintenance requirements are low and reliability is high. The generators are environmentally friendly, operate silently, and can be left at remote sites unattended for 12 or more months without maintenance.

Any application in areas unconnected to a commercial power grid that requires up to 5,000 watts of DC or AC power with infrequent maintenance and high reliability is a potential application for the Corporation's generators. The generators are also often installed as an independent power source to provide a backup to commercial grid power. The primary applications for the Corporation's thermoelectric generators are summarized below:

***a) Cathodic Protection***

The Corporation's generators are a key component in cathodic protection systems for underground oil and gas well casings and pipelines. The generators add an impressed current to the casing or pipeline and reduce corrosion which could otherwise lead to pipe leaks or breakage and resultant environmental damage.

***b) Data Gathering, Control Systems And Environmental Monitoring***

The Corporation's thermoelectric generators are used as a power source for data gathering systems which monitor and transmit oil and gas flow rates, volumes and other essential data from remote production facilities and for systems which control key oil and gas production equipment. The generators can also power environmental monitoring equipment such as the hazardous gas detection and warning systems frequently used in oil and gas production operations.

***c) Telecommunications and Radio Repeaters***

The Corporation believes that the expanding market for cellular phone networks and satellite communications systems will generate increased demand for the Corporation's generators. Thermoelectric generators are capable of providing an economical and reliable power source for the many transmitters, repeaters and translators that are located in remote and rural areas to provide such telecommunication services.

***Marketing Strategy***

While the original patents for thermoelectric generator electrical technology acquired from Minnesota Mining and Manufacturing Company in 1975 have now expired, the Corporation continues to develop new models to address expanded markets. For example, the Corporation is developing a 500 watt model for natural gas production and drilling applications that require "hazardous proof" certification. The Corporation will continue to keep the internal construction of the generators as proprietary information.

The Corporation emphasizes customer service and support. Its marketing team is comprised of engineers and technicians who are trained to identify customer needs and to design custom solutions. Sales offices are strategically located in Calgary, Alberta and Houston, Texas. The Corporation also has agents or representatives in more than 20 countries. The majority of its U.S. and foreign sales are denominated in U.S. dollars.

For the year ended December 31, 2001, sales outside Canada were approximately 65% of the Corporation's generator revenue (85% for the nine months ended December 31, 2000; 79% for the year ended March 31, 2000). Revenue from the Corporation's contract with GAIL accounted for 4% of the Corporation's revenue for the year ended December 31, 2001 (38% for the nine months ended December 31, 2000; 34% for the year ended March 31, 2000).

The Corporation intends to review growth opportunities to expand its generator division's product offerings and geographical presence.

### ***Competition***

To the best of the Corporation's knowledge, it is the only commercial manufacturer of thermoelectric generators in the 15 watts to 550 watts power range.

Solar panel technology provides indirect competition to the Corporation's generators; however, the Corporation believes that its thermoelectric generators offer an operating advantage compared to such technology since they require less maintenance, and are more dependable than current solar power industrial applications. In higher power applications, closed cycle vapour turbine technology offered by a Middle East based company is sometimes bid in competition to the Corporation's products. The Corporation believes that its generators are more reliable than that type of device, which has moving parts.

### **FACILITIES AND EQUIPMENT**

The Corporation's head office is located in a leased facility at 4908 52<sup>nd</sup> Street S.E., Calgary, Alberta. Certain functions of the Corporation's fuel cell division are also located in this facility, which is immediately adjacent to the Corporation's fuel cell pilot production plant situated in leased premises at 4852 52<sup>nd</sup> Street S.E., Calgary, Alberta. The Corporation's thermoelectric generator division and its subsidiary are located in leased facilities at #9, 3700 78 Ave. S.E., Calgary, Alberta, and at #614, 16760 Hedgcroft, Houston, Texas.

The Corporation also owns a 37,000 square foot facility in Bassano, Alberta for thermoelectric generator manufacturing. The Corporation places a high priority on the quality of its products and has qualified its generator operations for ISO 9002 certification (an internationally recognized quality assurance standard).

