

**APPLICABILITY OF THE ISO 14001 ENVIRONMENTAL
MANAGEMENT SYSTEM STANDARD TO MANITOBA
HYDRO.**

BY

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STANDARD TO MANITOBA HYDRO.**

BY

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**A Thesis/Practicum submitted to the Faculty of Graduate Studies of The University
of Manitoba in partial fulfillment of the requirements of the degree**

of

MASTER OF SCIENCE

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ABSTRACT

The aim of this thesis was to study and document the process and effects of applying, or conforming an Environmental Management System (EMS) to the international ISO 14001 EMS Standard in general, and more specifically, for an integrated electric utility such as Manitoba Hydro. In addition, an environmental management software package was evaluated, to determine its usefulness as a tool in developing, implementing and managing the above mentioned EMS.

An overview of environmental charters/guidelines, industrial initiatives and other EMS systems is presented to illustrate their roles in the eventual creation of the ISO 14000 series of environmental management standards.

ISO 14001 Environmental Management Systems - Specification with guidance for use is the fundamental part of the ISO 14000 series of environmental management standards. It defines a systematic process, by which organizations can identify and manage their environmental responsibilities and commitments, and may be objectively verified as evidence of their commitment should they so choose. ISO 14004 is a guidance document created to assist in implementing the ISO 14001 standard. Three auditing standards, that may be used with ISO 14001 are also discussed.

Manitoba Hydro has made a commitment to implement four EMSs, one for each of its Business Units. In accordance with their commitment to the Canadian Electricity Association Environmental Commitment and Responsibility (ECR) Program, the Generation EMS and Corporate EMS must be implemented by December 31, 1999. The EMSs for the other two business units will follow in 2002. Manitoba Hydro has elected to

develop numerous Local EMSs (LEMS), for individual facilities/operations; the cumulative LEMSs will form the comprehensive Business Unit EMS.

The ICF Kaiser ISO 14000 Workstation software was evaluated. It was used to conduct a gap analysis/assessment to determine the degree of conformance of Manitoba Hydro's existing EMS to the ISO 14001 EMS standard, and to establish a direction for EMS implementation. It was found to be a more useful tool for document management, than for assisting in EMS developmental stages.

The ISO 14001 based EMS was found to be an effective system to manage an organization's self prescribed environmental goals, with potential financial, political, legal and environmental benefits. However, the ISO standard does not require the demonstration of environmental performance, and is difficult to interpret and apply due to ambiguous language and lack of direction. Successful implementation by Manitoba Hydro requires top management commitment, a dedicated EMS team, full integration into the corporate business plan and establishment of a responsive internal and external communication network.

Managing the vast amount of documentation and records that result from implementing an EMS could be facilitated with an electronic information management system, which may also have added benefits in improving communication, education and EMS ownership. The tested software was found to be a capable document management tool, but lacks in guidance for planning and development and in accessibility to all levels of employees. A custom designed software may be considered by Manitoba Hydro in the future.

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LIST OF ABBREVIATIONS

BSI - British Standards Institute

CEA - Canadian Electricity Association

CERES - Coalition of Environmentally Responsible Economies

CSA - Canadian Standards Association

ECR - Environmental Commitment and Responsibility Program

EMAS - Eco-Management and Audit Scheme

EMS - Environmental Management System

EU - European Union

EVABAT - Economically Viable Application of Best Available Technology

GEMI – Global Environmental Management Initiative

ICC - International Chamber of Commerce

ISO - International Organization For Standardization

LEMS - Local Environmental Management System

NGO - Non-Governmental Organization

TC – Technical Committee

TQM - Total Quality Management

UNCED – United Nations Conference on the Environment and Development

UNEP - United Nations Environment Program

GLOSSARY

Assessment - an estimate or determination of the significance, importance or value of something.

Certification - procedure by which a third party gives written assurance that a product, process, or service conforms to specified requirements (interchanged with term “registration” in USA, incorrect terminology for EMS certification)

Compliance - an affirmative indication or judgement that the supplier of a product or service has met the requirements of the relevant specifications, contract or regulation; also the state of meeting the requirements (see also conformance)

Conformance - an affirmative indication or judgement that the supplier of a product or service has met the requirements of the relevant specifications, contract or regulation; also the state of meeting the requirements (see also compliance)

Continual Improvement - process of enhancing the environmental management system to achieve improvements in overall environmental performance, inline with the organization’s policy

Environmental Guidelines/Charters - codes of practice developed by NGOs to help businesses manage and improve their environmental performance

Environmental Management System - totality of things a company does to manage its environmental affairs, and monitor its effects on the environment

Environmental Policy - statement by the organization of its intentions and principles in relation to its overall environmental performance, which provides a framework for action and for setting of its environmental objectives and targets

Gap Analysis - an evaluation of the degree of conformance of the current EMS to the ISO 14001 EMS specification (often incorrectly interchanged with assessment)

Interested Parties - individual or group concerned with or affected by the environmental performance of an organization

Specification - the document that prescribes the requirements with which the product or service must conform

“I am I, plus my surroundings, and if
I do not preserve the latter, I do not
preserve myself”.

José Ortega y Gasset (1883–1955),
Spanish essayist, philosopher.
Meditations on Quixote, “To the
Reader” (1914).

1. INTRODUCTION

In 1972, the United Nations Conference on Human Environment convened, to assess the future of economic development and the global environment. As a result, an independent body called the World Commission on Environment and Development (Brundtland Commission) was formed. In 1987, the Commission published a report entitled “Our Common Future” which was first to introduce the term *sustainable development*, and is now considered to be the turning point in the relationship between the economy and the environment. The report defined sustainable development as: *development that meets the needs of the present without compromising the ability of future generations to meet their needs* (UNEP, 1995).

The concept of sustainable development has influenced the manner in which society today perceives the environment. Although the public’s current attitudes include environmental protection and management, it was not long ago when ignorance and carelessness led to environmental exploitation and destruction. As these attitudes and expectations have changed, environmental issues became the focus of public scrutiny on industry and businesses.

It has become increasingly clear that carrying on “business as usual” was no longer possible nor acceptable, and certainly not sustainable. In order to remain viable in the business world, environmental considerations would have to be integrated into the corporate business strategy and long term planning. In addition to sustainable development, pressure from the public, including both special interest groups and

consumers, the obligation of more and increasingly stringent environmental legislation, potential liabilities, commitments to shareholders, and green marketing have all impacted the manners in which business decisions are taken. Whereas in the past, decisions were dictated by their economic viability, considering only profits, productivity and efficiency, today, in addition to these criteria, health and safety, environmental impacts, resource and energy conservation, waste management and social impacts are included in the planning, evaluation and implementation processes. This marked a significant shift from past practices, and more specifically, integrating environmental considerations and decisions into a company's business strategy and long term planning have become part of doing business in today's global, competitive market.

In the past few years, industry has begun to take a more pro-active stance in regard to environmental management. Recognizing that sound environmental management on a voluntary basis can gain numerous benefits, many organizations have in fact, modified their corporate management strategy and fully integrated environmental care into their daily operations. Possible benefits include an enhanced corporate image, increased profits and competitiveness, reduced potential liabilities, reduced costs and the potential preclusion of further legislation. Prior to this transition, an "end of the pipe" or reactive approach was implemented when confronted with environmental issues. This simply no longer made good business sense. Taking a proactive approach rather than a reactive one, turned out to be less costly, more efficient; it allows for forward planning and is able to anticipate and therefore accommodate changes.

In confronting this new reality, companies began to develop programs that would manage their legal risks, and their impacts on the environment, while considering

technical feasibility the needs of their shareholders and interested parties. Companies made commitments through environmental policies and objectives, which defined their overall level of commitment, direction and expectations. As companies began to adopt environmental policies, they also began to perform environmental audits or reviews to determine and verify their environmental standing and the effectiveness of their environmental programs. Environmental issues were dealt with by dividing them into components such as: air, water and soil quality related tasks, waste management, ecosystem protection and other issues including legal requirements, audits etc. This system proved not to be very efficient given the numerous separated tasks and topics, that come under the umbrella of environmental management. It was this lack of clear organization and specific definition which eventually led to the development of an all encompassing environmental management system which could address all relevant issues in an integrated manner.

The term Environmental Management System, also referred to by the acronym EMS, is meant to cover the “totality of all things a company or organization does to manage its environmental affairs, and monitor its effects on the environment” (Ibbotson 1996). It is a systematic process that when properly implemented, can help an organization manage, measure and improve the environmental effects of its operations. A typical EMS would include the following components (Bisson 1995, GEMI 1996):

- **A Policy and Commitment** stage, that requires the direction and level of commitment to be decided by the senior management of the company.

- A **Planning** stage, which assesses risks, impacts and legal requirements, sets environmental goals based upon the organization's specific criteria, and defines procedures and practices.
- An **Implementation** stage that manages risks, impacts and commitments required to meet the company's goals including education and training, accountability, and maintenance of records. This stage would also include emergency preparedness and response plans.
- A **Measurement and Evaluation** stage requires that the company monitor its procedures and processes, the effects of its operations and evaluate the effectiveness of its EMS.
- A **Review and Improvement** stage periodically assesses the system, and identifies those areas which require change. In total these five stages become a cycle of continuous improvement.

Although the goals and objectives of policies vary between organizations, the EMS has common stages that all organizations implement in order to ensure, that the environment is considered in the policy, process and actions. These stages are very similar to those in Total Quality Management (TQM) Systems which are the foundations of environmental management systems.

The Deming Cycle, a process management tool developed by Dr. William Edwards Deming (1900–93), is the foundation of EMSs. An American statistician, and a forerunner in the field of quality control management, he used statistical analysis to

examine industrial production processes for faults. Deming earned his reputation while helping the Japanese industry rebuild their economy in the postwar years. Using a systematic approach to problem solving, his model came to be known as the Deming or Plan-Do-Check-Act (PDCA) Cycle (Starkey 1996). Deming referred to it as the Shewhart Cycle, (named after his teacher W. A. Shewhart), and later replaced "Check" with "Study", to reflect the actual meaning more precisely .

- the PLAN stage refers to Planning what will be done,
- the DO stage refers to Doing what has been planned,
- the CHECK stage Checks that plans were actually carried out, and
- the ACT stage Acts on the results of the checking process to change/correct plans.

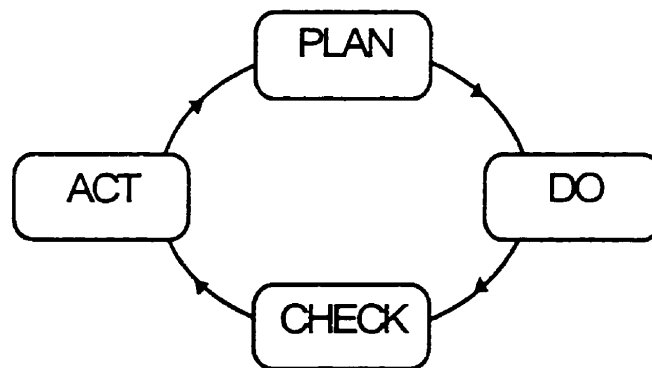


Figure 1: The Deming Cycle

While many organizations used the Deming Cycle to develop an EMS, vast differences in the quality of the EMSs became apparent. A lack of clear direction in

EMS development, and the need to ensure a certain level of quality, led to the development of several national, voluntary environmental management system standards in the past few years, mostly in Europe. The EMS standards were developed with the intent of providing organizations with a framework to implement an EMS within their organization to improve environmental performance and marketplace acceptance. Although, all provide similar elements, variations in their levels of detail, implementation procedures and requirements for accreditation, led to confusion defining the relative significance of the various standards, raising the necessity for one international standard that could cross global boundaries.

The aim of this Thesis is to study and document the effects of applying or conforming an Environmental Management System to the international ISO 14001 EMS standard. Through a case study carried out in Manitoba Hydro, a large provincial crown corporation, the standard's application, relevance and the advantages /disadvantages of adopting an ISO 14001 EMS are examined.

The observations and conclusions throughout the document have been collected and analyzed by the author, having been a part of the EMS development team in Manitoba Hydro.

The following chapter provides a general overview of the history and background that led to the creation of the ISO 14001 EMS standard. This is followed by a description of the ISO 14000 series of international environmental management standards, with emphasis on the System Evaluation Standards within the series. Manitoba Hydro's EMS, and its relationship to ISO 14001 is described. An electronic tool (ICF Kaiser ISO 14000 Workstation) is examined in order to determine its applicability and potential support to

Manitoba Hydro's EMS. A discussion of findings, followed by conclusions and recommendations complete this study.

2. OVERVIEW OF ENVIRONMENTAL CHARTERS/ GUIDELINES, INITIATIVES AND EMS STANDARDS

Following the 1987 publication of *Our Common Future*, the UN “Conference on Environment and Development” (UNCED), better known as the “Rio Earth Summit”, gathered in 1992 to discuss sustainable development. Emerging from the conference was a policy document, *Agenda 21*, containing guiding principles, describing how environmental issues could be solved through international cooperation (UNEP 1995).

At about the same time, various environmental guidelines and charters began to emerge. With the intent of helping businesses manage and ameliorate their environmental performance, these guidance documents, created by non-governmental organizations (NGOs), suggest codes of practice. Organizations may adopt these codes of practice, and declare that they conform to the charter/guidelines. Industrial associations too have created their own environmental guiding principles and codes of practice intended for members of the particular industry to adopt. Knowledge and experience sharing, as well as a common belief and stewardship towards the environment, help to define the new ways industries conduct business. This chapter will highlight some of the better known guidelines and charters that have influenced today’s businesses in the global market.

Concurrent to the emergence of the guidelines and charters, in pursuit of sustainable development, the 1990s led to the evolution of a number of EMS standards. The concept of EMSs was not unknown, but the introduction of standards for environmental management was a novel approach. The first standard to emerge was the

British Standard 7750 (BS 7750) developed by the British Standards Institute (BSI) in 1992. This was followed by the European Union's (EU) Eco-Management and Audit Scheme (EMAS) in 1993. At the same time, within the EU, other nations chose to develop their own standards. Ireland developed IS 310, France, X30-200, and Spain developed UNE77-801 and outside Europe, South Africa's SABS-0251, while others chose to adopt BS7750 as their national EMS standard. In late 1996, the long awaited, international environmental management standard, ISO 14001 was published, with intentions of crossing all trade and political borders as well as being applicable to any kind of organization (GEMI 1996, Starkey 1996).

In March 1997, the European national environmental management system standards (excluding EU's EMAS) were officially withdrawn, and replaced by the international ISO 14000 standards. However, they have been described here to illustrate their roles in the evolution of EMSs, and the specific characteristics that make them unique and worth mention. The following sections will highlight some of these various standards, charters and initiatives that have influenced the way business is done today.

2.1 Guidelines/Charters, Codes of Practice and Initiatives

Created by non-government organizations, environmental guidelines and charters (guidelines) are documents intended to assist or direct businesses in managing and improving their environmental performance. These guidelines are declarations of "good faith", and are usually not legally binding. Guidelines are broad statements, that are general enough to be adopted by any organization wishing to protect the environment.

While some charters are intended for all organizations, others target a specific industry. No matter their origins, all charters/guidelines and initiatives aim to promote better environmental management and improvement of environmental performance.

Universal and industry specific guidelines, initiatives and standards, were developed in order to combat negative public perceptions, and to promote voluntary environmental stewardship within. Codes of practice specific to the industry are usually a requirement for industrial association membership, and will be described in Section 2.1.4.

Guiding principles or codes of conduct can help an organization develop an internal environmental culture and common vision with the industry. They can also assist in shaping/driving specific corporate policies.

2.1.1 The Coalition of Environmentally Responsible Economies Principles (CERES)

In response to the Exxon Valdez oil spill disaster, the Coalition of Environmentally Responsible Economies (CERES), in 1989 developed the CERES Principles. Initially known as the Valdez Principles, the intent was to avoid such an accident from repeating by proposing a model corporate code of environmental conduct.

Of all the public guidelines/charters and initiatives that exist today, the CERES Principles are the most comprehensive, broad-minded and challenging. A company that endorses the CERES Principles pledges to strive towards meeting ten principles that commit an organization to sustainable development (Brophy 1996). The ten CERES principles can be found in Appendix A.

The introduction to the CERES Principles clearly makes a commitment to sustainable development; *“corporations must not compromise the ability of future generations to sustain themselves”*. Companies that have made a commitment to the Principles, have found “environmental proactivity can be accomplished while saving money, and improving the overall efficiency of the operation” (Brophy 1996). Several companies such as Sun Company Inc. and General Motors, have attested to numerous benefits they have reaped, since undertaking these principles. A reduction of energy consumption, number of spills, reduced emissions and positive recognition from public and investors are among some of the associated benefits. The Charter allows for the development of a comprehensive environmental policy, while also providing for a monitoring process by requiring an annual self evaluation of environmental progress that is made available to the public through a CERES report.

