Motivations, Enablers and Barriers to Conservation and Demand Management Activities of Industrial, Commercial and Institutional Organizations: A Milton, Ontario (Canada) Case Study

by

Stephen Mooney

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AUTHOR'S DECLARATION

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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Stephen Mooney

Abstract

In 2009, Ontario's electricity system is in the midst of redevelopment to be sustainable, competitive and reliable. To advance this goal, conservation and demand management (CDM) is a key part of the plan. For CDM plans to be successful, it is necessary to understand why organizations undertake CDM activities. This thesis presents a case study, from 2001 to 2006, investigating organizations' motivations, enablers and barriers associated with conservation, efficiency and demand response activities. Participants included general service customers with loads greater than 50 kW in Milton, Ontario (Canada). Interviews with representatives from 17 organizations included industrial, commercial and institutional customers. Observations at Milton Hydro Energy Drill Program events, analyses of participants' electricity usage data, and investigations of the participants' public profiles were included in the case study. All participants reported undertaking at least one CDM activity. The primary motivation was financial benefit. Customer satisfaction was also an important motivator for some participants. Adhering to business policies and objectives and environmental benefit were complimentary to these main motivations. The Energy Drill Program, in some cases, led to increased conservation and efficiency by encouraging a focus on internal systems and practices as well as by providing an opportunity for businesses to save on operating costs while benefiting from an associated positive public image. The commercial and industrial participants were interested in CDM activities as long as they fit within their business financial management requirements and/or contributed to their business's competitiveness through improved image or otherwise. The social and/or environmental benefits were seen as complimentary, yet not enough to drive the activities on their own. Most of the institutional participants emphasized the community contribution as an enabler of their participation in the demand response program, however, two of the four such participants did not appear to participate in the program on a regular basis, based on the program impact reports. This incongruity between reported and actual behaviour in this sector may be an interesting area for further research. The barriers reported were for known opportunities and these included the inadequate and uncertain financial benefits, technological uncertainty, and, particularly for the small to medium sized businesses, the limited capacity to further investigate and pursue opportunities. Future research could investigate each sector and/or CDM activity sub-category independently for more specific insights.

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Dedication

To the many who provided support and showed patience throughout this great personal learning experience as well as to those who will hopefully learn from and build on this work to advance understanding and ultimately solutions.

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Chapter 1: Introduction

Ontario's electricity system has received much attention due to a number of issues including the eastern-North American blackout of 2003, the projected provincial supply and demand challenges and the intention by the provincial government to eliminate coal powered generators from the supply mix. As is the case with many electricity systems throughout the world, Ontario is currently planning a future electricity system that is sustainable, competitive and reliable. The impetus for such planning is to replace aging infrastructure, mitigate high system prices, improve short and long term system reliability as well as to reduce both local and global pollutants from the generation assets. As all electricity supply options have physical limits, electricity conservation and demand management (CDM), defined in section 1.1.1, is seen as a key element of this plan. For these reasons, CDM is considered as a step towards a sustainable society. The potential contributions of CDM to sustainability are outlined further in section 1.2.

For CDM to be successful, however, a wide range of electricity consumers, including medium- and large-scale organizations, must be encouraged to take action. It is therefore necessary to understand how such organizations can be encouraged to take CDM actions. As medium to large industrial, commercial and institutional consumers are responsible for over 60% of all electricity consumption in Ontario[1] they are an important group to consider with respect to CDM involvement. Though there have been a number of experiences with CDM in the past and in various locations around the world, there has been minimal recent academic investigation into this sector of the economy in Ontario in relation to understanding the factors that lead or prevent the undertaking of CDM activities.

This thesis presents a case study of general service customers greater than 50 kW, medium- to large-scale industrial, commercial and institutional customers, in Milton Hydro's service area, a local municipal electric distribution utility in Ontario. The research was conducted in order to

[1] The number and energy usage data for medium to large commercial, institutional and industrial organizations are based on Ontario General Service consumers with greater than 50 kW demand. (Ontario Energy Board, 2008a)

understand the motivational and contextual factors involved in the decision-making of the participant organizations to undertake or not undertake CDM activities. The research included a mix of industrial, commercial and institutional participant organizations and investigated the decision-making factors for the CDM activity sub-categories of conservation, efficiency and demand response.

1.1 Research Question

The research question is why do organizations undertake electricity conservation and demand management (CDM) activities?

1.1.1 CDM Definition

CDM activities constitute those actions that aim to affect the load profile of an organization in a downward fashion and with a trend to consumption at off-peak times (International Energy Agency Demand Side Management Programme, 2008). CDM activities are classified as those that can be implemented without changing the main operations and objectives of the organizations.

There are many different terminologies that can be used to describe CDM-like activities, such as demand side management (DSM), conservation, efficiency, load leveling and shifting. Some of these are relative equivalents to CDM and some are subsets of the overall meaning of CDM. The Ontario Energy Board (OEB) reserves the term DSM for Ontario's natural gas utilities (Ontario Energy Board, 2008b). The OEB uses the term CDM solely for electricity reducing and shifting activities (Ontario Energy Board, 2008b), which is why it is chosen as the terminology for this research. A further definition of CDM activity categories is outlined in the following section.

CDM Categories

There are many different variations of CDM policy and program designs to address a wide range of CDM activities. That said, the variations in designs and activities are all based on the basic objectives of reducing both electricity consumption and demand.

The concepts of consumption and demand are significant factors in electricity system planning. Electricity demand refers to the amount of electricity that is being consumed at a given moment in time. Demand is usually measured as the highest consumption during a short time interval such as 5 minutes, 15 minutes or 1 hour. Consumption, however, refers to the amount of electrical energy that has been consumed over a longer period of time.

The Ontario Power Authority (OPA) initially defined CDM activities by five categories: conservation, efficiency, demand management, fuel switching and self generation (Ontario Power Authority, 2006). Each of these is further defined here.

"Conservation programs are defined as programs designed to change how customers use their appliances, lighting, water heating and space conditioning systems to minimize either annual energy use or shift their energy use to off-peak periods" (Ontario Power Authority, 2006, p. 16). In essence, these are operational activities that lead to reduced electricity demand and consumption.

"Energy efficiency refers to programs, technologies and measures that reduce the energy used by specific end-use devices and systems without reducing the quality of services provided, i.e. same or improved service for less energy. Energy efficiency programs are different than generalized conservation measures in that they seek to get customers to invest in more efficient designs or equipment rather than reducing their demand for the service through a reduction or shift in operating hours" (Ontario Power Authority, 2006, p. 17).

The OPA definition of demand management includes "both demand response (peak clipping) and shifting use from on-peak hours to off-peak hours. Demand response programs can be price responsive or reliability based" (Ontario Power Authority, 2006, p. 19). The OPA quotes the definition for demand response provided in the Federal Energy Regulatory Commission's (FERC) Assessment of Demand Response and Advanced Metering:

Changes in electricity usage by end-use customers from their normal consumption patterns in response to:

· changes in the price of electricity during the day (Time of Use)

· incentive payments designed to lower energy use at times when:

- wholesale market prices are high (Price Responsive Demand Management)
- system reliability is jeopardized (Reliability Based Demand Management)

(Ontario Power Authority, 2006, p. 19).

There is some overlap, however, in the OPA's definition of demand management and conservation in that they both include the concept of shifting usage to off-peak hours (Ontario Power Authority, 2006). For the purposes of this study, load shifting activities will be considered as conservation activities and demand response activities will be considered as one specific category in line with the peak-clipping and FERC definition identified for demand management. This effectively eliminates the need for a demand management category as its elements are divided into separate conservation and demand response activity categories.

The fourth OPA CDM category is fuel switching. The OPA defines fuel switching as "the switch of an electricity driven end-use application to another fuel carried out in a manner which reduces total energy usage" (Ontario Power Authority, 2006, p. 26). Fuel switching activities will be considered together with efficiency activities as they are, in effect, an activity related to the design or replacement of a technology similar to efficiency activities. The end result is similar in that both activities leads to reduced electricity usage through technology choices.

The last category is self generation which the OPA defines as "where the consumer installs a supply source such as solar photovoltaic, windmill, fuel cell, micro turbine and similar other technologies for meeting part or all of their electricity needs" (Ontario Power Authority, 2006, p. 28). The OPA also identifies that some users may "have a need for both electricity and heat" (Ontario Power Authority, 2006, p. 28) and they "can take advantage of cogeneration, also referred to as combined heat and power, where the waste heat produced by a generator produces both sources of energy: electricity and heat. By producing both electrical and thermal energy at the same time, cogeneration technology produces more energy from a single fuel source. This process and technology contributes towards displacing the need for both electricity and heat to be delivered by the grid" (Ontario Power Authority, 2006, p. 28). Though it is recognized that self generation and co-generation are valid forms of CDM they will be excluded from the scope of the research as these projects have a different set of complexities that are mostly separate from consideration of end-use modifications in operation and design. In particular, on-site generators may require approvals by the Ministry of Environment, connection agreements with utilities, etc. This makes them quite different from most other CDM activities.

The research will then consider three broad groups of CDM activities: 1) conservation, 2) efficiency and 3) demand response. All of these activity categories have the potential to affect an organization's electricity consumption and demand in a downward fashion and/or to create a shift towards off-peak usage as per the definition identified in section 1.1. The conservation category will primarily consider activities related to behaviour and operations of equipment. The efficiency category will consider equipment and facility design activities including fuel-switching activities as defined by the OPA. The demand response category will consider time specific and time-limited activities in response to external price signals, again, in line with the FERC definition adopted by the OPA.

1.2 Background

All electrical energy sources have some impact upon our natural and human environments (World Energy Assessment, 2004). The environmental impacts are a function of the generation source. These impacts can include displacement of animal and human populations due to the construction of large hydro dams, mining of uranium, the production and storage of radioactive waste from nuclear plants, local pollutants and greenhouse gas (GHG) emissions from fossil fuel burning power plants that are impacting the global climate system.

Canada is a signatory to and has ratified the Kyoto Protocol, the global agreement to curb GHG emissions. Although Ontario is not a signatory to the Protocol directly, the provincial government has made its own commitment to shut down all coal-fired power plants in the province by 2014. Many electricity systems around North America are facing reliability concerns, high costs of supply, and pressure to reduce emission levels from electricity generation facilities. Peak episodes due to extreme weather, generator shutdowns and other interruptions can cause concern for system reliability and costs. Ontario is in a particularly difficult situation, facing these same pressures in addition to its promise to phase out coal power, currently a key component of the province's overall electricity supply.

Electricity reduction, particularly during peak times in Ontario, leads to the reduction of hydrocarbon-based fuels such as coal and natural gas, which reduces GHG emissions, nitrogen oxides (NOx), sulfur oxides (SOx), and mercury emissions. CDM programs can be valuable in reducing pressures on the electricity system including those facing generators, transmission and distribution networks and consumers (Fahrioglu, 1998; Heffner, 2002). CDM activities can help to reduce electricity usage, alleviating peak demand and lowering consumption overall. Through the undertaking of CDM activities, utilities, customers and others can benefit from increased system reliability, decreased system costs and less environmental pollution.

1.3 Rationale

Though CDM activities are socially desirable, as identified above, an "efficiency gap" is often cited as an indication that there are opportunities to increase efficiencies in organizations in that there are CDM activities that are not adopted (Jaffe et al., 1993). The existence of the efficiency gap is used to justify that these organizations are not acting in a purely rational economic fashion and that there are many factors involved in the decision-making process within organizations (Dieperink et al., 2004; Harris et al., 2000). There is apparently much energy efficiency that can be tapped into within organizations (DeCanio, 1993) and much with significantly high rates of return, greater than the "economy wide cost of capital" (DeCanio, 1993, p. 906) and in some instances returns have been identified at greater than 30% (DeCanio, 1993). These references indicate that there exists cost-effective CDM, but that it is not being pursued. This cost-effective energy efficient "gap" suggests that there are more elements involved in the decision-making process than purely financial ones.

There are many studies that address various aspects of this issue. Within the context of understanding CDM decision-making, there are a wide range of considerations that form the focus of various studies. Studies include investigation of the internal management structure, barriers and opportunities within firms (DeCanio, 1993; Siero et al., 1996), investigation of the various financial analysis methods that can be used to evaluate energy efficiency investments (Harris et al., 2000; Thompson, 1997), some that focus on policies and/or program designs and results (Berry et al., 1993; Chamberlin et al., 1995; Farhar et al., 1989; Gehring, 2002; Harris et al., 2000; Moezzi et al., 2004) and still others that consider more broadly the impacts of internal and external contextual factors on CDM decision-making (Lohani et al., 1992; Lutzenhiser, 1993; Sandberg et al., 2003; Tonn et al., 2000). Studies related to the diffusion of energy saving technology innovations also identify decision-making factors similar to those involved in CDM decision-making (Dieperink et al., 2004; Vermeulen et al., 2006).

Some of these studies focus on specific consumer or end-use groups such as industrial consumers (Sandberg et al., 2003; Siero et al., 1996), small and medium sized industrial consumers (Tonn et al., 2000), new office buildings (Vermuelen et al., 2006), small businesses (Farhar et al., 1989) or more broadly on firms (DeCanio, 1993; Harris et al., 2000; Moezzi et al., 2004) and organizations (Lohani et al., 1992; Lutzenhiser, 1993). With respect to the CDM activities being considered, some studies focus solely on behavioural and operational activities (Siero et al., 1996), others on energy efficiency and design activities (Harris et al., 2000; Sandberg et al., 2003; Tonn et al., 2000) and still others focus on load management and/or demand response activities (Moezzi et al., 2004).

In 1993, Lutzenhiser claimed that organizational energy use has "received relatively little systematic attention" (p. 275). In 2004, Dieperink et al. identified that, "[their] review of the literature reveals, attention is paid to the demand side but the necessary insight is sparse and scattered" (p. 774). Harris et al. (2000) identify that the "literature highlights a complex and varied set of arguments" (p. 1) related to why the previously identified energy efficiency gap exists, but "with a distinct lack of consensus to date" (p. 1).

This identified existence of an economical energy efficiency gap as well as the identified lack of consensus on the reasons for it justifies the need for further research into demand side decision-making. Though there are many different types of research in this subject area, there are relatively few studies that consider the integration of the two bodies of literature, specifically the organizational behaviour and CDM related literature. Also, most of the studies focus on one organizational type or one CDM activity sub-category such as efficiency, as identified in the above paragraph. As CDM has made a significant ‘come back’ throughout North America (Gehring, 2002), it is beneficial to investigate the experiences of end-users and understand from a ‘ground-up’ perspective what are the factors and combinations thereof, that lead end-users, medium to large scale organizations in this case, to undertake CDM activities or not. An understanding of these factors can help municipal utilities such as Milton Hydro deliver programs to their wide cross section of customers as well as contribute to government policy designs and decisions.

1.4 Research Overview

The aforementioned research question was investigated using a case-study approach. The site for the case study research was Milton, Ontario, working with Milton Hydro, the Local Distribution Company (LDC), which is responsible for managing the distribution of electricity to Milton area residents and businesses. Milton Hydro engaged a number of their customers in a CDM program, the Energy Drill Program (EDP), which primarily encouraged their customers to participate in demand response events. The EDP began in early 2005 and was still operating at the end of the research period, which was December 31, 2006. The EDP operated by combining participating Milton Hydro customers as an aggregate offering to Ontario’s Transitional Demand Response Program (TDRP), which paid participants for reductions of their peak demand during program events. The TDRP is a form of economic demand response program; this program type, and others, will be described further in the literature review.

There are several reasons why Milton Hydro customers are good candidates for a case study on CDM activities: 1) Milton Hydro has a number of programs aimed at a wide cross section of electricity consumers, 2) Milton Hydro is one of the early-movers in Ontario in conservation and demand management programs, which means that there is enough depth of experience to warrant a study and 3) Milton Hydro has a customer base profile that is reasonably representative of many utilities throughout Ontario and North America.

As identified, the organizations under study are utility connected general service customers with greater than 50 kW electrical demand in the Milton Hydro service territory. These medium- to large-scale consumers were studied to examine what motivations, enablers and barriers led them to undertake or not to undertake CDM activities. The results of the study were derived from observations at Milton Hydro EDP events, participant interviews, analysis of participant electricity usage data and publicly available information about the participant organizations.

Medium- to large-scale electricity consumers are a valuable group to research in that they typically can provide a large single-source supply of CDM impact. These organizations may be engaged in general conservation, capital upgrades for efficiency and/or demand response activities throughout their facilities.

This research may make both academic and practical contributions. The academic contribution may be to provide greater insight into the relationship between medium to large organizations and their motivational and contextual factors that lead to or prevent the undertaking of CDM activities. That is, the specific results of this research will be considered within the broader context of the organizational behaviour literature and that related to electricity CDM activities. Practically, this study may contribute to the design of CDM programs and policies such that they may achieve improved results.

In Ontario, the organizations that may benefit from this study include the Ontario Centre for Excellence in Energy, the LDCs, the OPA, the OEB and the Ontario Ministry of Energy & Infrastructure.

1.5 Overview of Thesis

The next chapter, chapter two, presents a summary of the literature reviewed to understand the existing knowledge related to why organizations undertake CDM activities and to develop a set of propositions that served as the foundation of the research. Chapter three outlines the methodology used for the research including justification and explanation of the case study method, background and justification for the case study site in Milton, Ontario as well as the specific research methods used in the study. Chapter four presents the results of the observations, participant interviews, participant profile research and analysis of the participant electricity usage data. Chapter five includes the analysis of the research results with the aim of answering the research question with reflection on the literature review. The analysis identifies specific motivations, enablers and barriers to undertaking CDM activities related to each organizational profile and the CDM activity sub-categories of conservation, efficiency and demand response. The final chapter, chapter six, concludes with a summary of the main research findings, lessons learned throughout the research process and suggestions for future research.

Chapter 2: Motivating Organizations: Experiences in Electricity Conservation and Demand Management

As identified in chapter one, an efficiency gap is often cited as an indication that not only is there opportunity to improve efficiencies in organizations, but also that these organizations are not acting in a purely rational economic fashion and that there are many factors involved in the decision-making process. Dieperink et al. (2004), in referring to the adoption of energy-saving innovations, identify that "a theoretical approach based exclusively on economic reasoning provides insufficient grounds on which to adequately explain the behaviour of the (potentially) adopting actors" (p. 776).

In order to develop an understanding of why medium- to large-scale electricity consumers undertake CDM activities, various bodies of literature are reviewed. The literature consulted includes the organizational behaviour literature, primarily that which focuses on ecological responsiveness of organizations, and the 'CDM' literature, that which focuses on the factors involved in CDM decision-making. The organizational behaviour literature provides a more general overview of the factors that may lead organizations to undertake activities similar to CDM activities, while the 'CDM' literature provides much more specific factors that have been identified as important to CDM activity decision-making with organizations. The literature reviewed serves to identify a set of theoretical propositions that will be used to guide the data collection and analysis of the data, a process supported by Yin (2003).

The organizational behaviour literature is reviewed in section 2.1 in order to provide a conceptual foundation for the research. The literature is used to identify the motivational and contextual factors that may be involved in an organization's decision-making related to undertaking a CDM activity. Studies related more specifically to CDM decision-making will be reviewed in section 2.2. This section of the review will also incorporate some of the vast information available about CDM activities and programs available in the 'grey' literature, that is, through government and utility websites and related consultant reports. A final section, 2.3, brings the first two sections together in deriving a set of propositions, which inform the research design and analysis.

2.1 Organizational Behaviour

As identified, the organizational behaviour literature is used to understand the motivational and contextual factors that may be indicative as to why organizations undertake CDM activities. The organizational behaviour literature is that which examines the administration and management of organizations to identify patterns of behaviour for a wide variety of organizational contexts.

Given the previously identified benefits of CDM for the environment, decision-making related to CDM is considered within the spectrum of environmental decision-making. As such, the Corporate Ecological Responsiveness (CER) literature is used as the main resource for understanding corporate motivations and contextual factors. CER is defined as "a set of corporate initiatives aimed at mitigating a firm's impact on the natural environment" (Bansal et al., 2000, p. 717), which Bansal et al. (2000) specify as including "reducing energy consumption" (p. 717) which is consistent with the results of CDM activities. Of course, CDM activities are not exclusively environmental decisions and hence, general business literature is also used to understand organizational decision-making. As the study group may include medium sized commercial organizations and institutions, the Small and Medium Enterprise (SME) literature used in the understanding of organizational behaviour is also analyzed in this section.

The organizational behaviour literature identifies contextual and motivational theories that lead to corporate ecological responsiveness. The theories are presented in the following sections.

2.1.1 Contextual Theory

The contextual theory of organizational behaviour is simply that the context within which the organization is operating will impact the organization's decision making. Two main contextual theories are explored below: stakeholder theory and strategic issues management theory.

2.1.1.1 Stakeholder Theory

Hendry (2006) cites the definition of stakeholders established by Freeman (1984) as "those individuals or groups who can affect or are affected by the achievement of the organization's objectives" (p. 50). Hendry (2006) argues that organizations have direct and indirect stakeholders, those who have a direct relationship with the firm and those who do not. Direct stakeholders are considered to be "customers, employees, suppliers, and the communities in which their business operates" (Hendry, 2006, p. 50). These stakeholders are considered "at the top of the list" in terms of decision-making considerations (Hendry, 2006, p. 51).

With respect to the relative positions of stakeholders, Hendry (2006) cites Mitchell et al. (1997), stating that "power, legitimacy, and urgency could be used to characterize stakeholders and that the relative level of each determines the extent to which managers take a particular stakeholder into account" (p. 51). Hendry (2006) continues to cite Mitchell et al. (1997) to describe these three characteristics: power is identified as "the extent (to which one) can gain access to coercive, utilitarian, or normative means to impose (one's) will in the relationship" (Hendry, 2006, p. 51); Hendry (2006) draws from Suchman (1995) to define legitimacy as "a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions" (p. 51); urgency "exists only when two conditions are met: (1) when a relationship or claim is of a time-sensitive nature and (2) when that relationship or claim is important or critical to the stakeholder" (Hendry, 2006, p. 51).

2.1.1.2 Strategic Issues Management Theory

Strategic issues management theory relates to the ways in which companies prioritize and manage issues. Companies have priorities that they have to address and an internal structure and procedure by which those priorities are addressed.

DeCanio (1993) clarifies that "firms do not behave like individuals" (p. 906), but that the behaviour of the firm is based on the individuals, policies, processes and environment within the firm. He identifies that even though top-level management may have a high degree of control, the firm cannot operate with a "unitary will" (1993, p. 907). Sandberg et al. (2003) cite Ramesohl et al. (1997) identifying that decisions are not "exclusively rational" (p. 1625), but are affected by "organizational culture and social reality" (p. 1625). The impact of this can be both positive and negative with respect to encouraging energy-efficient investments.

Energy management can often be a low priority for organizations, particularly where the energy related operating costs are relatively low (Sandberg et al., 2003). The organizational behaviour literature would identify this as energy management having low issue salience. This leads to less concentration on energy management than on the core business (Sandberg et al., 2003). DeCanio (1993), without even addressing the low priority of energy management in some organizations, suggests that it is to be expected that there will exist "failures of complete maximization" (p. 907) with respect to achieving efficiencies in energy usage. That is, that it is unreasonable to expect energy usage by organizations to be 100% efficient. Referring to Herbert Simon, the Nobel laureate, DeCanio (1993) identifies that firms more typically make "satisfactory choices instead of optimal ones" (p. 907) and as Sandberg et al. (2003) identify, there are limits to rationality in decision-making. Sandberg et al. (2003) citing Velthuijsen (1995) claims that one of the main identified elements that leads to greater energy efficiency performance is that organizations make it a priority. This highlights that there is much complexity in organizational decision making and that one cannot expect organizations to operate 100% efficiently, which in itself is likely a reason for the identified energy efficiency gap. These examples also highlight the importance of management and internal priority setting in order to accomplish organizational goals, which likely also applies to CDM activity decision-making.