### **RESEARCH AND DEVELOPMENT**

The Corporation incurred the following research, engineering and product development costs by operating segment (expressed in thousands of Canadian dollars).

|                                                 | <b>Year<br/>Ended<br/>Dec. 31, 2001</b> | <b>Nine Months<br/>Ended<br/>Dec. 31, 2000</b> | <b>Year Ended<br/>Mar. 31,<br/>2000</b> |
|-------------------------------------------------|-----------------------------------------|------------------------------------------------|-----------------------------------------|
| Fuel cell research, engineering and development | \$13,988                                | \$4,643                                        | \$2,459                                 |
| Generator research, engineering and development | 1,099                                   | 337                                            | 518                                     |
| Cost recoveries                                 | -                                       | -                                              | (997)                                   |
|                                                 | <b>\$15,087</b>                         | <b>\$4,980</b>                                 | <b>\$1,980</b>                          |



## HUMAN RESOURCES

As at the dates below, the Corporation employed the following numbers of people<sup>1</sup>:

|                            | <b><u>Dec. 31</u></b><br><b><u>2001</u></b> | <b><u>Dec. 31</u></b><br><b><u>2000</u></b> | <b><u>March 31</u></b><br><b><u>2000</u></b> |
|----------------------------|---------------------------------------------|---------------------------------------------|----------------------------------------------|
| Fuel cell division         | 144                                         | 70                                          | 27                                           |
| Generator division         | 83                                          | 83                                          | 91                                           |
| Business development       | 7                                           | 1                                           | -                                            |
| General and administrative | <u>25</u>                                   | <u>19</u>                                   | <u>9</u>                                     |
| Total                      | <u><u>259</u></u>                           | <u><u>173</u></u>                           | <u><u>127</u></u>                            |

**Note:**

1. Excludes personnel related to discontinued operations.

The Corporation is actively recruiting additional personnel domestically and internationally for its fuel cell division.

Of the personnel based in Calgary, a significant number have university degrees or technical diplomas (including 15 Phds), providing the specialized skills that the Corporation requires to carry out its research and development programs.

The Corporation believes its relationship with its employees is excellent. Its employees are not represented by a labour union. Each employee is required to sign a non-disclosure and non-competition agreement as a condition of employment. To encourage attainment of medium and long-term corporate objectives, and to promote employee retention, a number of employees participate in the Corporation's incentive stock option plan.

## SELECTED FINANCIAL INFORMATION

|                                                           | Year ended<br>December 31,<br>2001 | Nine months<br>ended<br>December 31,<br>2000 | Year<br>ended<br>March 31, 2000 | Year<br>ended<br>March 31, 1999 |
|-----------------------------------------------------------|------------------------------------|----------------------------------------------|---------------------------------|---------------------------------|
| (thousands of Canadian dollars, except per share amounts) |                                    |                                              |                                 |                                 |
| Revenue from continuing operations                        | \$15,357                           | \$14,649                                     | \$18,534                        | \$10,300                        |
| Gross margin                                              | 4,883                              | 3,798                                        | 5,313                           | 3,433                           |
| Investment income                                         | 5,911                              | 3,605                                        | 444                             | -                               |
| Research, engineering and development – net               | 15,087                             | 4,980                                        | 1,980                           | 2,174                           |
| Net (loss) earnings from continuing operations            | (12,968)                           | (1,967)                                      | 140                             | (1,052)                         |
| Per common share - basic and diluted                      | (0.49)                             | (0.09)                                       | 0.00                            | (0.08)                          |
| Discontinued operations, net of income tax                |                                    |                                              |                                 |                                 |
| Earnings (loss) from discontinued operations              | 433                                | (372)                                        | 112                             | (274)                           |
| Gain on sale of discontinued operations                   | <u>744</u>                         | <u>-</u>                                     | <u>-</u>                        | <u>-</u>                        |
|                                                           | 1,177                              | (372)                                        | 112                             | (274)                           |
| Per common share – basic and diluted                      | 0.04                               | (0.01)                                       | 0.01                            | (0.02)                          |
| Net (loss)                                                | (11,791)                           | (2,339)                                      | 252                             | (1,326)                         |
| Per common share - basic and diluted                      | (0.45)                             | (0.10)                                       | 0.01                            | (0.10)                          |
| Preferred share dividends                                 | 500                                | 482                                          | 48                              | 197                             |
| Cash and short-term investments                           | 121,064                            | 135,300                                      | 24,290                          | -                               |
| Total assets                                              | 146,849                            | 160,675                                      | 41,439                          | 8,463                           |
| Long term debt/long term obligations under capital lease  | 407                                | 630                                          | 737                             | 1,014                           |
| Shareholders' equity                                      | 139,272                            | 151,467                                      | 35,085                          | 4,482                           |