Although the principles are all commonsense, the style in which they are written, which does not allow for misinterpretation of commitment, have caused many to repudiate the charter. Each principle makes a direct commitment to an action, which to some organizations appears too demanding and unrealistic to adopt. “The trend for most industries is to opt for other less demanding and less stringent charters” (Brophy 1996). Almost all of the organizations that have adopted the CERES Principles, are in the United States, where regulatory demands and enforcement are much stronger than anywhere else. In Europe, most environmental management is still voluntary. As of the writing of this document, 48 companies have endorsed the CERES Principles. Included are General Motors Corporation, Coca Cola USA, ITT Industries, Polaroid Corporation, and Sunoco, Inc.

2.1.2 International Chamber of Commerce (ICC) Business Charter for Sustainable Development

The International Chamber of Commerce's (ICC) Business Charter for Sustainable Development is the most widely supported charter worldwide. Based in Paris, France, the ICC has over 2000 organizations that have endorsed the charter. Endorsement of the ICC Charter is voluntary, and commits companies to adopt the principles for environmental management. Developed in 1991, in response to government and public pressure, as a "code of conduct" for industry/businesses, it too may be used as a framework for developing an environmental policy (IISD 1998).

Sixteen principles (Appendix B) define the charter, describing environmental responsibilities with respect to aspects of health, safety and product management. Unlike CERES, the ICC does not monitor or control compliance to the Charter, claiming that commitment is a "good faith" process. There is no annual report that is released. The charter requires that "regular audits and assessments of compliance" be performed, and that appropriate information is periodically communicated to the Board of Directors, shareholders, employees, the authorities and the public. Assessments need not be scheduled, consistent or comparable, made public, and the released information is left to the organization's discretion (Brophy 1996, Phyper and Ibbotson 1996).

Although the charter's title includes sustainable development, the principles do not reflect this concept as in the CERES Principles. The language is not as strong as the former charter, including broad generalizations that can be misinterpreted.

2.1.3 The Environment Business Forum

This charter was developed by the Confederation of British Industry (CBI), and most of its members are in the United Kingdom. Intended to help businesses improve their environmental performance, and demonstrate the actions they are taking, it requires members to implement its “Agenda for Voluntary Action” (Brophy 1996).

Members are required to submit an Action Plan which describes how the Agenda will be fulfilled, and within a year must produce a Corporate Environmental Policy Statement. Subsequently, environmental performance must be assessed and progress is reported in a public document annually. These principles are similar to an environmental management system. The CBI contends that without regular environmental reporting, adoption of guidelines is like “window dressing”. Members determine their own objectives and targets and rates of environmental improvement, without any defined standards to be met.

2.1.4 Industrial Initiatives

Listed below are several other environmental charters that have been developed. Upon endorsement, companies commit to incorporate the guiding principles into their policies and activities, thereby adopting a proactive approach to environmental management. In addition to other business-initiated guiding principles, numerous industrial environmental charters have been developed (Phyper and Ibbotson 1996). These include among others:

- Keidanren (Japan Federation of Economic Organizations)

- The Business Council on National Issues (Canadian based)
- National Round Table on the Environment and Economy (NRTEE, Canadian based)

Canadian Industrial Associations which have prepared environmental policies, guidelines or codes of practice include:

- Canadian Chemical Producers' Association (CCPA)
- Canadian Pulp and Paper Association
- Canadian Petroleum Products Institute
- Canadian Manufacturers' Association
- The Mining Association of Canada
- Canadian Electricity Association

2.1.5 Responsible Care

Probably the best known initiative by an industry is the "Responsible Care" program developed by the Canadian Chemical Producers' Association (CCPA) in 1984. Specific to the chemical industry, this initiative comprises guiding principles and codes of practice that were developed to combat the industry's poor public image resulting in part from a few high profile disasters. The guiding principles and codes of practice provide members with recommendations on how to improve organizational performance in environmental, and health and safety issues. Implementing the principles and codes of

practice of the Responsible Care program is a condition of membership to the CCPA (CCPA 1996, Phyper and Ibbotson 1996).

The guiding principles and codes of practice relate to:

- community awareness and emergency response (CAER)
- research and development
- manufacturing
- transportation
- distribution
- hazardous waste management

The codes of practice define the company's responsibilities and are accompanied by workshops, seminars and implementation manuals. Additionally the CAER requires that companies handling chemicals:

- know the community concerns and respond to them
- inform the community of risks associated with its operations
- have its own emergency response plan and ensure it is integrated with the community emergency response plan.

2.1.6 Environmental Commitment and Responsibility Program (ECR)

The ECR Program is an industrial initiative developed and implemented by the members of the Canadian Electricity Association (CEA) in November 1997. The program is based on creating more transparency within the industry and stakeholders, while

committing to four principles related to environmental performance (CEA 1998, Manitoba Hydro 1998). Participation in the ECR program is a requirement of membership in the CEA,, and all participating Canadian electric utilities must adopt the following four principles:

1. to be more efficient in their use of resources;
2. to reduce the adverse environmental impacts of their business;
3. to be accountable to their stakeholders; and
4. to ensure that their employees understand the environmental implications of their actions and have the knowledge and skills to make the right decisions.

Each of the four principles is supported by measures and indicators. In addition, the ECR program consists of the following elements that each utility is required to fulfill:

1. a declaration of (the above) principles, and reporting of the measures and indicators;
2. a commitment to implement an environmental management system (EMS) consistent with the international standard -ISO 14001;
3. an annual performance report for 14 environmental indicators to measure and assess performance;
4. an independent verification process to evaluate each utility's compliance with the ECR program;
5. reporting to a public advisory panel that will provide independent assessment and recommendations in the form of an annual report, to the CEA Board of Directors on environmental issues and the implementation of, and improvements to the ECR Program.

The principles above will be documented and measured annually, and compiled in to a report that will be available to all stakeholders. Furthermore, no less than once every five years, the member utilities will have their performance verified by an independent, outside body. Electric utilities across Canada are participating in this Program.

2.1.7 Global Environmental Management Initiative (GEMI)

Although, not an industrial initiative, the Global Environmental Management Initiative known better as GEMI, is a Washington, DC, based non-profit organization that was assembled in 1990 by numerous leading companies, to assist businesses in achieving a high level of environmental, health and safety management. These goals are met through the sharing of tools and knowledge between the organization's members.

GEMI's 28 member companies are all world leading companies including AT&T, Coca Cola, Eastman Kodak and others. They operate in a variety of industrial sectors, each bringing their line of expertise. Through collaborations with members and international organizations such as the United Nations Environment Program (UNEP) and the International Chamber of Commerce, GEMI promotes a business ethic for sustainable development and environmental management (GEMI 1996, GEMI 1999).

2.2 Environmental Management Systems Standards

The following section will briefly overview various environmental management system standards and their components. The standards that will be described include: BS 7750, EMAS, Irish Standard 310, CSA 7750, ISO 14001/4.

Standard documents may be of two kinds; either specification or guidance. A *specification* standard is a set of requirements that must be satisfied, and may later be verified for conformity, while a *guidance* standard is a document that only provides advice, rather than a set of verifiable requirements.

Common to all EMSs is the concept of improvement over time. Some standards use the term continual improvement, while others use continuous improvement and one standard, CSA uses both. "Continuous" means *uninterrupted*, while "continual" means *frequently reoccurring*. The goal is to show improvement over time, and will not be measured specifically according to the definitions (Starkey 1996).

Environmental performance requirements beyond compliance with environmental legislation and a commitment to continual improvement, is not included in any of the standards that will be presented.

2.2.1 British Standard 7750 (BS 7750)

The first standard to emerge was the British Standard 7750 (BS 7750) developed by the British Standards Institute (BSI) in 1992 at the request of the Confederation of British Industry (CBI). In 1990, after being asked to consider the issue of third party assessment of environmental performance, BSI concluded that environmental

performance, was indeed a management issue, and could be addressed with an environmental management system standard, as was the case of the quality management issue earlier (Starkey 1996). BSI's mandate was to develop an archetype for organizations implementing an EMS. Compatibility with the quality standard BS 5750 (ISO 9000) was integral and therefore it shares many management system principles found in BS 5750. It had to be comprehensive, but generic enough for all business sectors to implement. Following, two years of pilot studies by organizations in various industrial sectors, BSI revised and published the final standard BS 7750 in January 1994. The specification contains the following elements:

- Introduction
- Section 1 - Scope
- Section 2 - Informative references
- Section 3 - Definitions
- Section 4 - Environmental management system requirements

Following the specification are two annexes which are informative only, and not required as part of the specification. One annex provides guidance on the EMS requirements, while the other describes the links between the EMS standard BS7750, and the quality standard BS 5750 (now BS EN ISO 9001).

According to BS7750, “two organizations carrying out similar activities but having different environmental performance may both comply with its requirements”.

The following flow chart depicts the BS 7750 environmental management system elements, and their respective sections (CSA 1995):

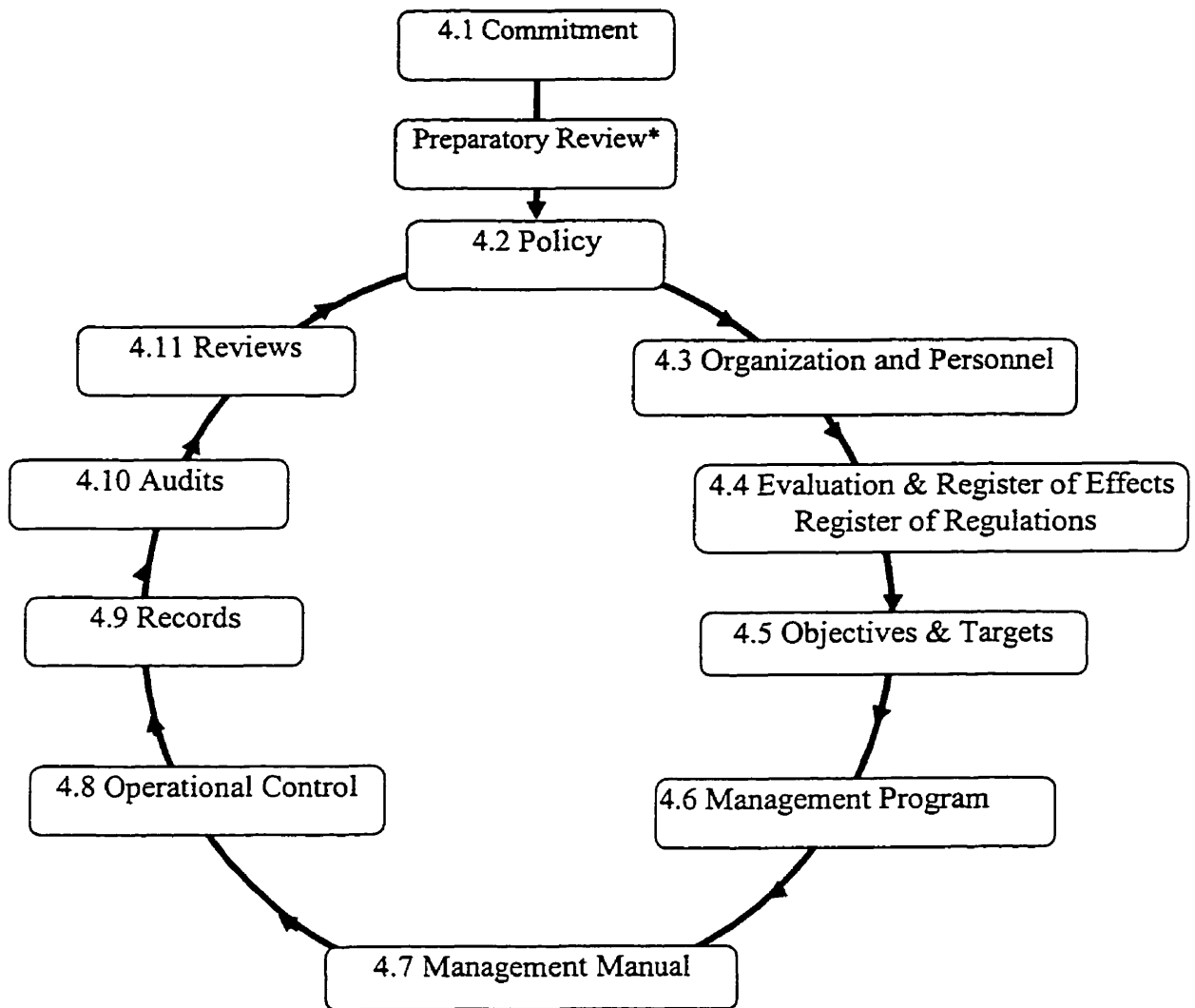


Figure 2: Flowchart of BS7750 EMS Elements

*The preparatory review above, is not a requirement of the specification. It is however recommended in order to determine an organization's environmental standing. The annex contains details describing how to conduct a review.

A summary of the highlights of the BS 7750 EMS specification is presented below. The standard is intended to apply to all types and sizes of organizations (Phyper and Ibbotson 1996, Puri 1996).

An Environmental Policy (4.2) is required that must provide for the setting and publication of environmental objectives, commit to continual improvement and be made available to the public.

Organization and Personnel (4.3) requires the organization to determine and record the responsibility, authority, and interrelations of key personnel whose work affects the environment. A verification that ample personnel and resources are available to achieve the environmental objectives is required, and senior personnel are appointed to assure that the environmental performance objectives are attained. There is also a requirement for formalized environmental awareness training.

The Environmental Effects (4.4) section is one of the most important sections in the standard. It requires that procedures be established and maintained for:

- receiving, documenting and responding to communications (internal and external) from relevant interested parties regarding environmental issues
- examining and evaluating the environmental effects (direct/ indirect) of its activities, products and services, and for compiling a register of those identified as significant
- compiling a register for legislative, regulatory and other policy requirements

Objectives and Targets (4.5) are set including those with regulatory requirements, those developed from the environmental effects register, as well as the financial, operational, stakeholder and business requirements of the organization.

Management Programs (4.6) are developed to meet the environmental objectives and targets. Responsibility, means and timelines should be included.

A Management Manual (4.7) is required that contains:

- environmental policy, objectives and targets, programs
- key roles and responsibilities
- description of EMS element interactions
- provide direction to related documentation
- document control

Operational Control (4.8) requires that management define responsibilities within the organization for control, verification, measurement, testing and corrective action and ensure that they are satisfactorily carried out.

The organization is required to develop and maintain a system of Environmental Management Records (4.9) “in order to demonstrate compliance with the requirements of the EMS, and to record the extent to which planned environmental objectives and targets have been met.”

Environmental Management Audits (4.10) are conducted to verify the conformance of the EMS to the environmental policy and objectives and programs, and how effectively they are carried out. The frequency of audits will be related to the significance of the environmental effect, and previous audit results.

Environmental Management Reviews (4.11) requires that management periodically review the EMS to ensure the requirements are being met, and to, “address the possible need for changes to the policy and objectives, in light of changing circumstances and commitment to continual improvement”.

The definition of continual improvement in BS 7750, is the “year-on-year enhancement of overall environmental performance”, and includes “the application of measures, with a view to reducing adverse environmental effect to levels not exceeding those corresponding to economically viable application of best available technology (EVABAT)”. This is the only requirement regarding environmental performance in BS 7750.

The focal point of BS 7750 is its “effects register”, that requires organizations to look at the environmental effects of their activities/products/services, to determine environmental significance, and finally to develop objectives and targets for reducing those effects. The effects register furnishes the organization with a definite system for promptly acting upon identified environmental problems. An auditor may also utilize the register to determine if the organization’s system for evaluating significance is acceptable. In June 1997 BS EN 14001 replaced BS 7750, after the ISO 14000 international standards were adopted by the UK.

2.2.2 European Union: Eco-Management and Audit Scheme (EMAS) Regulation

In 1990, the European Commission issued a discussion paper, which would later be the foundation for the Eco-Management and Audit Scheme (EMAS). In 1992, the

European Union (EU) proposed the EMAS Regulation, to encourage industry to review and continuously improve and standardize their environmental performance. This required annual environmental audits, and a detailed public environmental statement of the findings. Although the first draft was released as a mandatory regulation, that would apply to the worst polluters in the EU, (the industrial sector) it was revised to a voluntary scheme, after affected companies and sites charged that a level playing field would no longer exist, with companies outside of the EU. In addition to its new voluntary status, the annual audits were now only required once every three years. EMAS was officially adopted in 1993, and open to company participation in April 1995 (EMAS 1993, Tibor and Feldman 1996).