2.1.2 Motivational Theories

The three main categories of motivation for an organization to be ecologically responsive identified by Bansal et al. (2000) are competitiveness, legitimation and ecological responsibility. Bansal et al.'s (2000) definition of ecological responsibility was synonymous with altruism. As CDM activities have more societal benefits than just ecological ones, altruism will be used as the third motivational category. A description and overview of each motivation is provided in the sections below.

2.1.2.1 Competitiveness

Activities that are motivated by competitiveness are those that are deemed to have the potential "to improve long-term profitability" of the organization (Bansal et al., 2000, p. 724). Competitive advantage is gained when organizations provide "their customers with what they want, or need, better or more effectively than competitors; and in ways which their competitors find difficult to imitate" (Johnson & Scholes, 1999, p.271). More effective provision of goods and services to customers often means it is done in a more cost effective manner. Some believe that increasing financial gains and competitive advantage should be the sole objective of any organization. Hendry (2006) cites Friedman (1962) who suggested that the "one and only social responsibility of business [is] to use its resources and engage in activities designed to increase its profits" (p. 47).

Different organizational types have different motivations with respect to economic advantage, however all organization types have to manage their finances in a responsible way. The financial driver is arguably stronger for the commercial and industrial businesses, but many institutional organizations also have tight budgets, many priorities and may not be allowed to go into deficit so management of finances is also very important. As CDM activities can result in lower operating costs for organizations, competitive motivations may be an important driver for their undertaking.

2.1.2.2 Legitimation

Bansal et al. (2000) draw from Suchman (1995) and argue that "a motive of legitimation refers to the desire of a firm to improve the appropriateness of its actions within an established set of regulations, norms, values or beliefs" (p. 726). Organizations respond to pressures to operate within the social-norms of their communities. Organizations may identify different social-norms depending on the community in which they consider themselves to be operating. Maintaining operations in compliance with societal standards is a means by which the organization maintains a sense of legitimacy within that society.

Sometimes these "social-norms" can be set by the actions of one organization. The actions of one organization can influence another to act in a similar manner – what Hendry (2006) refers to as "mimetic isomorphism" (p. 75). This is similar to the identification by Bansal et al. (2000) of field cohesion as an important contextual factor that leads to legitimating motivations.

Legitimating motivations can be an effective means to encourage an organization's engagement in any activity. A legitimating motivation may have a significant role in an organization's decision to undertake a CDM activity particularly if the activity is part of the social-norm of the organization's community and stakeholders. The motivation of legitimation is linked to stakeholder theory, identified above, in that the organization's stakeholders will often establish, either directly or indirectly, the norms that the organization must follow to maintain legitimacy.

2.1.2.3 Altruism

The third motivational category identified by Bansal et al. (2000) is ecological responsibility. Bansal et al. (2000) define ecological responsibility as a "motivation that stems from the concern that a firm has for its social obligations and values" (p. 728). This concern for the "social good" is equated to altruistic behaviour on the part of the organization. So, since CDM activities may have more societal benefits than just ecological ones, altruism is used to describe this motivation category. Organizations, being comprised of people, certainly have the ability to realize the importance of specific activities and how they might benefit the general public. Altruism includes motivations for benefiting the community, society at large, including the environment and arguably maintaining electricity reliability.

Hendry (2006), who investigates the "pathway" between Corporate Social Performance (CSP) and Corporate Financial Performance (CFP) cites Rowley et al. (2000) who "suggested that stakeholders provide one of the most important bridges in this pathway: Stakeholder groups notice particular aspects of a firm's social performance; they then take actions to demonstrate their approval or disapproval of it, in hopes of influencing the firm to either continue, discontinue, or modify the behavior. On many occasions, such activities on the part of the stakeholders are aimed specifically toward affecting firm profitability or other financial indicators, as stakeholders are aware of how important these measures of performance are to managers" (p. 48). This reference to stakeholders and how they can influence an organization's participation in Corporate Social Responsibility (CSR) activities demonstrates the overlap that naturally exists across theories of organizational behaviour and re-emphasizes the role that stakeholders play in an organization's decision-making process.

In the following section, the experiences of organizations with respect to CDM activities specifically are reviewed in order to understand the decision-making factors identified.

2.2 Experiences from CDM Policies, Programs and Activities

This section presents a review of literature related to CDM decision-making. The review considers research of end-user decision-making factors as well as the interventions and incentives that have been used in CDM policies as well as program designs by governments and utilities. The review includes studies from the late 1980s through to 2006 within European, Australian and North American contexts. Ultimately, the review leads to a number of propositions regarding the contextual and motivational factors that lead organizations to implement CDM activities. The focus is on determining why the end-user organizations undertake CDM activities not on why governments or other organizations develop policies or programs for encouraging CDM activities. Also, as a point of clarity, the focus is on the undertaking of CDM activities, which can include those pursued through participation in CDM programs, but program participation is not the sole focus.

Within the context of understanding CDM decision-making, there are a wide range of elements that form the focus of various studies as identified in section 1.3. A number of the studies referenced are based in Europe, for example Sweden (Sandberg et al., 2003), and the Netherlands (Dieperink et al., 2004; Siero et al., 1996; Vermeulen et al., 2006). Though Europe is often identified as having different attitudes to North America with respect to environmental management including energy conservation (Siero et al., 1996), these studies nevertheless identify many similar factors as those identified in the North American studies referenced related to the decision-making process. Factors identified as important in CDM activity decision-making are reviewed in the following broad sections on organizational, financial and technical elements. The last section of 2.2, section 2.2.4, identifies specific factors involved in demand response program activities.

2.2.1 Organizational Elements

There are a number of elements of an organization's profile that may lead to understanding why a CDM activity is undertaken or not. The profile of the organization including the sector and billing type can be important factors in leading to the undertaking of CDM activities (Farhar et al., 1989). Electricity usage, public profile and actor network are also identified as important factors to consider by Sandberg et al. (2003) and Dieperink et al. (2004) respectively.

The OPA identifies that “each sector has distinct characteristics in the way electricity is used and therefore the potential for CDM related savings is different” (Ontario Power Authority, 2006, p. 55). Many programs and research studies are also divided by sector, which is an indication, in itself, that motivations and contextual factors may be different across these different sectors. Blok, (2005) claims that an overview of program evaluation suggests that sector oriented programs perform better than generic programs.

One factor identified as an indicator that an organization is likely to have undertaken CDM activities is the level of electricity usage by the organization. Sandberg et al. (2003) references Velthuijsen (1995) who identified that the greater the usage of electricity the greater the likelihood of energy efficiency investments to have taken place.

An organization’s public profile or image is of importance in relation to the actor network in which the organization operates. Dieperink et al. (2004) explain that “characteristics of the actor and the networks in which the actor participates (government, market, society) could have an impact on [the] decision-making process” (p. 773). This is a direct link to stakeholder theory identified in the organizational behaviour literature. Internal as well as external stakeholders, such as customers, suppliers, contractors and consultants, industry partners and associations, communities, and governments, can all influence an organization’s CDM activity decision-making process.

Policies and objectives of an organization may also lead to the organization undertaking CDM activities. As Dieperink et al. (2004) identify, “whether a company actually considers innovation options partly depends on the existence of a corporate energy and/or environmental policy and organizational provisions for their implementation” (p. 776).

The research by Berkhout et al. (2007) on organizations and factors that promoted their use of “green” electricity identifies internal champions as an important part of encouraging the initiative to proceed particularly as it there was no clear financial benefit to the decision. Dieperink et al. (2004) refer to early adopters of technologies as “individuals who take the initiative to gather information (mostly on the basis of their own professional experience) and perform their own cost-benefit analysis" (p. 777). Though Berkhout et al.'s (2007) definition of an internal champion is one that is driven by their personal environmental values and Dierperink et al.'s (2004) by their own initiative, it is arguably the individual with the initiative that is the internal champion, irrespective of their environmental perspective.

Sandberg et al. (2003), again citing Ramesohl et al. (1997), claim that CDM activities can be motivated directly by concern for the environment and/or be "driven by an ecological philosophy" (p. 1625). As identified in chapter one, CDM activities can lead to reduced emissions which may be a goal for the organization. Electricity system reliability can be critical to some organizations, particularly those operating industrial processes. Moezzi et al.'s 2004 study of large consumers (electricity demand greater than 2 MW) identified electricity system reliability as a motivator among some participants to undertake CDM activities.

2.2.2 Financial Elements

Both the organizational behaviour literature and more specific CDM-related studies identify financial interests as important factors in CDM activity decision-making (Dieperink et al., 2004; Hendry, 2006). Many policy papers and programs address the various financial elements of electricity pricing including market structures as well as different pricing models such as critical peak, real-time, time of use and pollution pricing (Moezzi et al., 2004). The focus on these matters in the literature emphasizes the importance of finances as a key decision-making factor. Also, as identified previously, finances are a key factor for organizations acting with competitive motivations.

There are multiple possible electricity billing structures, of which, the price levels and billing methods can be important factors in encouraging CDM activities. The increased trend toward Time of Use (TOU) rates and interval meters throughout North America is linked to this notion. In 2001, California installed more than 20,000 TOU meters with the goal of achieving 500 MW of peak-demand reduction during the first year of operation (King et al., 2005). Lutzenhiser (1993) reports that sub-metering, associated with direct billing for individual units, can reduce consumption by up to 35% at the building level. These are strong indications of the potential impact of finances and more specifically, billing structure, on CDM activity decision-making.

Some studies investigate the best and/or most often used methods for CDM investment valuation (Harris et al., 2000; Sandberg et al., 2003; Thompson, 1997). Some studies also consider the management related considerations of the investment valuation and approval process (DeCanio, 1993; Sandberg et al., 2003; Thompson, 1997). The main investment valuation and decision rules identified by Harris et al. (2000) are positive net present value (NPV), rate of return on capital, payback period and upper limit on debt-equity. Harris et al. (2000) found that 80% of participants preferred the payback method. Sandberg et al. (2003) found that "favourable market conditions and short pay-back time (were the) most important incentives for investing in energy conservation" (p. 1625). In relation to the theory of strategic issues management, DeCanio (1993) identifies that short paybacks are often preferred by managers to align with the short-term performance evaluations that will influence the manager's compensation. DeCanio (1993) and Sandberg et al. (2003) similarly identify that if the investment can be delayed it would improve short-term finances that much more, hence an incentive for the manager to delay.

Harris et al. (2000) and Sandberg et al. (2003) both suggest that NPV is the best method to use, since it takes the discount rate into consideration, even though payback is the most often used. Thompson (1997) argues that the NPV calculation and selection of discount rate can significantly impact energy efficiency investment decisions. One important factor in reaching higher cost efficiency is the investment decisions affecting industrial production systems over the economic lifetime of the investments, a period that can range from 1 to 40 years (Sandberg et al., 2003). Sandberg et al. (2003) identify that the "investment calculus" (p. 1627) can be quite different depending on the size and scope of the investment. Similar to lifetime, equipment operating hours is an important factor in determining the value of the investment. If the equipment operates for a relatively short time period, the payback may be too long to encourage the investment (Dierpeink et al., 2004). This is a challenge for electricity demand reduction efforts by utilities. During hot and humid summer afternoons, high demands can be due to cooling loads. However, hot and humid afternoons in Ontario are relatively few, leading to a low relative annual energy usage. It is difficult to encourage large investments for avoidance of demand during these short operational time periods.

Financial incentives in CDM programs can be helpful in encouraging upgrades of equipment and/or implementation of energy efficient designs (Dieperink et al., 2004; Gehring, 2002). These incentives should obviously benefit the investment valuation however it is calculated. Blok (2005) citing Elliot and Nadel (2003) identifies, however, that "expectation/desire for financial incentives'' (p. 1639) can also be a barrier in that organizations will not invest without the expected incentives. Another barrier to energy efficient investments can be the existence of other more attractive investment opportunities (Sandberg et al., 2003). Initial or upfront capital costs are also an important financial factor, particularly for SMEs (Farhar et al., 1989).

2.2.3 Technical Elements

The capacity of the organization can be an important factor in deciding whether to undertake CDM activities, particularly the technical and/or energy management capacity. Technical capacity is identified as an obstacle for many organizations and is highlighted in del Brio et al.'s (2003) study of SME environmental decision-making as well as Tonn et al.'s (2000) review of the Industrial Assessment Centre (IAC) program for industrial SMEs. Sandberg et al. (2003) cite Velthuijsen's (1995) findings that complex organizations have greater energy efficiency performance. This may be reflective of a link between complexity of an organization and the capacity within.

Information is likely the most frequently identified enabler in encouraging energy efficiency decisions. Finances are also one of the most consistently identified factors, but with respect to external influences acting on organizations through programs, for example, information provision through energy audits or otherwise are sometimes touted as being even more influential than financial incentives (Chamberlin et al., 1995; Harris et al., 2000). Similarly, Sandberg et al. (2003) focus their study on the "need for investment decision support" (p. 1) for industrial managers and refer to Velthuijsen's (1995) findings that those organizations that use "more knowledge sources" (p. 1625) and "have a greater awareness of information" (p. 1625) are more likely to perform better in terms of being more energy efficient. It is known that "electricity is the most widely used form of energy in most facilities, yet electrical systems are among the least understood of all plant systems" (Office of Energy Efficiency, 2002, p. 72).

Harris et al. (2000) identify lack of expertise as a risk for some organizations. Similarly, in the pursuit of heat pump installations, Dieperink et al. (2004) identify "lack of know-how" (p. 776) as a barrier.

The provision of energy related information to the customer, feedback, is often considered an essential part of linking energy conservation and demand response (King et al., 2005). Siero et al. (1996) found that feedback encouraged competitive behaviour and helped advance energy conservation behaviour within organizations. Many utilities have also gone beyond just providing monthly consumption information and provide online energy analyses or even more detailed consumption information (King et al., 2005). Energy audits can be a source of information related to CDM activities. Harris et al. (2000) found the Enterprise Energy Audit Program (EEAP) to be a good support for organizational CDM decision-making combined with financial subsidies. Similarly, Tonn et al. (2000) found that the IAC program proved to be valuable for industrial SMEs for the same information provisional reasons. Follow-up by encouraging stakeholders and knowledge transfer are also identified as critical elements in encouraging ongoing and future CDM activities (Sandberg et al., 2003). These factors are effectively equivalent to monitoring and reporting, which are commonly encouraged in utility management applications.

The technological fit of any particular technology is an important consideration for an organization. "In order to fit in, the equipment has to meet certain company-specific technical conditions" (Dieperink et al., 2004, p. 776). Production characteristics and requirements are also an important consideration in CDM decision-making (Dieperink et al., 2004). "Technological and economic characteristics of the innovation and more general context factors are also relevant as factors that influence the considerations made in the decision-making process" (Dieperink et al., 2004, p. 773). As Sandberg et al. (2003) identify, energy efficiency may just be a by-product of improving quality and productivity in production processes, the saving of raw materials, the extension of equipment life and/or the reduction of maintenance requirements (p. 1626). The impetus for energy efficient investments may come from new builds, retrofits, the need to replace a depreciated installation (Dieperink et al., 2004), broken equipment (Blok, 2005) or equipment due for replacement or if there is a need to expand capacity. Sandberg et al. (2003)

identify an interesting result in that one industrial participant claimed that a new build will tend to be “state of the art” (p. 1628) whereas retrofits will not be done to that level.

Sandberg et al. (2003) also point out that organizations will focus on the issues at hand and that equipment failures are often the impetus for any changes (p. 1627). These are often a time when energy efficient choices could be made. This issue of priority setting within organizations is obviously a direct link to the importance of organizational policies as well as to strategic issues that management theory identified previously.

Regulations and standards are also often considered to be one of the most significant means of encouraging CDM activities to take place (Vermeulen et al., 2006). This research assumes regulations and standards are being met by participants and investigates CDM activities undertaken that are above and beyond these minimums.

Though the factors identified above often apply to demand response activities, there are some unique elements of demand response activities, particularly the variety of contractual requirements, financial benefits and operating characteristics. The following section identifies different types of demand response programs and factors that have been identified as influencing the decision-making of program participants.

2.2.4 Decision Factors Specific to Demand Response

There are typically two main types of demand response programs operated by utilities and/or electric system operators: emergency and economic. These programs have different objectives and different operating characteristics, including frequency and duration, payment levels and level of participation obligation.

Emergency Demand Response

An emergency demand response program is designed as part of an electricity system reliability program. These programs are based on a participant’s previously bid response capacity, that is, the amount of electricity demand that organizations commit to reduce in response to an emergency appeal in times of electric system peak demand. These programs typically pay high rates for actual reduction, but often also include reserve payments for capacity that is effectively on standby. Such programs, intended primarily to maintain system reliability, "are designed to be available during the top 100 peak hours of the year" (King et al., 2005, p. 55). Both the reliability and the financial incentives can be motivational factors to encourage participation in these programs.

Program participants are usually contracted for a minimum number of event hours such as two, three or four hours. Requests for reduction are typically given one-day prior or at least three hours in advance of a peak demand period. In most programs, demand reductions can be supplied by either reducing one's consumption, or by the use of on-site generators, which still effectively reduce the demand on the electric system (NYSERDA, 2004).

Pricing is a major element of program design. In emergency situations, there is great value for all consumers in maintaining the reliable operation of the electric grid. In New York, which is typical of other programs, participants in the Emergency Demand Response Program are paid the greater of $500 US/MWh or the wholesale electricity price (NYSERDA, 2004).

Programs differ in that some have a requirement for a specified contracted reduction amount and certainty of response, whereas others do not. Those that do have contracted minimums will typically be the ones to pay reserve payments for the demand capacity that is on standby. These programs will also, however, charge penalties to participants that do not meet their contracted demand reductions. According to one study about "50% of the contingency programs [sampled] levied some form of financial penalty" (Heffner, 2002, p. 4).

Another form of demand response program is the economic demand response program, which will be explored further in the section below.

Economic Demand Response

An economic demand response program is one that pays the participating consumer for reducing electricity demand during peak electric system price periods. These programs can also be beneficial for electric system reliability, but are primarily used to target high electricity supply costs. As electricity prices can range from $40/MWh to over $1000/MWh (Heffner, 2002), these programs are intended to stabilize or eliminate high costs for all consumers.

The payment structure of economic demand response programs is often based on a strike price above which participants can reduce load and be compensated for it. Payments are usually based on the greater of the pre-determined strike price or the wholesale electricity price during the response. Research has shown that reductions from this type of program are usually "much lower and often less predictable than load relief from contingency (emergency) programs" (Heffner, 2002, p. 4). This may be a reflection of the more contractual nature of emergency programs, the lesser frequency of operation or the financial benefits associated with participating in the emergency program.

Real-time pricing (RTP) is similar to economic demand response programs in that the theory behind exposing customers to real-time wholesale electricity prices is that this will lead to reduced consumption during peak price periods. The main difference between RTP and economic demand response programs is that the benefit of responding to RTP is only in the saved electricity costs whereas economic demand response programs will offer an increased financial incentive over and above the participant's realized electricity savings.

A study of an RTP program operating in New York by Moezzi et al. (2004) provides one of the most comprehensive analyses of the impact of this relatively new method of consumer pricing. One of the findings from the study is that industrial consumers will typically not include modifications to batch production processes during a demand response event or due to high real-time prices as production is worth more than savings on electricity (Moezzi et al., 2004). Moezzi et al. (2004) reference Herriges et al. (1993) and Schwarz et al. (2002) reporting that studies related to RTP programs of large customers "have shown modest results for most customers, with a few very price-responsive customers providing most of the aggregate response" (p. 4).

Goldman et al. (2004) argue that "default RTP for large customers does deliver modest demand response" (p. 14). It is expected that "better dissemination of enabling technologies and customer education regarding response strategies would probably improve DR" beyond the results achieved in their study (Goldman et al., 2004, p. 14). This is similar to the potentially enabling benefits of information and technical capacity identified in the previous section. Goldman et al. (2004) argue that "there is a strong need for customer education and assistance to develop response strategies to realize inherent price response potential" (Goldman et al., 2004, p. 14). Finally, the recommendation from the study is that "RTP is best implemented as part of a portfolio of DR options" (Goldman et al., 2004, p. 14). The combination of financial incentives, educational information, and technologies is seen as being an important factor that leads to CDM activities. Again, these are all consistent with the important factors identified in the previous section.

The following section outlines the propositions derived from the review of organizational behaviour and CDM-related literature that were used to inform the research design.

2.3 Informing the Research Design and Analysis

This section incorporates elements from both sections above to derive a list of propositions that informed the research design and analysis. The organizational behaviour literature identifies contextual and motivating factors (Bansal et al., 2000) involved in the decision-making process. Literature related to CDM activities, however, often identifies enablers (Moezzi et al., 2004) and barriers to action (Farhar et al., 1989). The enablers and barriers identified in the CDM literature are essentially the specific contextual factors that are involved in CDM activity decisions as they serve to influence the more general motivations of organizations.

Table 2.1 identifies the motivations, enablers and barriers that were identified in the literature review that may influence CDM activity decisions by the research participants. As identified in Table 2.1, the motivations considered are as per the major headings of competitiveness, legitimation and altruism. The enablers and barriers considered are mostly those identified in section 2.2 of the organizational, financial and technical elements. These are broad categories that include many of the sub-categories also identified as important contextual factors in section 2.1.

Table 2.1: Propositions of Motivations, Enablers and Barriers of CDM Activities

Motivations		
Competitiveness	Legitimation	Altruism
Enablers and/or Barriers		
Financial Benefit	Sector	Internal Champion
Electricity Usage	Environmental concerns	Technical Capacity
Organizational policies	Electricity System Reliability	Technological Fit
Public Profile & Actor Network	Information	

These propositions will inform the research design, primarily the interview guide, and be used as guiding categories for the coding of research results presented in chapter four. The next chapter outlines the methodology used for the research.

Chapter 3: Methodology

This chapter outlines the research design and methods used in the thesis. Section 3.1 describes and justifies the selection of a case study method. Section 3.2 provides background information specific to the Milton Hydro case and the sample group from which research participants were recruited. Section 3.3 outlines the research plan including the methods for data collection and analysis incorporating the propositions derived in chapter two as well as identifies the limitations and challenges of the research.

3.1 Case Study Method

As previously identified, the research is a case study of a sub-set of medium- to large-scale Milton Hydro customers. The research was conducted during the latter half of 2006 and early 2007 investigating the time period from 2001 to the end of 2006. As identified in chapter one, there are several reasons why Milton Hydro customers were good candidates for the case study: 1) Milton Hydro had a number of programs aimed at a wide cross section of their electricity consumers; 2) Milton Hydro was one of the early-movers in Ontario in CDM programs, which means that there was enough depth of experience to warrant a study of this kind; and 3) Milton Hydro has a varied customer demographic that is arguably reasonably similar to that of many utilities throughout Ontario and North America. The case study method is chosen for a variety of reasons, which are outlined in this section.

Yin (2003), in his writing on case study research, explains that, "in general, case studies are the preferred strategy when 'how' or 'why' questions are being posed, when the investigator has little control over the events, and when the focus is on a contemporary phenomenon within some real-life context" (p. 1). These case study criteria aligned well as this research attempted to understand why organizations undertake CDM activities; the investigator had very little control, if any, over events related to the research and as CDM related activities were a current topic in the electricity industry at the time of the research.

Yin (2003) also writes that, "the case studies method allows investigators to retain the holistic and meaningful characteristics of real-life events – such as… organizational and managerial processes" (p. 2). As the research attempted to understand the motivations of organizations and their decision-making processes related to CDM activities, this aspect of case study research was critical to the investigation of the research question.

In case study research, it is important that the researcher have "contextual material to describe the setting for the case" and "have a wide array of information about the case to provide an in depth picture of it" (Creswell, 1998, p.39). The context of the case, presented in section 3.2, includes information about the Ontario electricity situation and detailed information about the Milton Hydro service area. This contextual information was identified through Ontario electricity and energy related websites, email list-serves and media sources. The specifics related to Milton Hydro, their programs and customers was identified through shared information with that organization.