## QUARTERLY INFORMATION

|                                                           | 2001    |         |         |         | 2000    |         |         |          |
|-----------------------------------------------------------|---------|---------|---------|---------|---------|---------|---------|----------|
|                                                           | Dec. 31 | Sep. 30 | Jun. 30 | Mar. 31 | Dec. 31 | Sep. 30 | Jun. 30 | Mar. 31  |
| (thousands of Canadian dollars, except per share amounts) |         |         |         |         |         |         |         |          |
| Revenue from continuing operations                        | \$3,109 | \$3,571 | \$2,379 | \$6,298 | \$4,358 | \$3,710 | \$6,581 | \$10,743 |
| Investment income                                         | 993     | 1,407   | 1,636   | 1,875   | 2,073   | 1,189   | 343     | 289      |
| Net (loss) income from continuing operations              | (5,843) | (2,959) | (3,952) | (214)   | (703)   | (877)   | (387)   | 1,522    |
| Per common share - basic and diluted                      | (0.21)  | (0.12)  | (0.14)  | (0.02)  | (0.04)  | (0.04)  | (0.01)  | 0.06     |
| Net earnings (loss) from discontinued operations          | -       | 968     | (236)   | 445     | (331)   | (94)    | 53      | 139      |
| Per common share – basic and diluted                      | 0.00    | 0.03    | (0.01)  | 0.02    | (0.01)  | 0.00    | 0.00    | 0.00     |
| Net (loss) income                                         | (5,843) | (1,991) | (4,188) | 231     | (1,034) | (971)   | (334)   | 1,661    |
| Per common share – basic and diluted                      | (0.21)  | (0.09)  | (0.15)  | 0.00    | (0.05)  | (0.04)  | (0.01)  | 0.06     |

## MANAGEMENT'S DISCUSSION AND ANALYSIS

The Corporation's "Management's Discussion and Analysis" related to the Corporation's financial statements for the fiscal years ended December 31, 2001, December 31, 2000 and March 31, 2000 contained on pages 10 to 14 of the Corporation's December 31, 2001 Annual Report and 14 to 17 of the Corporation's December 31, 2000 Annual Report, are incorporated herein by reference.

## MARKET FOR SECURITIES

The Common Shares of the Corporation are listed for trading on the Toronto Stock Exchange under the symbol "GLE".

## DIRECTORS AND OFFICERS

The following table sets forth the name, municipality of residence and principal occupation for the past five years of the directors and officers of the Corporation. The term of office of each director will expire at the end of the next annual meeting of shareholders of the Corporation.