Subscribing to the voluntary regulation entitles a company to register the site on an EU authorized list, and to use an EU approved graphic and statement of participation to publicize participation. One of the EU's primary goals in introducing the regulation, was to reduce trade barriers among member states, and expand trade in the European Union, since environmental protection and enforcement in the EU varies among member states. As an EU regulation in member states, EMAS becomes a national law, and as such, each state must provide for EMAS participation.

EMAS requires that companies implement a formal environmental management system, conduct periodic audits, and publish independently verifiable public statements regarding the companies' environmental performance. EMAS allows participation only to industrial companies, waste disposal, gas, steam, electrical and mining sectors in the EU, and for local government in the UK only. Additionally, only specific sites within a

company where industrial activity is performed, can be registered, rather than the entire company.

EMAS consists of 21 articles and 5 annexes. The annexes of EMAS are part of the regulation, and are mandatory, unlike the annexes in other standards which are only informative.

Article 1 of the regulation states the aims of EMAS as:

“Community scheme allowing voluntary participation by companies performing industrial activities...established for the evaluation and improvement of the environmental performance of industrial activities and the provision of relevant information to the public...the objective of the scheme shall be to promote continuous improvements in the environmental performance of industrial activities.”

The following statements highlight some of the particular characteristics of EMAS. As already mentioned, the regulation is voluntary, and site specific. EMAS promotes continual improvement of environmental performance while requiring compliance with environmental legislation as a minimum.

- There is a requirement for an initial review
- Registers of significant environmental effects and relevant legislation are required
- Setting of objectives and programs for continuous improvement is required
- EVABAT is referred to with regards to environmental performance
- Auditing is a requirement against set objectives

- Publication of an environmental statement is required

An environmental statement must be prepared by the company “specific to each site audited”, including the initial environmental review and subsequent audits or audit cycles. This public environmental statement and its verification is a main objective of EMAS. After the first statement is issued, companies must produce simplified annual statements between audit years.

A requirement of EMAS is the adoption of an environmental policy that embodies compliance with all environmental regulatory requirements and a commitment to achieve “reasonable continuous improvement of environmental performance, with a view to reducing environmental impacts to levels not exceeding those corresponding to economically viable application of best available technology (EVABAT)”.

EMAS requires the following components to be included in its policy, as well:

- assessing the environmental impact of its activities
- implementing pollution prevention
- providing information to the public about the environmental impact of the company’s activities
- providing advice to customers about the environmental aspects of handling, use and disposal of its products

Additionally, within the policy, EMS program and audits, EMAS prescribes a list of 12 issues that must be addressed including among others, environmental impact reduction, energy management, product planning, raw materials management, and waste avoidance.

EMAS requires that an initial environmental review that is focused on issues addressed in the policy be conducted. This would be used to direct the development of the EMS. If a company already has an EMS, the review would be used to determine that the requirements of EMAS are met.

EMAS requires the company to define environmental objectives “at the highest appropriate management level, aimed at the continuous improvement of environmental performance...” consistent with its policies.

A requirement of EMAS, is that the company examine and assess the environmental effects of its activities, and compile a register of significant effects. All legislative, regulatory, and other policy requirements pertaining to the environmental aspects of its activities, products, and services must also be recorded, and made publicly available.

The validated environmental statement is forwarded to the competent body of the member state where the site is located, and is disseminated to the public, in that state after the site is registered. Each year a complete list of registered sites is published in the Official Journal of the EU.

2.2.3 Canadian Standard Association (CSA Z750)

The Canadian Standards Association (CSA) is a non-governmental, national, standard setting organization. A multi-stakeholder consensus process was used to develop the voluntary Environmental Management System document CSA Z750-94. Published in September 1994, this guidance document is part of a series of environmental documents

developed as a management tool which aims to provide advice to Canadian businesses and organizations wanting to improve their environmental performance (CSA 1995, Brophy 1996).

The standard is defined in the following sections:

- Section 1 - Scope
- Section 2 - Definitions
- Section 3 - Environmental Management Systems

An appendix follows that contains seven examples of environmental guiding principles that can be used to develop an organization's environmental policy. Included are ICC's Charter for Sustainable Business and, the Coalition of Environmentally Responsible Economics (CERES) Principles.

The EMS is based on four principles; **Purpose, Commitment, Capability and Learning.**

1. an organization should have **Purpose**; it should focus on what needs to be done.
2. people in the organization should have the **Commitment** to take the appropriate action in support of the environmental management system.
3. the organization should have the **Capability** of performing in support of its objectives.
4. an organization should be **Learning** how to perform better in pursuit of its objectives, and it should be continuously **Learning** how to improve its own management and learning processes.

The EMS guidance document includes a self-assessment entitled “Getting Started”, and practical advice from organizations that have already implemented EMSs addressing each of the four principles. Based on their experiences, this “Tool Kit”, as it is known, contains information, questions and answers, and advice to develop an EMS. It is not a comprehensive development tool though.

2.2.4 Irish Standard (IS 310)

Published in 1994, the Irish Standard (IS 310) describes in its “forward”, EMAS’s influence on its development, and the intent of the standard to complement the Irish quality system standards. Like BS7750, it applies to all organizations. The “forward” in this standard, is unique from the others mentioned thus far, in its depth and seriousness. Its bold and direct statements make it worthy of including here, even though the standard has already been officially withdrawn. Additionally, it is the only EMS document to include the definition of sustainable development.

The following is taken from the “forward”, “responsibility arises in recent times from such phenomena as, global warming, ozone depletion and deforestation. These all pose a great threat to mankind, and an obvious response is called for in terms of conservation measures such as, e.g. the conservation of scarce and/or non-renewable resources, the daunting problem of environmental pollution and destruction of nature’s ecological systems is the result of insensitive exploitation by mankind of natural resources of various kinds”. In addition, “is a philosophical and spiritual concern of great interest to people everywhere and lies at the root of the concept of sustainable

development”. It continues to describe that environmental programs that address only air, water and soil issues are incomplete, and interactions of communities and industry must also be addressed.

In defining the aim of the EMS, IS 310 states that in addition to developing an environmental policy statement, and implementing a program of “environmental and conservation measures” to achieve the environmental policy , it also adds, to achieve “elimination or reduction of significant adverse effects on the environment from the organization’s activities”. This last comment goes beyond the statements in BS 7750 and EMAS.

Like EMAS, IS 310 requires a publicly available report to be produced, not less than once every three years. It must contain information pertaining to the organization’s activities, EMS outline, programs, its effectiveness, and environmental performance with respect to environmental objectives including “details of complaints relating to nonconformity with the specified requirements, how these were resolved and any legal proceedings against the organization”. No other EMS standard has this requirement (Brophy 1996).

2.2.5 ISO 14001: Environmental Management Systems - Specification with guidance for use

Published in the fall of 1996, by the Organization for Standardization (ISO), this EMS specification was the product of an international collaboration (ISO 1996a). Part of the ISO 14000 series of environmental management standards, the ISO 14001

specification and the ISO 14004 guidance document describe the basic elements of an EMS.

ISO 14001 is based on 5 core elements:

1. Environmental Policy
2. Planning
3. Implementation and Operation
4. Checking and Corrective Action
5. Management Review

Chapter 4 describes the ISO series of environmental standards in greater detail.

3. OBJECTIVES

The aim of this thesis is to study the effects of applying, or conforming an EMS to the ISO 14001 International Environmental Management System Standard in general; more specifically, how it affects a large provincial Crown Corporation such as Manitoba Hydro, as viewed through the specific case study using this large integrated electric utility.

In order to attain these objectives, the following will be examined within the study:

1. Describe and analyze the ISO 14000 series of standards and their applicability, with emphasis on its following components:
 - ISO 14001: *Environmental Management Systems - Specification With Guidance for Use*,
 - ISO 14004: *Environmental Management Systems - General Guidelines on Principles, Systems and Supporting Techniques*,
 - ISO 14010/ 11/12: *Guidelines for Environmental Auditing*
2. Examine the relevance of these standards to Manitoba Hydro and its EMS, and assess the advantages and disadvantages of adopting an ISO 14001 EMS.
3. Evaluate *ICF Kaiser ISO 14000 Workstation* - software for implementation of the ISO 14001 standard, in order to determine whether it is a necessary or useful tool in developing, implementing, and managing an EMS.

4. ISO 14000 SERIES OF ENVIRONMENTAL STANDARDS

4.1 Background

ISO, as the International Organization for Standardization is more commonly known, is not an acronym, but is in fact derived from the Greek word *ISO*, meaning “equal”. Founded in 1947, ISO today has 128 members, representing countries and organizations worldwide. A non-governmental organization, based in Geneva, ISO’s focus is to provide international standardization for products and services in order to facilitate international trade by removing barriers. ISO defines a standard as “a documented agreement containing technical specifications or other precise criteria to be used consistently as a rule, guideline, or definition of characteristics, to ensure that materials, products, processes, and services are fit for their purpose”. All of ISO’s standards are voluntary, although, often countries will adopt the ISO standards, thereby a requisite to do business, and as such, no longer strictly voluntary. The Canadian Standards Association (CSA) represents Canada as ISO’s designated authority.

Technical committees (TCs) within ISO specialize in drafting standards in specific areas. Standards are developed by ISO in all sectors except electrical and electronic engineering. As part of the standards development process, Technical Advisory Groups (TAGs), made up of representative member nations, provide advice to the TCs. Governments, industries and other interested parties may participate in the development process. Until very recently, ISO’s focus was on technical/scientific standards. In the 1980’s, TC 176 was asked to develop a quality management standard, in order to

standardize one aspect of organizational management. In 1987, the ISO 9000 series of international, generic quality management standards were adopted.

By this time, the environmental debate was escalating, and during 1991, UNCED (United Nations Conference on the Environment and Development), had asked ISO to participate in the Rio Conference in the following year. As a result, ISO formed an advisory group known as the Strategic Advisory Group on the Environment (SAGE). Even though their mandate was only to evaluate the need for standards, they had begun to work on developing standards. In 1993, TC 207 was created to develop a number of environmental standards in different areas, including environmental management systems and tools. Canada was named Secretariat of TC 207.

TC 207's scope included standardization in the field of environmental management, tools, and systems. However, it excluded:

- test methods for pollutants,
- setting limit values regarding pollutants or effluents,
- setting environmental performance levels; and
- standardization of products.

The scope of the environmental standard was to include a concept from the ISO 9000 quality management standards, in that the management standards were process standards, and as such should not specify final objectives. ISO 9000 standards address process quality rather than product quality. In other words, the management process must be consistent which in turn should produce consistent quality products. The quality of the product is not evaluated, that is determined between the customer and organization. ISO

14000's scope too, was to develop only process standards (von Zharen 1996, Baker and McKiel 1998).

4.2 ISO 14000: An Overview

ISO 14000 is a series of environmental standards that was developed by the International Organization for Standardization (ISO). These voluntary and generic standards are aimed at providing organizations with a structured framework to manage their environmental impacts, responsibilities and commitments. The ISO 14000 series includes a number of standards addressing; management systems, auditing, environmental performance evaluation, labeling, life-cycle assessment and product standards, and can all be *stand alone* documents.

The standards within the ISO 14000 series, may be classified as either a guidance or specification standard. ISO 14001(*Environmental Management Systems - Specification with Guidance for Use*) is the only specification; all other standards within the series are guidance documents. A specification has prescriptive requirements and may be objectively audited to these, while a guidance standard, is a descriptive document only, and cannot be audited. Specification documents use the words *shall* and *must*, expressing requirements, while guidance documents utilize the word *should*, which is intended only as a recommendation, rather than a requirement. ISO 14004, is a guidance document intended to be used with ISO 14001, and contains recommendations and additional details for further clarification of the standard.

The ISO 14000 series can be classified into two main groups, i) Organization Evaluation, in which the organization's management and evaluation systems are

addressed, and ii) Product Evaluation as outlined in the following sections (4.2.1 and 4.2.2).

4.2.1 Organization Evaluation Standards

- a. Environmental Management System (EMS)
 - i) ISO 14001, Environmental management systems - Specification with guidance for use
 - ii) ISO14004, Environmental management systems - General
 - iii) Guidelines on principles, systems and supporting techniques
- b. Environmental Auditing (EA)
 - i) ISO 14010, Guidelines for environmental auditing - General principles
 - ii) ISO 14011, Guidelines for environmental auditing - Audit procedures - Auditing of environmental management systems
 - iii) ISO 14012, Guidelines for environmental auditing - Qualification criteria for environmental auditors
- c. Environmental Performance Evaluation (EPE)
 - i) ISO 14031, Guidelines on environmental performance evaluation

4.2.2 Product Evaluation Standards

- a. Environmental Labeling (EL)
 - i) ISO 14020, Goals and principles for environmental labeling

- ii) ISO 14021, Environmental labels and declarations - Self declaration of environmental claims - Terms and definitions
- iii) ISO 14022, Environmental labels and declarations - Self declaration of environmental claims - Symbols
- iv) ISO 14023, Environmental labels and declarations - Self declaration of environmental claims - Testing and verification methodologies [NOTE: ISO 14021- 14023 have recently merged into one document.]
- v) ISO 14024, Environmental labels and declarations - Environmental labeling - Type I - Guiding principles and procedures
- vi) ISO 14025, Environmental labeling - Type III labeling
- b. Life Cycle Assessment (LCA)
 - i) ISO 14040, Life cycle assessment - Principles and framework
 - ii) ISO 14041, Life cycle assessment - Goals and definitions/scope and inventory analysis
 - iii) ISO 14042, Life cycle assessment - Impact assessment
 - iv) ISO 14043, Life cycle assessment - Improvement assessment
- c. ISO Guide 64 (formerly ISO 14060) - Guide for the inclusion of environmental aspects in product standards

ISO 14050, Terms and definitions - Guide on the principles for ISO/TC 207 terminology work. This document is linked to the entire ISO 14000 series of standards.

The focus of this study is on the organization evaluation standards within the ISO 14000 series; specifically ISO 14001 EMS specification, and the supporting guidance documents, ISO 14004 and ISO 14010/11/12 the environmental auditing standards.

4.3 ISO 14001, Environmental Management Systems - Specification with Guidance for Use

As previously mentioned, ISO 14001 is the only specification standard within the series, and as such, the only one that can be used in third party certification (registration) and/or self declaration. Elements within the standard must be fulfilled in order to meet the specifications (requirements) of certification. In order for a third party registrar to grant certification (the term registration is used in the United States for legal reasons), the elements of the standard must be implemented and documented with evidence that the EMS has in fact been fully integrated into the organization. It is also possible for organizations to self-certify to the standard, whereby second parties accept self declarations, thereby avoiding the high cost of third party involvement.

An organization's EMS is judged against this standard, and once certified, the organization may declare that it has implemented a documented EMS that is consistently followed. Although implied, certification does not mean that the organization produces more environmentally sound products, or that its activities or services are more environmentally conscious.

The following table lists the International ISO registrations as of September, 1998. Japan leads with 1091, followed by the United Kingdom at 800 registrations and Germany with 630 (Hart 1998a).

Table 1: International ISO registration

Estimated worldwide certifications: 5,446

Argentina	29
Australia	90
Austria	80
Belgium	10
Brazil	40
Canada	60
Chile	2
China	32
Colombia	1
Costa Rica	1
Czech Republic	8
Denmark	150
Egypt	15
France	110
Finland	90
Germany	630
Hong Kong	20
Hungary	20
Iceland	1
India	60
Indonesia	26
Ireland	65
Israel	1
Italy	100
Japan	1,091
Korea (South)	247

Lebanon	1
Liechtenstein	1
Malaysia	46
Mexico	30
Morocco	1
The Netherlands	299
New Zealand	9
Northern Ireland	2
Norway	42
Pakistan	1
Philippines	20
Poland	8
Portugal	2
Scotland	5
Singapore	50
Slovenia	2
South Africa	25
Spain	81
Sweden	292
Switzerland	251
Taiwan	242
Thailand	57
Turkey	11
United Arab Emirates	1
United Kingdom	800
United States	188

The specification is structured as follows, with five core elements (in bold) defining the EMS:

Introduction

Scope

References

Definitions

Environmental management system requirements

General requirements

1. Environmental Policy

2. Planning

Environmental aspects

Legal and other requirements

Objectives and targets

Environmental management program

3. Implementation and Operation

Structure and responsibility

Training, awareness and competence

Communication

Environmental management system documentation

Document control

Operational control

Emergency preparedness and response

4. Checking and Corrective Actions

Monitoring and measurement

Nonconformance and corrective and preventive action

Records

Environmental management system audit

5. Management Review

Following the specification, are three informative annexes;

Annex A - Guidance on the use of the specification,

Annex B - Links between ISO 14001 & ISO 9000, and

Annex C - Bibliography.

The following sections will provide details on the components of the ISO 14001 EMS standard.