Case study research allows, and in fact is typified by, the use of "a wide array of data collection procedures" (Creswell, 1998, p. 39) and reliance on "multiple sources of information" (Creswell, 1998, p. 61). This is a beneficial practice in that the multiple sources of data provide a means of achieving "redundancy of data gathering" (Stake, 2000, p. 443). This is an important aspect of what is typically called "triangulation", meaning that the researcher uses "multiple perceptions to clarify meaning, verifying the repeatability of an observation or interpretation" (Stake, 2000, p. 443). In keeping with this practice, the research relied upon multiple sources of data: 1) participant observations of the Milton Hydro CDM program process, specifically the EDP events; 2) interviews with a sample of Milton Hydro medium- to large-scale customers, the participants; 3) an analysis of participant electricity usage data; and 4) publicly available information about the participant organizations. Further details regarding these data sources are presented in section 3.3.

The following section provides the background information specific to the Milton Hydro case and the sample group from which research participants were recruited.

3.2 The Case Study: Milton Hydro

This section presents a summary of the context related to Milton Hydro's service area particularly in terms of the CDM-related activities that were ongoing at the time of the research. The section also identifies the specifics of the sample group from which the research participants were recruited. The research focused on Milton Hydro's medium- to large-scale customers and ran in parallel with the main Milton Hydro CDM program designed for this customer group, the EDP.

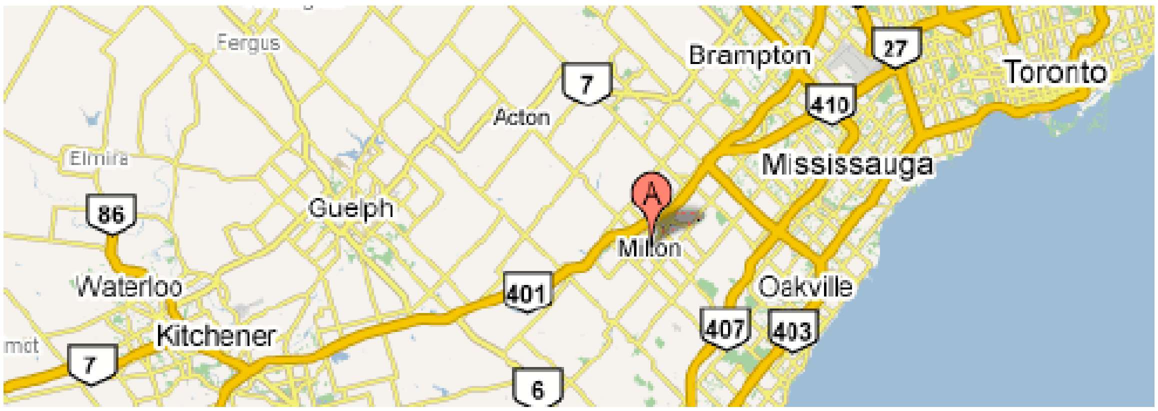

Figure 3.1: Milton, Ontario source: Google Maps

Figure 3.1 shows Milton's location in southern Ontario. Milton is a fast growing community located 60 km west of Toronto, Ontario. Since 2002, the population has been growing at a rate of approximately 10% per year and getting relatively younger in terms of the average age of the community (Town of Milton, 2008). In 2006, Milton had 53,900 residents (Town of Milton, 2008). There are a variety of business types operating in and around Milton. One in 5 residents work in business services, 17% in other services, 13.6% in manufacturing services, and 10.3% in retail trade; the remainder divide among wholesale trade, finance and real estate, health care and social services, educational services, construction industries, and the lowest proportion, 2.6%, work in agriculture and resource based industries (Town of Milton, 2008). The following section provides an overview of the broader Ontario context at the time of the research.

3.2.1 Ontario Context

The Ontario situation is relevant to Milton Hydro customers in as much as it impacts them through media, public awareness and through direct involvement with Milton Hydro. The electricity pricing for Milton Hydro customers is regulated by the Ontario Energy Board, which makes this a significant provincial contextual factor that influences the local situation in Milton.

Up until and throughout the summer of 2006, there was an increasing amount of information in the public domain regarding electricity supply choices, electricity system reliability concerns, electricity pricing, and the relation to environmental issues such as clean air and climate change. These all had potential to influence the electricity consumer to undertake CDM activities. At the time of the research, one of the most significant direct outreach initiatives to consumers in the Milton area related to CDM activities was the EDP initiated by Milton Hydro, which is described further below.

The Independent Electricity System Operator (IESO) was engaged in a number of demand response initiatives, which included both emergency and economic demand response programs. These programs included the Emergency Load Reduction Program (ELRP), Hour-Ahead Dispatchable Load (HADL) and the Transitional Demand Response Program (TDRP). These programs were intended to increase the system reliability and mitigate high market prices as well as increase Ontario's demand response capability. A focus on these types of programs is included in the literature review of chapter two. As the TDRP is the main program relevant to the research, further details of the program are included in Appendix B.

Most electricity Local Distribution Companies (LDCs) in Ontario had a CDM program in place that targeted at least some of their customer base. The LDCs could act as aggregators of IESO programs as well as offer their own independent programs. There were also many community-based programs as well as those organized by environmental non-governmental organizations (ENGO). These programs included a wide range of activities from community outreach and education to air conditioner replacement programs.

As much as the programs described above applied to a wider range of participants than those of this study's focus, they all could have had some influence on the decision-makers of the organizations in question. The next section describes Milton Hydro's CDM activities, particularly those related to the customer group targeted for this research.

3.2.2 Milton Hydro Customers and CDM Activities

At the time of the research, Milton Hydro had a number of CDM programs designed to target their range of customers: residential, small organizations (General Service (GS) < 50 kW) and medium to large organizations (GS > 50 kW, > 1000 kW and > 5000 kW). For a description of Milton Hydro customer and rate classes refer to Appendix C.

In Milton Hydro's service area, all of the medium- to large-scale customers have interval meters installed[2]. Most of these have been installed since 2001. These customers are either part of the Regulated Price Plan (RPP) or the Spot Market rate class. The organization types included in the medium- to large-scale customer class include industrial, commercial, and institutional customers.

At the time of the research, in 2006, Milton Hydro was coordinating many CDM programs and supporting activities in its service area. The CDM programs and supporting activities for the medium- to large-scale customers were as follows.

1. Conservation and Demand Management (CDM) Newsletter

   Milton Hydro distributed a newsletter to its general service customers to provide information on CDM programs. The newsletter also included energy conservation tips for each season.

2. Seminar Series: PowerView for General Service customers

   Seminars were offered to teach customers how to use their interval meters and the web-based PowerView energy and cost monitoring software.

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[2] The interval meters record the metered consumption in hourly intervals.

3. Energy Drill Program (EDP)

The EDP was a program specific to Milton Hydro designed to aggregate customer participation in the Transitional Demand Response Program (TDRP), operated by the IESO. A customer registered in the EDP received notifications of TDRP response times, based on high electricity system prices, and if they responded during those times they would receive a payment, in addition to their accrued savings, for their reduction during that peak time period. The payment was equivalent to what would have been paid to the electricity generator for supplying the equivalent power to the grid. The EDP was offered at no cost to participating organizations by Milton Hydro. Any upgrade to an organization's equipment was the responsibility of that organization. The EDP is described further below.

4. Transitional Demand Response Program (TDRP)

The EDP was an aggregating program to the TDRP, a demand response program administered by the IESO. The EDP provided customers with a comprehensive plan of action while the TDRP was the mechanism by which the customers were financially compensated for their response during peak period times. Milton Hydro acted as an aggregator for the TDRP program.

The Energy Drill Program

The Energy Drill Program (EDP) was the primary program that targeted medium- to large-scale customers to participate in CDM activities in Milton. The program solicited participation from organizations in demand response events, educated and encouraged them with respect to CDM activity opportunities in the workplace, taught them about electricity systems, electricity bills and available online tools for monitoring usage as well as provided support for customers, as required, throughout the implementation of the demand response activities. The EDP in Milton was primarily an economic demand response program, though it also encouraged general conservation and efficiency through a consultation process.

Research participants were recruited from Milton Hydro's medium- to large-scale customers. This group was selected based on the coincident recruitment for the EDP by Milton Hydro that targeted this same customer group. The research leveraged the EDP events as well as contact database for the parallel recruitment effort. Milton Hydro customers could participate in the EDP, yet not be part of the research and similarly research participants were not all participants in the EDP.

Milton Hydro started the EDP in 2005 and operated the program at least until the end of 2006, which was the end of the research time period. The EDP as implemented in 2005 included a one-on-one presentation, energy audit and report to large electricity consuming organizations, identifying options for conservation and participation in the TDRP. Nine organizations participated in the program in 2005.

In order to reach a larger number of customers in 2006 – namely a goal of 20-30 more organizations - the format for program delivery was modified. The program included seminars and workshops designed to teach customers how they could create their own demand response plans, thus attempting to alleviate the need for one-on-one recruitment as in 2005. Support from Milton Hydro, as required, was offered to interested customers, but the intention was to reduce the amount of time spent with each customer in order to minimize program delivery costs. The EDP for 2006 consisted of the following major components: Seminars, Workshops, Site Assessments and Test Drills, and the Notification and Reporting System.

As with the program design in 2005, a key element of success was believed to be getting "buy in" from senior decision makers within organizations. As such, a contact database was developed with the senior business and/or operational contacts at the majority of medium- to large-scale customers in the Milton Hydro service area. Priority was assigned to customers to focus recruitment for the EDP. Priority was based on the size and type of the customer's load and the anticipated ability and willingness of that customer to participate in the EDP. The priority ranking was made by Milton Hydro's consultant without a definitive formula, but based on the experiences with the Milton Hydro customers and the operation of the EDP since early 2005.

The following sections describe each of the elements of the EDP in greater detail.

Seminars

It was primarily commercial and industrial customers that were solicited for the seminars and workshops as many of the institutional customers were either already engaged in the program or were being solicited separately. The seminars included information about CDM initiatives in Milton, the Ontario electricity system situation with respect to reliability concerns and generation mix, the provincial demand response programs and how they operated. The seminars were also intended to provide an opportunity for customers to share information related to their CDM and/or EDP experiences. The seminars served as an observation opportunity for this research.

After the seminar, customers were asked to complete the EDP Partnership Agreement. This agreement was made between Milton Hydro and senior management of the organizations to encourage the greatest commitment from that organization. If organizations committed to the EDP Partnership Agreement, then they would be eligible to take part in the workshops and site assessments as required.

Workshops

The aim of the workshops was to teach EDP participants how to perform a self-audit with respect to identifying activities that could be included as part of a demand response event. These sessions were more technically oriented than the introductory seminar and included more detail regarding the customer's involvement in the EDP, including information about the notification and reporting systems. The workshop materials included a set of forms that guided the customer in the development of a demand response plan within their organization.

Site Assessments and Test Drills

The site assessments and test drills were made available to customers by Milton Hydro to help them work out the possible demand response activities appropriate for their facility and to help pre-determine the anticipated amount of potential electricity reductions. These assessments and drills are often conducted alongside the facility manager and/or the internally designated Energy Drill Marshall (a creation of the EDP). The time allocated for the site assessment was facility dependent, but on average could be completed within one day.

Notification and Reporting Systems

The EDP operations consisted of a notification and a reporting system. The notification system alerted the customer in advance of an anticipated high price period, wherein they were asked to respond by lowering their consumption. The reporting system was designed to provide feedback to the EDP participants including any achieved electricity demand reduction as well as cost savings and payments from the TDRP program. It was identified that if the results only show up on the electricity bill then the finance department may be the only group to see the bill and that the operations staff and managers may not know of the program results. Without a separate report to the individual EDP participants, these individuals may not have known the results of their actions.

The notification and reporting systems were seen as critical elements to the success of the EDP. Both systems were revised for EDP implementation in 2006. The notification system was modified such that EDP participants could select a price level at which they were notified for action. Initial implementations in 2005 resulted in EDP participants receiving multiple notices throughout the day as price thresholds were not set high enough and notification limits were not set. This excess of notifications may have led to inaction based on simple annoyance or confusion about when the most effective time to respond occurred.

The following section outlines the specifics of the research method.

3.3 The Research

The research method was designed based on the literature related to organizational behaviour and the experiences of organizations with CDM activities, as well as based on the case specific details related to the Milton Hydro service area, and in particular those related to the medium- to large-scale customers.

As stated, the research is a case study of electricity customers in the Milton Hydro service area. Research participants were recruited from Milton Hydro's medium- to large-scale customers. This group was selected based on the coincident delivery of the EDP by Milton Hydro that targeted this same customer group. The parallel operation of the research and the EDP allowed for determination of the motivations to undertake CDM activities related to both the EDP and other CDM activities such as conservation and efficiency.

The goal of the research was to understand why organizations participate in CDM activities. Based on the case context the research included a wide variety of organization types commensurate with the customer mix of the municipal utility. The research also included many different CDM activity types and related motivations, enablers and barriers of the participant organizations. This reflects the "real life" situation for Milton Hydro, the municipal electric utility, delivering conservation programs to their customers.

The CDM activities that were investigated as part of the study are those of conservation, efficiency and demand response as defined in chapter one. Propositions as to the motivations, enablers and barriers of organizations to undertake CDM activities were derived in chapter two. These are used as the basis for the research as well as in the analysis of the research results. The time period for the research was from 2001 through to the end of 2006. This timeframe was based on the availability of interval meter data for the participants. These interval meter data were used to analyze the impacts of the CDM activities identified by the participants.

The research attempted to combine social science research with technical elements of CDM activities and impacts to overcome existing research criticisms and improve on the combination of research methods as identified and supported by Lutzenhiser (1993).

Throughout the research process the researcher was acting as a Milton Hydro employee. Data collected belonged to Milton Hydro and resultant de-identified data were passed to the researcher in order to protect the anonymity of participants in the research. This arrangement was made primarily for the benefits it provided in terms of accessing participant data and contact information for interview recruitment.

As identified in section 3.1, the data collection methods employed in the research included: 1) participant observations of the Milton Hydro CDM program process, specifically the EDP, 2) interviews with a sample of Milton Hydro medium- to large-scale customers, the participants, 3) analysis of participant electricity usage data and the Milton Hydro EDP settlement logs and 4) search of publicly available information about the participant organizations.

The research initially considered testing various approaches to examine the success of motivating organizations to undertake CDM activities. However, additional initiatives for testing customer motivations were not introduced in Milton Hydro's service area. The EDP, in its delivery, already included many significant initiatives such as direct contact with senior management, seminars and workshops, site visits, educational information and promotional opportunities for participants. To avoid the potential confusion and complexity that would arise through the delivery of separate initiatives by the University of Waterloo, it was decided to follow the existing plans set out by Milton Hydro in their EDP recruitment. The various data collection methods are outlined in the following sections.

3.3.1 Participant Observations

The research included observations of the Milton Hydro EDP process and events. These observations included participation during internal meetings at Milton Hydro in preparation for the EDP events, participation at the EDP seminars, workshops, site assessments and test drills, and discussions with Milton Hydro employees and their consultant regarding the program, process and research participants.

The Milton Hydro customers taking part in the EDP events were a subset of the medium- to large-scale customers. The subset of customers was dependent on their response to Milton Hydro's recruitment efforts for these events.

Participant observations are where the researcher "may actually participate in the events being studied" (Yin, 2003, p. 94). There are issues often identified with participant observations, primarily that there are often "potential biases produced" (Yin, 2003, p. 94). Yin (2003) identifies four main issues with participant observations: 1) there is "less ability to work as an external observer" (p. 94); 2) it is common to "become a supporter of group" (p. 96); 3) that the participant role may require more attention than the observer role, and 4) that it is hard to be in the "right place at the right time" (p. 96).

As participation in the events was minimal, and there was no advocacy for the Milton Hydro customers or for Milton Hydro on the part of the researcher, the risk of not being able work as an external observer was not a concern. However, it was possible that if the researcher was significantly engaged in the project delivery it may have eliminated the distinction between the researcher and Milton Hydro. As noted, the researcher's participation was minimal, enough to avoid the sense of being considered the researcher "keeping an eye" on the situation, but not too much to be seen as part of Milton Hydro or the associated consulting team. Recruitment for the program events was entirely the responsibility of Milton Hydro and the researcher was not involved in the promotion or encouragement of the EDP. Participation by the researcher was limited to providing handouts, brief presentations explaining program design and/or technical details.

This limiting of involvement also eliminated any concerns of being too involved such that the researcher would miss important observations. As the EDP events were scheduled in advance and held at one location, there was no concern related to the researcher being in the right place at the right time.

Observing the EDP process was intended to provide insights with regard to consumer motivations. It was intended to gain a better understanding of their concerns, questions, limitations and perspectives of CDM in general as well as specific to demand response programs such as the EDP. As the site visits and test drills took place, issues related to the EDP as well as to CDM activities in general were discussed and there was great potential that some key motivations, enablers and barriers for organizations to participate or not participate would be identified. The observations made were recorded as field notes. The observations of the program events helped in the development of the interview guide.

Table 3.1 indicates the number of observed events and the number of medium- to large-scale customers that were part of each event.

Table 3.1: Observations of EDP Events

Type of Event	Number of Events	Attendee Make-up*
EDP Test Drill/Site Visit	1	- Single Customer: Interviewee P6
EDP Site Visit/Audit	1	- Single Customer: Interviewee P7
EDP Seminar Milton Town Hall June 26 & 27, 2006	2	- Attendees were mix of commercial/industrial medium- to large-scale customers in Milton Hydro service area - 51 attendees representing 38 unique organizations
EDP Workshop Milton Town Hall July 25, 2006	1	- Attendees were mix of commercial/industrial medium- to large-scale customers in Milton Hydro service area - 7 attendees representing 5 unique organizations

* Details about participants and the use of participant identifier Px are outlined in section 4.1.

3.3.2 Interviews

The primary source of data for the research is from interviews conducted with a sample of medium- to large-scale Milton Hydro customers, the research participants. The interviews provided an opportunity to ask direct questions to decision makers at these organizations regarding motivations, enablers and barriers related to their CDM activities. The interviews sought to understand why customers undertake or do not undertake CDM activities. The interviews were intended to be personal in-depth interviews similar to those conducted by Sandberg et al. (2003).

The primary steps in the interview process were recruitment of interviewees, the interviews themselves and compilation of the data. The process for each of these steps is outlined below.

Interview Recruitment

The recruitment process conducted by Milton Hydro for the EDP included the identification of approximately 200 of the senior managers responsible for decisions regarding CDM participation at 143 medium- and large-scale organizations. These senior managers were called and sent invitations on behalf of Milton Hydro to take part in the EDP. Milton Hydro had created a small database of these contacts that prioritized customers for contact based on load size and anticipated level of interest in the EDP. The database also contained comments related to the phone solicitation and participation levels in the EDP to date.

The interview recruitment was dependent on self-selection by medium- to large-scale customers. The recruitment was initially conducted using random sampling techniques preferred by deductive research approaches (Palys, 2003). Initially, the study solicited participation from these 143 medium- to large-scale Milton Hydro customers through addressed mailing of a Recruitment Information Letter and Consent Form (Appendix A). Milton Hydro's contact database was used for addressing these letters. The letter provided the potential participant with information about the purpose and method of the study as well as an assurance of their confidentiality with respect to the data they provide.

Further recruitment efforts were conducted at the EDP seminars and workshop. At the events, the President of Milton Hydro introduced the researcher and encouraged the attendees to participate in the interviews. Event attendees were provided with letters and consent forms at the time as well as notified that they would be contacted for participation.

Based on the response rate (two willing participants from 143 organizations) to the recruitment letters and efforts at the EDP seminars and workshop (one willing participant), the recruitment method was changed to include direct phone calls to participants on Milton Hydro's customer contact list. Initially calls were made from the top to the bottom of the list, but as response to phone solicitation was also low it was decided to pursue specific Milton Hydro customers to participate in the interviews based on the experiences of Milton Hydro. That is, customers who, at a minimum, had contact with Milton Hydro and expressed an interest in the EDP or CDM activities in general, as recorded in Milton Hydro's contact database, were targeted based on their anticipated responsiveness to the interview solicitation. In total, the research managed to recruit 19 individuals from 17 participant organizations to take part in the interviews. The responses to the interview solicitations are summarized in Table 3.2.

Table 3.2: Interview Solicitation

Initiative	Results
Number of organizations and individuals solicited for interviews by letter (either mailed or handed out at the workshop)	- 198 individual letters representing 143 organizations
Respondents to letter (number of organizations)	- 5 Total (3.5%) - 2 “Yes” that did participate (1.4%) - 1 “Yes” (0.7%), but then did not participate. (Initial email response implied they assumed it was mandatory to participate. It was assumed that they eventually realized it was not mandatory.) - 2 “No” (1.4%)
Recruits from Seminars and Workshops (number of organizations)	- 1 “Yes” (0.7%) that did participate
Recruits from direct phone solicitation (number of organizations)	- 14 “Yes” (9.8%) that did participate
Total Number Interviewed	- 19 interviewees from 17 participant organizations (12% of organizations)

Interview Process and Guide

The interviews were designed primarily to be open-ended to allow for the greatest freedom in response from the interview participants. This was also similar to Sandberg et al.’s (2003) use of a questionnaire with questions of an open-ended nature. It was anticipated that the interviews would result in story-centered descriptions of the motivations, enablers and barriers that have led to or prevented the participant organizations from undertaking CDM activities.

> The strength of such story-centered descriptions is their ability to highlight path dependencies and causal or at least functional relationships, often distinguishing themselves from normative models. That is, stories are often told because they illustrate a point that needs illustration, in distinction from what would be otherwise assumed (Moezzi et al., 2004, p. 6).

Though a number of propositions were developed in chapter two as to why the organizations may have undertaken CDM activities or not, the propositions were general in nature and the research sought a specific contextual understanding of the participant’s motivations, enablers and barriers. Gorden (1987) identifies this as an appropriate situation for conducting interviews as opposed to a questionnaire as “the exploratory values of the unstructured interview are impossible to attain in a questionnaire where there is no opportunity to formulate new questions or probe for clarifications" (p. 11).

The interview guide included some specific questions as well as some open-ended questions (Appendix A). The interviews aimed to identify which CDM activities the participants had or had not undertaken and to identify information that would help quantify the level of impact of the activities that were undertaken. With respect to quantifying the impact, the interviews were used to collect information that could be used to help guide the analysis of the electricity consumption data. The quantitative impact was sought as a means to verify the undertaking of the activity.

As an open-ended question, the interview participants were then asked why they undertook or did not undertake the specific CDM activities they identified. Following the participant's initial response, a set of probes were used to identify whether a pre-defined set of factors were part of the decision-making process to undertake the CDM activities that they did. The probes were designed based on the research propositions identified in chapter two. The probes were used if the participant had not previously confirmed one or more of the set of factors based on the initial open-ended question. A few of the probes were specific to the CDM activity sub-categories of efficiency and demand response. These were only asked of participants that had identified these activities. Where the participant identified CDM activities that were considered, but not acted on, the same process was followed.

Conducting Interviews

In order to adapt to the range of organizations and potential CDM activities under study an open-ended and semi-structured interview style was used. As stated, probes were used to help guide both interviewer and prompt interviewee as required. "Probing is a way to get the respondent motivated and steered toward giving relevant, complete, and clear responses to meet the objectives of the interview" (Gorden, 1987, p. 419).

It was important to prioritize the propositions to be addressed throughout the interviews due to time limitations placed on the researcher by the participants. The researcher was conscious that the interview participants were customers of Milton Hydro, the organization he was effectively representing. The interview guide did evolve throughout the interview process as experience led to a better structure which primarily helped to prioritize the information sought, including identifying the specifics of the CDM activities undertaken. The final version of the interview guide is included in Appendix A.

Interview guides were printed and notes were taken during the interview process. These notes were written up after the interview and grouped into the various categories developed for the results section of chapter four.

3.3.3 Electricity Data and Energy Drill Program Settlement Analysis

The electricity consumption data analysis and EDP settlement analysis was performed to quantify the impact of the CDM activities undertaken by the participant organizations. Quantifying the impact of the CDM activities was intended as a means of verifying that the participants had undertaken the activity. The electricity consumption data and EDP settlement analysis were provided directly by Milton Hydro.