## Directors

| Name and Municipality of Residence                      | Director Since     | Principal Occupation or Employment for past Five Years                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------------------------------------------|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Robert B. Snyder <sup>(2)(3)</sup><br>Edmonton, Alberta | January 13, 1994   | Chairman of the Board of Directors of the Corporation since June 2, 1997; prior thereto, President and Chief Executive Officer of the Corporation from August 1996; prior thereto, Managing Director of the Corporation from November 1995, prior thereto Senior Vice-President of Nova Gas Transmission Ltd. until March 1995.                                                                                                           |
| James F. Perry <sup>(3)</sup><br>Calgary, Alberta       | September 9, 1999  | President and Chief Executive Officer of the Corporation since April 1, 1999; prior thereto, President of the Corporation from June 2, 1997; prior thereto, Executive Director of Petro-Trade. Previous positions include President of Computalog Ltd. from 1991 to 1992; President of Alberta Ventures Fund from 1986 through 1988; and 15 years with Schlumberger Ltd. including President of Schlumberger of Canada from 1982 to 1985. |
| Kerry W. Brown <sup>(1)(3)</sup><br>St. Albert, Alberta | February 14, 1992  | President and CEO of Foundation Equity Corporation since 1992; Chairman of McCoy Bros. Inc. (a TSE listed truck parts and service company) since July 1995.                                                                                                                                                                                                                                                                               |
| John W. Chomiak <sup>(2)</sup><br>Edmonton, Alberta     | May 11, 1994       | President and Chief Executive Officer, Hemisphere Engineering Inc. (a domestic and international engineering services company)                                                                                                                                                                                                                                                                                                            |
| Glynn G. Davies <sup>(1)(3)</sup><br>Calgary, Alberta   | December 15, 1994  | Private investor; President of G.G. Davies & Associates (a private consulting group) from 1994 to 1999; Director and Vice President of Barra Resources Inc. from 1997 to 1999; Vice President, Chief Operating Officer and Chief Financial Officer of Computalog Ltd. from 1990 to 1994; prior thereto, President and Chief Executive Officer, Dreco Energy Services Ltd.                                                                 |
| John C. Howard <sup>(1)</sup><br>Edmonton, Alberta      | August 14, 1996    | Managing Partner, Howard Kirkpatrick Associates, Chartered Accountants; Director of Foundation Equity Corporation; Director of McCoy Bros. Inc. (a TSE listed truck parts and service company).                                                                                                                                                                                                                                           |
| Henry Yip <sup>(2)</sup><br>Edmonton, Alberta           | September 10, 1998 | Executive Vice President of Network Services, AT&T Canada since March 2001, prior thereto, Vice President, Network Operations, TELUS Communications Inc. from March 1999; prior thereto, Vice President - Network Services and Technology Planning, TELUS from September, 1995.                                                                                                                                                           |

| <b>Name and Municipality of Residence</b>        | <b>Director Since</b> | <b>Principal Occupation or Employment for past Five Years</b>                                                           |
|--------------------------------------------------|-----------------------|-------------------------------------------------------------------------------------------------------------------------|
| Norman Fraser <sup>(2)</sup><br>Toronto, Ontario | September 27,<br>2000 | Independent financial consultant since 1995; prior thereto, Vice President and Director of RBC Dominion Securities Inc. |

## **Officers**

| <b>Name and Municipality of Residence</b>  | <b>Title</b>                                                                       | <b>Principal Occupation or Employment for past Five Years</b>                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Jim Barker<br>Calgary, Alberta             | Vice President,<br>Business<br>Development &<br>Marketing                          | Vice President, Business Development & Marketing since March 5, 2002; prior thereto, Vice President, Business Development since January 2, 2001; prior thereto, Chief Executive Officer of RMS Research Management Systems since January 1, 1999; prior thereto, President and Chief Executive Officer of AgriVest Capital Corporation since October 1, 1997; prior thereto, Vice President of Working Opportunity Fund since December 1, 1991. |
| Paul A. Crilly<br>Calgary, Alberta         | Vice President,<br>Finance & Chief<br>Financial Officer,<br>Corporate<br>Secretary | Vice President, Finance & Chief Financial Officer since June 2000; prior thereto, Senior Vice President, Finance and Chief Financial Officer of Ryan Energy Technologies Inc. since July 1996; prior thereto, Controller, Canadian Operations with Canadian Fracmaster Ltd. since March, 1992; prior thereto, Senior Manager, Taxation with Deloitte and Touche, Chartered Accountants.                                                         |
| Peter Garrett<br>Calgary, Alberta          | Chief Operating<br>Officer                                                         | Chief Operating Officer of the Corporation from November 13, 2001; prior thereto President of Garrett & Associates (a private consulting company) from February 2001; prior thereto Vice President, Wireless Product Development, Nortel Networks from January 1997.                                                                                                                                                                            |
| Debabrata (Dave) Ghosh<br>Calgary, Alberta | Vice President<br>and Chief<br>Technology<br>Officer                               | Vice President and Chief Technology Officer since July 20, 2001; prior thereto, Vice President of the Fuel Cell Division of the Corporation from December, 1999; prior thereto, Manager of the Fuel Cell Division from June, 1998; prior thereto Manager of Manufacturing Technologies Department with the Alberta Research Council.                                                                                                            |
| Bernie LeSage<br>Calgary, Alberta          | Vice President,<br>Generator<br>Division                                           | Vice President of the Corporation from 1997; prior thereto, Manager of Manufacturing Systems from November, 1992.                                                                                                                                                                                                                                                                                                                               |