4.3.1 Introduction

The introduction begins by describing an increased concern that organizations have to “achieve and demonstrate sound environmental performance”. Driven by increasing legislation, concern from interested parties, and sustainable development, “a structured management system integrated within the overall management activity” would be required for effectiveness. The intent of ISO 14001 is to provide organizations with the basic elements of an effective management system to control the environmental impacts of organizations’ activities, products and services.

It also includes the following statement which is reminiscent of that which was seen earlier in the BS 7750 standard: “does not establish absolute requirements for environmental performance beyond commitment, in the policy, to compliance with applicable legislation and regulations and to continual improvement. Thus two organizations carrying out similar activities but having different environmental performance may both comply with its requirements”.

It also states that this standard “contains only those requirements that may be objectively audited for certification/registration purposes and/or self-declaration purposes”. It is “applicable to all types and sizes of organizations and to accommodate diverse geographical, cultural and social conditions”. It is not intended to apply to aspects of occupational health and safety management, and therefore these aspects won’t be audited.

Finally, it refers to the fact that the standard need not be established independently of any already existing management system, it should be integrated into the organization’s overall management system.

4.3.2 Scope

This section establishes the intent of the ISO 14001 standard. It clearly states that “it does not itself state specific environmental performance criteria”. It provides the requirements for an EMS in order for an organization to be able to “formulate a policy and objectives taking into account legislative requirements and information about

significant environmental impacts”, and it only applies to environmental effects that the organization can control or has influence over.

4.3.3 Definitions

Included in the standard is a section of definitions of terms used within the specification.

4.3.4 Environmental Management System Requirements

Section 4 of the standard states the requirements of the EMS, and contains five core elements and sub-elements. Together the 17 elements define an environmental management framework that requires some procedures, or documents and/or records to be established and maintained. The following sections will describe the elements and their specific requirements.

4.3.5 Environmental Policy

According to ISO 14001, an environmental policy is defined as a “statement by the organization of its intentions and principles, in relation to its overall environmental performance which provides a framework for action and for the setting of its environmental objectives and targets”. The environmental policy reflects the organization’s level of commitment to the environment, its values and mission, and provides direction for the organization’s environmental commitments.

In order to successfully implement an EMS, commitment from all levels of employees and management is required. Most importantly though, is *visible* commitment

of top management. “Top management” may be defined differently in organizations according to their structure, but all must reflect belief in the initiative for it to be successful.

The environmental policy in the standard in fact requires that “top management shall define the organization’s environmental policy and ensure that...”, reflecting the integral role top management is required to play. The environmental policy has six key elements that must be addressed. The first requires that the policy statement be “appropriate to the nature, scale and environmental impacts of its activities, products or services”. It must also:

- commit to continual improvement, prevention of pollution and to comply with relevant environmental legislation, regulations, and other requirements to which the organization subscribes
- provide a framework for setting and reviewing environmental objectives and targets
- be documented, implemented, maintained, and communicated to all employees
- available to public

The commitment to continual improvement refers to improvement of the “management system”, not environmental performance. There is no obligation within the standard to continually improve environmental performance.

A commitment to comply with legislation, regulations and other requirements to which an organization subscribes, implies that an organization can conform to the standard’s requirements, even though it is not in compliance with environmental

legislation. This is because, the organization is only required to make a commitment to comply. The organization must also comply with any other commitments, industrial standards, internal policies and programs to which it subscribes. However, there is an expectation that continued compliance with an EMS and continual improvement, would eventually result in regulatory compliance.

The concept of prevention of pollution, requires that the organization consider opportunities to prevent pollution. ISO defines prevention of pollution as “uses of processes, practices, materials or products that avoid, reduce or control pollution, which may include recycling, treatment, process changes, control mechanisms, efficient use of resources and material substitution”. This concept is very important, and becomes even more crucial when objectives, targets and programs are developed. Finally, the policy must be made available to the public.

4.3.6 Planning

The planning phase has four components, which are the essence of the EMS. The first requirement, is for a procedure to identify the “environmental aspects of the organization’s activities, products and services”, over which it can control and influence, in order to determine the environmental impacts which are significant. Environmental aspect is defined as an “element of an organization’s activities, products or services that can interact with the environment”, while an environmental impact is defined in the standard as “any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization’s activities, products or services”. The

organization is then required to consider the significant aspects in the development of its environmental objectives, and to keep this information up to date.

The next procedure required in the planning phase, is one that identifies and allows access to, any legal and other obligations that may affect the organization, or to which the organization subscribes, “that are applicable to the environmental aspects of the organization’s activities, products and services”.

The organization is also required to develop and document environmental objectives and targets “for each relevant function within the organization”, while considering,

- legal and other requirements
- significant environmental aspects
- technological options
- financial requirements
- operational requirements
- business requirements
- views of interested parties

Finally, the Planning element of the specification requires that programs or action plans be developed and carried out to meet the environmental objectives and targets. Included within these plans are the “designation of responsibility, means and time frame” by which they are to be completed. There is an additional note that requires any “new

developments, and new or modified activities, products or services” to be designed to meet the requirements of the environmental management program.

4.3.7 Implementation And Operation

The previous sections described the essential components of the ISO EMS. The Implementation and Operation element describes supplementary components that are required for the system to properly function. The first of the sub-elements is Structure and responsibility, which requires that “roles, responsibility and authorities” be defined, recorded, and that this information is communicated. It also defines a role for management, to provide the resources necessary to implement and maintain the EMS. It defines resources as “human resources and specialized skills, technology and financial resources”. Management is also required to appoint management representatives that will:

- ensure that the EMS is developed and implemented according to the specification, and
- report to top management on EMS performance, and as a base for EMS improvement

In addition to defining responsibilities for those individuals required to facilitate the EMS, training needs must be identified for all persons that “may create a significant impact on the environment”. Appropriately this section is titled Training, awareness and competence. Raising of employee awareness procedures for the following issues are required:

- importance of an employee's conformance to the EMS policy, procedures and requirements, and their roles and responsibilities to achieve this, and the "potential consequences of departure from specified operating procedures",
- the actual or potential significant environmental impacts that may arise from their activities, and the environmental benefits of better personal performance

The organization is required to have procedures that address internal communication within the organization and external communication from interested parties with respect to the EMS and environmental aspects. The organization is also asked to consider, and subsequently record its decision regarding communicating information externally relating to significant environmental aspects.

The organization is required to have information that describes the EMS's core elements and their interactions, and it should also provide directions to other relevant documents. This can be in paper or electronic form.

Procedures for managing documents are required. The procedures must address issues such as defined locations, periodic document review, availability of current documents at respective locations, and instructions for obsolete document replacement and retention.

Operations that are associated with significant environmental aspects are identified in order to insure that the policy, objectives and targets are met. Procedures are required to address maintenance, potential deviations, and communication of these procedures and requirements to suppliers and contractors.

Procedures are required to “identify potential for and respond to accidents and emergency situations, and for preventing and mitigating” the associated environmental impacts. Current emergency preparedness and response procedures require review and possible revision, and it is advised these procedures be tested.

4.3.8 Checking and Corrective Action

Documented procedures are required to regularly monitor and measure the operations and activities that may have a significant impact on the environment, and for evaluating compliance with the relevant environmental legislation.

Procedures are required for defining responsibility and authority for:

- nonconformance handling and investigation
- actions to mitigate impacts
- initiating and completing corrective and preventive action

Changes in the operations due to the corrective and preventive action require documentation.

Training, audit results and reviews require records that are “legible, identifiable and traceable to the activity” , and must be protected and easily retrievable if necessary. These records are required in order to demonstrate conformance to the standard.

Programs and procedures are required for *periodic* EMS audits. They address scope, frequency, methods, responsibilities, and reports, and are conducted in order to:

- determine if the EMS conforms to the standard
- implemented properly, and

- provide audit results to management

4.3.9 Management Review

Top management is required to review the EMS at predetermined intervals to ensure:

- continuing suitability
- adequacy, and
- effectiveness

Potential changes to policy, objectives and other elements are addressed based on audit results, changing circumstances and the commitment to continual improvement.

The specification is followed by two annexes, that unlike EMAS, are not requirements, rather they meant to provide some clarification. The first, an informative annex “gives additional information and is intended to avoid misinterpretation”, while annex B defines links between ISO 14001 and ISO 9001.

4.3.10 Annex A

Annex A reiterates the specification’s intent “that the implementation of an environmental management system described by the specification will result in improved environmental performance”. This is based on “improvements in its EMS are intended to result in additional improvements in environmental performance”, but it continues to state that “although some improvement in environmental performance can be expected

due to the adoption of a systematic approach, it should be understood that the EMS is a tool which enables the organization to achieve and systematically control the level of environmental performance that it sets itself". Finally it summarizes and states, "the establishment and operation of the EMS will not, in itself, necessarily result in immediate reduction of adverse environmental impact".

The specification continues to state that the system should enable an organization to:

1. establish an environmental policy appropriate to itself
2. identify environmental aspects of the organization's past/ present and future activities, products or services to determine significant environmental impacts
3. identify legislative and regulatory requirements
4. identify priorities and set appropriate objectives and targets
5. establish a structure and program(s) to implement policy and achieve objectives and targets
6. facilitate planning, control, monitoring, corrective action, auditing and review activities to ensure policy and EMS are complied with and appropriate
7. be capable of adapting to changing circumstances

The Annex adds detail, and expands on the brief instructions contained within the specification for almost every element. Some elements contain no additional information, but state that "text may be included in a future revision".

4.3.11 Annex B

Annex B identifies links between ISO 14001 and ISO 9001. “ The objective of the comparison is to demonstrate the combinability of both systems”.

4.4 ISO 14004: Environmental Management Systems - General Guidelines on Principles, Systems and Supporting Techniques

ISO 14004 is a guidance document that in very broad terms is intended only to provide help and advice in the development and implementation of an EMS, and cannot be used as audit criteria. The influence of the CSA Z750 guidance standard on ISO 14004, can be seen in the structure of the document; after all Canada, represented by CSA was the key player in drafting ISO 14004. ISO 14004 was published as a final international standard in September 1996 (ISO 1996b), and is scheduled to undergo revisions beginning 1999.

ISO 14004 is based on five principles, each of which reflects the five core elements of ISO 14001.

Principle 1 - Commitment and policy

An organization should define its environmental policy and ensure commitment to its EMS.

Principle 2 - Planning

An organization should formulate a plan to fulfill its environmental policy.

Principle 3 - Implementation

For effective implementation, an organization should develop the capabilities and support mechanisms necessary to achieve its environmental policy, objectives and targets.

Principle 4 - Measurement and evaluation

An organization should measure, monitor and evaluate its environmental performance.

Principle 5 - Review and improvement

An organization should review and continually improve its environmental management system, with the object of improving its overall environmental performance.

Preceding the five principles, is an introduction, containing an Overview which describes the purpose of this standard, and what the implementation of an EMS is expected to accomplish. Included in this Overview are ten key principles for managers implementing an EMS. The second section within the introduction, titled “Benefits of Having an EMS”, describes how an EMS can “provide confidence to its interested parties”, and some potential benefits that may be “associated with an effective EMS”.

The standard provides information and advice followed by examples and important considerations, in the form of practical help boxes. The information found here is meant to facilitate the development and implementation of an EMS. Although the ISO 14004 standard contains the word “should” throughout the document, it is not a specification and is not intended to be audited. Some of the guidelines address requirements of ISO 14001, while others go beyond the specification. For example, in the

Commitment and Policy section, the standard emphasizes the importance of top management commitment for the successful implementation of an EMS. Clearly without full commitment from top management, the EMS initiative is sure to fail. This in fact is a requirement of the ISO 14001 policy, whereby “top management shall define the organization’s environmental policy and ...”, while, the following initial review, described in ISO 14004, is not required by ISO 14001, (it was a requirement of EMAS) but is a logical step to undertake in order to ascertain the organization’s position before attempting to conform to the ISO 14001 standard.

Other segments that go beyond the scope of ISO 14001 can also be found in this document. For example, the standard provides practical help in developing an environmental policy, suggests that the guiding principles in Annex A, can be used to draft a policy. Some of the recommendations within the guidance go beyond the narrower requirements of the ISO 14001 standard. For example, ISO 14004 suggests that when drafting an appropriate policy, “a detailed review” of The Rio Declaration and the ICC Business Charter found in Annex A should be included. It also suggests the embodiment of life cycle thinking should be considered.

The *Planning* section provides some definition and examples, as well as issues to consider when trying to comprehend and interpret the cryptic language of ISO 14001. Although more, much needed, definition is given to the terms, and helpful examples are included, there still lacks a clear “how to” set of instructions on fulfilling the standard’s requirements. This section, addresses:

- identification of environmental aspects and evaluation of associated environmental impacts
- legal requirements
- environmental policy
- internal performance criteria
- environmental objectives and targets
- environmental plans and management program.

Implementation describes the importance of having the proper resources; human, physical and financial to carry out the implementation of an EMS. Other integral factors that lead to a properly functioning EMS, are identifying persons for responsibility and accountability, and assigning roles, ensuring that awareness in the organization exists and that motivation is maintained. The role of top management's commitment requirement is a common thread throughout the document. Imperative to all having responsibility in achieving the environmental objectives and targets is ensuring that the necessary knowledge, skills and training are given. The scope may vary according to the role each individual plays.

Communication of results is required on an internal level within the organization, and some organizations also communicate externally on their environmental activities. Identifying and establishing processes for two-way vertical and horizontal communication will allow the system to continually grow and improve. A process for response from interested parties (including employees) is essential for continual

improvement and motivation/moral. This section also describes in a practical help box, what items may be included in a report, and how an organization can report environmental information.

EMS documentation is addressed in the following section. Maintaining clear and complete documentation pertaining to the system that is readily understood and available is imperative to the system's successful integration and implementation.

The document also suggests areas of an organization that may require adjustment to their operations in order to conform to the environmental policy, objectives and targets that the EMS requires. Emergency preparedness and response plans and procedures are part of any EMS, but sequentially play a substantial role in a due diligence defense, should a potential liability arise.

Measurement and evaluation describes the requirement of checking any system as a key component of closing the loop. Monitoring and measuring performance against the environmental objectives and targets require processes to ensure reliability of data and to identify and document appropriate indicators and measures. Additionally, corrective and preventive actions must be in place, and their effectiveness must be measured and documented. Examples of records and information that must be kept and managed are included, followed by the requirement to conduct periodic internal audits.

Review and Improvement describes some of the components necessary, to review and continually improve the EMS in order to improve the overall environmental performance.

The guidance is followed by two informative annexes. Annex A contains two examples of international guiding principles; The Rio Declaration on Environment and

Development, and the ICC Business Charter for Sustainable Development. Annex B is the bibliography, that has incorporated portions of the ISO Auditing standards 14010/11/12 into the guidance.

4.5 ISO 14010, 14011, and 14012: Auditing Standards

4.5.1 Environmental Auditing

Whether the organization is undertaking a periodic internal audit as required by the ISO 14001 specification or the organization is undergoing the certification process, auditing assesses the organization's environmental management processes against its environmental policy and stated objectives.

According to ISO 14001, the organization "shall establish and maintain a program and procedure for periodic environmental management system audits to be carried out" in order to check if the EMS conforms to the plans of environmental management, and to provide managers with these results for review and continuous improvement. Auditing is an integral part of the standard. Periodic environmental audits (internal) described above do not have any prescribed time frame, but a schedule based on the organization's discretion is required. This auditing process is a requirement of the standard.

Should an organization choose to become certified to ISO 14001 through self-declaration or third party audit, they must be able to prove conformance to the requirements of the standard. A third party audit (external audit) allows for independent verification of the EMS's conformance to the ISO 14001 standard. This audit may also

integrate the ISO 14010/11/12 auditing standards. A self-declaration of conformance may use the results of internal audits, while also having incorporated the ISO 14010/11/12 auditing standards if they so choose.

Environmental auditing is an important component of the comprehensive approach to environmental management. The auditing standards within the ISO 14000 series are briefly summarized below. All three auditing documents are guidance documents:

1. ISO 14010, Guidelines for environmental auditing - General principles
2. ISO 14011, Guidelines for environmental auditing - Audit procedures - Auditing of environmental management systems
3. ISO 14012, Guidelines for environmental auditing - Qualification criteria for environmental auditors

The ISO 14010/11/12 auditing standards were published in October 1996. They are intended for auditors, (including internal, third party and companies that certify auditors) rather than for the party that will be audited. These are standards to which third party registrars must comply, defining general principles of performing audits and proper conduct, how to carry out an audit and finally the required qualifications of ISO auditors.