The researcher analyzed the electricity consumption data of the participant organizations in an effort to determine the impact of the reported CDM activities on the electricity consumption and/or demand profile of participants. The baseline selected for the analysis was based on information provided during the participant interviews, including the date and time range of CDM activities undertaken, as well as the other operational factors that may have otherwise impacted the participant's electricity consumption or demand.

3.3.4 Publicly Available Information

Publicly available information about the organizations that participated in the interviews was used to identify the public profile of the participating organization. The public profile of the organizations in terms of their respective organizational networks and organizational image was used to provide indications as to why the participant may have decided to undertake a CDM activity or not. This public profile serves as a means of cross-referencing interview responses with other indications of why the organization did or did not undertake the CDM activities.

This information was sought from public information sources including organizational websites, public messages through advertisements, media articles, awards sites, the IESO, and/or from their industry associations and business partners.

Some of the questions considered in conducting the public information search were as follows:

Does the organization have policies related to environmental stewardship and/or social/community involvement?

Does the organization's competitors, suppliers, customers and/or partners have such policies?

Does the organization belong to an industry association? What policies/practices does the industry association promote and what practices do the majority of its members follow?

What does the organization's mission statement indicate about its potential as a participant in CDM activities?

The public profile of the participant was deemed to have relevance to the undertaking of CDM activities if there was any indication of their intent to operate efficiently, contribute to environmentally beneficial initiatives and/or concern for the electricity system.

The following section outlines the compilation of results and analysis elements of the research.

3.3.5 Results and Analysis

The primary data of this research are qualitative in the form of participant interviews and observations, but also include the results of the quantitative electricity consumption data analysis and EDP settlement analysis. The results, presented in chapter four, include compiled data from the observations, interviews, electricity usage data analysis, and public information research.

Once compiled, the data were analyzed to identify overall trends and categorizations drawn regarding participants' experiences and interview responses (Creswell, 1998). The objective was to identify any relationships that exist between the variety of organization profiles, the CDM activities undertaken and their associated motivations, enablers and barriers. The analysis will highlight particularly interesting cases as well as elements of the study that provide the best indications of motivations, enablers and barriers which were identified throughout the research process.

The data were analyzed according to Yin's (2003) theoretical proposition strategy, which relies on responding to the theoretical propositions, or questions that led the study. This analysis was supported by the comparison of the research results to the organizational behaviour and CDM literatures to identify any correspondence that may exist and/or identify additional factors, which might contribute to this body of knowledge. The analysis is presented in chapter five.

3.3.6 Challenges and Limitations

The study was limited by a number of factors including scope, time, and budget. There are limitations related to the level of intervention that could be introduced in the Milton Hydro service area. Some interventions, such as establishing a competition between organizations to achieve the greatest electricity reductions, as per Newman et al. (1992), or adjustment of economic factors, were not feasible based on their complexity of organization, time, cost and required regulatory interventions.

It was a challenge and limitation to access a significant number of decision makers for this research. The coincident solicitation for interview participants with that for the EDP may have proven beneficial in some instances, but not in others. The EDP contact database and Milton Hydro consultant were helpful in identifying those customers that had even minimal interest in the subject matter, however, those customers may have confused the research recruitment with that for the EDP and/or they may have not had the interest to participate in both the EDP and the research.

There are limits with respect to participant classification and activity reporting in order to maintain participant confidentiality both in terms of the ability to find out information about organizations as well as in reporting them in the thesis. This limits the specific details that can be revealed in some cases for participants, their CDM activities as well as their reasons for doing them.

Most of the data collected in the research were as reported by the interview participants. Though the research includes participant observations, electricity data analysis and the gathering of public information about the organizations, the enablers and barriers identified were primarily based on the self-reported information provided by interview participants. This is a risk as participants may have been inclined to provide socially acceptable answers, misrepresent the situation or they simply may have forgotten important elements of the CDM activity or associated decision-making process.

The recruitment of the interview participants required direct phone solicitation, which often resulted in the interview being completed as part of the same phone call. That is, once a willing participant was identified it was best to take advantage of the opportunity. This situation, however, prevented the public profile search and the electricity usage data analysis to be completed in advance of the interview as the researcher was unable to predict which Milton Hydro customers would be willing to participate in the interview. This inability to conduct pre-interview research and analysis limited the researcher's ability to ask participants about public profile elements or identified patterns and changes in the electricity usage data specific to the organization. This resulted in a less comprehensiveness interview, thus limiting the ability to pose specific questions related to those two sources of data.

The next chapter presents the results of the research.

Chapter 4: Results: Who, What and Why?

This chapter contains the findings from the case study of Milton Hydro medium- to large-scale customers which sought to determine why organizations do or do not undertake CDM activities. In answering the question the research investigated which electricity CDM activities the participants have or have not undertaken, what electricity consumption and demand impacts those activities have had, and what were the associated motivations, enablers and barriers related to undertaking of CDM activities. Analysis of these results will follow in chapter five. The analysis will consider how these results align with the propositions developed in chapter two and the existing literature on organizational behaviour and electricity CDM activities.

As there are a limited number of participants in the study (all were volunteers and some were directly targeted for participation based on their anticipated responsiveness to the solicitation), it is important not to generalize the study's findings to all medium to large customers as arguably the study sample consists of those organizations that are more inclined to be involved in CDM activities and therefore willing to talk about them.

The results of the research are presented in 'who, what and why' sections. The first section, 4.1, identifies the organizational characteristics and public profile of each of the interview participants. The second section, 4.2, identifies the CDM activities and electricity consumption and demand impacts for each of the interview participants. The third section, 4.3, presents the motivations, enablers and barriers related to the undertaking of CDM activities.

4.1 Interview Participant Profiles

Participants of the case study were those organizations that were involved in the interviews. The interviewees were representatives from a range of medium to large size organizations, particularly in terms of electricity demand and consumption. The mix of interviewee participants is a consequence of the solicitation process outlined in chapter three.

Table 4.1 identifies the 17 interview participants and their sites. The table identifies each participant's sector, demand range and billing category.[3]

In a single case study, such as this one, privacy considerations are significant, hence the use of the general representation of sector category as one of industrial, commercial, or institutional rather than use of the more specific North American Industry Classification System (NAICS) codes, for example. The same principle has been applied in identifying the demand range of the participants rather than specific kW and kWh levels. All of the interview participants had an hourly interval meter installed in or after 2001 and are subject to either time-of-day Regulated Price Plan (RPP) rates or Spot Market prices (see Appendix C for explanation of rates).

Table 4.1: Interview Participant Profiles

P#	Site Identifiers (if more than one)	Sector	Demand Range	Billing Category
P1		Commercial	50 kW - 1000 kW	Spot Market
P2		Industrial	50 kW - 1000 kW	RPP
P3		Commercial	50 kW - 1000 kW	RPP
P4		Institutional	50 kW - 1000 kW	RPP
P5		Commercial	50 kW - 1000 kW	Spot Market
P6	P6a, P6b, P6c	Institutional	> 1000 kW	RPP
P7		Industrial	50 kW - 1000 kW	Spot Market
P8		Industrial	> 1000 kW	Spot Market
P9		Institutional	> 1000 kW	Spot Market
P10		Commercial	50 kW - 1000 kW	Spot Market
P11		Industrial	50 kW - 1000 kW	RPP
P12		Commercial	50 kW - 1000 kW	RPP
P13		Industrial	50 kW - 1000 kW	RPP
P14		Commercial	50 kW - 1000 kW	Spot Market
P15		Industrial	50 kW - 1000 kW	Spot Market
P16		Commercial	50 kW - 1000 kW	Spot Market
P17		Institutional	50 kW - 1000 kW	RPP

Table 4.2 identifies the involvement of each participant throughout the various stages of the case study. As identified in chapter three, the opportunities for participant involvement were in the

[3] The participant organizations had a variety of organizational structures. P6 was a participant organization with multiple sites. The P6a, P6b and P6c identifiers represent the multiple P6 sites. The sites are primarily referenced in section 4.2 for CDM activity and impact assessment.

observations of the EDP events (seminars, workshops, or site visits) as well as the participant interviews. All of the interviews were conducted after the EDP events. This table is provided to indicate the level of exposure that the researcher had with each participant throughout the study.

Table 4.2: Interview Participant Research Involvement

P#	Milton Hydro EDP Event Observations*			Interview Method and # of Participants	
	Seminar	Workshop	Site Visit	Telephone	In-Person
P1	X	X	X		1
P2	X	-	-	1	
P3	-	-	X		1
P4	-	-	-	1**	1**
P5	X	-	X		2
P6	-	-	X***	1	
P7	X	****	X***		1
P8	X (2)	-	X		1
P9	X (3)	-	-		2
P10	-	-	-	1	
P11	X	X (2)	-	1	
P12	-	-	-	1	
P13	X	-	-	1	
P14	-	-	-	1	
P15	-	-	-	1	
P16	X	-	-	1	
P17	-	-	-	1	

*An 'X' indicates one representative participated in that Milton Hydro EDP event. If more than one representative participated the number is indicated by the value in ().
**P4 interview involvement included two interviews with two distinct, but related, organizations that have influence over the activities of the site in question.
***Site Visits with Milton Hydro's consultant.
****P7 applied for a workshop, which was eventually cancelled, due to low response.

The profiles of the interview participants in the case study are compared against all those in the Milton Hydro medium- to large-scale customer group (GS > 50 kW) that was targeted for the research and for the EDP. In Table 4.3, the sector and demand range of the interview participants is compared against this larger group to give a sense of the extent to which this study may be representative of the mix of organizations in this municipality. Comparable data for the categories of Table 4.3 are not readily available for an Ontario comparison.

Table 4.3: Interview Participants as Compared to Milton Hydro GS > 50 kW

	Industrial	Commercial	Institutional	50-1000 kW	> 1000 kW
Case Study Interview Participants (n = 17)	35%	41%	24%	82%	18%
Milton Hydro GS > 50kW* (n = 143)	37%	47%	17%	95%	5%

*Taken from Milton Hydro contact database. Summation of percentages not adding exactly to 100% is due to rounding.

Table 4.4 presents the public profile information of each participant organization as it relates to factors that have led the organization to undertake CDM activities or not. The information is primarily based on a public information search for general characteristics indicative of each of the participant organizations' environmental and/or electricity CDM related profiles as described in chapter three. The process for the public information search and determination of the relevance to CDM activities is outlined in section 3.3.4.

Table 4.4: Interview Participant Public Profile

P#	EDP*	TDRP**	IESO***	External Recognition ****	Self Promotion/Reporting *****	Public Profile Relevance to CDM
P1	X	-	-	-	Environmental product line, Donates to environmental group, Website: environmental promotion	Y
P2	-	-	-	-	Industry association to "improve efficiency", but not specific to electricity	Y
P3	X	-	-	-	None	N
P4	X	-	-		News release re: "conservation" initiative, environmental initiatives	Y
P5	-	-	-	-	None	N
P6	X	-	-	-	Significant "conservation" focus including water, forests, ecological conservation and some energy references.	Y
P7	-	-	-	-	Website: identifies service as "Environmentally safe"	Y
P8	X	-	X	-	Environmental Policy, ISO 14001, Parent organization website: CSR information	Y
P9	-	-	-	-	Website: identifies environmental benefits of service	Y
P10	-	-	-	TSX	Annual Report section re: good corporate citizen – promote energy conservation	Y
P11	X	-	-	-	None	N
P12	-	-	-	-	No environment mentioned, President is community supporter	Y
P13	-	-	-	-	None	N
P14	-	X	-	-	Extensive environmental reporting	Y
P15	X	-	-	-	International HQ website: environment page and detailed reporting	Y
P16	-	-	-	Energy Star Award	Environmental product line and many online resources	Y
P17	X	-	-	-	Community initiatives, No environment mentions, 2006 Annual Report mentions "Energy Drill" partnership	Y

*Organization a participant in the EDRP
**Organization a participant in the TDRP
***Organization identified on the IESO website as a participant in other IESO programs or in a CDM related case study
****Recognized for CDM related efforts: Voluntary Challenge & Registry Program, Awards, Dow Jones, Sustainability Index, Jantzi Social Index, Globe and Mail Annual Rating, TSX
*****Promotes CDM related products, services, or activities: Press Releases/Web Site Promotion, Sustainability/Environmental Report, Annual Report and/or Industry Association, competitor or organizational partner that promotes CDM related products, services, or activities

As indicated earlier, this information will be drawn upon, as appropriate, in chapter five to highlight any links among organizational profile characteristics, CDM activities and impacts as well as motivations, enablers and barriers.

4.2 CDM Activities and Impacts

This section identifies what CDM activities the interview participants undertook and the electricity consumption and demand impacts of those activities. Those activities not undertaken by interview participants are not revealed here, but discussed in the barriers section of 4.3.

As identified in chapter two, the CDM categories considered in the research consisted of conservation, efficiency, and demand response. The research results led to identification of multiple demand response activity categories based on differences in the activities undertaken. The demand response activities were categorized as “peak” and “program” activities.

Peak activities are those that are undertaken by participant organizations to reduce their peak demand for a limited period of time, but not as part of an external program. These efforts to reduce peak demand can be based on peak electricity prices, peak electricity system demand, peak temperatures and/or due to smog days or other triggers. Program activities include demand response activities that are undertaken in accordance with the Milton Hydro EDP and/or the associated IESO TDRP, to which the EDP is an aggregator.

The participants undertook a wide variety of CDM activities. The research with respect to CDM activities and impacts was designed to 1) identify and categorize the activities undertaken by participants, and 2) to quantify the impact of the activities. The quantitative analysis attempts to isolate the impact of the CDM activity on the participant’s electricity demand and/or consumption, as applicable. The quantitative analysis was performed as a means of verifying the activities reported during the interviews. As there are many factors that can impact energy usage it can be difficult to directly assess the impact of a CDM activity. In order to determine the impact of the CDM activity through quantitative analysis it is important to account for these factors. The quantitative analysis is presented as a percentage change to electricity demand and/or consumption, as applicable, in order not to reveal the actual magnitude of electricity demand and/or consumption of the participants which might, in turn, serve to reveal the participant's identity. The quantitative analysis methods that were used to determine the impacts of the various types of CDM activities are outlined in the following sections.

Impact Analysis of Conservation, Efficiency and Demand Response Peak Activities

The quantitative analysis of the conservation, efficiency and demand response peak activities used weather and operational correction factors to normalize the electricity usage data against an established baseline. The researcher performed the quantitative analysis for these activities including the weather correction as described below.

Weather Correction

A weather correction factor was used to account for the impact of the change in weather on electricity demand and consumption. The weather correction of the electricity consumption data was completed using factors provided by Hydro One, the provincially owned transmission and distribution company. Hydro One provided weather correction factors for the class of interview participants (GS > 50 kW) in Milton. Their correction factors only apply to participants belonging to the Standard Industrial Classification (SIC)[4] system groups of 23 to 35 inclusive.

> The correction factors are based on weather correction methodology used by Hydro One for many years. (The) Ontario Energy Board has approved the method for the cost allocation study involving more than 80 Ontario local distribution companies - which is close to completion – as well as for (the) Hydro One distribution rate hearing in 2005. Basically, the method removes abnormal weather effects from load in relation to temperature, humidity, wind speed, and cloud cover. (Alagheband, 2007)

Hydro One explained that the reason the weather correction factors only applied to these SIC groups is that the other groups have no or a trivial amount of weather-sensitive load compared to their total electricity usage. For example, a small office in a plant may have air-conditioning but that is trivial compared to the total electricity usage by the plant. The participant organizations were categorized using the SIC system. For those participants, 10 of 17, that belong to the SIC groups 23 to 35 the daily weather correction factors were applied to each hour of the electricity consumption data for the years 2001 to 2006. The specific participant SIC groups are not

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[4] The U.S. Department of Labor Occupational Safety & Health Administration publishes the SIC manual, which identifies those major groups at www.osha.gov/pls/imis/sic_manual.html.

identified in order to protect participant confidentiality. The seven participants that were not part of these SIC groups did not have their electricity consumption data weather corrected.

Operational Correction

The operational factors identified in section 3.3.2 were included as part of the interview guide to be used in the impact analysis. In many cases, specific operational factors were not available from interview participants for the time periods required. For industrial participants with potential production variability, the impact analysis was not performed if the production variability was not known. The one industrial participant that did provide production information did so based on an approximation of linear decline over four years. None of the commercial or institutional participants provided specific occupancy data for the required time periods and as such, where the consumption data of these participants were analyzed a consistent occupancy pattern was assumed.

Baseline Establishment

The impacts of the conservation and efficiency activities are evaluated by comparing the normalized consumption over time periods selected based on when the CDM activities were undertaken. The reference time period is called the baseline. The baseline was chosen based on when the activity was undertaken as well as the duration and frequency of the activity. The baseline was specific to each activity and is identified with each analysis presented below.

Impact Analysis of Demand Response Program Activities

The EDP already had an established methodology, based on the TDRP, for determining the impact of the demand response activities so the quantitative impact analysis of the demand response program activities uses the TDRP method as opposed to using the method outlined above.

Any further details related to the specific analysis will be presented in the appropriate section below. The conservation and efficiency activities and impacts are presented in sub-section 4.2.1, those of demand response peak activities in 4.2.2, and lastly 4.2.3 presents those for the demand response program activities. The demand response peak activities and impacts are dealt with separately from the demand response program activities due to the differences in the data analysis methods.

4.2.1 Conservation and Efficiency

This section identifies the conservation and efficiency activities that were undertaken by the interview participants and the impact of those activities. As previously identified, conservation activities are operational activities that lead to reduced electricity demand and consumption. Efficiency activities pertain to equipment and design choices for the participating organizations. Conservation activities also include load-shifting and/or activities designed to lower peak consumption. These peak reducing activities are different from demand response peak and program activities in that they are longer term or more routine activities and are not performed occasionally, for a short duration and/or in response to a specific trigger. Table 4.5 identifies the conservation and efficiency activities that each participant reported undertaking during the interviews.

Table 4.5: Conservation and Efficiency Activities

Conservation and Efficiency Activities	Organizations																
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17
Conservation																	
Process Review								X				X			X		
Reduced Lighting Levels	X								X							X	
Reduced HVAC*	X														X		
Turn Off Equipment (Nights/Weekends)								X		X			X		X	X	X
Reduce Electric Heating						X			X								
Shift Usage To Off-Peak Times		X	X						X				X				
Efficiency																	
Lighting - Timers, Photocells			X		X				X			X			X		
Programmable Thermostats								X	X			X		X			
Upgrade Lighting			X		X		X	X					X	X		X	X
Upgrade/Maintain Windows			X	X													
Modify/Upgrade HVAC*	X		X		X						X					X	
Upgrade Process Equipment		X						X					X				

* Refers to at least one element of the Heating, Ventilation, and Air Conditioning (HVAC) system.

Table 4.5 identifies that all interview participants that identified some form of conservation and efficiency activity they had completed in the past or were doing on an ongoing basis. Participants P4, P5, and P16 also identified having reminder and awareness campaigns as well as hosting workshops either internal to their organizations or externally, within the community. As these were not direct activities resulting in electricity usage reductions at their facilities, they were not included as CDM activities.

Conservation and Efficiency Impacts

Table 4.6 identifies the impact of the activities undertaken by a select number of participants. The analysis performed is as per the method identified in section 4.2 for conservation, efficiency and demand response peak activities. The participant activities analyzed were selected based on the availability of information about the activity undertaken.

The analysis attempted to determine the proportional change in consumption (kWh) due to the identified activity. The change in consumption was analyzed as these activities are more energy based and without knowing specific time and profile of the activities it was deemed too uncertain to calculate the demand impact. Table 4.6 identifies the change in consumption (kWh) over a specific time period as well as the baseline method used for the evaluation. The time period and baseline were chosen based on the specifics of the activities undertaken. Only P14 reported a variable occupancy factor, that is, an expansion of their facility. As identified in section 4.2, where the occupancy factor was unknown for non-industrial participants, a constant occupancy factor was assumed. The averaging of multiple historical time periods, where the data were available, was done with the intention of improving the baseline accuracy.

Table 4.6: Conservation and Efficiency Activity Impacts

P#	Savings (kWh)	Analysis Time Period	Baseline Method: Baseline Time Period vs. Impact Time Period
P5	8%	4 months	Average of Nov 2003-Feb 2004 vs. Nov 2004-Feb 2005
P10	9%	1 year	2004 vs. Average of 2005 and 2006
P14	-30%	1 year	Average of June-May 02/03, 03/04, 04/05, vs. June-May 05/06 Occupancy factor: 30% expansion
P17	18%	1 year	Average of 2004 and 2005 vs. 2006

*Positive savings numbers indicate reductions in electricity usage

P5 upgraded their lighting prior to 2001, the start of the interval meter data history. The impact analysis of P5's activities was based on the reported upgrade of the HVAC system prior to the start of winter in 2004. P5 installed new controllers to improve the efficiency of the HVAC system in one of the five suites in the building. P10's average yearly consumption dropped by 9% over the time that a new manager was running the facility. P14 had reportedly undertaken a renovation in 2005 using high efficiency equipment. The impact results, showing a 30% increase in consumption, are considered questionable as they are based on a quick estimate by the interviewee of the size of the expansion that took place. P17 identified replacing the T12 fluorescent lights they still had from the 1970s to T8 lights in 2005. P17 also identified that in the summer they "up it a little bit" with respect to the air conditioning setpoint. The analysis of these activities indicates a drop in average annual consumption of 18%.

Though some participants also identified undertaking conservation and efficiency activities the impact analysis was not performed due to missing data. P1 identified upgrading three of six air conditioning units in 2001, which were 20 years old, however, this was prior to the start of the data set and hence was not part of the analysis. P4's activities were also undertaken before the start date of the available data. P2 estimated an 8-10% reduction from the efficiency improvements made, but without production data for this participant it is a challenge to identify the impact by analyzing the electricity data. This lack of production data also made it difficult to analyze the impact of conservation and efficiency activities by P6, P7, P8 and P11. P15 identified a dynamic operations schedule, which made it difficult to analyze the impact. P15, however, was able to identify many different activities and was an obviously engaged operations manager with respect to energy management. As P16 had a new efficient facility, it was also a challenge to determine a baseline for comparison.

The activities of participants P1, P3, P9 and P13 were considered primarily to impact peak period usage. The impacts of these conservation and efficiency activities are presented in the next section. The primary activities of P4, P6, P8, and P11 are covered in the demand response program section of 4.2.3.

Impacts of Conservation and Efficiency Activities During Peak Periods

The changes in median peak demand (kW) and the peak period consumption (kWh) to off-peak consumption (kWh) ratio were analyzed for those participants (P1, P3, P9, and P13) that identified reducing peak period consumption or shifting usage to off-peak periods. As there were no production data available for P2, the impact analysis was not performed. The median peak demand was used instead of the mean as with fluctuating demand values due the median gave a better representation of a typical demand profile.

The peak time period used for analysis was dependent on the participant's billing category. The RPP participants, P3 and P13, were billed based on established time-bands defined as on-peak, mid-peak and off-peak. The RPP time bands are identified in Appendix C. The impact analysis for P3 and P13, therefore, considered the ratio of on-peak to off-peak. The peak time period for the spot market participants (P1 and P9) was defined as 7am-7pm on weekdays that are not statutory holidays, which is consistent with Milton Hydro's billing definition. Table 4.7 presents the impact analysis for those peak period conservation activities undertaken by participants that were identified in Table 4.5.

Table 4.7: Peak Period Activity Impacts

P#	Savings (%)*		Time Period	Baseline Method: Baseline Time Period vs. Impact Time Period
	Median Peak Demand (kW)	On-Peak to Off-Peak Consumption (kWh/kWh) Ratio		
P1 Black-out	35%	30%	1 week	Black-out Aug 14, 2003: Average of 3 weeks pre-blackout and 3 weeks after
P1 Energy Drill Days / "power save days"	27%	31%	2 days	Energy Drill days: Average of equivalent weekdays for 3 weeks prior and 3 weeks after Aug 1 – Aug 2, 2006, not including days with Energy Drill events.
P3	7%	3%	1 year	2002 vs. 2006 Assume consistent occupancy
P9	-14%	-2%	1 year	4pm-10pm, 2001-2004 vs. 2005 and 2006 Assume consistent occupancy
P13	20%	14%	1 year	2002 vs. 2006 Production factor: -40% over 7 years. Production as 85% of total usage.