| <b>Name and Municipality of Residence</b> | <b>Title</b>                        | <b>Principal Occupation or Employment for past Five Years</b>                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------------------------|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Brian McGurk<br>Calgary, Alberta          | Vice President,<br>Human Resources  | Vice President, Human Resources since October 2, 2001; prior thereto, Manager, Human Resources since October 2, 2000; prior thereto, Manager of Employee Effectiveness at Telus Mobility Inc. since February 2000; prior thereto, Senior HR Advisor at Telus Management Services Inc. since February 1998; prior thereto, Manager, Employee Relations with Canadian Regional Airlines since January 1997; prior thereto, Human Resources Advisor since March 1994. |
| Donelda P. Bester<br>Calgary, Alberta     | Assistant<br>Corporate<br>Secretary | Assistant Corporate Secretary of the Corporation from August, 1997; prior thereto, various positions from 1990.                                                                                                                                                                                                                                                                                                                                                    |

**Notes:**

- (1) Member of the Audit Committee.
- (2) Member of the Corporate Governance and Compensation Committee.
- (3) Member of the Executive Committee.

As at the date hereof, the directors and officers of the Corporation, as a group, beneficially owned directly or indirectly, or over which control or direction is exercised, 1,309,316 common shares or approximately 4.5% of the issued and outstanding common shares of the Corporation. The information as to the shares beneficially owned, not being within the knowledge of the Corporation, has been furnished by the respective directors and officers of the Corporation.

## **DIVIDEND RECORD AND POLICY**

The Corporation has not paid any dividends on any of its outstanding common shares and does not intend to pay such dividends in the foreseeable future. Any future determination to pay dividends on the common shares will be at the discretion of the board of directors of the Corporation and will be dependent upon the Corporation's earnings, capital requirements and financial position, as well as general economic conditions, bank lending requirements and other factors deemed relevant by the board of directors of the Corporation. In addition, there may be restrictions placed on the Corporation's ability to declare dividends on one class or series of shares in preference to other classes or series.

The Corporation has issued Cumulative Redeemable Convertible Preferred Shares, Series 2, for which dividends are payable in accordance with the terms thereof.

## **RISK FACTORS**

The risks and uncertainties described below are not the only ones the Corporation faces. Additional risks and uncertainties, including those that the Corporation does not know about now or that it currently deems immaterial, also may adversely affect the Corporation's business.

### **The Corporation Expects to Incur Substantial Losses**

The Corporation has incurred substantial expenditures over the last four years on fuel cell development and commercialization. The Corporation expects to make significant expenditures on fuel cell technology going forward, which may result in substantial losses in the future. The Corporation cannot predict whether it will operate profitably. The Corporation expects to continue to make significant investments in product development to achieve commercialization of its products.

### **The Corporation May Never Complete the Development of Commercially Viable Fuel Cells and Fuel Cell Systems**

The Corporation does not know when or whether it will successfully complete development of commercially viable SOFC systems for any of its target and prospective markets. Despite the Corporation's accomplishments, it must develop or otherwise acquire access to substantial technological advances in relation to its systems, particularly in the areas of fuel cell stacks and systems integration, before it is able to produce a commercially viable product.

### **The Corporation Must Lower the Cost of its Fuel Cell Systems and Demonstrate their Reliability**

The Corporation's fuel cell systems currently cost significantly more than the cost of many established competing technologies. If the Corporation is unable to produce fuel cell systems that are competitive with competing technologies in terms of price, reliability and longevity, consumers will be unlikely to buy products containing the Corporation's fuel cells and fuel cell systems. The price of fuel cell systems is dependent largely on material and manufacturing costs. The Corporation cannot guarantee that it will be able to lower these costs to the level where it will be able to produce a competitive product or that any product produced using lower cost materials and manufacturing processes will not suffer from a reduction in performance, reliability and longevity.