4.5.2 ISO 14010 Guidelines for environmental auditing - General principles

This document provides general principles used in environmental audits to organizations, auditors and their clients. ISO 14010 defines an audit as a “systematic, documented verification process of objectively obtaining and evaluating evidence to

determine whether specified environmental activities, events, conditions, management systems, or information about these matters conform with audit criteria, and communicating the results of this process to the client” (ISO 1996c). The client sets the scope of the audit, and the auditors must be independent of the activities to ensure objectivity. The audit conclusions include both audit findings and “judgment or opinions” about the audit process.

4.5.3 ISO 14011 Guidelines for environmental auditing - Audit procedures - Auditing of environmental management systems

ISO 14011 establishes audit procedures for planning and performing an audit of an EMS to determine if the company is meeting the goals of their environmental policies and conforms to the audit criteria; it is applicable to all types and sizes of organizations operating an EMS. Although EMS audits are a requirement of ISO 14001, the use of 14011 is not, which may cause some confusion. It is expected though, that the registrar will use ISO 14011 during a registration audit. One of the important features of ISO 14011 is that the auditor is required to assess the internal management review process. Audit findings must be based on factual evidence, while the inclusion of audit conclusions is optional.

4.5.4 ISO 14012 Guidelines for environmental auditing - Qualification criteria for environmental auditors

ISO 14012 provides guidance on qualification criteria for environmental auditors and lead auditors for both internal and external audits. The standard is followed by two informative annexes. Annex A describes the evaluation of the environmental auditors' qualifications, and Annex B describes the Environmental auditor registration bodies. Again, ISO 14001 does not require the use of this standard for an auditor, but they may choose to do so (von Zharen 1996).

It should be mentioned that an analysis and applicability of the ISO 14000 series of standards is provided in the discussion chapter of this thesis.

5. MANITOBA HYDRO'S EMS

As a member of the Canadian Electricity Association (CEA), Manitoba Hydro, along with other member utilities across Canada, is participating in an industry-wide environmental initiative known as the Environmental Commitment and Responsibility Program (the ECR Program). In adopting this initiative, Manitoba Hydro makes "a commitment to implement an environmental management system (EMS) consistent with the international standard - ISO 14001". This second element of the ECR Program, is the focus of this study.

The EMS implementation schedule as required by the ECR Program, obliges Corporate and Generation Business Units of CEA Utilities to implement their EMSs by December 31, 1999. Transmission and Distribution, and other remaining Business Units are to implement by December 31, 2002. Within the Program, each electric utility is given freedom to determine the direction and scope of implementation best suited for their organization. The ECR Program is flexible, and contains no prescribed mandate on the organizations' EMS structures.

Manitoba Hydro resolved to develop and implement four EMSs within the corporation, one for each of four respective Business Units; Corporate, Power Supply, Transmission and Distribution, and Customer Service and Marketing. Manitoba Hydro has begun to develop and implement EMSs for the Corporate and Power Supply Business Units. The Business Units are made up of Divisions, and in the case of Power Supply, the Generating Stations and Converter Stations report within two of the six Divisions. It was

decided that each separate facility/operation was to develop their own Local EMS (LEMS), and that the cumulative LEMSs would establish the Business Units' EMS. Each facility/operation would have its own environmental objectives, that must incorporate the corporate environmental policy, other commitments, and conform to the overall business plan. There are many overlaps and linkages between Business Units. The same would be true for the EMSs.

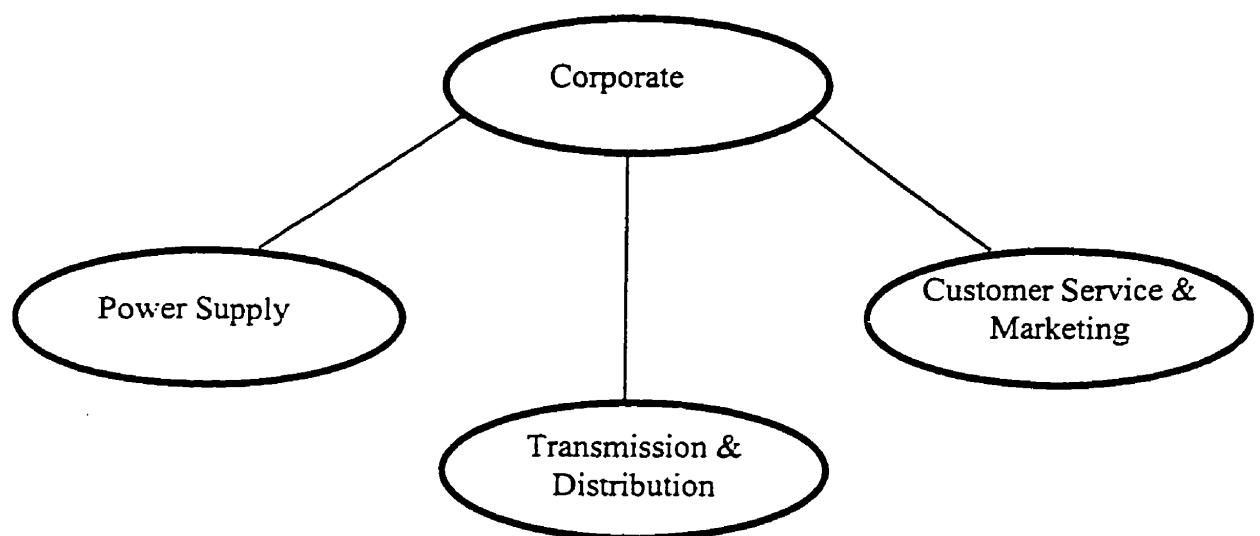


Figure 3: Corporate Structure of Manitoba Hydro

The Power Supply Business Unit has six Divisions – Finance and Administration, Generation North, Generation South, High Voltage Direct Current (HVDC), Power

The relationship between the Corporate EMS and cumulative LEMSs is analogous to the Power Supply EMS.

The development and implementation of the EMS at Manitoba Hydro, was initiated by the establishment of a dedicated EMS team. A Corporate Business Unit Coordinator was first named, that would oversee the entire undertaking, and be responsible for the development and implementation of the Corporate EMS, through the cumulative Corporate LEMSs. Other duties also included keeping top management (President/CEO of Manitoba Hydro) informed of progress. In addition, a Power Supply (Generation) Business Unit Coordinator position was also created, who reports to the Vice President of Power Supply. This individual, is responsible for the development and implementation of the cumulative Generation LEMSs, that would subsequently give rise to the Power Supply EMS. The Manitoba Hydro EMS team was later extended, by the addition of an administrator and advisor. In addition to the core Manitoba Hydro team, three external consultants were contracted to advise and guide the team through the EMS development and implementation stages. Eventually, Coordinators for all the Business Units will be named.

Prior to a LEMS development, a local coordinator would be identified that was responsible for organizing the local development initiative within that facility/operation. Assistance from the EMS team would be provided. Generally, one Manitoba Hydro EMS team member worked with a consultant to form a mini-team, to provide guidance in awareness, interpretation, development and implementation of the LEMS.

Before beginning the development of Manitoba Hydro's EMSs, an initial assessment was conducted in one of the thermal generating stations, to determine how the in place management of Manitoba Hydro's environmental issues conforms to the requirements of the ISO 14001 EMS. An external party carried out the initial assessment which yielded no surprises. As one individual in Hydro - Québec, so accurately characterized the situation at an ECR meeting, "we (the utilities) have a lot of environmental management (programs), but not a lot of system".

Often times the term *gap analysis* is used synonymously with an environmental assessment. However, this is inaccurate, as a gap analysis measures gaps from the prescribed system requirements, on an already existing environmental management system, while an initial assessment is used to establish direction for the development of an EMS where one does not exist. The assessment began with a walk around and sites visits, and was followed by numerous interviews and finally, a document review.

The first crucial step in the development of Manitoba Hydro's EMS had been taken. "Gaps" had been identified, but translating recommendations into action plans was one of the most challenging steps in the development and implementation process for the EMS. A recurring requirement was the need for formalizing plans, responsibilities, and elements of a management system that was already in existence. Strengths in Manitoba Hydro's environmental programs, were also identified, however they required integration into a system.

Manitoba Hydro, while planning its activities created a Corporate Environmental Policy as required by ISO 14001. It drives and directs the EMS. The environmental policy included all six required elements of the ISO 14001 standard, and was shared with

every facility/operation that began their EMS development for input from the staff. The policy belongs to every employee, and as such should allow for input to reflect ownership. It is a living document, continually changing to continually improve. The intent of Manitoba Hydro, having received senior management commitment was to construct the EMS from the bottom up, allowing for input and participation from all levels of employees, thus cultivating ownership and a sense of responsibility for the system.

6. ELECTRONIC MANAGEMENT OF EMS

In the section on Environmental Management System Documentation of ISO 14001, it states that “the organization shall establish and maintain information, in paper or electronic form....”, and further, the Document Control section describes the requirements that should be applied to all documents maintained within the system. Key to any successful management framework is proper document management; it is also a specific requirement of the ISO 14001EMS standard.

Since the release of the ISO 14001 Standard in September of 1996, numerous databases and software tools have quickly appeared in the marketplace. Most of these software tools have been marketed as a panacea for every organization implementing the ISO 14001 specification. Some of the early software was advertised as if the software was the EMS. Software tools should be able to offer the following (Phyper 1997):

- adequately provide information on the ISO 14001 requirements
- allow for proper documentation of problems and storage of action items
- create reports on outstanding deficiencies
- provide tracking capabilities
- allow users to input and, therefore assess other requirements that the organization may impose on itself (i.e. corporate/plant policies and procedures).

Manitoba Hydro is in the process of testing one software’s capabilities, and whether it can be of any assistance to Manitoba Hydro, given the organization’s structure,

culture and specific needs. One of the aims of this study was to test that software, specifically, its ease of use and comprehensibility for managing environmental information required by the EMS standard.

6.1 ICF Kaiser ISO 14000 Workstation

The ICF Kaiser ISO 14000 Workstation selected by Manitoba Hydro was examined in order to determine its usefulness in developing and implementing the corporation's ISO 14001 EMS. It is a Lotus Notes based application that is comprised of eight modules. Included in the software package are online versions of ISO 14001 and ISO 14004, an online user guide, online audit guidance from America Society for Testing and Materials (ASTM), and a demo database.

Module 1. Assessment This first module includes a set of eighty-eight questions that precisely reflect the ISO 14001 specification in order to determine how closely the EMS in question conforms to the ISO 14001 requirements. It can be used as an assessment or gap analysis tool. Each section within the assessment module is linked to the specific corresponding sections from ISO 14001 and ISO 14004 for further clarification, and contains ASTM audit guidance linked to each question. Responses to questions are scored between 0 to 4 where,

Level 0 = not initiated

Level 1 = under development

Level 2 = documented / developed

Level 3 = deployed

Level 4 = assessed / verified / improved

A total score for each of the five core EMS elements is determined. Scores are interpreted in ranges of 0 to 25, 26 to 75, and 76 to 100, and are cross referenced to a general score interpretation for each of the five core elements.

Questions to be included in the assessment are chosen through a roundabout step by step process. Each question is followed by a “create action” option, which allows the creation of necessary steps to reach conformance. The actions created in this stage automatically appear on the next module; Conformance Plan. There is also room to add comments and insert supporting documents that can be linked, in order to prove conformance to the standard. This requires that the document is first created in another module, then linked to the assessment module. An example of some gap analysis questions can be seen in Appendix C of this thesis.

Module 2. Conformance The information in this module can be used to manage the actions required by the organization to take in order to conform to the ISO 14001 specification. This module contains all action plans. It lists both Action (conformance) and Corrective Action documents. These documents may be seen here, but are created elsewhere. The Action document originates from the Assessment module, and the Corrective Action from the Implementation module. The module lists All Actions/ Actions /Corrective Actions. And within those one may choose All/Complete/Incomplete, where further details may be retrieved, such as: responsibility allocation, staffing, scheduling, priority rating and tracking progress.

This module allows the tracking and management of actions required to progress towards conforming to the standard. “All” view in tabular form shows: date required, responsible person and other staff, completed would show the same, except with completion date, not yet completed includes due date, priority rating from 1-3; (1-hi, 2-med, 3-lo), responsibility, staff, status, late actions, also mail can be forwarded to people to remind them of responsibilities. One other icon represents the action’s status; red light-not started, yellow deferred, green started. This module also allows for context specific retrieval of the ISO 14001 and 14004 standard references.

Module 3. Supporting Documents Allows documents required to meet the ISO 14001 EMS documentation specifications, to be developed and managed here, with version identification, distribution, updates, and archiving abilities. A supporting document can be created in both the Assessment and Supporting Document modules. Supporting documents may be located by:

- the element in the ISO 14001 standard
- distribution list
- facility
- document author
- update responsibility
- subject: i.e. hazardous materials, air
- type: i.e. policy, objectives and targets
- update due date and,

- archived : stores outdated documents

Module 4. Records EMS records are developed, stored, controlled and archived in this module. These can be tracked by location, subject, and date of collection. Record documents can be linked to Supporting documents of procedures in Module 3. This allows for more information to be provided in order to collect records accurately. The records may be located as in the list above of supporting documents. A record includes the following data:

- facility
- title
- subject
- type (element of ISO standard)
- author
- date
- responsible for completion
- collection frequency date
- copies distributed to
- supported steps (other ISO elements that would require this record)
- related documents/links
- comments
- content (place record here, may be imported from any location)

Finally, the records may also be archived and retrieved in this module.

Module 5. Implementation Organizes and documents all the elements required to comply with the ISO 14001 standard. Activities, products and services are identified with corresponding environmental aspects, impacts, legislative requirements and other commitments, objectives, targets, operational controls, programs and monitoring/measurement and corrective action (if required). All of these can be linked to supporting documents, records and any other relevant document with comments.

Module 6. Contents All documents within the 8 modules of the database can be quickly retrieved from this module. The information is organized into the following categories, in alphabetical order, allowing for quick access:

- Action
- Activity
- Assessment
- Corrective action
- Product
- Record
- Reports setup
- Supporting documents

Module 7. Standards The full text of the ISO 14001 and 14004 standards are included within the database and can be easily accessed in this module. As previously

mentioned, assessment and conformance plan modules also provide access to the standards. The standard may also be printed from the database.

Module 8. Reports The reporting module has 2 components: reporting and graphing, whereby, text and graphical reports can be generated and printed. The reporting tool (text) may generate four reports; an ISO 14000 Gap Analysis Report, which summarizes assessment findings into question, answer and demonstration, a Plans and Actions Report, where all/completed /incomplete can be tracked. A Performance Report for activities/products and services which include objectives, targets, actual performance and a column for conformance, and, a Corrective Action Report by responsible person, date and degree of completion.

In order to run the reporting tool and graphing tools, specific additional access is required. The graphing tool allows for the results of the 14001 assessment module to be presented graphically as bar charts depicting results. The first view presents a summary of the entire standard, while the other three views produce bar charts of the Planning element and sub-elements, Implementation and sub-elements, and Checking and corrective action with the respective sub-elements. Included in the database is also a reference document entitled the "ISO 14001 Requirements for Procedures, Documentation, and Records", that in general terms, describes the standard's requirements for each element of the ISO 14001 standard.

6.2 ICF KAISER Software and Manitoba Hydro

Typically, the initial step an organization commences with, when undertaking the implementation of an EMS, is the assessment / “gap analysis”. The gap analysis assesses the organization’s current EMS against the requirements of the specification. The results indicate the degree to which the organization’s EMS conforms to the ISO 14001 standard, and helps define direction for the organization.

A pilot study was undertaken at one of Manitoba Hydro’s thermal generating stations. It was the first facility to undergo the assessment / “gap analysis”, and to subsequently begin the development of an ISO 14001 EMS. The degree of conformance of MB Hydro’s pre-ISO EMS to the ISO 14001 EMS, and the software’s usability in the gap analysis were tested. The task was conducted by two ISO trained auditors from ICF Kaiser. Upon completion of the assessment, a report was generated that contained findings, documentary evidence and recommendations. This report was generated using Microsoft Word, and not the reporting tool included in the software package. It was subsequently found that the reporting tool of the software is not capable of producing such a “gap analysis” report.

The questions generated by the software to be used in the gap analysis, directly reflect the language in which the specification is written. Manitoba Hydro personnel who were asked to respond to these questions, being unfamiliar with the terminology, were often unclear to the actual meaning of the questions, and required that the questions be rephrased. See Appendix C for sample questions.