*All peak kW and peak period kWh calculations include adjustments for holiday exemptions
Positive savings numbers indicate reductions in electricity usage

The results of P1's peak period conservation activities are quite high for both the week following the eastern-North American blackout of 2003 as well as on two key days for EDP events in 2006. P3 has relatively little change in on-peak to off-peak consumption ratio over the time period of analysis. P3 identified that their electricity consumption was 55% off-peak through activities such as promoting laundry use at night. P3 identified many activities undertaken over many years, which is why it may be hard to identify a significant change in on-peak to off-peak consumption. P9's impact analysis shows an increase in on-peak demand and consumption ratio, which does not coincide with interview or observational results. This is an indication of the difficulty of relying on the impact analysis to verify interview and observation results. Table 4.7 identifies P13 having a 20% reduction in peak demand and a 14% reduction in on-peak to off-peak consumption even with the change in production accounted for.

The next section presents the activities and impact analysis of the demand response peak activities.

4.2.2 Demand Response Peak

As previously identified, demand response peak activities are those that are undertaken by participant organizations to reduce their peak demand for a limited period of time, but not as part of an external program. Table 4.8 below identifies the demand response peak activities that the interview participants reported undertaking.

Table 4.8: Demand Response Peak Activities

Demand Response Activities	Organizations																
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17
Reduce Lights										X		X				X	
Reduce HVAC*																X	

*HVAC: Heating, Ventilation and Air Conditioning

Demand Response Peak Impacts

The activities that P10, P12 and P16 identified were undertaken at peak temperature and/or peak price times, but without any specified dates or times of their activities and, again, were not part of the EDP or TDRP demand response programs.

Though the peak activities were undertaken at unspecified times the impact analysis for P10, P12, P16 was performed for two of the hottest, highest priced and highest demand days of 2006 for which the TDRP was dispatched and the IESO also issued power warnings, namely Tuesday August 1 and Wednesday August 2, 2006 (Independent Electricity System Operator, 2008). This time period was selected based on an assumed likelihood of the participants undertaking peak activities during this time. As these activities were not undertaken as part of the EDP, the analysis for the activities was not included in the EDP settlement log provided by Milton Hydro. The data were analyzed to identify percentage changes in the median peak demand (kW) as well as the peak period consumption (kWh) for that time period. The ratio of on-peak to off-peak consumption was not analyzed as the participants identified load curtailing activities rather than load shifting activities.

The baseline was determined by calculating the average peak demand and peak period consumption for the same days of the week, in the three weeks that preceded August 1 and 2, 2006 and in the three weeks that followed. As the occupancy data were not available for these specific days, it was assumed that occupancy was consistent. The baseline method attempted to account for any inconsistencies in occupancy by comparing similar days of the week, namely Tuesday and Wednesday, within a short time period (July 11, 2006 to August 23, 2006) and did not include any holidays in the calculation. The peak period was selected as between 7am-7pm as per Milton Hydro's rate structure.

Table 4.9 identifies the results of the analysis for peak activity participants. All participants involved in peak activities were analyzed in the same way for the time period of August 1 to August 2, 2006.

Table 4.9: Demand Response Peak Activity Impacts

P#	Savings (%)*		Time Period	Baseline method
	Peak kW	Peak Period kWh		
P10	22%	22%	2 days	Average of equivalent weekdays for 3 weeks prior and 3 weeks after August 1 – August 2, 2006
P12	15%	11%		
P16	11%	14%		

*Positive savings numbers indicate reductions in electricity usage

According to the impact analysis, each of the participants had a kW impact of greater than 10% and up to 22% (for P10). The peak savings are relatively equivalent to the peak period savings indicating each of these participants likely reduced their usage for the majority of the days in question.

The next section presents the results, activities and impacts of those participants that were registered in the EDP and/or TDRP programs.

4.2.3 Demand Response Program

This section identifies the demand response program activities undertaken as part of the EDP or the TDRP. As identified previously, the EDP is an aggregator for the TDRP so, in effect, all EDP participants are TDRP participants.

Initially the activity level of the EDP as a whole is presented in section 4.2.3.4 below. Secondly, the activities and impacts of the interview participants involved in the EDP or TDRP are identified in sections 4.2.3.5 and 4.2.3.6. All but one of the interview participants considered in this section were EDP customers. P14 was not an EDP customer, but did participate in the TDRP. The impact analysis is limited to interview participants only and does not include all the participants in the EDP nor in the TDRP.

4.2.3.4 Energy Drill Program Results

Table 4.10 shows the results of the EDP in terms of the number of registered Milton Hydro customers in the EDP ("EDP customers"), interview participants registered in the EDP, the number of EDP event notifications and the number of EDP customers and interview participants that had a positive demand response recorded in the EDP settlement log as provided by Milton Hydro. A positive response refers to a recorded demand reduction of greater than zero, which would actually be a reduction in their demand during the event.

Table 4.10: EDP Results

	2005 (1st year of EDP operation)	**2006**
# of EDP customers*	8 new and total organizations and sites	20 total organizations 22 total sites 12 new organizations 14 new sites
# of EDP customers as Interview Participants	3 of 8 organizations (P4, P8, P17)	8 of 20 organizations (P1, P3, P4, P6, P8, P11, P15, P17)
# of Event Notifications for EDP**	1227 (July 1 – December 31, 2005)	Total: 148 Jan 1 - Feb 28, 2006: 39 March 1 – Dec 31, 2006: 109
# of EDP customers with at least one positive response***	7 of 8 organizations	10 of 20 total organizations 12 of 22 total sites 3 of 12 new organizations 5 of 14 new sites
# of EDP customers as Interview Participants with at least one positive response ***	2 of 3 organizations (P4, P8)	4 of 8 organizations (P4, P6, P8, P11)

* EDP customers are those who have signed an EDP Agreement with Milton Hydro. This agreement leads to the customer receiving Energy Drill event notifications indicating times for which a financial credit will be provided if the customer has a measurable positive demand response based on the established analysis method of the TDRP. The agreement does not require customers to undertake demand response activities upon receipt of the event notifications, as it is a completely voluntary program.
** March 1, 2006 is a key dividing date as that is the date after which EDP customers were required to provide a notification confirmation back to Milton Hydro indicating their intent to participate in each EDP event. This was a requirement to receive payments for participation.
*** The EDP settlement log is a record of when the EDP customers had a measurable positive demand response based on the established analysis method of the TDRP.

The difference between notifications in the last half of 2005 vs. all of 2006 is tremendous. This was primarily due to the summer weather starting early in 2005 and the average temperature being the highest on record for Ontario (Independent Electricity System Operator, 2005).

4.2.3.5 Demand Response Program Activities

Table 4.10 reveals that 40% of EDP customers were also interview participants. Table 4.11 identifies the participants that were part of the EDP or just the TDRP. The interview participants undertook the activities identified in Table 4.11 as part of the demand response programs.

Table 4.11: Demand Response Program Activities

Demand Response Program Activities	Organizations																
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17
Program																	
Energy Drill/TDRP	X		X *	X		X		X			X				X		X
TDRP														X			
Activities																	
Reduce Lights	X			X		X		X			X			X	X		X
Reduce HVAC**	X			X		X		X			X			X	X		
Turn Off / Don't Use Office Equipment				X		X					X						
Turn Off / Don't Use Industrial Equipment						X (P6a)					X						

* P3 joined the EDP after completion of the interview, but before December 31, 2006, the end date for the research. This allowed for some impact analysis of P3's EDP participation.
** HVAC: Heating, Ventilation and Air Conditioning

The majority of demand response activities were undertaken by reducing lighting and/or increasing the temperature setting of the facility's air conditioning. P1 identified undertaking "power save days" where, upon receipt of the EDP event notification, they would turn down the lights and air conditioning for the remainder of the day, incurring more savings than would be credited through the EDP as the EDP would last for a lesser amount of time. These savings were analyzed in the previous section as conservation peak period activities.

P3 signed up for the EDP as a result of the research interview. P3 was attempting to use the facility's internal communication system to communicate EDP event hours to the facility occupants. P4 instituted a system where, upon receipt of event notifications, multiple facility occupants were dispatched to reduce lighting, air conditioning and peripheral power equipment throughout designated areas of the facility.

At sites P6b and P6c, the demand response activities were limited to reducing lighting and air conditioning requirements. In preparation for the EDP Test Drill, a facility inspection was completed at site P6b in the spring. A number of electrical loads were found that had been left on since the winter. This was an indication that P6b's EDP participation led to increased conservation. P6a is primarily a seasonal wintertime responder by shifting usage of a large load.

P8 primarily participated by reducing their air conditioning load. The majority of P8's load is for their industrial operations, but this load was not used to provide a demand response. P11, on the other hand, reduced all major loads and minor ones including their production shop, lighting, air conditioning system, computers and coffee maker. While undertaking the demand response, P11 experimented with their air conditioning system to improve the efficiency of its operation with respect to the air intake and output configuration. This may have led to increased efficiency of operation after the EDP event.

P14 has an external control system which they used to reduce lighting and air conditioning usage at their multiple facilities as part of their participation in the TDRP. P15 did sign up for the EDP, but claimed, "there is not much to give" as the lights in their facility, their primary load, are not conducive to switching on and off. P17 was not able to reduce their air conditioning usage much as they have cooling commitments during hot days. They were able to reduce lighting, which helps reduce their cooling demand as well as potentially provide a demand response impact.

4.2.3.6 Demand Response Program Impacts

The impact for each interview participant was determined through analysis of the EDP settlement log and the participant's respective electricity consumption data provided by Milton Hydro. The EDP settlement log contains the results of the EDP with respect to the impacts of each participant involved in the EDP. As the EDP is an aggregator to the TDRP, the results in the EDP settlement log are derived using the TDRP settlement equation. The TDRP settlement equation does not require correction for factors such as occupancy, production or weather. A description of the TDRP equation is included in Appendix B.

Prior to March 2006, Milton Hydro did not require an EDP customer to reply to the EDP event notifications indicating their intent to undertake a demand response and credited the customer automatically if the application of the TDRP settlement equation resulted in a measurable positive response, that is, a demand response impact. This was consistent with the TDRP process, but starting in March 2006 Milton Hydro, at the request of the IESO, instituted a requirement for EDP customers to reply to the event notifications indicating their intent to undertake a demand response activity corresponding with the event notification. As can be seen in Table 4.10, in 2005, seven of eight EDP customers and two of three interview participants had a recorded positive response in the EDP settlement log. In 2006, only 12 of 20 EDP customers and four of eight interview participants had a recorded positive response in the EDP settlement log. The impact of the change to the notification protocol on participation rates is examined further with the EDP impact analysis below.

Table 4.12 identifies the participation rates, maximum and median impacts as determined for those interview participants that did have a positive response recorded in the EDP settlement log. These participants are grouped in the top half of the table and highlighted in white. The total participation rates as well as the rates up to the end of February 2006, when the change in reply/notification process took place, and from March 2006 to the end of December 2006, are shown for each of these participants.

The maximum and median demand response values were also calculated using the positive responses recorded in the EDP settlement log. The maximum value indicates the greatest positive response measured derived by application of the TDRP equation. The median value is presented to provide an indication of a typical demand response impact for each participant. Positive values indicate a reduction in electricity demand.

Participants P1, P3, P15, and P17 did not have a recorded positive response in the EDP settlement log though they all indicated taking part in some level of demand response activity. The log results indicate that they likely did not reply to the event notifications, as required post March 1, 2006. The electricity consumption data of each of these participants were analysed by the researcher using the TDRP settlement equation to determine if they did have measurable positive responses during EDP event times. Of those participants that registered in the summer of 2006 or later, the TDRP equation was applied to all of the event times from the participant's Energy Drill Agreement Date to December 31, 2006 as there were relatively few such times. This information is highlighted in grey in Table 4.12.

Participant P17 was registered for a long time in the EDP, yet had no positive responses in the EDP settlement log during that time. Since application of the TDRP equation to all of P17's historical data would have been quite cumbersome the TDRP equation was only applied to key event times during which there were event notifications in order to identify any impact of demand response activities[5]. This same method was used for P14 as there is no record of their participation with Milton Hydro as they were a direct participant in the TDRP and not the EDP. These data are represented in the bottom half of Table 4.12 and highlighted in white.

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[5] Similar to the impact analysis undertaken for the demand response peak activities in section 4.2.2 the key event hours selected are August 1 and August 2, 2006 which were two of the hottest, highest priced and highest demand days of 2006 for which the TDRP was dispatched and the IESO also issued power warnings (Independent Electricity System Operator, 2008).

Table 4.12: Demand Response Program Impacts

P#	Energy Drill Agreement Date	Number of Notifications [a]	Number of Responses [a]	Participation Rates (% of Responses / Notifications) [a]	Max. Demand Response (% of baseline)	Median Demand Response (% of baseline)
P4	July 05	1375/1266/109	486/486/0	35/38/0	75%	11%
P6a	Jan 06	144/39/105	29/21/8	20/54/8	82%	32%
P6b	May 06	89/0/89	16/0/16	18/0/18	41%	26%
P6c	May 06	89/0/89	2/0/2	2/0/2	23%	22%
P8	July 05	1375/1266/109	339/314/25	25/25/23	44%	5%
P11	Aug 06	64/0/64	19/0/19	30/0/30	35%	14%
P1	July 06	77/0/77	54	70/0/70	62%	14%
P3	Oct 06	20/0/20	6	30/0/30	25%	14%
P15	Sept 06	20/0/20	7	35/0/35	7%	3%
P14	N/A	N/A	0	N/A	N/A	N/A
P17	July 05	1375/1266/109	19	N/A	71%	16%

Notes: 1) Results are for the period from the Participant's EDP Agreement Date to December 31, 2006.
a) Results for three time periods: Participant's EDP Agreement Date to December 31, 2006 / Participant's EDP Agreement Date to February 28, 2006 / March 1, 2006 – December 31, 2006
b) Top white band: These are the results for those participants that had responses recorded in the EDP settlement log. The number of responses includes positive responses as identified in the EDP settlement log. Positive responses were credited automatically until February 2006, but required a customer reply indicating intent to respond after March 1, 2006. Participation rates are based on the number of responses identified in the EDP settlement log.
c) Middle grey band: The TDRP equation was applied to the electricity consumption data for P1, P3, and P15 for the time period between their Energy Drill Participation Agreement Date and December 31, 2006 as their were few instances to test. The number of responses is as determined through application of the TDRP equation to the participant's electricity consumption data.
d) Bottom white band: The TDRP equation was applied to the electricity consumption data for P14 and P17 for the time period Aug 1 – Aug 2, 2006. The number of responses is the number of positive responses as determined through this application of the TDRP equation. Participation rates are not applicable for the entire time period.

The impact of the change in the reply/notification process can be seen in Table 4.12. P4 had no recorded participation once replies were required to be sent to Milton Hydro. It is quite obvious that P4 gained from the automatic application of the TDRP equation prior to March 1, 2006. P6a's results are indicative of their winter season load. As their initial and primary activities were in January 2006, their response rate was higher prior to the change in reply/notification process. Though P8 had many responses recorded during the time prior to the change at the end of February 2006, their participation rate only changed from 25% to 23% after this time.

The greatest measured impacts in terms of relative response were by P6a, P4, P17 and P1. P4 is a long term EDP participant with a median impact of 11% over 486 measurable positive responses. Though there is some uncertainty about the participation rate of P4 in the EDP, this median value likely provides a good indication of their demand response capability.

Participants P1, P11, and P6 (a, b, and c) primarily participated for a few days around the time of their EDP registration. For these few days they provided double-digit percentage responses, but did not continue to participate much beyond the initial few days. That being the case, the maximum and median values calculated provide a good indication of their demand response capability.

It was not possible to be certain of the circumstances behind each TDRP event hour and therefore no correction for changes in occupancy, operations, production or weather was made to the data. This is consistent with the TDRP baseline procedure. Some of the maximum demand response values and positive responses determined in the analysis, however, are suspected of coinciding with an end of shift or of a closure such as on a Friday night or Sunday evening; that is, that their electricity demand fell for non-demand response reasons. This is the case for P4, P8, P1 and P17. The median provides an indication of a more likely value as the result of demand response activities.

Though P17 identified that they were not able to adjust their air conditioning much during EDP events, they did have 19 measurable positive responses throughout August 1 and August 2, 2006 with a median impact of 16%. A similar analysis of P14's data throughout the same time period reveals no positive results in terms of demand response participation in the TDRP.

The following section, 4.3, presents the decision factors identified by the participants related to the undertaking of the CDM activities identified in this section. The impact analysis of the electricity usage data presented in the preceding sections for each of the CDM activity sub-categories was intended to be a means of verifying that the participants did do the CDM activities they reported doing in the interviews. That impact analysis, however, proved to be challenging to conduct for all participants for a number of previously identified reasons related to lack of information and confidence in the specifics provided by the interviewees with respect to CDM activity dates and related operational factors (see section 3.3).

The impact analysis of the conservation and efficiency activities was the most challenging to get reliable results as there are many variables involved typically over a longer period of analysis. This challenge is frequently recognized by CDM program evaluators and researchers (Gillingham et al., 2004). Typically, such an analysis would require an energy audit and dedicated participation from participants in terms of information provision. The validity of the impact analysis of the demand response peak activities is also considered a challenge as the analysis was completed for a select number of dates that though arguably the participant would likely have been undertaking an activity at that time it is impossible to be certain. The demand response program activities may have some questionable results, but at least the analysis for those activities does follow the standard of the IESO that at the time had set the TDRP baseline verification standard. The activities considered for the purposes of examining motivations, enablers and barriers in the following section are those that were self-reported by the participants in the interviews as opposed to those that were revealed through the impact analysis.

4.3 CDM Activity Decision Factors

This section presents the data which indicate why the interview participants undertook the CDM activities that they did and/or why they did not undertake particular CDM activities. The data presented here are collected from the interviews and the participant observations as they related to each of the interview participants.

The motivations, enablers and barrier categories identified by the review of the organizational behaviour and CDM literatures in chapter two were considered in the coding of the interview data. As identified in chapter two, motivations are factors that represent the reasons that organizations were interested in CDM activities. These factors are categorized, more generally, for CDM activities overall and not for each of the CDM activity sub-categories of conservation, efficiency and demand response. Enablers are those factors that appealed to the motivations of the organizations and either helped the participant undertake a CDM activity or, even if a CDM activity was not undertaken, the enabler was an identified supporting factor in its consideration. Barriers are those factors that were either overcome in order that the participant could undertake a CDM activity or were factors that were not overcome and therefore prevented the undertaking of a specific activity.

Figure 4.1 shows how the relationships among motivations, enablers and barriers were considered in the data analysis with respect to factors that lead or did not lead to the undertaking of CDM activities.

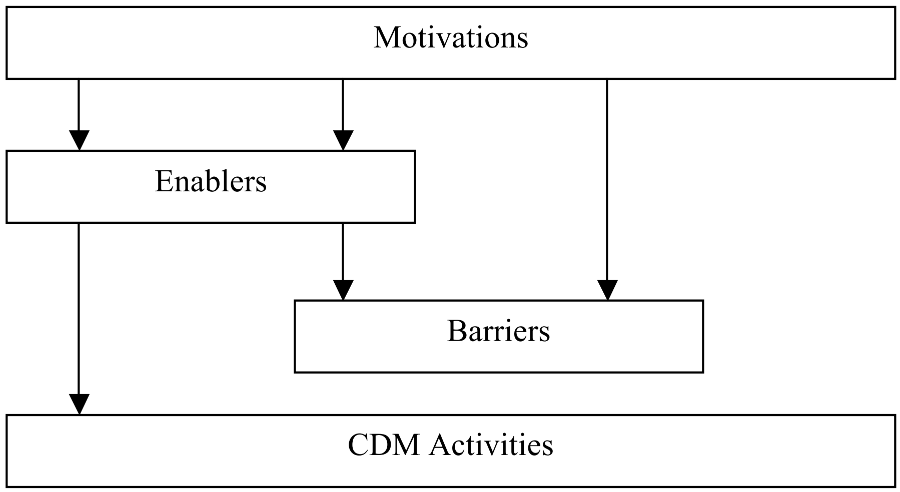

Figure 4.1: Motivations, Enablers and Barriers

Following Figure 4.1, consider the following example: a participant may identify financial benefit as an important motivating factor in their decision-making. The EDP offers a financial incentive for participation. If the financial incentive of the EDP led the organization to participate in the program than the incentive would be considered an enabler. A lack of incentive or an inadequate financial incentive may prevent the organization from participating, which would thus be a barrier to their participation.

The resultant notes from the interviews and participant observations were coded into these categories based on the definitions outlined above. As identified above, the motivations are more general in nature and are presented without delineation by CDM activity type. The motivations were coded into the three categories of competitiveness, legitimation, and altruism as identified in chapter two. The enablers and barriers were also coded into sub-categories of internal, external, financial and technical for each CDM activity type: conservation, efficiency, demand response peak and demand response program.

Internal enablers were those elements that were primarily related to the internal operations of the organization including the policies and objectives of the organization, the decision makers and champions within the organization, the experiences with CDM activities and other internally controlled matters. External factors were those that primarily related to activities and/or stakeholders that were external to the participant organizations, but that impacted the internal decision-making. Financial and technical factors are identified separately as these can be a combination of internal and external factors and are also arguably some of the most significant factors in enabling CDM activities (Harris et al., 2000).

4.3.1 Motivations

The motivations attributed to each of the interview participants were derived from the interview data and participant observations, where applicable. The interviews are the most direct source, in this research, for determining motivations related to an organization's undertaking of CDM activities. The interview results relating to motivations were coded by motivational themes. The major motivation categories of competitiveness, legitimation, and altruism were all derived from the literature review presented in chapter two. A list of these motivational themes and the frequency of their identification are presented in Table 4.13.

The motivations are those identified for the organizations as opposed to those of the individual who represented the organization in the interview or through participant observations. Where some individuals identified personal reasons that led them to pursue the undertaking of CDM activities, these factors were captured as enablers in section 4.3.2 for the organization to undertake the CDM activity.

Table 4.13: Motivations

Motivations	Organizations																
	P1	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**	**P10**	**P11**	**P12**	**P13**	**P14**	**P15**	**P16**	**P17**
Competitiveness																	
Finances	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Organization Image	X	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-
Customer Satisfaction	X	X	X	X	X	-	X	X	-	-	-	-	-	-	-	X	X
Employee Satisfaction	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Operations Improvement	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-
Legitimation																	
Consistent with Business Policies and Objectives	-	-	X	X	-	X	-	X	X	-	-	X	X	X	X	X	X
Community Initiative	X	-	-	X	-	X	-	X	-	-	X	-	-	-	-	-	X
Business Management	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	X	-
Altruism																	
Consistent with Business/Personal Values	-	-	X	X	X	X	-	X	-	X	X	X	X	-	X	X	X
Electricity System Reliability	X	-	-	-	-	X	-	X	X	-	-	-	-	-	-	X	-
Environmental Benefit	X	-	-	X	-	X	-	X	-	-	-	X	X	-	X	X	X

Table 4.13 shows a wide range of motivations identified by the participants. The following sections include descriptions and examples of each category of motivations. The major categories of competitiveness, legitimation and altruism are as per the propositions developed in chapter two. The sub-categories of each of these major categories were defined in alignment with the propositions identified in chapter two where appropriate. Any sub-categories that were not previously identified in chapter two are identified and defined in the appropriate sub-section below.

Competitiveness

As identified in chapter two, competitiveness is defined as "the potential to improve long term profitability" (Bansal et al., 2000, p. 724). Competitiveness includes factors related to finances, organization image, customer satisfaction, employee satisfaction, and operations improvement. Table 4.13 shows that all participants identified at least one competitive motivation in their decision-making related to undertaking of CDM activities.

Finances

All participants identified being motivated by finances, that is, a motivation to generally manage and/or improve their financial situation. P1 had been "carefully watching costs" as a very large competitor had moved into town. With respect to the reason for undertaking CDM activities, P1's response was, "it's obvious, costs!".