### **A Mass Market for Fuel Cells and Fuel Cell Systems May Never Develop or May Take Longer to Develop than Anticipated**

A mass market may never develop for fuel cell systems, or may develop more slowly than anticipated. Fuel cells and fuel cell systems represent an emerging market, and the Corporation does not know whether end-users will want to use them. If a mass market fails to develop or develops more slowly than anticipated, the Corporation may be unable to recover the expenditures it will have incurred in the development of its products and may never achieve profitability.

### **Deregulation of Utility Industry**

One of the Corporation's markets is for stationary power generators, a market that is driven by deregulation and restructuring of the electric utility industry in Canada, the U.S. and elsewhere and by the requirements of utilities, independent power producers and end users. Deregulation of the electric utility industry is subject to government policies that will determine the pace and extent of deregulation. Changes in government and public policy over time could impact deregulation and adversely affect the Corporation's prospects for commercializing stationary power generators and the Corporation's financial results.

### **The Corporation has entered into Memorandums of Understanding (MOUs) with Potential Strategic Partners**

The Corporation is negotiating definitive agreements with strategic partners with whom MOUs have been signed. Failure to successfully negotiate and execute these definitive agreements may effectively terminate its working relationship with these partners.

### **The Corporation is Dependent on its Relationships with its Strategic Partners**

The Corporation has entered into relationships with strategic partners for design, product development and distribution of natural gas-fueled and propane fuelled SOFC systems. These agreements, terms and conditions governing these relationships allow for termination by the Corporation's partners.

### **Certain of the Corporation's Fuel Cells and Fuel Cell Systems will be Components of Other Companies' Products**

To be commercially useful, certain of the Corporation's fuel cells and fuel cell systems may be integrated into products manufactured by Original Equipment Manufacturers ("OEMs"). The Corporation can offer no guarantee that OEMs will manufacture appropriate products or, if they do manufacture such products, that they will choose to use the Corporation's fuel cells and fuel cell systems. Any integration, design, manufacturing or marketing problems encountered by OEMs could adversely affect the market for the Corporation's fuel cells and fuel cell systems and its financial results.

### **Changes in Environmental Policies Could Hurt the Market for the Corporation's Products**

Stricter environmental laws and regulations governing emissions of green house gases and pollutants have given impetus to the development of fuel cells generally. Although the development of alternative energy sources, and in particular fuel cells, have been identified as a significant priority by many governments, there is no certainty that governments will not change their priorities or that any such change would not materially affect the Corporation's development of its products.

### **The Corporation Currently Faces and Will Continue to Face Significant Competition**

The Corporation's products face and will continue to face significant competition. New developments in technology may negatively affect the development or sale of some or all of its products or make its products uncompetitive or obsolete. Other companies, many of which have substantially greater resources, are currently engaged in the development of products and technologies that are similar to, or may be competitive with, certain of the Corporation's products and technologies. As the fuel cell has the potential to replace existing power sources, competition for fuel cell products will come from current power technologies, from improvements to current power technologies and from new alternative power technologies, including other types of fuel cells. Each of the Corporation's target markets is currently serviced by existing manufacturers with existing customers and suppliers. These manufacturers use proven and widely accepted technologies such as internal combustion engines and turbines as well as coal, oil and nuclear powered generators. Additionally, there are competitors working on developing other fuel cell technologies in the Corporation's targeted markets. A large number of corporations, national laboratories and universities in the United States, Canada, Europe and Japan possess fuel cell technology and/or are actively engaged in the development and manufacture of fuel cells. Each of these competitors has the potential to capture market share in various markets, which would have a material adverse effect on the Corporation's position in the industry and its financial results. Many of the Corporation's



competitors have financial resources, customer bases, businesses or other resources, which give them significant competitive advantages.