The gap analysis tool was tested a second time on a corporate Division, by the author, (a member of Manitoba Hydro's EMS team) in order to determine that Division's conformance to the standard, and to evaluate the usefulness of the tool. Based on the experience gained in the first gap analysis, all questions were translated into lay terms, prior to conducting the assessment, in order for it to be useful for the target audience (AppendixE). The process of using the software directly during the questions phase was found to be impractical as it would be too slow. Therefore, all questions had to be printed out first, and data entering was performed at a later time. This was also done by the software representatives in the pilot study. The data entry process was found to be very time consuming and was finally discontinued. Since the Gap Analysis module is divided into sections that reflect the standard's structure, enough data had been entered to observe the software's laborious, yet ineffective process, to justify ceasing data entry, while still substantiating all following observations and conclusions.

Finally, the software was analyzed during the EMS developmental phase in order to determine its application, if any for that purpose. Each of the eight software modules was examined and analyzed during the planning, development and implementation stages of the Manitoba Hydro EMS, in order to explore its usefulness as a guidance, interpretation and developmental tool in addition to document control and management. It was not found to be of any assistance during the guidance, interpretation and developmental stages of the process. The software may be used for document control and electronic system management, which could also serve as a "road map" during an environmental audit.

7. DISCUSSION

7.1 Critical Evaluation of the ISO 14001 Standard

Much confusion has arisen from the ISO 14000 environmental management series of standards. Often called “environmental standards”, they are commonly misconceived as “performance” standards for the environment, by both experienced environmental professionals, and the public. There is an assumption that the International Organization for Standardization has set standards for environmental protection as also supported by Gleckman and Krut 1997, but in fact, the ISO 14000 series are not performance or compliance standards, rather they are process standards. The standards offer an organization the tools and system to manage their environmental responsibilities, and to meet the goals that they have prescribed for themselves. Herein lies more confusion that surrounds the standard. Two organizations that have “different environmental performance” and different goals, may both be in conformance with the specification, and may therefore be certified (ISO 1996a). This doesn’t reflect a level playing field, which was one of the original goals of the international standard.

The ISO 14000 standards were based upon the same concept as the ISO 9000 series of quality management standards. The ISO 9000 standards address process quality, rather than product quality, and therefore produce consistent product through process, and do not specify final quality objectives (Cascio et al 1996). The quality of the product is not defined by the standards, but is determined between customer and organization. Unless an organization is required to improve the quality of its product over time, or at

minimum, has a requirement which would define limits for acceptability, the standards appear to be deficient in substance. This too has been said of the ISO 14000 standards. Although the standards were developed according to the mandate of their authors, many believe that the standards do not make enough of a commitment to the environment, and that in order to mitigate pollution and affect other environmental issues, environmental goals are required (Cascio et al 1996).

Compliance with the ISO 14001 specification requires conformance to the standard, not the demonstration of environmental performance. Simply put, ISO 14001 is a management system that in this case, addresses environmental issues. The premise behind the specification is that if the system is continually improved, eventually so should the organization's environmental performance. "Improvements in the environmental management system are intended to result in additional improvements in environmental performance", but, it also continues on to state that, adopting the standard, "will not in itself guarantee optimal environmental outcomes"(ISO 1996a).

Moreover, when an organization seeks certification, it defines the scope of the certification audit. This may include single or multiple sites, facilities, or processes, and may exclude others. This offers a corporation the flexibility to register units separately (as in the case of SaskPower) or under one certificate (as is considered by Manitoba Hydro). However, this flexibility also allows for a very misleading situation to arise, whereby a facility receives ISO 14001 certification, but only for their narrowly defined scope. Such an occurrence took place in Ontario Hydro, where a nuclear generating station was ISO 14001 certified, but the scope of the audit excluded the nuclear generating process (Camplong 1998), which can potentially impact the environment significantly. Should a

serious situation arise at this facility, it would reflect badly on all utilities, while discrediting the ISO certification, and potentially the ECR program.

Conformance to the EMS specification is met by implementing all procedures, documents and/or records, as prescribed by the different elements of the standard. The specification compels an organization to address the way its activities, products and services may affect the environment. This in turn induces the organization to identify, examine and question numerous environmental issues that may not have received prior attention. This process also gives way for the organization to look at the issues in a different perspective, not only in terms of “end of the pipe” solutions, rather finding opportunities to affect environmental interactions positively and proactively. Implementation of the EMS whether it fails or succeeds, will undoubtedly increase staff and management awareness of environmental issues.

One of the major stumbling blocks to using the EMS specification is the language in which it has been written. Unclear wording, that is open to broad and varied interpretations, poses problems for any organization implementing the standard. Not only does the organization struggle to elucidate the standard’s requirements (Appendix E), but then cannot be sure that its interpretations will match those of the external certification auditor, should the organization choose to become certified. The standard requires further clarification in a number of areas, and will be revisited in 1999 (Hart 1998a), at which time hopefully, some of these issues will be addressed and rectified, based on experiences to date. “Clarity and consistency in the standard’s definitions of various tools and strategies, and their order of preference, will make it easier for facilities to understand what they should be striving toward to improve their EMSs”(Barkett 1998).

The five core elements and respective sub-elements describe the environmental management system in terms of a PLAN - DO - CHECK - ACT strategy, while continually improving the system. The POLICY stage describes six requirements that must be included within the policy statement. One of the requirements is that a commitment is made to continual improvement of the system, and to prevention of pollution, which is defined in the standard as “use of processes, practices, materials or products that avoid, reduce or control pollution, which may include recycling, treatment, process changes, control mechanisms, efficient use of resources and material substitution. The phrase prevention of pollution as described in the standard includes “end of the pipe” solutions, which is different from pollution prevention, which in the United States has been defined as “source reduction” and has legal implications. A commitment to prevention of pollution is defined in the policy, and again in the objectives and targets, requiring them to be consistent with this commitment. The inclusion of a waste minimization hierarchy may help to elucidate the “commitment to prevention of pollution”.

The organization, within its policy, is required to commit to comply with relevant environmental legislation and other requirements. Surprisingly, an organization can be certified to ISO 14001 while not being in compliance with all the environmental legislation. This organization must only be able to demonstrate conformance to the system (commitment to comply) rather than compliance to relevant legislation. During an environmental certification audit, the auditor will verify that these commitments are fulfilled, in addition to the requirements of the standard. In the case of Manitoba Hydro,

“other requirements” refers to their Sustainable Development Principles, ECR, and all other programs, initiatives and commitments made.

The PLANNING stage requires that an organization’s environmental aspects over which it has control or influence are identified; environmental aspect being an “element of an organization’s activities, products or services that can interact with the environment”. It is required to determine which aspects have or can have a significant environmental impact; environmental impact defined as “any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization’s activities, products or services”. Clear definition or direction is very much absent from this section. “Significant” is not defined in the standard, and is only developed slightly further in ISO 14004. The standard does not address environmental impacts, rather it addresses environmental aspects, which are mentioned again in Annex A very briefly. No clear direction or clarification is given to these terms that are the nucleus around which the entire system is built.

The standard requires a procedure to “identify and have access to legal and other requirements” applicable to the environmental aspects (not only significant ones). A register is not obligatory as in EMAS or BS 7750, rather a process for identification and continuous flow of information is required. This product would in fact be a list of relevant legislation and other requirements.

When establishing environmental objectives and targets the organization has to “consider” legal and other requirements, significant environmental aspects, technological options, financial, operational and business requirements, and the views of interested parties. Without performance requirements, the word “consider” allows for the dismissal

of any environmental objectives and targets as long as they are justified. The programs implemented will ultimately depend on the level of commitment the organization has made, and has stated in its policy and pollution prevention strategies.

Unlike the concept of EVABAT in EMAS, best available technology where economically viable, is not required by ISO 14001, in order to avoid prescribing performance. The introduction does make reference to best available technology; “in order to achieve environmental objectives, the EMS should encourage organizations to “consider” implementation of the best available technology, where appropriate and where economically viable”. These are not requirements of the standard. Although this is repeated once again in Annex A, where EVABAT may be an option, “where economically viable, cost effective and judged appropriate by the organization”. The fact that EVABAT was mentioned a number of times, albeit not in the specification, but in the introduction and Annex, points to the compromises made by TC 207 between those that wanted to include it in the specification and those that thought it was too performance oriented (Baker 1998). The same can be said of many of the requirements that were part of the BS 7750 standard, that were incorporated into ISO 14001’s Annex. The use of “soft” words such as *appropriate*, and *consider* open opportunities for organizations to minimize the investments they make in the system so long as they substantiate their decisions.

IMPLEMENTATION AND OPERATION describes the necessary components required to implement the programs, which allow the system to function. Communication horizontally and vertically, awareness training for all employees, and specific continual education, for those whose activities may cause significant impacts, is essential to the

implementation phase. ISO 14001 doesn't require the organization to monitor contractors, Annex A only suggests that the organization "should require that contractors ...demonstrate that they have the requisite training".

The organization is required to "consider processes for external communication, on its significant environmental aspects and record its decision". Both EMAS and BS 7750 require that the organization publish registers of their significant environmental effects, while ISO does not. EMAS also requires an annual environmental statement to be published. External reporting is a proactive communication vehicle that demonstrates an organization's commitment to its policies, to the environment and to the public's concerns. ISO is considered to be weak in this area and it is also going to be revisited in 1999. A key factor behind EMAS' public disclosure, is that companies will be motivated to improve their environmental performance through public pressure. This can only occur if an organization is "transparent". Manitoba Hydro publishes a bi-annual Sustainable Development report, and is also required by its commitment to ECR to publish an annual report including environmental performance as measured by specific indicators.

Unlike BS 7750, an Environmental manual is not required by the ISO standard, but a short guide that contains the policies, objectives and targets, and roles and responsibilities, and provides direction to the core elements of the standard, may act as a "road map" for the system, without becoming a cumbersome document.

Essentially, ISO 14001 provides the elements, that are required in a systematic approach for managing environmental issues and commitments. For optimal system performance, the standard should be fully integrated into the existing management framework of the organization, and not as an add on. That is to say, that environmental

implications should be considered with other issues, every time an organization takes decisions.

ISO 14001 does not specify any performance requirements and as such has been criticized as being too weak. It can be applied to all types of organizations or portions of organizations worldwide, and in order, to be widely applicable, has been accused of applying the lowest common denominator for environmental protection. To illustrate the ISO 14001 EMS' intent, Joe Cascio, the Chairman of the US Technical Advisory Group in 1994, summed up the system by stating that he did not care "how much waste an ISO certified firm dumps into a river. What is important, is that the company's EMS knows it happened" (Gleckman 1997). This clearly reiterates that this standard measures conformance not performance and environmental aspects not impacts.

One of the requirements of EMAS, and a strong suggestion of BS7750, is to conduct an environmental review prior to EMS implementation. Though not a requirement of ISO 14001, it is suggested in Annex A, and further developed in ISO 14004. "An organization with no existing environmental management system should, initially establish its current position with regard to the environment by means of a review". Clearly understanding the organization's position prior to EMS development is essential to appropriately plan an organization's course of action. This should have been a prerequisite of the standard's EMS.

Although the standard is intended to be a flexible tool, which allows an organization to determine its own level of commitment to environmental performance, the lack of some instructions, clear direction, and terminology clarification tends to confuse matters, rather than simplify the issues.

A company that is certified under ISO 14001, can be certified with the EU's EMAS regulation, if the company can demonstrate to an accredited verifier that their EMS, audit procedures and public environmental statement meet EMAS' requirements. The Committee for European Standardization (CEN) has developed a bridging document, which identifies the areas that are not covered by ISO 14001, and that must be met in order to "bridge" the gaps. The organization is required to issue a public statement of its objectives and targets, establish a register of its significant environmental effects, and pledge to use best available technologies (Baker 1998).

7.2 Implementing ISO 14001 in Manitoba Hydro

As a member of the CEA, Manitoba Hydro adopted the Environmental Commitment and Responsibility (ECR) Program, and as a result has begun to implement an EMS consistent with ISO 14001. Developing and implementing an EMS for a large utility that is a Crown Corporation, can be a very daunting task, as was the experience of many other corporations (Diamond 1996). Comprised of four Business Units, that each includes numerous distinct divisions, operations and facilities, the challenge for Manitoba Hydro to implement a Corporate wide EMS can be at times overwhelming. ISO 14001's ambiguous language, associated with the absence of any specific "how to" instructions or clarification of anticipated final product, only magnifies the immense challenge that Manitoba Hydro is embarking on.

Realizing the magnitude of time and work required to effectively implement an EMS, Manitoba Hydro's top management established dedicated positions to this

important project, rather than adding on more responsibilities to existing positions. As the project progressed, it became more and more evident that for a corporation like Manitoba Hydro, this was the correct decision.

Developing, implementing and ensuring the system is fully integrated within the corporate management framework, requires that the team as a whole, possesses many specialized qualifications. Included are the need for strong communication skills, environmental knowledge with an understanding of current and future trends, an understanding of real and potential environmental impacts, management skills, quality management systems, and an understanding of relevant legal issues. In addition, the team must have access to any required personnel with specialized skills (internal or external consultants) that can contribute to the construction of the system. The importance of having coordinators that understand the corporate culture and can work within the system, is imperative to its success and acceptance, and therefore, relying only on external consultants, would not have been the right choice for Manitoba Hydro.

Although the system will undergo continual improvement, an initial stable, strong base on which to continue building is essential. This requires an initial significant investment of planning and preparation time by the EMS team. A well prepared EMS team can simplify and consistently explain the process to participating corporate employees and ensure that tasks are carried out as best as can be the first time. This, in turn would gain employees' trust and acceptance of the EMS and the team implementing it.

Since the ISO 14001 standard does not set environmental performance targets, the first and most critical step the organization has to take, is to define their level of

commitment to the environment and set specific environmental objectives. Manitoba Hydro has already developed and adopted thirteen Principles of Sustainable Development (Appendix D) that have far surpassed the minimal requirements of ISO 14001. The ISO standard requires Manitoba Hydro to meet these principles, and will verify this in the future should certification become an issue.

Manitoba Hydro's Vision is "to be recognized as the best utility in North America with respect to rates, reliability and customer satisfaction, and to be considerate of all people with whom we have contact". At present, this vision doesn't reflect Manitoba Hydro's commitment to the environment, therefore it is recommended by the author, that this statement should be updated for the year 2000, to include "considerate of all people and the environment". This statement would then exhibit Manitoba Hydro's commitment to the environment, which includes many good environmental programs, the implementation of an EMS, and a commitment to the ECR program. In addition to reflecting a commitment to the environment, the vision statement would, set the standard for the rest of the corporation and peers within the industry, while publicizing that which Manitoba Hydro is already doing.

Manitoba Hydro's Sustainable Development Principle addressing Waste Minimization, describes a hierarchy (guidance for decisions) for waste management that requires the organization to eliminate or reduce as the primary choice, followed by reuse and recycling, and finally disposal in an environmentally sound manner. This hierarchy which supports sustainable development is clearly missing from the standard. It should be reinforced during EMS development (in addition to the other principles) in order to grant employees some guidance when developing programs to fulfill their environmental

objectives and targets. It was my experience, that some Manitoba Hydro employees were not aware of the Sustainable Development Principles, or did not understand the Principles and their implications. Consequently this meant that the Principles were not guiding the decisions some employees were making, and as such, were not being applied routinely into their duties.

Defining aspects, significant impacts and subsequently significant aspects, although only one short paragraph within the standard, is the most difficult stage. This section does not begin to suggest the energy, patience and time needed to interpret, define, comprehend; plan and document; develop records, and record this sub-element of the specification. A Honda manufacturing plant in Ohio that recently earned ISO 14001 certification, also claimed that “this stage would never end”, (as was often heard at Manitoba Hydro too), noting that they (Honda) had examined 15 worksheets before deciding on the one that would work best for them (Parry 1998).

As a big integrated utility, Manitoba Hydro has plants located throughout the province of Manitoba. Each of these facilities have direct interactions with the environment and are developing and implementing LEMSs according to the ISO standard. However, it is extremely important to bear in mind that these facilities and the environment are also affected by decisions made by other divisions (Engineering, Power and Planning, etc.). These indirect environmental effects should also be considered at the initial stage of EMS development.

A common problem within large corporations, is that many initiatives are introduced, and employees quickly become bored or lose interest and are mainly concerned about the way it will impact their duties, even before it has started. This is

especially true for environmental issues, where some staff don't think they can impact or influence the environment, while others believe that all that can be done is already being done. Additionally, some believe that their primary responsibility does not include environmental issues. Initial employee "buy in" and sustaining interest, are some of the biggest challenges that Manitoba Hydro faces. Manitoba Hydro has top management commitment, that has supported this initiative fully from the start. The environmental policy that was developed bottom up, with employee input, has given employees a sense of ownership and commitment. The sentiment only becomes stronger as staff work together to build a system that they can take pride in, while realizing the importance of this initiative.