P2 identified that, "if we weren't faced with competition and could pass along the costs we wouldn't be into CDM". He said, initially he "wasn't going to reply [to the interview request] as there is no such thing as conservation, but called to make sure" (P2) the interviewer got the perspective of his specific sector. His point was that he would not undertake CDM activities except where it made financial sense and that there was no environmental consideration on his part towards conserving electricity.

P5 said, "making money is the main motivation" and that he didn't intend to be "too liberal with money" (P5). His undertaking of CDM activities was to reduce operating costs and to improve operations. P7 said clearly, "short answer, it's all about money" (P7). "If [they are] aware of something that makes economic sense they'll take advantage" (P7). They were glad that it was "good for the environment, but [that they] wouldn't spend money to do it" (P7).

P9 identified that "monetary [incentives] attract attention" (P9) and P11 was curious about the EDP payments when called for the interview, even though, as they said, "We might have only saved $10" (P11). P12 identified that the company president would save money where he could. "[I'm] not sure whether it's for the benefit of the world or his pockets" he said, followed by a laugh (P12).

"Honestly, it's primarily financially driven" P15 said. "If energy was one-quarter the price there wouldn't be as much concern regarding conservation, sad to say" (P15). He identified that CDM activities had to be reasonably priced and could not be a significant capital outlay.

Organization Image

Two of the participants identified being motivated to undertake CDM activities due to the benefits to their organization's image. P1 undertook some of the relatively largest conservation efforts by reducing lighting and air conditioning during peak times, which coincided with his hours of operation. Similar conservation activities had been undertaken by his large competitor, which had received media coverage for their activities. P1 complained that the media did not support his organization as well and identified the opportunity for publicity from the Milton Hydro EDP as a beneficial part of participation. P1 had put signage at the front of his business to notify customers of his participation in the EDP. P9 indicated there was an expectation from the government for their organization to contribute to CDM activities since the eastern-North American blackout of 2003.

Customer Satisfaction

Nine of the 17 participants identified maintaining and/or improving customer satisfaction as an important motivating factor to undertaking CDM activities. P4 identified that a motivation for participating in the EDP was based on it being "interesting and engaging" for their customers (P4). P5's main priority is making the facility attractive to existing and new customers by running a "quality operation" (P5). P8 was also clear that "customer service and satisfaction is a top priority for the organization." Upon probing as to the importance of their customers in their CDM decision-making, P16 exclaimed, "it's huge" (P16).

Employee Satisfaction

A number of P1's employees are concerned about the environment, which was part of motivating them to participate in the EDP.

Operations Improvement

P8 indicated that as CDM activities can often be coincident with improvements to the plant process, a motivation for them was to improve operations through increased efficiency, speed and reduced operating costs.

Legitimation

Legitimation is a more basic motivation than competitiveness. That is, organizations cannot begin to compete if they are not legitimated in the eyes of their stakeholders. Thirteen of 17 participants had at least one indication of being motivated by legitimation. Three primary legitimating motivations were identified: consistency with business policies and objectives, involvement in a community initiative and general business management practices.

Consistent with Business Policies and Objectives

Eleven of 17 participants were motivated to undertake CDM activities as they were consistent with the business's policies and objectives. This was equivalent to the proposition identified through the literature review. P4 identified that the EDP was "good for the [stakeholders]" and helped to meet the expectations of the organization from the public perspective. P8 is part of a larger organization that sets company policies, of which CDM activities, based on their environmental and cost benefits, are a part. P17 identified it as "what we do" in that they were the type of organization that would typically be involved in a community program like the EDP.

Community Initiative

CDM activities that were part of a community initiative, such as the Milton Hydro EDP, were motivating to six of 17 participants. P1 identified having been involved in other community initiatives, besides the EDP. He was the first to agree to the interview at the EDP event coordinated by Milton Hydro, which in some way may have represented his willingness to participate in community initiatives. During the interview, P1 identified "being a good corporate citizen" as if quoting from the mainstream discourse. P4 also indicated a sense of responsibility tied to their role in the community. P8 identified that they "do anything [they] can" towards being "responsible citizens." P11 indicated, similarly to P1, that "[they're] small, [but they're] just trying to help and be good citizens."

Business Management

Some CDM was simply part of good business management practices including replacing worn out parts, maintain operations and manage risk. This was the case for two of the participants: P13 and P16. P13 replaced lights, as old ballasts do not do well with their process equipment. P16 warned that “if you don’t [take] control of stores it’s going to hit you” (P16) referring to the monitoring and control system they use to manage the electricity consumption at their stores.

Altruism

Altruism includes motivations for benefiting the community, as well as society at large, and includes protecting the environment and maintaining electricity reliability. Fourteen of 17 participants identified some level of altruism in their CDM decision-making (see Table 4.13). The altruistic motivations identified are organizations being consistent with their business and personal values, maintaining electric system reliability, and environmental benefit.

Consistent with Business/Personal Values

For 12 of 17 participants, CDM activities were motivated by their business and personal values within the organization. It was obvious from the interview that electricity management was a passion for P3. He had kept a box of old newspaper clippings related to the former Ontario Hydro and had kept an original compact fluorescent light bulb to demonstrate to clients the change in price for that particular technology. P3 identified a personal motivation for CDM in that he “[doesn’t] like to waste” (P3). P4 indicated that he knew “about [the] moral and economic value of conserving energy” (P4). When asked about personal values, P5 replied that his “personal values” led him to “do this right”, that is, with respect to the way he manages his business. P12 president’s personal wind turbine at his home property was indicated as a reference to the company’s values, commitment and concern for the environment (P12). P10 and P13 both referenced lessons learned as “kids growing up”, leading to value CDM like-activities (P10 and P13). P16 believed “it’s the responsible thing to do.”

Electricity System Reliability

Helping to maintain the reliability of electricity system was a motivating factor for five of 17 participants. P8 identified, with respect to their CDM efforts, “it’s not much, but it’s something” (P8) in terms of contributing to electric system reliability. P9 identified that their recent initiatives were related to the “largest blackout”, referring to the eastern-North American blackout of 2003, and that there was a need to “tighten [their] belt.” P16 indicated that their actions were in accordance with two power warnings from the IESO and that the Ontario “power supply isn’t the greatest” (P16).

Environmental Benefit

Nine of the 17 participants identified the environmental benefits of CDM activities as a motivator for their undertaking. P4 identified respect for the environment as "one of the guiding principles" for his organization. P13 identified being motivated by "general heightened awareness of environmental concerns" and "everybody's willingness to go extra steps." P15 indicated that there was a "small green component" to decisions and being a "good corporate citizen." P16 identified the environment as being an important consideration for him and for the organization. "It's a little bit environmentally friendly," said P17 and that they "do what [they] can."

4.3.2 Enablers

Enablers for each of the interview participants are identified based on an analysis of the interview data as well as based on participant observations. Enablers are identified in association with the specific CDM activities undertaken by interview participants. The enablers are identified in Table 4.14 for each of the CDM activity sub-categories: conservation, efficiency, demand response peak and demand response program. Where enablers identified were general to all CDM activities undertaken by the participant organization each of those activities are listed in the table. Where the enabler was specific to one or multiple CDM activities, it is represented as such.

Table 4.14: Enablers

Enablers	Organizations																
	P1	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**	**P10**	**P11**	**P12**	**P13**	**P14**	**P15**	**P16**	**P17**
Internal																	
Policies/Objectives	-	-	CEM	M	-	CM	-	CEM	CE	-	-	CEK	CE	EM	CEM	CEK	CEM
Environment and/or Electricity Awareness	CM	-	CEM	M	-	CM	-	CEM	CE	-	-	CEK	CE	-	CEM	CEK	CEM
Internal Champion	CM	-	CEM	-	-	-	-	-	-	CK	-	CEK	-	-	CEM	CEK	-
Demand Response Program	C	-	-	-	-	C	-	-	-	-	E	-	-	-	-	-	-
New Build/ Renovations	-	CE	-	-	-	-	-	-	-	-	-	E	-	E	-	E	E
External																	
Customer Environment and Electricity Awareness	CM	-	CEM	M	-	CM	-	CEM	-	-	-	-	-	-	-	CEK	-
External Initiatives and Support	CM	-	M	M	-	M	-	M	CE	-	M	E	-	-	M	-	M
Hot Outdoor Temperature	C	-	-	-	-	-	-	-	-	K	-	K	C	-	-	-	-
Financial																	
Financial Benefit	CEM	CE	CEM	EM	E	CM	E	CEM	CE	CK	EM	CEK	CE	EM	CEM	CEK	CEM
Time of Use Pricing	-	C	C	M	-	-	-	-	-	-	-	-	C	-	-	K	-
Financial Incentive	M	-	M	M	-	M	-	M	-	-	M	-	-	M	M	-	M
Technical																	
Capacity and Management	C	-	CEM	M	E	M	E	CEM	CE	-	EM	CK	C	M	CEM	CEK	-
Functionality, Quality and Availability	E	CE	-	-	E	-	E	E	-	-	E	E	E	-	E	E	E

C: conservation, E: efficiency, DR: demand response peak and program, K: demand response peak, M: demand response program

Table 4.14 shows a wide range of enablers identified by the participants. The enablers were divided into categories of internal, external, financial and technical as defined in the introduction of section 4.3 above. The following sections include descriptions and examples of each enabler category. The categories were derived as a result of the research experience and data coding effort. Where the enablers identified in the research data aligned with those of the propositions identified in chapter two the proposition categories were used otherwise a new category was defined.

Internal

Policies/Objectives

Policies and objectives of the organization include CDM specific or related policies such as environmental or electricity management requirements. Such policies could include setting related performance objectives for employees and/or targets for electricity savings.

Eleven of 17 participants identified organizational policies and/or objectives as enablers to undertaking the CDM activities that they did. P4 identified that the environment was "a significant issue" within the organization and was "getting close to being a major issue" (P4) which was an enabler in getting approval for environmental related initiatives and associated budgets. P8 identified that their head organization "dictates environmental guidelines" with "audits regularly." He identified their shutdown routine as being followed strictly in that they were "going to shut it down [as it's a] company thing." P8 also identified that for undertaking efficiency or CDM activities in general, there was "no problem getting money" (P8). The combination of prioritization of energy management for employees as well as the ability to have finances available makes the organization's policies an obvious enabler for undertaking significant CDM activities. Similarly, P15 indicated that "it's something that the company has taken an interest in" and that "there's internal support for it" (P15).

As part of the internal policy and/or objective, target setting was identified as an important step towards accomplishing CDM activities. P4 had recently completed a target setting process arriving at a 6% planned reduction in electricity demand and consumption. P8 suggested "set a goal of 5%" and then "if [you] get that, go for another 3-5%." The interviewee identified "when one thinks they're at the 'end of line' for CDM, they can often find something else" (P8). P9 similarly suggested to "always find [the] easiest solution to save somewhere" and that "hydro (electricity) [was] easy to tackle." P9 suggested targeting lighting. P15's approach was also similar to "get biggest stuff down first" referring to those activities with the greatest electricity savings potential.

Environment and/or Electricity System Awareness

The promotion and awareness of environment and/or electricity system reliability issues were enablers to 11 organizations taking CDM actions. In some cases, this awareness led to the creation of formal policies and objectives while in others the benefits were simply recognized in the undertaking of specific CDM activities.

P13 identified that the understanding of environmental impacts of electricity consumption can lead to CDM actions. P13 identified that a general heightened awareness of environmental concerns is contributing to "everybody's willingness to go extra steps." (P13)

P8 identified their involvement in the EDP as being based on the fact that the "system load is high" which would serve to act as an enabler in combination with their motivation to maintain electricity system reliability. P9 identified "blackouts" as being something that got attention within their organization and may have enabled them to undertake a number of CDM activities. P4 identified respect for the environment as one of the guiding principles for the organization. For P15, he said, "there's always a green aspect to things - new ballasts [for example], PCB issues and stuff like that" (P15).

Internal Champion

An internal champion is someone who can be identified as championing the CDM cause within the organization. The interviews and observations identified six instances in which an internal champion played a role in leading the organization to undertake a CDM activity. A few examples are presented below.

The P3 interviewee, as previously identified, demonstrated a strong interest in financial management and energy savings. He said he understood the value of energy conservation, found it of great personal interest and was reportedly a strong advocate for undertaking CDM activities. The president of organization P12 was identified as being "into it (environmental protection) big time" so much so, according to the interviewee, that the president had a wind generator at his personal property, as previously noted. The president was identified as being the leader on similar initiatives. P15's Energy Manager had mapped out all the energy consumption for the facility and was in constant pursuit of further energy savings. P15 was the first in line for the electricity retrofit incentives for business that were soon to become available through Milton Hydro.

The P16 interviewee was another strong example of an internal champion. He had just started at the organization in the year prior to the interview. "I take my job more seriously than the guy that used to sit there", he said. With respect to the CDM activities he has undertaken he claimed they were "[his] own initiative" and that he tries "to be as green as [he] can be." The P16 interviewee took environmental sciences in college and "brought what [he's] done at other jobs" in terms of energy management practices to P16. He says he "sat at [his] desk quietly until someone said, 'hey, why are we so under budget!'" referring to their budget for electricity expenses. He also sits on the organization's environment council.

Demand Response Program

In three instances, participation in the EDP acted as an enabler for increased electrical conservation and efficiency. Not only did P1 conserve for the majority of an event day under the EDP (i.e. more than required by the program), they reported that through participation in the EDP event they would identify which of their lights were most needed to provide their minimal lighting requirements; namely, those that were left on during an EDP event. These lights would be the first to be upgraded to a higher efficiency. This was not captured as an enabler to efficiency as the activity was not undertaken during the time of the research. P11's EDP participation involved experimentation with their air conditioning system to improve cooling efficiency at a higher temperature setpoint. It is likely that their efforts to improve airflows and heat dissipation led to an improved system arrangement and an overall increased efficiency of electricity use in air conditioning. Lastly, in preparation for the EDP Test Drill, P6 undertook a facility inspection in the spring and found a number of loads, including heaters, lights, fridges and freezers, which had been left on since the winter as already noted. These are examples of conservation and efficiency enabled by the EDP process.

New Build/Renovations

Many participants identified a greater possibility for implementation of CDM activities for new builds as well as during renovations. Five of 17 participants identified having undertaken CDM activities in recent new builds or renovations. P12's building was only four years old, which was identified as an enabler to having the non-traditional geothermal heating and cooling system installed. P16 identified that all of their new buildings were using some of the highest energy efficiency technologies available for lighting, heating and air conditioning. P14 and P17 made their efficiency improvements to lighting and air conditioning during an expansion and renovation respectively.

External

Customer Environment and Electricity Awareness

Customer awareness and satisfaction were enablers where these factors promoted the undertaking of CDM activities at participant organizations. If a customer's environment and electricity awareness led to their satisfaction related to the undertaking of CDM activities than this was often an enabler to satisfying the organization's motivation of achieving customer satisfaction. Six of 17 participants identified that customer awareness of environmental and/or electricity benefits of CDM activities helped them justify the undertaking of CDM activities. For all of the demand response participants this customer awareness enabled them to curtail their lighting and air conditioning during the demand response program events. P1's employees helped encourage participation in the EDP and their related "power save days" as the owner identified that "a bunch of staff are 'tree huggers.'" In P3's case, the interviewee did clarify up front that the specific building in question was "the only building [he would] talk about" with respect to CDM activities excluding the other buildings he manages. The building is mostly occupied by seniors who the interviewee suspects are more conservative in nature. P4 identified that "some minimal buy-in" was needed from occupants to participate in the EDP.

External Initiatives and Support

Initiatives that promoted and encouraged CDM activities and provided support in the planning and execution process were enablers to CDM activities.

The Milton Hydro initiative related to the EDP was an obvious enabler for all EDP participants, in that the promotion by Milton Hydro facilitated the decision to participate in the program. There were a number of specific elements of the initiative that were identified by participants as leading to their involvement.

P1 identified the offer of publicity by Milton Hydro as appealing for their small business. As a small business, they have to compete with their large competitor that promotes and engages in similar CDM activities. P1 argued that the program will have a "snowball" effect as companies get publicity for their good deeds.

P1 was also attracted by the fact that they were "not the only one" participating in the EDP. P1 identified that the group effort by organizations was important so the public does not identify any one company as being "cheap" through their activities to curtail lighting and air conditioning, for example.

Milton Hydro supported P4, P6 and P17 in the planning and implementation of the EDP at their organizations without which they would not have been able to participate. P4 identified an added benefit in that the implementation design incorporated education elements for their customers. P4 went further to identify that without the funding for the implementation from Milton Hydro they would not have been able to participate.

P9 identified that the Milton Hydro intervention "helped a bit" through their "proactive initiative" and provision of a "contact person." P9 identified it as similar to the interview in that at least considerations were made "just [by] having someone visit."

P4 and P15 both identified the benefit of partners and external support for evaluation and undertaking of CDM opportunities. P4 indicated that "everybody likes to have partners" (P4), particularly related to their development of conservation guideline documents. P15 identified that they are "hearing more about it [CDM activities] too" from consultants and that "information is a lot more readily available." When P12's geothermal system was being designed and built, the architects and designers "were into it" (P12) in that they had an interest in the system and new design.

Hot Outdoor Temperature

For some participants, hot outdoor temperatures led to the undertaking of CDM activities. Examples include P1's conducting of "power save" days outside of the EDP event hours, in which P1 would reduce lighting and air conditioning use. Through the EDP program, P1 knew that hot days during the summer were typically when the electricity system was strained and that by reducing their lighting they would reduce the heat load on their air conditioning system resulting in two sources of electricity savings. P12 said their "pot light fixtures" were the "first to go, especially during hot days as they [the lights] generate so much heat." P13 conserved during hot summer days as their process equipment "increases the temperature too much", so they "don't use [the equipment] in the extreme heat, or the air conditioner, as there is no point."

Financial

Financial Benefit

A CDM activity that was identified as having a financial benefit to the organization was an enabler to that activity being undertaken as that benefit directly satisfied the financial motivation. Financial benefit is a general category that identifies CDM activities that were either deemed to have acceptable payback periods and/or investment returns, a reduction in electricity operating expenses, a financial incentive or complimentary financial benefits from related activities. This category is in effect a superset of the following more specific categories of electricity pricing and financial incentives.

Payback period requirements on CDM investments varied for participants. The payback period criterion of some participants was an enabler for the undertaking of some CDM activities, but was a barrier for others. P13 would typically require a payback of 3-5 years. P15 needed a payback of 2 to 2.5 years and said, "if you can make payback, save money and energy – 'we're all a lot better off.'" P16 wanted a 2-3 year payback on capital investments. Some participants, such as P5, did not have a defined payback period required nor did they just look at the payback period for decision analysis. They also considered the value of the investment over its anticipated lifetime, more equivalent to a net present value approach.

Time of Use Pricing

Time of use electricity pricing was an enabler where CDM activities were promoted based on the specific pricing structure in terms of billing category and associated time of use price variations. P2 recognized the coincident benefits of arranging operations at off-peak hours. P13 identified value in that they were "more aware" of "what [the] cost was" exactly and could reorganize their activities as appropriate. Though P13 could not identify if their electricity bill changed very much, the interviewee claimed that before the installation of their interval meter, there was much less incentive to shift or minimize usage.

Financial Incentive

Financial incentives were enablers where an additional financial incentive was provided in addition to the financial savings achieved by undertaking the CDM activity. The financial incentives were enablers that appealed to the motivation of maintaining and improving financial value. Nine of 17 participants, all of those that participated in the EDP and the TDRP, identified the value of the financial incentive tied to participation in the EDP. P1 identified that the payments from the EDP "soften the blow" and that they were glad to "save money on [electricity] savings and alert! [the EDP event notification]" referring to his response to an EDP event. P4 identified they were "looking for quick payback" and that part of their motivation was "cost and financial savings for sure." P4 identified that they were only involved in the EDP due to consulting support and funding provided by Milton Hydro. P4 wanted to expand the EDP to multiple facilities inside and outside of Milton Hydro's service area, but at the time only had financial support from Milton Hydro, which would limit the expansion possibilities. P8, with respect to the EDP, also wanted to "save some money" and said that "overall it adds up" (P8).

P5 claimed that they "would love to do that" with respect to participating in the EDP, though they did not participate in the EDP based on barriers identified in section 4.3.3. P5 identified that even though their absolute loads were small the electricity and financial gains were relative, so participation would be as beneficial to them as to an owner of a larger building. P7 also identified that where there was an "economic reason" they would "take advantage of rebates" and did so in their renovation in early 1990s. P7, who did have a site visit related to participating in the EDP, but did not participate, identified that the EDP was "right on the mark" by providing an "economic reason." P2 was clear to say, "cost savings work for themselves."

Technical

Capacity and Management

Capacity and management were enablers when technical capacity, including the existence and use of monitoring and control systems, technical competence and operations and energy management were promoting factors in the undertaking of CDM activities. Conservation and demand response practices are behavioural and operational by definition; however, if the participant did not identify a formalized energy management or operational process that promoted and/or led to these CDM activities then they were not classified as having been enabled by their operations.

Technical competence was an important factor for many participants in identifying the CDM activities to undertake, as well as in assuring themselves of the benefits of the activities. This was satisfied in various ways, including through an internal resource, external consultant or product supplier.

The use of electricity monitoring and control systems helped nine of 17 participants further understand their usage, as well as assisted them in analyzing and verifying the results of CDM activities. The participants had a range of systems in place from simple to extensive in terms of the system capabilities. Participants used their systems for all types of CDM activities. Some conservation and efficiency activities included the programming of loads to operate at off-peak times and only when facilities were occupied, as well as zonal control of the heating and air conditioning system. Some demand response peak and program activities were enabled by the announcement of EDP events through a closed-circuit television (CCTV) system, by remote control of facility lights and air conditioning, including responding to an external trigger such as outdoor temperature or electricity spot market price.

Preventative maintenance was identified specifically by P16 as a enabler for CDM in that their practice of reducing to one-half lighting overnight and also rotating which lights are on both reduces the consumption as well as extends the life of the ballasts and bulbs. This is an example of operations management that led to a conservation activity.

Ten of 17 participants identified having some level of an ongoing energy management effort. This ranged from those with dedicated departments or personnel (P8, P9, P15, P16) to those that identified having informal processes such as where staff would "get together to look around, go down and check something out" (P12).

Functionality, Quality and Availability

Functionality, Quality and Availability were enablers where these elements of technical equipment and systems promoted the undertaking of CDM activities. Many efficiency undertakings coincided with the need to replace old or broken equipment for operational requirements.

P2's major efficiency upgrade was based on the ability to access a higher voltage distribution line that was available from a nearby industrial facility that had closed. As a result, P2 identified being able to use higher efficiency equipment. P12 and P15 identified changing their lighting ballast type, leading to a reduction in electricity consumption, as replacements for their existing installed lighting ballasts were no longer available. One enabler for P2's off-peak operations was a switch to electric motors that were quiet enough to run at night, as opposed to their original diesel motors. The quality of machine was an enabler of CDM for P13. The higher quality machine was more electrically efficient.

4.3.3 Barriers

Barriers for each of the interview participants are identified based on the results of the interviews as well as based on participant observations. Barriers are identified for specific CDM activities that participants did not undertake. The barriers are identified in Table 4.15 for each of the CDM activity sub-categories: conservation, efficiency, and demand response program. Demand response peak activities were not included as part of the interview as they were not contemplated in advance of all the interviews. Enablers and barriers can often be the same factor, either satisfied or not, that leads or prevents a project being undertaken. It was not always the case, however, that if a participant did not identify a factor as an enabler that they would identify it as a barrier and vice-versa. That is, there is not a reversible relationship between Table 4.15 and Table 4.14.