### **The Corporation Depends on its Intellectual Property and Failure to Protect that Intellectual Property Could Adversely Affect the Corporation's Future Growth and Success**

Failure to protect the Corporation's existing intellectual property rights may result in the loss of its exclusivity or the right to use its technologies. If the Corporation does not adequately ensure its freedom to use certain technology, it may have to pay others for rights to use their intellectual property, pay damages for infringement or misappropriation and/or be enjoined from using such intellectual property. The Corporation relies on patent, trade secret, trademark and copyright law to protect its intellectual property. Some of its intellectual property is not covered by any patent or patent application. The Corporation's patent position is subject to complex factual and legal issues that may give rise to uncertainty as to the validity, scope and enforceability of a particular patent. Accordingly, the Corporation cannot assure that any of the patents filed by it or other patents that third parties license to it will not be invalidated, circumvented, challenged, rendered unenforceable, or licensed to others of any or the Corporation's pending or future patent applications will be issued with the breadth of claim coverage sought by it, if issued at all. In addition, effective patent, trademark, copyright and trade secret protection may be unavailable, limited or not applied for in certain foreign countries. The Corporation also seeks to protect its proprietary intellectual property, including intellectual property that may not be patented or patentable, in part by confidentiality agreements and, if applicable, inventors' rights agreements with strategic partners and employees. The Corporation cannot assure that these agreements will not be breached, that it will have adequate remedies for any breach or that such persons or institutions will not assert rights to intellectual property arising out of these relationships.

### **The Corporation's Failure to Obtain or Maintain the Right to Use Certain Intellectual Property May Negatively Affect its Business**

The Corporation's future success and competitive position depends in part upon its ability to obtain or maintain certain proprietary intellectual property used in its principal products. This may be achieved, in part, by prosecuting claims against others who it believes are infringing its rights and by defending claims of intellectual property infringement by its competitors. While the Corporation is not currently engaged in any material intellectual property litigation, it could become subject to lawsuits in which it is alleged that the Corporation has infringed the intellectual property rights of others or commence lawsuits against others who it believes are infringing upon the Corporation's rights. The Corporation's involvement in intellectual property litigation could result in significant expense to it, adversely affecting the development of sales of the challenged product or intellectual property and diverting the efforts of the Corporation's technical and management personnel, whether or not such litigation is resolved in its favour. In the event of an adverse outcome as a defendant in any such litigation, the Corporation may, among other things, be required to:

- pay substantial damages;
- cease the development, manufacture, use, sale or importation of products that infringe upon other patented intellectual property;
- expend significant resources to develop or acquire non-infringing intellectual property;
- discontinue processes incorporating infringing technology; or
- obtain licences to the infringing intellectual property.

The Corporation cannot assure that it would be successful in such development or acquisition or that such licences would be available upon reasonable terms. Any such development, acquisition or licence could require the expenditure of substantial time and other resources and could have a material adverse effect on the Corporation's business and financial results.

**The Corporation Has No Experience Manufacturing Fuel Cells and Fuel Cell Systems on a Commercial Basis**

To date, the Corporation has focused primarily on research and development and has no experience manufacturing fuel cells and fuel cell systems on a commercial basis. In order to produce fuel cells and fuel cell systems at affordable prices the Corporation will have to make its fuel cells and fuel cell systems through high volume automated processes. The Corporation does not know whether it will be able to develop efficient, automated, low-cost manufacturing capability and processes that will enable it to meet the quality, price, engineering, design and production standards or production volumes required to successfully mass market its fuel cells and fuel cell systems. Even if the Corporation is successful in developing its manufacturing capability and processes, it does not know whether it will do so in time to meet its product commercialization schedule or to satisfy the requirements of its customers. The Corporation's failure to develop such manufacturing processes and capabilities could have a material adverse effect on its business and financial results.

**The Corporation is Dependent on Third Party Suppliers for the Supply of Key Materials and Components for its Products**

A supplier's failure to supply materials or components in a timely manner, or to supply materials and components that meet the Corporation's quality, quantity or cost requirements, or the Corporation's inability to obtain substitute sources for these materials and components in a timely manner or on terms acceptable to it, could harm its ability to manufacture fuel cells and fuel cell systems. In addition, certain components of the Corporation's fuel cells utilize scarce natural resources and the Corporation is dependent upon a sufficient supply of this commodity. While the Corporation does not anticipate significant near or long term shortages in the supply of these resources, such shortages could adversely affect its ability to produce commercially viable fuel cells or significantly raise its cost of producing fuel cells.