Prior to the decision to implement an ISO 14001 like EMS, employees that were directly affected by environmental legislation, licenses, or programs, were aware of their responsibilities of their position, and to the environment. A positive consequence of ISO 14001, is that awareness training for all those developing their EMS, has caused employees to consider how their actions may impact the environment. While examining their activities, products and services, employees that prior to this initiative, had no reason (in their minds) to consider the environment, also began to re-evaluate their roles and interactions with the environment. Environmental roles and responsibilities must become part of every employee's job description, and continual education at all levels is required to maintain the system. Verification of education is also an integral component of success.

The need for good, consistent and constant communication for an effective system cannot be overstated. This became especially evident during the identification of

significant aspects stage. Employees were reliant upon consistent, repeatable and explicit communication to guide and reinforce their understanding, and subsequent decisions, during the development process. Under already challenging circumstances, confusion quickly ensued when instructions and/or terminology were inconsistent. Messages often differed because of personal communication styles, thus reinforcing the need for a singular message.

Manitoba Hydro publishes a publicly available bi-annual Sustainable Development report describing energy, environmental, water, land air, waste and controlled products and how the Manitoba Hydro's Principles Of Sustainable Development were implemented. In addition, as a requirement of the ECR program, Manitoba Hydro along with the other utilities will publish results of specified environmental indicators used to monitor and measure environmental performance. These activities already comply with the suggestions of the standard and surpass its requirements.

Care should be taken during the crucial, initial planning stage not to turn the EMS implementation process into an exercise in documentation. This could lead to a bureaucratic exercise that would not contribute to continual improvement of environmental performance, rather it will act to simply keep administration busy (Wilson 1997). The EMSs' ultimate effectiveness and survival depend upon its full integration into the organization's management structure and its implementation tied to financial accountability. Integrating the EMS with business practices allows the organization to set practical and feasible goals which are achievable.

An ISO 14001 based EMS may have certain benefits for Manitoba Hydro. First, it offers a systematic, all encompassing, integrated management system for environmental issues, which through a continual, self-examining process should bring the corporation closer to achieving its environmental goals. Depending on the essence of its goals and objectives, this EMS can lead to an improvement in Manitoba Hydro's environmental performance. Another benefit is the increased environmental awareness of management and staff, that is gained through the process of identifying aspects/impacts of their activities. The company's public perception may also be improved.

The EMS may improve on some business aspects, such as cost saving through source reduction and increased efficiency (Baker et al; 1998), and even by being preferred by organizations that require their contractors to have EMSs (Tibor 1998). Although not currently applicable in Canada, another example of the potential benefits associated with the implementation of an EMS was demonstrated when the John Roberts Company in Minneapolis (Parry 1998b), had their premiums for pollution event insurance reduced, because they implemented an EMS.

An established EMS is increasingly being viewed by the courts as an essential component of proper management and due diligence. That was demonstrated in the case of Prospec Chemicals Ltd., of Alberta, which was instructed by the court, as part of their sentence in a pollution case, to establish an ISO 14001 certified EMS by June 1998 (Saxe 1996). In two other court cases in the USA, General Motors was instructed to certify one of its facilities to ISO 14001, in turn for a reduced penalty, and ASARCO Inc. was instructed to implement an EMS, in 38 facilities across seven states, in addition to a \$6.4 million fine (Hart 1998). However, although having an EMS is desirable in order to

establish a defense of due diligence, it does not ensure it. Proper implementation and risk assessment are also required, as was demonstrated in the case of R. vs. Northwood Pulp and Timber Ltd. in British Columbia. In spite of the fact that the kraft pulp mill had an excellent EMS, lack of adherence to procedures led to a toxic release, and the company was found liable (Green 1998).

ISO specifically states in the introduction that it is “not intended to address, and does not include requirements for, aspects of occupational health and safety (OH&S) management; however it does not seek to discourage an organization from developing integration of such management system elements”. Though not a requirement of the standard, during development of Manitoba Hydro’s EMS, an opportunity to develop a systematic approach to OH&S management was identified. Numerous human health impacts emerged from the environmental aspect evaluation exercise, suggesting potential for the integration of systems.

A last issue that Manitoba Hydro has to consider is whether to certify/register the EMSs to ISO 14001. Certification is not required by the standard or the ECR program, it is a costly venture and its benefits are not certain. However, the certification process, which includes a thorough audit, compels the organization to ensure proper implementation. It also provides tangible independent evidence of the quality of the EMS. In the future, certification may be required, or at least be preferred, as has already been demonstrated in the marketplace. One additional factor that the author observed, was that when employees thought that certification was the goal, the initiative was taken very seriously.

Manitoba Hydro elected to develop an EMS, for each Business Unit, comprised of cumulative LEMSs, and may take one of two approaches, if it decides to proceed with certification. Individual site certification would allow gradual certification of units as soon as their LEMSs are implemented, without depending on the progress of other units. This would allow for the immediate demonstration of Manitoba Hydro's commitment to the environment. However, individual site registrations would probably result in less cohesiveness between the systems. It may also be more expensive, than registering the four Business Units, unless not all sites are to be certified. This in fact is another option, since certification is not required by ECR, only the implementation of an ISO like EMS. That allows Manitoba Hydro to certify its generating sites or those linked to exportation initially.

Certifying each of the Business Units, although more complicated, would be in the long run, less costly and would ensure an overall better corporate wide system cohesiveness. It is therefore suggested that Manitoba Hydro certifies each of its Business Units, while considering an early phase certifying specific sites, in response to market forces and Manitoba Hydro's position within the electric utility industry. As electric utilities nation-wide are completing the development and implementation of their EMSs, many are contemplating certification and the associated high costs. Some utilities have begun to explore Manitoba Hydro's EMS/LEMS framework as an alternative solution to multiple site certification (Windsor 1999).

As a leader in Manitoba's community, and within the electric utility industry, Manitoba Hydro is in a position to set a high environmental standard of conduct and responsibility for its employees, customers, interested parties and peers. Implementing an

EMS is no longer a moral choice, it is the right thing to do (Brennan, 1998) given today's competitive global market.

7.3 Evaluation Of Environmental Management Software

In October 1997, Ernst and Young published a benchmark study conducted for BC Hydro, entitled "Profiling Environmental Management in the Electric Utility Industry". One of the issues that was examined, was the implementation of a computer based management information system as a "tool to manage large amounts of environmental information and communications between various functions on environmental programs" (Ernst & Young 1997). The study included thirty utilities; nine Canadian, thirteen U.S., five European, and one utility from each of the following countries, Australia, New Zealand and South Africa, later referred to as ANZSA. Within the survey, the Canadian and U.S. utilities that participated were the most comparable in their responses, while the responses of the remaining utilities, were more varied.

Meeting the challenges of an EMS, requires the effective and efficient management of a great deal of environmental information. This includes operating procedures, records, and documents, and clear and consistent communication vertically and horizontally, within the organization. The results of the survey indicate, that over seventy percent of the participating utilities have implemented or will implement a computer based Environmental Management Information System (EMIS). More specifically, all Canadian utilities, and two thirds of the U.S. utilities and ANZSA responded that, they already have or intend to implement a computer based management

system. Of the European companies surveyed, 60% of the participants indicated that there was no intent to implement an EMIS.

As the decision to implement a computer based information management system within companies gains popularity, so do the numerous software options available to companies. In the above mentioned study, it was observed that solutions developed within the respective company, were preferred over prefabricated software purchases. For those companies, that had made a commitment to an EMIS, it was found that 58% preferred an in-house option, while only 5% purchased a system. It was also observed, that 21% of companies were using a combination of both an in-house product and a prefabricated purchased software system. The remainder of companies at the time of the survey had not decided which system would be implemented within their organization.

Although the results indicate, that in-house developed solutions were preferred over the prefabricated software solutions such as the Caribou system, SPS Ecovision, ICF Kaiser's ISO 14000 Workstation and SAP (which were selected by some of the utilities). It is possible that the relatively smaller utilities found these packages more feasible both financially and with respect to dedicating staff, and sufficient for their needs. Another possibility may be, that a commitment was made by some utilities to utilize software, and a prefab was simpler and more inexpensive initially, and only with use and experience would the total requirements of the systems' capability come to light. Whether an organization opts for an additional in-house solution, or another prefab software to cover extra functions, or not to use a computer based management system at all, will only be determined with experience and time. The in-house solutions were based on several

platforms which include Excel, Intranets, Lotus Notes, Access, and Wide Area Networks (WANs).

Finally, the participating utilities were presented with a number of management functions such as record keeping, policies, procedures and regulations, scheduling, event tracking, hazardous waste tracking, environmental monitoring data, management reporting, audit planning and execution, and a category of other. They were asked to define which of these functions would be computerized, and which would be undertaken manually. Once again, the North American utilities and ANZSA tended to computerize more of their management functions, than their European peers, which preferred to use more manual management processes. Most of the environmental management functions had been computerized, except for audit planning and execution, event tracking and management reporting (Ernst & Young 1997).

The discrepancies between European and North American and/or ANZSA utilities may be attributed to the fact that the European utilities have had more experience with EMSs, than North American or ANZSA utilities, and have been able to determine the worth of an EMIS based on experience. It may also be, that today's software options are better than those that were available previously.

Manitoba Hydro selected the ICF Kaiser ISO 14000 Workstation, to ascertain whether this software package would suit the needs of this Provincial Crown Corporation. The product was marketed to Manitoba Hydro as a development and implementation tool. ICF Kaiser suggested, that for optimal application, their consultation would be advised. Manitoba Hydro opted to employ their services for an initial pilot run of the assessment /gap analysis tool only, and chose to use local consultants for the EMS development.

The eighty-eight questions which comprise the gap analysis, directly reflect the language of ISO 14001, which was one of the reasons it was selected by Manitoba Hydro. The success of completing the questionnaire was found to be directly related to the individual asking the questions and his/her ability to interpret the standard's unclear language.

Selecting and printing out the questions for the assessment is not a direct process. The assessment must be carried out manually, at which time scores and or information are documented. Following an assessment, the data must be entered back to the software. Using the electronic gap analysis tool, was no different than the numerous hard copy checklists that are available on the market today. In fact, some of the latter are less time consuming. The assessment score evaluations are too generalized to contribute to an action plan for conformance. As mentioned earlier, the report which was generated by the software representatives was produced using MS word, and that the reports module within the software, cannot produce the data contained in their report.

In general the software was found to be a tool limited to document management. It offered no aid during the development stage, i.e. interpretations, sample worksheets, examples etc. The software allows for data to be imported, so that information that has been developed prior to now in Manitoba Hydro can be entered into the database in its original form. As with any database, ICF 14000 Workstation, can be a useful tool in maintaining documentation and records and with tracking programs, target dates, responsibilities, etc. In the implementation module, the significance key word list is predetermined and could not be modified to reflect the specific needs of this corporation,

although qualifying comments can be added. It does not offer direct access to environmental legislation CDs, which is offered by a number of other software packages.

As with every new piece of software, a learning period is required in order to establish a level of comfort. The ICF Kaiser software was found not to be intuitive, regardless of the Lotus Notes platform it uses. The minimal training provided by the company was unclear, and technical assistance from the Canadian office in Toronto was often not available. It was also found that experiencing the development and implementation of an EMS is needed to gain understanding of the software. In order for the software to be useful, it must be available across the corporation, which would require training. Considerations would have to be made as to who can edit documents, and who can read only.

Finally, it is ironic that an environmental management software is very wasteful, when it comes to paper use. During questions print out, an additional blank page was always printed with ICF Kaiser's logo, while 25% of the first page also was reserved for this logo.

Although JD Phyper has identified the requirements of an EMS software package (Phyper 1997), these are only the basic minimum requirements, since several software packages on the market today offer additional features. Since every organization has different needs, different EMSs and a different corporate culture, it is hard to imagine that a generic software would fit these unique specifications. Northern Telecom (www.nortel), having had a number of years of experience with EMSs and EMS software, recently opted to replace the software they were using, with a custom modification developed by Caribou. This was also reflected in the Ernst & Young report, whereby companies with

some EMS experience opted for an internal modification of the software they were using. It is foreseeable that after a few years of experiencing this software and establishing the EMS, Manitoba Hydro will be able to better define its needs from an EMS software, and would probably have one custom made to better suit their purposes.

8. CONCLUSIONS AND RECOMMENDATIONS

The aim of this project was to study the effects of applying, or conforming an EMS to the ISO 14001 International Environmental Management System Standard in general, and more specifically, to Manitoba Hydro. An analysis of the standard's components and their relevance to Manitoba Hydro was conducted, and an EMS software was evaluated to determine its usefulness for the corporation.

8.1 Conclusions

The ISO 14001 EMS specification can be used to effectively manage environmental responsibilities and commitments if it is fully integrated and properly implemented into an organization's business plan. The inherent cycle of continual improvement should lead an organization to constantly improve achievement of its self-set environmental goals.

The standard does not define any environmental performance goals, and does not require an organization to comply with any legislation, only a "commitment to comply" with the process is required. The standard's language is ambiguous, which may give rise to different interpretations and complicate implementation. It may be difficult for smaller organizations to implement it due to the potential financial and human resource commitments required.

Implementing an EMS consistent with ISO 14001 to a corporation such as Manitoba Hydro, may have other benefits in addition to providing a good management tool for environmental issues. Financial gains through source reduction, waste minimization and improved efficiency, as well as enhanced environmental performance,

increased environmental awareness for management and staff, improved public relations, and support for a defense of due diligence are all anticipated benefits.

Successful EMS implementation and continued maintenance in Manitoba Hydro must have visible commitment of top management, full integration into the corporate business plan and a dedicated EMS team. Employees' awareness, continual education and input that is encouraged and promptly responded to, are also a must in order to ensure a sense of ownership and active participation. The public and other interested parties' input must be considered, in order to shape and continually improve the environmental management system. An effective EMS can only be built through full cooperation between all levels of the organization, and not through command and control or the adoption of a prefabricated, disconnected system developed outside the specific corporate culture.

Although the ISO EMS standard has a number of weaknesses, and implementing an ISO 14000 like EMS is a large investment both financially and of human resources, its benefits far outweigh its costs. Doing business in today's global market requires an organization to commit to sustainable business practices. The weaknesses of the ISO EMS standard are compensated by other commitments that Manitoba Hydro has already made (Sustainable Development Principles, ECR Program requirements, bi-annual Sustainable Development reports). Most importantly, the staff at Manitoba Hydro is committed to this process, and has the capability of driving the level of environmental performance increasingly higher.

Although the certification process is not required by the standard or the ECR Program, and is a costly venture, it is concluded to be beneficial to Manitoba Hydro, due

to benefits comparable to those associated with implementing an EMS. It compels the corporation to ensure proper implementation, increases employees' participation and may have potential future business benefits.

The ICF Kaiser ISO 14000 Workstation software was found to have a limited applicability for Manitoba Hydro. It is a document management tool, which can be used for implementation and maintenance of the system. It contains no instruction or direction for the development process. i.e. interpretations, worksheets etc. Its usefulness on the corporate wide intranet will be limited since it is not a user friendly product.

In addition to the above capabilities, an effective electronic system should allow all employees access to Manitoba Hydro's environmental policies, initiatives, updated accomplishments, and how it affects employees and their work sites. This will increase awareness and ownership, and also allow employees an understanding of what they can anticipate during development and implementation of their LEMS. It is foreseeable that based on knowledge gained from experience with its EMS, Manitoba Hydro will be able to define its specific needs, and will develop a custom designed electronic system.

8.2 Recommendations

Based on the above study and my experience in Manitoba Hydro, I offer the following recommendations:

- Manitoba Hydro's Corporate Vision should be updated for the year 2000, to include "considerate of all people and the environment", thus visibly reflecting Manitoba Hydro's environmental commitment.

- Manitoba Hydro should continue the EMS implementation process.
- If Manitoba Hydro decides on certification, it should certify each of its Business Units, while considering an early phase certifying specific sites, in response to market forces and Manitoba Hydro's position within the electric utility industry.
- Establish an electronic management system that can be accessed by all employees on the intranet as a vehicle of continuing communication. The system should be designed by staff that understand the EMS, its requirements, and other software products that address the specific requirements of Manitoba Hydro.