Table 4.15: Barriers

Barriers	Organizations																
	P1	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**	**P10**	**P11**	**P12**	**P13**	**P14**	**P15**	**P16**	**P17**
Internal																	
Approvals	-	-	E	-	-	-	-	-	-	E	-	-	-	-	-	-	-
Commitment and Effort	E	-	-	CM	-	-	CM	-	-	M	-	M	M	-	-	M	-
Security	-	-	-	-	-	-	-	-	CE	-	-	-	-	-	C	-	-
External																	
Customer Satisfaction	-	-	-	-	C	-	M	-	-	-	-	-	-	-	-	-	CM
Outdoor Temperature Very Hot	-	-	-	-	-	-	-	M	-	-	M	-	-	-	-	-	M
Outdoor Temperature Very Cold	-	-	-	-	-	-	-	-	-	-	-	-	C	-	C	-	-
Financial																	
Electricity Pricing	-	-	-	-	-	-	-	-	CEM	-	-	-	E	-	-	-	-
Large Investments	-	-	-	E	-	E	E	-	-	E	-	-	E	-	E	-	-
Payback Period	E	-	-	E	E	-	E	E	E	E	-	-	E	-	E	-	-
Technical																	
Original Design	E	-	-	C	-	-	-	C	C	-	-	-	-	-	-	-	-
Not Conducive with Operations	-	M	-	-	M	-	M	M	-	-	-	-	-	-	-	-	M
Functionality, Quality and Availability	-	-	-	-	EM	-	E	-	E	E	E	-	E	-	M	-	-

C: conservation, E: efficiency, M: demand response program

Table 4.15 shows a wide range of barriers identified by the participants. Sixteen of the 17 participants identified at least one barrier to a CDM activity. P10 was the first participant to identify demand response peak activities. The following sections include descriptions and examples of each barrier category.

Internal

Approvals

Both P3 and P10 identified having to obtain approvals from the board or headquarters, respectively, as a barrier to undertaking efficiency activities.

Commitment and Effort

The commitment and effort required to undertake CDM activities was identified as a barrier for seven of the 17 participants. This was primarily in relation to the undertaking of demand response activities, which often required on site personnel to be involved in turning off lights and turning down the air conditioning. P4 identified that a consideration with any new activity was staff asking "how much do [they] have to do that's additional?" He identified that his staff were already "overwhelmed" and could "barely cope" with their existing workload. P7 said he had "no time to sit down and figure (it) out" and similarly, for P13 undertaking a new CDM activity, it "depends on how much effort is involved." P16 identified that they were not enrolled in a demand response program (EDP or TDRP) as the programs are "[for] when they (the IESO) want you to do it", which P16 indicated was a commitment they were not willing to make.

Security

Two participants identified meeting security requirements as a barrier to conservation. P15 identified a base level lighting requirement for their security system as one barrier to complete reduction of consumption. P9 identified that the "philosophy 10 years ago was (to ensure) security" in the lighting of their customer-used spaces, whereas now, while safety still was a concern, there is a stronger emphasis on design for efficiency and lower consumption overall.

External

Customer Satisfaction

With respect to conservation and demand response, a few participants, including P5, P7 and P17, identified customers as a barrier. With respect to conservation, P5 recalled a fight with a tenant over turning off the lights, in which he concluded, "I won't ask her again" (P5). With respect to P5's participation in the EDP, a barrier was that the tenants controlled their own lighting and air conditioning, but were all billed from a single meter for the building, which reduces the benefit any single tenant can gain from conserving or participating in the EDP. P17 identified that the lighting and cooling in their facility was an important part of their service to customers.

Customer timelines were an important consideration for P7, particularly with respect to the undertaking and extent of demand response participation. P7 is involved in an industry that operates based on "just in time" production and is subject to "tight time-lines" (P7). P7 identified a change over the years in that customers "used to wait for long periods", but now they "concentrate on procedure and process to ensure [they] are ready for customers" (P7). In fact, meeting these timelines has led to an increased electrical demand in that he has doubled the amount of equipment he uses to ensure speedy operations. P7 did not participate in demand response as he said, "you can't stop customers" (P7).

Outdoor Temperature Very Hot

When the outdoor temperature was very hot it would limit demand response participation for three of 17 participants. P8 identified that, for their participation in the EDP, they would shut off some lights as well as exhaust fans and rooftop make-up air systems "if (it was) not a real hot day" (P8). P11 said that it "took about an hour to become unbearable" with respect to the temperature when they turned up their air conditioning set-point from 23°C to 28°C during the EDP event. Very hot outdoor temperatures shortened the amount of time P11 was willing to participate. P11's air conditioner was too small and could not keep up with the cooling demand most of the time.

Outdoor Temperature Very Cold

When the outdoor temperature was very cold, two participants identified that their electrical usage would increase. P15 identified that with very cold outdoor temperatures they would use their supplemental electric baseboards for heating.

Financial

Electricity Pricing

Electricity pricing was only identified as a barrier for two participants. A barrier for P9 was that their primary load occurred throughout the night, which they said meant there was "really no incentive" to reduce that peak load (P9). P13 identified that there were limits to how much of an investment they would make as they rented the space they were occupying. Electricity prices were not significant enough that it would be worth their while to invest in some efficiency activities.

Large Investments

Six of the 17 participants identified the large investment required for efficiency activities as a barrier. As P15 stated, "(It is) difficult to justify a quarter million dollars for environmentally friendly."

Payback Period

Meeting payback period requirements was a barrier for nine of the 17 participants. Some of the larger organizations identified preferred payback periods from within 1 year to 3-5 years. Some of the medium sized organizations identified that they didn't have "much of an idea of payback" and would "need to operate for a year" (P2) after the point of installation to see how their costs were affected. Another explained that they did not install T8 lighting because the "payback was forever" (P1). One institutional participant, P4, was looking for year-on-year savings and identified that a 15-year investment was not attractive. Another institutional participant, P9, said that a payback of 3-4 years was acceptable, but that "21 years (for example) was not worth it." P5 identified that a 5-7 year payback made the "best investment" (P5), while P7 said the payback they were looking for depended on the "life-expectancy of the equipment" (P7).

Technical

Original Design

Four of the 17 participants identified that the original design of their facilities was a barrier to undertaking CDM activities. For most participants, the barrier was related to the undertaking of conservation activities. P8 identified that if they were to build their facilities again, they "would design differently," (P8) particularly with respect to putting "lights on different breakers" for better control. P1, P4 and P9 also identified barriers in terms of the arrangement of lights and circuit design with respect to limiting their ability to control lighting in specific areas. As P9 identified, "retrofitting 25 year old installations is tough."

Not Conducive with Operations

Five of the 17 participants identified a barrier to participating in the EDP was that the program was not conducive to their operations requirements. With respect to EDP participation, some participants identified limitations to participate based on their technologies. For P2, the limitation related to a need for consistent and stable refrigeration. A barrier for P5 was the need to receive notifications, respond confirming participation in the EDP events and then carry out the reductions on site. P5 was not equipped with 'real-time' systems or personnel that could perform these functions. P8 faced limitations to the extent of EDP response possible as they identified "we can't send workers home" (P8).

Functionality, Quality and Availability

For seven of the 17 participants technology functionality, quality and availability were barriers primarily for undertaking efficiency activities. Some participants - specifically P5, P7 and P9 - did emphasize that any efficient technology has to "do the job" (P7) and be "compatible with the (operating) environment" (P7). P7 identified that due to the "nature of the business" they "need reliable equipment." P5 identified trying some high efficiency lighting 10 years prior, but they experienced "too many burnouts." It compounded the negative experience that the high efficiency lights were installed in a hallway and above a stair case, both high traffic zones, as well as being a difficult and frustrating place in which to get up and down to change the lights. As P5 emphasized the need for service quality above all else, this level of equipment reliability was not acceptable nor worth it from his perspective.

P7 also identified that if a component was critical it was “need(ed) now” and that a “high efficiency motor in two weeks is not an option” (P7). This example highlights the situation of equipment decisions being made as components fail and need replacing, rather than any long term planning for equipment replacement.

This fourth chapter presented all of the results data of the research in terms of the participant organizational profiles, section 4.1, the CDM activities and impacts, section 4.2, and the motivations, enablers and barriers in section 4.3. The next chapter considers the various results presented in this chapter and analyzes them to identify common themes across the participants as well to identify sub-groups with commonalities in terms of organizational profiles, CDM activities, and motivations, enablers and barriers.

Chapter 5: Analysis of Results

This chapter presents the analysis of the research results to answer the research question of why organizations do or do not undertake CDM activities. The analysis considers the relationships among the various results presented in chapter four, namely the organizational profiles, the CDM activities undertaken or not undertaken, and the corresponding motivations, enablers and barriers.

The first section, 5.1, analyzes the motivations that led to CDM activities for the various organizational profiles involved in the study. The second section, 5.2, identifies the CDM activities undertaken across the various organizational profiles and includes the analysis of the enablers for these various organizational profiles as well as for all the CDM activities sub-categories of conservation, efficiency, demand response peak and demand response program. The third section, 5.3, includes the analysis of the barriers for the various organizational profiles as well as for all the CDM activities sub-categories. In each of these sections, the analysis considers how the findings align with the propositions developed in chapter two from the literature on organizational behaviour and electricity CDM activities.

5.1 Motivations of CDM

The motivations identified by the research were presented in section 4.3 of the previous results chapter. The analysis of the identified motivations is presented in Table 5.1, which identifies the frequency and relative percentage of each motivator for all participants as well as for each of the different organizational profiles included in the participant group.

Table 5.1: Motivations of CDM Activities

	Total (17)		Industrial (6)		Commercial (7)		Institutional (4)	
	#	%	#	%	#	%	#	%
Competitive	**17**	**100%**	**6**	**100%**	**7**	**100%**	**4**	**100%**
Finances	17	100%	6	100%	7	100%	4	100%
Organization Image	2	12%	0	0%	1	14%	1	25%
Customer Satisfaction	9	53%	3	50%	4	57%	2	50%
Employee Satisfaction	1	6%	0	0%	1	14%	0	0%
Operations Improvement	1	6%	1	17%	0	0%	0	0%
Legitimation	**13**	**76%**	**4**	**67%**	**5**	**71%**	**4**	**100%**
Consistent with Business Policies and Objectives	11	65%	3	50%	4	57%	4	100%
Community Initiative	6	35%	2	33%	1	14%	3	75%
Business Management	2	12%	1	17%	1	14%	0	0%
Altruism	**14**	**82%**	**4**	**67%**	**6**	**86%**	**4**	**100%**
Consistent with Business/Personal Values	12	71%	4	67%	5	71%	3	75%
Electric System Reliability	5	29%	1	17%	2	29%	2	50%
Environmental Benefit	9	53%	3	50%	3	43%	3	75%

The number and percentage format in each cell represents the frequency and relative percentage within the particular category

Table 5.1 reveals the importance of competitive motivations, particularly those that are finance related. This was not a surprising finding considering the frequent identification and attention given to financial considerations in the literature (Harris et al., 2000; Hendry, 2006). Besides the prevalence of this motivator, the qualitative interviews added emphasis to the importance of this motivator for many participants. A strong example of that was provided by P7 who said, "short answer – it's all about money." Customer satisfaction was the next most prevalent competitive motivation identified consistently.

A CDM activity being consistent with a business policy or objective was the most prevalent legitimating motivator with highest proportional indication by institutional participants. Dieperink et al. (2004) previously identified the importance of organization policy as being important to encouraging CDM-like activities. Community initiative was most noted by institutional participants, which is likely a reflection of the public link to institutional organizations. The institutional participants all identified a common sentiment with respect to why they undertook CDM activities. They all said it was part of "what they do", "who they are", and "if [they] didn't do it, who would?"

The alignment of CDM activities with business and personal values as well as the environmental benefits were altruistic motivations for many of the participants though the environmental benefit was more frequently identified as a motivation by institutional participants. The majority of Energy Drill participants also identified that they "were doing their part" and/or being "good corporate citizens." With respect to environmentally beneficial activities, similar to electricity CDM, this is also often identified as being an important motivator (Bansal et al., 2000). Satisfying these altruistic motivations was often identified as a welcome additional benefit to CDM activities, but, on their own, they could not drive large and costly project decisions within the participant organizations.

The following two major sections analyze the enablers and barriers to undertaking CDM activities by the organizational profile parameters and by each of the CDM activity sub-categories.

5.2 Enablers of CDM

The analysis considers enablers of CDM activities by two major categories: the organizational profile parameters and the CDM activity sub-categories of conservation, efficiency, demand response peak and demand response program. This section first identifies the CDM activities undertaken by the various organizational profile parameters (5.2.1), then analyzes the enablers by those organizational profile parameters (5.2.2), and finally analyzes the enablers by the CDM activity sub-categories (5.2.3).

5.2.1 CDM Activities and Organizational Profiles

The research participants consisted of a variety of different organizational profiles by sector, demand range, billing category and public profile. Table 5.2 identifies the CDM activities undertaken by participants across the various organizational profiles included in the research.

Table 5.2: CDM Activities by Organizational Profile Parameters

CDM Activities	Total (17)		Organization Type						Demand Range				Billing Category				Public Profile Relevance			
			Industrial (6)		Commercial (7)		Institutional (4)		50 kW – 1000 kW (14)		> 1000 kW (3)		RPP (8)		Spot Market (9)		Yes (13)		No (4)	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Conservation	12	71	4	67	5	71	3	75	9	64	3	100	7	88	7	78	11	85	3	75
Efficiency	15	88	6	100	6	86	3	75	13	93	2	67	6	75	8	89	10	77	4	100
Demand Response Peak	3	18	0	0	3	43	0	0	3	21	0	0	1	12	2	22	3	23	0	0
Demand Response Program	9	53	3	50	3	43	3	75	7	50	2	67	5	62	4	44	7	54	2	50

Commercial participants identified the greatest number of CDM activities overall as well as in proportion to the number of participants. The proportion of participants that undertook efficiency and conservation activities was quite high for all organizational profile parameters indicating that most participants had done or were doing some level of CDM activities, which is likely a result of the participant self-selection process. That is, those Milton Hydro customers that were already doing some CDM were more likely to participate in the interviews.

The relative number of participants that undertook demand response peak activities was low for most organizational profile parameters. Commercial participants in the lower demand range with a relevant CDM public profile were more likely to undertake these activities. This is not a commonly identified activity in the literature, however commercial participants may be more sensitive to costs and the peak reducing activities are typically visible to stakeholders, which may explain the link of this activity to participants with a relevant CDM public profile. There was not a noticeable difference amongst RPP or Spot Market participants for this activity, which is interesting as Spot Market participants are exposed to the greater fluctuations in peak electricity prices. This may be an indication that participants were unaware of these different billing structures and could benefit from further energy related information, feedback, which King et al. (2005) identifies as an often essential part of linking energy conservation and demand response.

Institutional participants were proportionally the greatest undertakers of demand response program activities. Table 4.12, however, shows that the participation rates, after the change in notification/reporting system, of two of the three institutional participants (P4 and P17) were zero and likely zero or very low. This may be indicative of a tendency for institutional organizations to sign up, but not necessarily to stay committed or achieve a significant impact.

Velthuijsen's (1995) finding that large users of electricity are more likely to have made energy efficiency investments was true for two out of three large users above 1000 kW demand, however the industrial organizations had all undertaken efficiency activities. In fact, 15 of 17 participants had undertaken efficiency activities, which could potentially be a result of the participation self-selection process.

5.2.2 Enablers by Organizational Profile

This section analyzes the variety of enablers to undertake CDM activities with respect to each of the various organizational profiles. Table 5.3 presents the enablers indicated for each of the organizational profile parameters.

Table 5.3: Enablers by Organizational Profile Parameters

Enablers	Total (17)		Organization Type						Demand Range				Billing Category				Public Profile Relevance			
			Industrial (6)		Commercial (7)		Institutional (4)		50 kW – 1000 kW (14)		> 1000 kW (3)		RPP (8)		Spot Market (9)		Yes (13)		No (4)	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Internal	**15**	**88**	**5**	**83**	**6**	**86**	**4**	**100**	**12**	**86**	**3**	**100**	**8**	**100**	**7**	**78**	**12**	**92**	**3**	**75**
Policies/Objectives	11	65	3	50	3	43	3	75	6	43	3	100	4	50	5	56	8	62	1	25
Environment and/or Electricity Awareness	11	65	2	33	5	71	4	100	9	64	3	100	6	75	6	67	10	77	2	50
Internal Champion	6	35	1	17	5	71	0	0	6	43	0	0	2	25	4	44	5	38	1	25
DR-Program	3	18	1	17	1	14	2	50	2	14	1	33	1	13	1	11	1	8	1	25
New Build/Renovations	5	29	1	17	3	43	1	25	5	36	0	0	3	38	2	22	5	38	0	0
External	**13**	**76**	**4**	**67**	**5**	**71**	**3**	**75**	**10**	**71**	**3**	**100**	**7**	**88**	**6**	**67**	**10**	**77**	**3**	**75**
Customer Environment and Electricity Awareness	6	35	1	17	3	43	2	50	4	29	2	67	3	38	3	33	5	38	1	25
External Initiatives and Support	10	59	3	50	3	43	4	100	7	50	3	100	6	75	4	44	8	62	2	50
Hot Outdoor Temperature	4	24	1	17	3	43	0	0	4	29	0	0	2	25	2	22	3	23	1	25
Financial	**17**	**100**	**6**	**100**	**7**	**100**	**4**	**100**	**14**	**100**	**3**	**100**	**8**	**100**	**9**	**100**	**13**	**100**	**4**	**100**
Financial Benefit	17	100	6	100	7	100	4	100	14	100	3	100	8	100	9	100	13	100	4	100
Time of Use Pricing	5	29	2	33	2	29	1	25	5	36	0	0	4	50	1	11	3	23	2	50
Financial Incentive	9	53	3	50	3	43	3	75	7	50	2	67	5	63	4	44	7	54	2	50
Technical	**16**	**94**	**6**	**100**	**6**	**86**	**4**	**100**	**13**	**93**	**3**	**100**	**8**	**100**	**8**	**89**	**12**	**92**	**4**	**100**
Capacity and Management	14	82	5	83	6	86	3	75	11	79	3	100	6	75	8	89	10	77	4	100
Functionality, Quality and Availability	11	65	6	100	4	57	1	25	10	71	1	33	5	63	6	67	8	62	3	75

5.2.2.1 Organization Type

There was a relatively even split in the make-up of participants considering the classification of industrial (six of 17), commercial (seven of 17) and institutional (four of 17). The greatest common enablers across the groups, as seen in Table 5.3, were financial benefit and technical capacity and management. These two factors were so prevalent they will not be repeated in each of the following sub-sections, as they can be an assumed enabling element in the vast majority of instances. The more prevalent and unique enablers of each organization type are discussed below.

Industrial

In addition to those common enablers mentioned above, technical functionality, quality and availability was the only enabler that was associated mostly with industrial participants. As can be seen from the analysis of enablers by CDM activity sub-categories below, this is likely indicative of the fact that the industrial participants all undertook efficiency activities.

Electricity system reliability can be a motivator for some industrial organizations to participate in CDM activities (Moezzi et al, 2004). This was not identified as a prevalent enabler for most industrial participants in the research; however, this is likely due to the relatively small size of most of the industrial participants, at least compared to those in Moezzi et al.'s study. The six industrial interview participants were quite different from each other in terms of their relative electricity demand sizes. The largest participant, P8, however, did identify concern for electricity system reliability as a motivation and enabler to their demand response program participation.

Commercial

Commercial participants had a greater prevalence of internal champions than the other organizational categories.

Institutional

The institutional participants had a greater prevalence of being enabled by the environment and electricity awareness of both internal and external stakeholders as well as by the external initiatives and support for the demand response program activities.

5.2.2.2 Demand Range

Medium Sized Organizations 50 - 1000 kW

The majority of participants, 14 of 17, were medium sized organizations with electricity demand in the range of 50 to 1000 kW. The medium sized organizations were enabled by the presence of an internal champion and technical functionality, quality and availability proportionally more than the larger demand organizations were. The larger organizations may have less of a need for internal champions.

Large Organizations > 1000kW

Internal policies and objectives, environmental and electricity awareness of all stakeholders, external initiatives and support enabled the larger organizations with demand ranges greater than 1000 kW. Though not all of these participants were industrial participants, these enablers were all characteristic of an industrial participant. The larger user is just inherently more likely to put in place policies and objectives as well as technical resources to achieve the financial benefits available from managing their electricity usage (Velthuijsen, 1995). This study confirms this widely held notion.

5.2.2.3 Billing Category

Interestingly, the RPP participants identified time-of-use as an enabler more often then did the Spot Market participants. RPP for Milton Hydro's commercial customers is based on time bands (on-peak, mid-peak and off-peak) with varied prices, which is likely easier to understand and plan around than that of the unpredictable Spot Market.

5.2.2.4 Public Profile

The relative number of participants that did have a CDM related public profile to those that did not makes the comparison of the two groups with respect to enablers relatively weak. That said, the two enabler categories that are most uniquely prevalent for these profile parameters are internal polices and objectives as well as environmental and electricity awareness. This may indicate that organizations that are trying to promote their CDM related activities externally are also making efforts to encourage them internally. This coincides with the importance of having such policies, which has been identified by Dieperink et al. (2004).

5.2.3 Enablers by CDM Activities

This section analyzes the prevalence of enablers to CDM activities overall as well as to each of the sub-categories of CDM activities. Table 5.4 identifies the enablers to CDM activities overall as well as to the specific CDM activity sub-categories of conservation, efficiency and demand response peak and program.

Table 5.4: Enablers by CDM Activities

Enablers	Overall CDM Activities (17)		Conservation (14)		Efficiency (15)		Demand Response Peak (3)		Demand Response Program (9)	
	#	%	#	%	#	%	#	%	#	%
Internal	**15**	**88**	**12**	**86**	**11**	**73**	**3**	**100**	**8**	**89**
Policies/Objectives	11	65	9	64	9	60	2	67	3	33
Environment and/or Electricity Awareness	11	65	10	71	8	53	2	67	7	78
Internal Champion	6	35	6	43	4	27	3	100	3	33
DR-Program	3	18	2	14	1	7	0	0	0	0
New Build/Renovations	5	29	1	7	5	33	0	0	0	0
External	**13**	**76**	**7**	**50**	**5**	**33**	**3**	**100**	**8**	**89**
Customer Environment and Electricity Awareness	6	35	5	36	3	20	1	33	5	56
External Initiatives and Support	10	59	2	14	2	13	0	0	8	89
Hot Outdoor Temperature	4	24	2	14	0	0	2	67	0	0
Financial	**17**	**100**	**12**	**86**	**15**	**100**	**3**	**100**	**9**	**100**
Financial Benefit	17	100	12	86	15	100	3	100	9	100
Time of Use Pricing	5	29	3	21	0	0	1	33	1	11
Financial Incentive	9	53	0	0	0	0	0	0	9	100
Technical	**16**	**94**	**9**	**64**	**13**	**87**	**2**	**67**	**7**	**78**
Capacity and Management	14	82	8	57	8	53	2	67	7	78
Functionality, Quality and Availability	11	65	1	7	11	73	0	0	0	0

#: the number of times the factor was classified as an enabler for the CDM activity type
%: the number of times the factor was classified as an enabler for the CDM activity type / the total number of participants reporting any enabler for the CDM activity type

Though it can be seen in Table 5.4 that there were a variety of enablers to CDM activities, the table also reveals that some enablers were more prevalent for specific CDM activity sub-categories. Regardless of the CDM activity sub-category, there are often multiple factors that lead to decisions to undertake CDM activities. Enablers were more specific to the CDM activity sub-categories than to the organizational profiles.

Where the CDM activity results directly satisfy any of the motivations the results are in themselves an enabler. This includes financial benefit, customer satisfaction, adhering to organization policies and objectives, achieving environmental benefits.

Financial benefit was of obvious value for all participants. The combination of financial and environmental benefits is often a promoted element of CDM (Harris et al., 2000; Sandberg et al., 2003). Financial incentives were of value to all participants in the EDP. Some participants identified anticipating financial incentives from utilities and governments for efficiency activities such as equipment retrofits.

Technical capacity and management was the next most prevalent enabler to financial benefit. This result confirms the often-identified benefits of technical capacity and management including information resources in the literature (Chamberlin et al., 1995; del Brio et al., 2003; Harris et al., 2000; Sandberg et al., 2003; Tonn et al., 2000). In fact, as identified in chapter two information provision through energy audits or otherwise are sometimes touted as being even more influential than financial incentives (Chamberlin et al., 1995; Harris et al., 2000).