**The Corporation May Not Meet its Product Development and Commercialization Milestones**

To gauge the Corporation's progress, it intends to operate, test and evaluate fuel cells and fuel cell systems under actual conditions. If its systems exhibit technical defects or are unable to meet cost or performance goals, including power output, useful life and reliability, its commercialization schedule could be delayed and potential purchasers of its initial commercial systems may decline to purchase further systems or may choose to purchase alternative technologies.

**Dependence on Key Personnel**

The success of the Corporation is dependent upon, among other things, the services of the President and Chief Executive Officer, Chief Operating Officer, the Vice Presidents, and other key management and technical personnel. The loss of the services of these personnel for any reason could have a material adverse effect on the prospects of the Corporation. The Corporation currently has key man insurance for some of its critical personnel. There is no guarantee that the funds received from such policies in case of

mishap would fully compensate the Corporation for the loss of such personnel. In addition, the future success of the Corporation will depend in large part on its ability to attract and retain qualified personnel, and there can be no assurances such personnel can be attracted and retained.

### **Skilled Labour Shortages**

The Corporation requires experienced engineers, technicians and journeyman welders and machinists to conduct its business. No assurance can be given that the supply of these skilled persons will always be adequate to meet the Corporation's requirements or that the Corporation will be able to attract an adequate number of skilled persons.

### **Market Conditions Related to the Corporation's Thermoelectric Generators**

Demand for the Corporation's thermoelectric generators depends primarily on the level of spending by oil and natural gas companies for gas exploration and development activities, and on the level of gas pipeline construction activity. These activity levels are directly affected by fluctuations in world energy prices, world supply and demand for oil and natural gas and government regulations, both domestic and international, all of which are beyond the control of the Corporation and its customers. Reduced levels of activity in the oil and natural gas industry can intensify competition and result in lower revenue and operating profit margin.

### **Warranty Costs**

The Corporation has made a provision for thermoelectric generator warranty expenses in its financial accounts. The Corporation believes that this provision is adequate and reasonable given the past reliability and experience with its products. There is no certainty that this provision will be sufficient, and material adverse financial effects could be encountered should future reliability not be as anticipated.

### **International Activities**

The Corporation's international activities can be subject to inherent risks, including foreign government regulations, rates of currency exchange, foreign currency exchange controls and political risks. To mitigate certain of these risks, the Corporation may obtain insurance when such insurance is available on acceptable terms. Such coverage is not always available and, when available, may be subject to unilateral cancellation by the insuring companies on short notice. The Corporation's operating results may be subject to changes in the Canadian dollar/United States dollar exchange rate since most international sales are transacted in U.S. dollars. The Corporation has seldom hedged its exposure to such currency fluctuations to date.

### **Insurance**

The Corporation carries insurance that it considers adequate having regard to the nature of the risks and the costs of coverage. The Corporation may not, however, be able to obtain insurance against certain risks or for certain equipment located from time to time in certain areas of the world. The Corporation is not fully insured against all possible risks, nor are all such risks insurable.

## **ADDITIONAL INFORMATION**

The Corporation will provide the following documents to any person upon request to the Assistant Corporate Secretary of the Corporation at 4908 – 52 Street S.E. Calgary, Alberta T2B 3R2:

1. when any securities of the Corporation are in the course of a distribution pursuant to a short form prospectus or a preliminary short form prospectus has been filed in respect of a distribution of any such securities:
  - a) one copy of this Annual Information Form, together with one copy of any document, or the pertinent pages of any document, incorporated by reference herein;
  - b) one copy of the comparative financial statements of the Corporation for the year ended December 31, 2001, together with the report of the auditors (the "Financial Statements"), and one copy of any interim financial statements issued subsequent thereto;
  - c) one copy of the Management Information Circular dated in respect of the annual meeting of shareholders of the Corporation to be held on June 5, 2002 (the "Information Circular"); and
  - d) one copy of any other documents that are incorporated by reference into the preliminary short form prospectus or the short form prospectus and not required to be provided under paragraphs (a) through (c) above; or
2. at any other time, one copy of any of the documents referred to in paragraph 1(a) through (c) above.

Additional information, including information concerning directors' and officers' remuneration and indebtedness, principal holders of our securities, options to purchase common shares, and interests of insiders in material transactions is contained in the Information Circular. Additional financial information is provided in the Financial Statements.