REFERENCES

- Baker M.B. and M. McKiel** (1998). ISO 14000 Questions and Answers. 4th ed. CEEM Information Services, Fairfax, Virginia USA
- Barkett, B.** (1998). Understanding the differences between prevention of pollution and P2. International Environmental Systems Update, vol. 5, no. 11, November, pp. 14-15.
- Bisson D.** (1995). ISO 14000: What Is It and Why was It Developed. Canadian Environmental Auditing Association Annual Meeting, October 26-27, 1995, Toronto, Ontario, Canada. pp.26-34
- Brennan, R.B.** (1998). Personal communication. President and CEO, Manitoba Hydro.
- Brophy M.** (1996). Environmental guidelines and charters. The Standardization of Environmental Management Systems. Welford R. Corporate Environmental Management Systems and Strategies. Earthscan Publications Ltd., London, England. pp.105-117
- Camplong, C.** (1998) Personal communication. Camplong and Associates Inc.
- Canadian Chemical Producers Association (CCPA).** (1996). Responsible Care: A Total Commitment (Brochure).
- Canadian Electricity Association (CEA).** (1998). The Environmental Commitment and Responsibility Program (Brochure).
- Canadian Standards Association (CSA)** (1995). Introduction to Environmental Management.
- Cascio, J., Woodside, G. and P. Mitchell** (1996). ISO 14000 Guide: The New International environmental Management Standards. McGraw -Hill, USA.
- Diamond, C.** (1996). Environmental Management System Demonstration Project Final Report, NSF International , Ann Arbor, Michigan.
- EMAS Regulation** (1993). Community Eco-Management and Audit Scheme. Council Regulation (EEC) No 1836/93 of 29 June 1993.
- Ernst and Young.** (1997). Profiling Environmental Management In the Electric Utility Industry.

- Gleckman, H. and R. Krut (1997).** Neither international nor standard: the limits of ISO 14001 as an instrument of global corporate environmental management. ISO 14000 and Beyond: Environmental Management Systems in the Real World, Greenleaf Publishing, Sheffield, England, pp. 45-60.
- Global Environmental Management Initiative (GEMI).** (1996). ISO 14001 Environmental Management System Self-Assessment Checklist. Washington D.C., USA.
- Global Environmental Management Initiative (GEMI).** (1999). www.gemi.org
- Green, P.E.J.** (1998). A new due diligence precedent for EMS. Hazardous Materials Management, October/November, p. 20.
- Hart, J.** (1998a). ISO 14001 Global certification chart. International Environmental Systems Update, vol. 5, no. 9, September, pp. cc-ee.
- Hart, J.** (1998b). ISO document status. International Environmental Systems Update, vol. 5, no. 10, October, p.19.
- Hart, J.** (1998c). GM turns penalties into positives. International Environmental Systems Update, vol. 5, no. 11, November, pp. 4-9.
- Ibbotson B.** (1996). Introduction. Ibbotson B. and Phyper J, eds., Environmental Management in Canada, McGraw-Hill Ryerson, Toronto, Ontario, Canada. p.2
- International Institute for Sustainable Development (IISD).** (1998). Strategic Planning Toolbox. <http://iisd1.iisd.ca>
- International Organization for Standardization** (1996a). ISO 14001: Environmental Management Systems - Specification with Guidance for Use. Geneva, Switzerland.
- International Organization for Standardization** (1996b). ISO 14004: Environmental Management Systems - General Guidelines on Principles, Systems and Supporting Techniques. Geneva, Switzerland.
- International Organization for Standardization** (1996c). ISO 14010: Guidelines for Environmental Auditing - General Principles. Geneva, Switzerland.
- Manitoba Hydro** (1998). Sustainable Development Report. 3rd edition. 1996 & 97.
- Northern Telecom** (1998). www.nortel.com/cool/environ/home.html

- Parry, P.** (1998). Ohio manufacturing plant sets pace for Honda. *International Environmental Systems Update*, vol. 5, no. 10, October, pp. 12-13.
- Parry, P.** (1998b). Insurance company takes surprising action. *International Environmental Systems Update*, vol. 5, no. 7, July, pp. 15-16.
- Phyper J.D. and B. Ibbotson** (1996). Non Government Organizations. Ibbotson B. and Phyper J, eds., *Environmental Management in Canada*, McGraw-Hill Ryerson, Toronto, Ontario, Canada. pp.135-153
- Phyper, J.D.** (1997). Does software ensure conformance with ISO 14001? *Hazardous Materials Management*, October/November, pp. 28-30.
- Puri S.C.** (1996). *Stepping Up to ISO 14000*. Productivity Press, Portland, OR. USA. pp.77-105
- Saxe, D.** (1996). Voluntary compliance mechanisms. *Hazardous Materials Management*, April/May, p. 86.
- Starkey R.** (1996). *The Standardization of Environmental Management Systems*. Welford R. *Corporate Environmental Management Systems and Strategies*. Earthscan Publications Ltd., London, England. pp. 59-91
- Tibor T. and I. Feldman** (1996). *ISO 14000: A Guide to The New Environmental Management Standards*. Times Mirror Inc., USA. pp.77-91
- United Nations Environmental Program (UNEP).** (1995). *Environmental Management System Training Resource Kit*. The Hague, Netherlands. pp.1-5
- Von Zharen W.M.** (1996). *ISO 14000 Understanding The Environmental Standards*. Government Institutes, Inc., Rockville, Maryland USA.
- Wilson, R.C.** (1997). Taking steps to avoid implementation pitfalls. *Pollution Engineering*, November , pp. 43-45.
- Windsor, D.** (1999). Personal communication. Senior Manager Environmental Protection, Manitoba Hydro.

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APPENDIX A

The CERES Principles

Introduction

By adopting these Principles, we publicly affirm our belief that corporations have a responsibility for the environment, and must conduct all aspects of their business as responsible stewards of the environment by operating in a manner that protects the Earth. We believe that corporations must not compromise the ability of future generations to sustain themselves.

We will update our practices constantly in light of advances in technology and new understandings in health and environmental science. In collaboration with CERES, we will promote a dynamic process to ensure that the Principles are interpreted in a way that accommodates changing technologies and environmental realities. We intend to make consistent, measurable progress in implementing these Principles and to apply them to all aspects of our operations throughout the world.

1. Protection of the Biosphere

We will reduce and make continual progress toward eliminating the release of any substance that may cause environmental damage to the air, water, or the earth or its inhabitants. We will safeguard all habitats affected by our operations and will protect open spaces and wilderness, while preserving biodiversity.

2. Sustainable Use of Natural Resources

We will make sustainable use of renewable natural resources, such as water, soils and forests. We will conserve nonrenewable natural resources through efficient use and careful planning.

3. Reduction and Disposal of Wastes

We will reduce and where possible eliminate waste through source reduction and recycling. All waste will be handled and disposed of through safe and responsible methods.

4. Energy Conservation

We will conserve energy and improve the energy efficiency of our internal operations and of the goods and services we sell. We will make every effort to use environmentally safe and sustainable energy sources.

5. Risk Reduction

We will strive to minimize the environmental, health and safety risks to our employees and the communities in which we operate through safe technologies, facilities and operating procedures, and by being prepared for emergencies.

6. Safe Products and Services

We will reduce and where possible eliminate the use, manufacture or sale of products and services that cause environmental damage or health or safety hazards. We will inform our customers of the environmental impacts of our products or services and try to correct unsafe use.

7. Environmental Restoration

We will promptly and responsibly correct conditions we have caused that endanger health, safety or the environment. To the extent feasible, we will redress injuries we have caused to persons or damage we have caused to the environment and will restore the environment.

8. Informing the Public

We will inform in a timely manner everyone who may be affected by conditions caused by our company that might endanger health, safety or the environment. We will regularly seek advice and counsel through dialogue with persons in communities near our facilities. We will not take any action against employees for reporting dangerous incidents or conditions to management or to appropriate authorities.

9. Management Commitment

We will implement these Principles and sustain a process that ensures that the Board of Directors and Chief Executive Officer are fully informed about pertinent environmental issues and are fully responsible for environmental policy. In selecting our Board of Directors, we will consider demonstrated environmental commitment as a factor.

10. Audits and Reports

We will conduct an annual self-evaluation of our progress in implementing these Principles. We will support the timely creation of generally accepted environmental audit procedures. We will annually complete the CERES Report, which will be made available to the public.

Disclaimer

These Principles established an ethic with criteria by which investors and others can assess the environmental performance of companies. Companies that endorse these Principles pledge to go voluntarily beyond the requirements of the law. The terms may and might in Principles one and eight are not meant to encompass every imaginable consequence, no matter how remote. Rather, these Principles obligate endorsers to behave as prudent persons who are not governed by conflicting interests and who possess a strong commitment to environmental excellence and to human health and safety. These Principles are not intended to create new legal liabilities, expand existing rights or obligations, waive legal defenses, or otherwise affect the legal position of any endorsing company, and are not intended to be used against an endorser in any legal proceedings for any purpose.

APPENDIX B

ICC Charter Principles

1. Corporate priority

To recognize environmental management as among the highest corporate priorities and as a key determinant to sustainable development; to establish policies, programmes and practices for conducting operations in an environmentally sound manner.

2. Integrated management

To integrate these policies, programmes and practices fully into each business as an essential element of management in all its functions.

3. Process of improvement

To continue to improve corporate policies, programmes and environmental performance, taking into account technical developments, scientific understanding, consumer needs and community expectations, with legal regulations as a starting point, and to apply the same environmental criteria internationally.

4. Employee education

To educate, train and motivate employees to conduct their activities in an environmentally responsible manner

5. Prior assessment

To assess environmental impacts before starting a new activity or project and before decommissioning a facility or leaving a site.

6. Products and services

To develop and provide products or services that have no undue environmental impact and are safe in their intended use, that are efficient in their consumption of energy and natural resources, and that can be recycled, reused, or disposed of safely.

7. Customer advice

To advise, and where relevant, educate customers, distributors and the public in the safe use, transportation, storage and disposal of products provided and to apply similar considerations to the provision of services.

8. Facilities and operations

To develop, design and operate facilities and conduct activities taking into consideration the efficient use of energy and materials, the sustainable use of renewable resources, the minimization of adverse environmental impacts of waste generation, and the safe and responsible disposal of residual wastes.

9. Research

To conduct or support research on the environmental impacts of raw materials, products, processes, emissions and wastes associated with the enterprise and on the means of minimizing such adverse impacts.

10. Precautionary approach

To modify the manufacture, marketing or use of products or services or the conduct of activities, consistent with scientific and technical understanding, to prevent serious or irreversible environmental degradation.

11. Contractors and suppliers

To promote the adoption of these principles by contractors acting on behalf of the enterprise, encouraging and, where appropriate, require improvements in their practices to make them consistent with those of the enterprise; and to encourage the wider adoption of these principles by suppliers.

12. Emergency preparedness

To develop and maintain, where significant hazards exist, emergency preparedness plans in conjunction with emergency services, relevant authorities and the local community, recognizing potential transboundary impacts

13. Transfer of technology

To contribute to the transfer of environmentally sound technology and management methods throughout the industrial and public sectors.

14. Contributing to the common effort

To contribute to the development of public policy and to business, governmental and intergovernmental programs and educational initiatives that will enhance environmental awareness and protection.

15. Openness to concerns

To foster openness and dialogue with employees and the public, anticipating and responding to their concerns about the potential hazards and impact of operations, products, wastes or services, including those of transboundary or global significance.

16. Compliance and reporting

To measure environmental performance; to conduct regular environmental audits and assessment of compliance with company requirements, legal requirements and these principles; and periodically to provide appropriate information to the Board of Directors, shareholders, employees, the authorities and the public.

APPENDIX C



Assessment

Manitoba Hydro - Generation South Brandon, Manitoba

4.3.1 Environmental Aspects

Score

- a. Procedure established and is maintained to identify the environmental aspects of its activities (for purpose of identifying significant impacts)? ●

0 - Not initiated

Create Action→

-
- b. Procedure established and is maintained to identify the environmental aspects of its products (for purpose of identifying significant impacts)? ●

0 - Not initiated

Create Action→

-
- c. Procedure established and is maintained to identify the environmental aspects of its services (for purpose of identifying significant impacts)? ●

0 - Not initiated

Create Action→

-
- d. Organization ensures that the significant environmental impacts identified above are considered in setting environmental objectives? ●

1 - Under development
Create Action→

Subtotal: 1

Rating (Subtotal/16 * 100%): 6.25

Comments:

Author: Orly Loves/MANHYD
Composed: 07/02/98 04:16:21 PM

APPENDIX D

Manitoba Hydro's Principles of Sustainable Development

Stewardship of the Economy and the Environment

- Recognize our responsibility as a caretaker of the economy and the environment for the benefit of present and future generations of Manitobans.

Shared Responsibility

- Ensure that Manitoba Hydro's employees, contractors and agents are aware of our sustainable development policies and guiding principles and encourage them to act accordingly.
- Encourage the Corporation's employees to share their knowledge of the concepts and practical applications of sustainable development.

Integration of Environmental and Economic Decisions

- Treat technical, economic and environmental factors on the same basis in all corporate decisions, from initial planning to construction to operations to decommissioning and disposal. To the extent practical, include environmental costs in economic and financial analysis.

Economic Enhancement

- Enhance the productive capability and quality of Manitoba's economy and the well-being of Manitobans by providing reliable electrical services at competitive rates.

Efficient Use of Resources

- Encourage the development and application of programs and pricing mechanisms for efficient and economic use of electricity by our customers. As well, efficient and economic use of energy and materials will be encouraged throughout all our operations.

Prevention and Remedy

- To the extent practical, anticipate and prevent adverse environmental and economic effects that may be caused by corporate poli-

cies, programs, projects and decisions rather than reacting to and remedying such effects after they have occurred.

- Purchase, where practical, environmentally sound products taking into account the lifecycle of the products.
- Address adverse environmental effects of corporate activities that cannot be prevented by:

- first, endeavouring, wherever feasible, to restore the environment to pre-development conditions or developing other beneficial uses through rehabilitation and reclamation.

- second, striving to replace the loss with substitutes that would enhance the environment and/or associated resource uses while offsetting the type of damage experienced.

- third, making monetary payments for compensable damages on a fair, equitable and timely basis.

Conservation

- To the extent practical, plan, design, build, operate, maintain and decommission corporate facilities in a manner that protects essential ecological processes and biological diversity.
- Give preference, where practical, to projects and operating decisions that use renewable resources or that extend the life of supplies of non-renewable resources.

Waste Minimization

- Manage all wastes arising from corporate activities by:
- first, endeavouring to eliminate or reduce the amount generated.
- second, striving to fully utilize reuse and recycling opportunities.
- third, disposing of remaining waste in an environmentally sound manner.

Access to Adequate Information

- Share relevant information on a timely basis with employees, interested people and governments to promote a greater understanding of Manitoba Hydro's current and planned business activities and to identify impacts associated with the Corporation's plans and operations.

Public Participation

- Provide opportunities for input by potentially affected and interested parties when evaluating development and program alternatives and before deciding on a final course of action.

Understanding and Respect

- Strive to understand and respect differing social and economic views, values, traditions and aspirations when deciding upon or taking action.
- Give preference to those alternatives which best fulfil corporate objectives while minimizing infringement on the ability, rights and interests of others to pursue their aspirations.

Scientific and Technological Innovation

- Research, develop, test and implement technologies, practices and institutions that will make electrical supply and services more efficient, economic and environmentally sound.

Global Responsibility

- Recognize there are no political and jurisdictional boundaries to our environment, and that there is ecological interdependence among provinces and nations.
- Consider environmental effects that occur outside of Manitoba when planning and deciding on new developments and major modifications to facilities and to methods of operation.

APPENDIX E

Example of ISO 14001's ambiguous language and translation into lay terms of ICF Kaiser's Gap Analysis questions:

1. ISO 14001, section 4.3.1 Environmental Aspects

"The organization shall establish and maintain (a) procedure (s) to identify the environmental aspects of its activities, products or services that it can control and over which it can be expected to have influence, in order to determine those which have or can have significant impacts on the environment. The organization shall ensure that the aspects related to these significant impacts are considered in setting its environmental objectives".

1. ICF Kaiser Gap Analysis Questions Regarding Environmental Aspects

- a. Procedure established and is maintained to identify the environmental aspects of its activities (for purpose of identifying significant impacts)?
- b. Procedure established and is maintained to identify the environmental aspects of its products (for purpose of identifying significant impacts)?
- c. Procedure established and is maintained to identify the environmental aspects of its services (for purpose of identifying significant impacts)?
- d. Organization ensures that the significant environmental impacts identified above are considered in setting environmental objectives?

3. Gap Analysis Questions Translated Into Lay Terms

Environmental Aspect, Impact and Significance must first be introduced in lay terms.

- a. Have you identified the activities you perform, decisions you make, services you provide or products you supply that affect the environment?
- b. Does a procedure exist for identifying aspects (your interactions with the environment)?
- c. How is it used?
- d. When was it established?
- e. Is it documented?
- f. Do you know the environmental impacts of your activities, decisions, products or services?
- g. Does a procedure exist for identifying impacts?
- h. When and how often do you use it?
- i. Is it documented?
- j. Do you distinguish between environmental impacts of your operations that are significant and therefore deserve attention and those that are not significant, thus not requiring attention?
- k. Does a procedure exist for determining significance?
- l. How often do you use it?
- m. When was it established?
- n. Is it documented?