Follow-up by encouraging stakeholders and knowledge transfer are also identified as critical elements in encouraging ongoing and future CDM activities (Sandberg et al., 2003). These factors are effectively equivalent to monitoring and reporting, which are commonly encouraged in utility management applications.

As per the previous section, these two factors were so prevalent as enablers they will not be repeated in each of the following sub-sections, as they can be an assumed enabling element in the vast majority of instances.

Though there was not a particularly high prevalence of internal champions among the participant group, of those identified, most reported undertaking more numerous and impactful activities than the average participant (see Table 4.12). The magnitude of activity impacts has not been addressed in much of the literature on environmental responsiveness and CDM activities by organizations. P16 was one of the most significant CDM actors in the participant group with some of the most enablers as well, including organizational policies and objectives, internal champion, customer awareness and internal capacity and management. There may be a correlation between the combination of these enablers and the extent and impact of the CDM activities undertaken.

The behavioural CDM activities of conservation and demand response had similar enablers and barriers different than those of the technical efficiency activities. Internal champions, outdoor temperatures, and external support were enablers for conservation and demand response activities. Environment and electricity awareness was also a prevalent factor in the conservation activity category. The visibility of conservation activities over efficiency activities may have played a part in this distribution of enablers.

Though environmental and electricity awareness was one of the more prevalent internal enablers as well as the policies and objectives of the organizations, many participants identified an importance of finances over these factors particularly with respect to efficiency activities that require relatively significant financial investments. Payback and the size of the investment were identified as important factors in the decision. The payback requirements ranged quite significantly for the participant organizations.

Technical functionality, quality and availability was a prevalent enabler for efficiency activities. The findings of Sandberg et al. (2003) support the importance of technology suitability. This is in line with the theme that the complimentary benefits of the CDM activity were important in the decision-making process (Sandberg et al., 2003).

New builds/renovations was also an enabler for efficiency. The opportunities in new buildings for higher efficiencies are well documented in various literature sources (e.g. Sandberg et al., 2003). The demand response program served as an enabler to efficiency in one instance. King et al. (2005) investigated if demand response programs can lead to increased conservation. The few cases in this study that identified conservation and efficiency benefits from demand response programs suggest that there are some benefits possible and that further study into this particular topic may prove useful.

All demand response peak participants were identified with an internal champion who led these activities. This may be an important element, as arguably these activities require a greater level of awareness and initiative related to electricity management. Demand response peak activities are not a commonly identified activity in the literature. Demand response program, by contrast, is very widely covered in the literature. The difference identified in this research was that demand response peak activities were being undertaken in response to a variety of different triggers as opposed to those defined by a utility agencies like the OPA and FERC. That is, electricity prices and electricity system driven additional financial incentives were not the only reasons that participants would undertake such peak demand reducing activities.

One enabler most particular to demand response program activities, as can be seen in Table 5.4, was that of external initiatives and support. This is a direct result of the technical consultation provided by Milton Hydro in developing the EDP. Interestingly, only one demand response program participant identified time of use pricing as being an enabler to their participation. This is in contrast to the notion that time of use pricing will lead to greater customer responsiveness (Moezzi, 2004). Technical capacity and management play a role for a number of participants in that their control systems and operators were involved in the undertaking of the activities. Customer awareness was also important for some, including those with business to customer relationships and public institutions.

An interesting observation from the impact verification data analysis of demand response program activities was that some participants were credited with large impacts at questionable times meaning the demand response credit may not have been a result of intentional reduction activity on the part of the participant. The credit was a result of the baseline method used to determine the demand response contribution. These large impacts translated into financial incentives that may have been an enabler for the ongoing participation of the participant in the program.

Also, as was indicated in section 4.2, prior to March 2006 participants were not required to respond to event notifications indicating their intent to participate in the event. The impact of this change in requirements can be seen in the participation rates before and after the change. Participant P4, for example, went from 38% to 0% and participant P6a from 54% to 8%. These participants were very likely being credited with program participation without actually undertaking the activities. The baseline equation was indicating a savings, however there was likely no intentional activity being undertaken by the participants. Again, these ongoing payments could have been an enabler for these participants.

Understanding how the baseline equation worked and examining some of the examples discussed above was insightful in that it revealed that some participants with variable load profiles might have had something to gain from participation in the EDP as the randomness of their operations may have resulted in a calculated demand response, even if no intentional actions were taken, for which they may have been financially rewarded. As there were no penalties for program participants that did not participate in specific events, there was really no reason for organizations not to sign up to the EDP. This, however, was not identified by any of the participants as an enabler to participation and in fact, as identified in the following section, the presumed commitment required by the EDP was a barrier for some interview participants.

The next and final section of chapter five analyses the barriers to undertaking CDM activities.

5.3 Barriers of CDM

The analysis considers barriers to CDM activities by two major categories: the organizational profile parameters and the CDM activity sub-categories of conservation, efficiency, and demand response program. As identified in section 4.3.3, the demand response peak activities were not included in the investigation of barriers, as they were not contemplated in advance of all the interviews. This section first analyzes the barriers by the organizational profile parameters (5.3.1) and then by the CDM activity sub-categories (5.3.2).

Table 5.5: Barriers by Organizational Profile Parameters

Barriers	Total (16 Participants w/ Barriers)		Organization Type						Demand Range				Billing Category				Public Profile Relevance			
			Industrial (6)		Commercial (7)		Institutional (4)		50 kW – 1000 kW (14)		> 1000 kW (3)		RPP (8)		Spot Market (9)		Yes (13)		No (4)	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Internal	**10**	**63**	**3**	**50**	**5**	**71**	**2**	**50**	**9**	**64**	**1**	**33**	**4**	**50**	**6**	**67**	**8**	**62**	**2**	**50**
Approvals	2	13	0	0	2	29	0	0	2	14	0	0	1	13	1	11	1	8	1	25
Commitment and Effort	7	44	2	33	4	57	1	25	7	50	0	0	3	38	4	44	6	46	1	25
Security	2	13	1	17	0	0	1	25	1	7	1	33	0	0	2	22	2	15	0	0
External	**7**	**44**	**5**	**83**	**1**	**14**	**1**	**25**	**6**	**43**	**1**	**33**	**3**	**38**	**4**	**44**	**4**	**31**	**3**	**75**
Customer Satisfaction	3	19	1	17	1	14	1	25	3	21	0	0	1	13	2	22	2	15	1	25
Outdoor Temperature Very Hot	3	19	2	33	0	0	1	25	2	14	1	33	2	25	1	11	2	15	1	25
Outdoor Temperature Very Cold	2	13	2	33	0	0	0	0	2	14	0	0	1	13	1	11	1	8	1	25
Financial	**10**	**63**	**4**	**67**	**3**	**43**	**3**	**75**	**7**	**50**	**3**	**100**	**3**	**38**	**7**	**78**	**8**	**62**	**2**	**50**
Electricity Pricing	2	13	1	17	0	0	1	25	1	7	1	33	1	13	1	11	1	8	1	25
Large Investments	6	38	3	50	1	14	2	50	5	36	1	33	3	38	3	33	5	38	1	25
Payback Period	9	56	4	67	3	43	2	50	7	50	2	67	2	25	7	78	7	54	2	50
Technical	**12**	**75**	**6**	**100**	**3**	**43**	**3**	**75**	**10**	**71**	**2**	**67**	**5**	**63**	**7**	**78**	**9**	**69**	**3**	**75**
Original Design	4	25	1	17	1	14	2	50	2	14	2	67	1	13	3	33	4	31	0	0
Not Conducive with Operations	5	31	3	50	1	14	1	25	4	29	1	33	2	25	3	33	4	31	1	25
Functionality, Quality and Availability	7	44	4	67	2	29	1	25	6	43	1	33	2	25	5	56	4	31	3	75

5.3.1 Barriers by Organizational Profile

The barriers to CDM activity for each of the organizational profile parameters are identified in Table 5.5. Commitment and effort was a greater barrier for medium sized organizations over large organizations. This was particularly the case for demand response program activities where internal capacities were limited, both in terms of human and technical resources. The perceived or real commitment requirements of the demand response program were too onerous from some the participants' perspectives. Payback periods were more of a barrier for Spot Market participants over RPP participants, which again may be indicative of the lack of understanding and/or related to the certainty of the RPP's time based price differences. Outdoor temperatures were barriers primarily to the CDM activities of industrial participants, which identifies the importance of weather on operations.

5.3.2 Barriers by CDM Activities

This section presents the barriers identified by CDM activities overall as well as by the CDM activity sub-categories. Again, as demand response peak activities were not contemplated in the original interview guide, there were no instances where a participant identified a barrier to this activity. Table 5.6 identifies the barriers identified for all CDM activities.

Table 5.6: Barriers by CDM Activities

Barriers	Overall CDM Activities (16)		Conservation (7)		Efficiency (10)		Demand Response Program (12)	
	#	%	#	%	#	%	#	%
Internal	**10**	**63**	**4**	**57**	**4**	**40**	**6**	**50**
Approvals	2	13	0	0	2	20	0	0
Commitment and Effort	7	44	2	29	1	10	6	50
Security	2	13	2	29	1	10	0	0
External	**7**	**44**	**4**	**57**	**0**	**0**	**4**	**33**
Customer Satisfaction	3	19	2	29	0	0	2	17
Outdoor Temperature Very Hot	3	19	0	0	0	0	3	25
Outdoor Temperature Very Cold	2	13	2	29	0	0	0	0
Financial	**10**	**63**	**1**	**14**	**10**	**100**	**1**	**8**
Electricity Pricing	2	13	1	14	2	20	1	8
Large Investments	6	38	0	0	6	60	0	0
Payback Period	9	56	0	0	9	90	0	0
Technical	**12**	**75**	**3**	**43**	**7**	**70**	**6**	**50**
Original Design	4	25	3	43	1	10	0	0
Not Conducive with Operations	5	31	0	0	0	0	5	42
Functionality, Quality and Availability	7	44	0	0	6	60	2	17

#: the number of times the factor was classified as a barrier for the CDM activity type
%: the number of times the factor was classified as a barrier for the CDM activity type / the total number of participants reporting any barrier to the CDM activity type

Similarly to the majority of identified enablers, the barriers to CDM activities were more relevant in consideration of the specific CDM activity rather than the organizational profile parameters. The greatest single identified barrier to conservation activities was the original design of the facilities used by the participant organizations. This barrier was related to the lack of control available primarily for lighting, but also for other loads such as zonal heating and cooling control. The literature reviewed did not identify this as a specific barrier. Commitment and effort, operational requirements, and outdoor temperatures were barriers for some conservation and demand response activities, which relates to the identification by Dieperink et al. (2004) that production characteristics and requirements are important considerations for organizations in CDM decision-making. Maintaining process operations was often considered more valuable than participating in a demand response program. One participant, however, did curtail their entire process operations. Moezzi et al. (2004) identified that most industrial facilities would not curtail their process during a demand response event or a high price period as the financial value of continually operating the process was typically greater than the electricity savings that could be attained. Maintaining the same level of services for their customers was the reason that customer satisfaction was a barrier for some. Both Hendry (2006) and Dieperink et al. (2004) recognized the importance of customers to organizations. Customers can be either an enabler or a barrier depending on the specific context.

Few participants identified that if the outdoor temperature was very hot, their demand response activity would be limited or cancelled as their primary contribution was due to curtailment of their air conditioning system. This is an idea that has not come up very often in the literature, but is an interesting challenge for demand response programs as the coincidence of electricity system reliability concerns and high costs are typically associated with high demands which have been increasingly occurring in Ontario during the summer months due to the more prevalent use of air conditioning. A hesitation on the part of a demand response program participant at higher outdoor temperatures may limit the success of such programs.

Technology was a barrier for two participants that considered participation in a demand response program. These barriers were in the form of lack of required control systems (P5) and unsuitable lighting technology for cycling off and on (P15). King et al. (2005) and Moezzi et al. (2004) have both identified the need for control systems as part of demand response program participation, evolution towards smart grids and of course, the need to consider appropriate technologies eligible for participation in programs. This study reinforces these arguments.

The most prevalent barriers to efficiency activities were large investments and inadequate payback periods. Technical functionality, quality and availability was always either an efficiency enabler or barrier. Other barriers included the requirement for higher levels approvals and electricity pricing which were also often related to the large financial investments. These barriers are regularly identified in the literature (e.g. Harris et al., 2000; Sandberg et al., 2003; Thompson, 1997).

The conclusions of the research and proposed next steps in terms of research opportunities are discussed in the next and final chapter.

Chapter 6: Conclusions

The objective of the research was to understand why organizations in Milton, Ontario undertook electricity CDM activities. As is the case with many electricity systems throughout the world in 2009, Ontario is redeveloping its electricity system to be sustainable, competitive and reliable. The impetus for such planning is to replace aging infrastructure, mitigate high system prices, improve short and long term system reliability as well as to reduce both local and global pollutants from the generation assets. As all electricity supply options have physical limits, electricity CDM is seen as a key element of this plan. For these reasons, CDM is considered as a step towards a sustainable society. For CDM to be successful, however, a wide range of electricity consumers, including medium- and large-scale organizations, must be encouraged to take action. It is therefore necessary to understand how such organizations can be encouraged to take CDM actions.

The research consisted of a case study of medium- to large-scale customers in Milton Hydro's service area, a local municipal utility in Ontario, in an effort to understand the motivations, enablers and barriers with respect to the undertaking of CDM activities. The research examined the motivational and contextual factors involved in decisions related to CDM activity through the investigation of the sub-categories of conservation, efficiency and demand response. The research included interviews with 17 participant organizations, observations at Milton Hydro events, analysis of participant electricity usage data and an investigation of the public profiles of the participants.

The analysis presented in chapter five reveals a number of key findings of the research that in many instances confirm the knowledge available in the literature, but also in many instances add new and important dimensions to the existing literature. One of the overall findings of the research was that all participants reported undertaking at least one CDM activity. This may be indicative that CDM activities are commonplace in many organizations. Some participants also identified CDM activities that they had not done, which is indicative that there may also exist opportunities for increased CDM activity within the organizations, reinforcing the notion of the existence of an efficiency "gap" as identified by Jaffe et al. (1993).

The research process also revealed a general disinterest on the part of the Milton Hydro medium- to large-scale customers to participate in either the Milton Hydro Energy Drill seminars and workshops or the research interviews. One of the challenges of the research was that even those customers that agreed to participate in the interviews were unwilling to dedicate much time to it. Many of the participants were only willing to conduct a brief phone interview, enough to answer the basic questions of the interview guide. These organizations may be undertaking CDM activities, but are simply not that interested or able to dedicate time to discussing them.

Specific motivations, enablers and barriers often varied by the participant's organizational sector and even more significantly by the CDM activity sub-categories of conservation, efficiency and demand response. It was clear that for all participants, finances were an important part of their decision-making process. Financial benefit was often a necessary, but not sufficient, factor in most CDM activity decisions. There were often a combination of factors involved in the decision-making process including financial benefit, consideration of customers and other stakeholders, technical capacity and management, and technology functionality, quality and availability. Most participants acknowledged the multiple benefits of CDM activities – that is, that they can provide financial and environmental benefits as well as help to promote their images as 'good corporate citizens.'

Enablers of conservation and demand response program activities were often similar. This may be due to the fact that these activities required behavioural change rather than technical change. That is, the activities were more a function of organizational operations and ongoing management efforts than efficiency activities which are characterized by equipment and physical design changes. This behavioural element of conservation and demand response activities may be one of the reasons that the enablers and barriers to these activities are similar. These enablers included financial and environmental benefits as well as meeting customer expectations. Specific enablers for demand response program activities, particular those associated with the Milton Hydro EDP, were the financial incentive, promotion of a 'community image' that was associated with involvement in the program and the direct support provided by the utility in evaluating opportunities for reducing electricity usage. Enablers to demand response peak activities were primarily financial benefits, hot outdoor temperatures and the presence of an internal champion.

Efficiency activities were enabled by a need to replace or upgrade equipment, investments that met desired payback periods, often on the order of one to five years, and replacement technology that met the functional and quality requirements of the organization and that was available from suppliers within a short time period.

In a few instances, the demand response program itself led to increased conservation and efficiency within participant organizations. For some, program participation was an opportunity to focus on internal systems and practices, which led to identification of conservation and efficiency opportunities. For others, the demand response program events and associated awareness of their public benefit allowed participants to extend their demand response activity longer than the program events, which contributed to their increased conservation of electricity and costs as well as improved their public image.

The institutional participants had a greater prevalence of being enabled by the environment and electricity awareness of both internal and external stakeholders as well as by the external initiatives and support for the demand response program activities. Institutional participants often identified the community contribution as being a key driver for their undertaking of CDM activities and/or participating in community led programs, such as the demand response program. The impact analysis, however, indicated that some of the institutional participants may have signed up for the demand response program, but were, in the end, not actively participating. This discrepancy between reported and actual behavior within institutional participants may be an area worthy of further investigation.

The majority of commercial and industrial participants were motivated to undertake CDM activities that fit their business considerations. The social and/or environmental contributions were often welcome side benefits to a CDM activity that had a financial, functional and, in some cases, an image benefit. Most of the participants were undertaking CDM activities outside of utility led programs and irrespective of government policy. Minimization of expenses, including management of utility related operating costs, is a fundamental element of business management, which is likely why CDM activities were quite common for the majority of participants.

The medium sized organizations were enabled by the presence of an internal champion more than the larger demand organizations were. The larger organizations may have less of a need for internal champions as CDM activities were already a normal part of their operations. The larger user is just inherently more likely to put in place policies and objectives as well as technical resources to achieve the financial benefits available from managing their electricity usage (Velthuijsen, 1995). This study confirms this widely held notion.

Interestingly, the RPP participants identified time-of-use as an enabler more often then did the Spot Market participants. This may be because RPP is likely easier to understand and plan around than that of the unpredictable Spot Market. Those participants with a CDM related public profile were more likely to have been enabled by internal polices and objectives as well as by internal environmental and electricity awareness. This may indicate that organizations that are trying to promote their CDM related activities externally are also making efforts to encourage them internally. This coincides with the importance of having such policies, which has been identified by Dieperink et al. (2004).

The barriers identified were those associated with CDM activities that participants identified as being potential opportunities, but that they had not undertaken. These are, in effect, the indication that there are efficiency opportunities that exist within organizations. The main barriers identified were the financial benefits not being adequate or certain, some uncertainty related to the technology and, for the small to medium sized businesses, the internal capacity to further investigate and pursue opportunities was limited.

Barriers to CDM activities also varied by CDM activity sub-category: conservation, efficiency and demand response. Barriers to conservation and demand response program activities were similar in many instances. As per the similarities of the enablers to these activities, this may be due to their behavioural nature as opposed to a technical one. Common barriers included tenants that were not separately metered and billed, meeting safety requirements and expectations, operations and customer requirements and the limitations of the original facility design particularly in terms of the ability to control various loads as desired for conservation and/or demand response program activities. Barriers to demand response program activities that were different than those for conservation activities were in some instances the perceived commitment and effort required. Barriers to efficiency activities included meeting payback requirements, large up-front investments and technical functionality, quality and availability.

Commitment and effort was a greater barrier for medium sized organizations over large organizations. This was particularly the case for demand response program activities where internal capacities were limited, both in terms of human and technical resources. Payback periods were more of a barrier for Spot Market participants over RPP participants, which again may be indicative of the lack of understanding and/or related certainty of the RPP's time based price bands. Outdoor temperatures were barriers primarily to the CDM activities of industrial participants, which reinforces the importance of weather on operations.

One of the limitations of the research was that interesting commonalities were often identified within more specific organization profile groupings than the general classification of industrial, commercial and institutional. These could not be reported in order to ensure confidentiality of research participants. Similarly, interesting stories related to very specific CDM activities that could not be included due to the need to ensure confidentiality among a relatively small participant sample group. This was similar to the challenges identified by Moezzi et al. (2004) that "interesting stories are often closely linked to particular characteristics of a customer" (p. 6). This is an area that deserves attention with respect to how to overcome this obstacle, as some of the unique experiences of participants can be insightful in terms of highlighting challenges and opportunities for specific CDM activities.

Another limitation of the research was in quantifying the impact of the CDM activities undertaken by participants. This is a known challenge, identified in the literature as well as commonly understood in the energy management industry. Though it can be challenging enough to conduct a proper evaluation of the impact of a CDM activity, it is particularly challenging to properly evaluate an activity on a retroactive basis, that is after it has been undertaken and in the absence of a baseline evaluation. The ability to quantify impacts was desirable in order to demonstrate the links among the motivations, enablers and barriers and the impacts of the CDM activities. Without this, nonetheless, the researcher did sense that where multiple factors align, such as financial and environmental benefits, existence of an internal champion, as well as customer and organizational image benefits, the prevalence and impacts of CDM activities were greater. Though this does seem intuitive, as identified, it was hard to verify using the available data.

In utility driven CDM programs there is always the question of the net impact of a CDM activity on the consumer's overall electricity usage. Basic economic theory suggests that reduced input electricity costs, achieved through CDM activities, may lead to greater overall electricity usage through increased production. This may be the case for industrial organizations where the incremental production demand exists. The research did, however, include the case of P13 – a company that reduced overall electricity usage by manufacturing a higher cost and higher margin product, which thus required less production overall to achieve increased business benefits. This case of increased electricity usage as a result of CDM activities would arguably be less likely to occur for non-industrial customers, such as commercial offices and community buildings, as these operations are not so directly tied to electricity consumption. That said, the financial savings achieved through electricity CDM activities would likely be applied to other areas of consumption, which in a broader analysis the environmental impact of that other consumption could be compared with the avoided environmental impact through electricity generation.

The research contributes to the literature by adding more specificity to the organizational behaviour literature, which is very general with respect to motivational and contextual factors. The organizational behaviour literature often simply refers to organizations as firms. It is often not explicit as to the sector of the "firms", such as industrial, commercial, or institutional. There is, however, literature that distinguishes between the relative sizes of firms. The thesis identifies that the differences between sectors may be such that each deserves specific attention and should be considered an important differentiating factor in further organizational behaviour investigations.

The CDM literature is often segmented by sector and activity. There are few studies that look at the mix of organizational types and CDM activity types that were included in this study. Based on the differences between sectors and CDM activities that were identified in this research the more typical research focus on one organization type and few CDM activities does seem to be a reasonable approach. One of the contextual objectives, however, of the research was to understand an approach applicable to a municipal utility delivering CDM programs. This is a relatively typical scenario in Ontario as well as throughout North America. The research highlights the challenges municipal utilities face appealing to such a wide variety of customers that may be eligible for a wide range of CDM activities.

Another side result of the research was the challenge of defining and differentiating CDM activity types. Many activities include both behavioural and technological design elements, such as controls, sub-metering, and demand response. Conservation as a CDM activity was also a challenge to identify as a discrete activity and certainly in consideration of how best to quantify it. Further research may investigate the best methods to determine the impacts of these behaviours. Some information, however, is more onerous to obtain and often unknown by decision-makers, at least by many of the participants involved in this research. CDM, as defined in the first chapter, is not about changing the business for less electricity usage, but more about making efficient use of electricity to meet the needs of the business. That is, CDM, though divided from an electricity management perspective into conservation, efficiency and demand response, is really just economic efficiency with respect to minimizing operating costs relative to the business output.

Demand response is an interesting concept for electricity management and resource management in general. Elements of the underlying concepts behind demand response programs can often seem quite unusual and contradictory to a typical supply and demand economic model. It would be interesting for future research to consider if demand response was indicative of available conservation and efficiency.

As identified previously, organizations and their CDM activity opportunities are often unique. The research did not include a significant quantity of any one specific organization type and hence made unique consideration less meaningful. Further research would benefit from consideration of unique organizational and contextual situations. Future research could also investigate how each of the CDM sub-categories may be enablers or barriers to each other or specific means by which the barriers can be overcome.

Finally, many participants identified that there is almost always a CDM opportunity available to be undertaken. The research reveals that those activities that were good for their finances as well as for society and the environment were appealing to many of the participants. Further efforts that lead to alignment of these criteria will likely have the greatest results in terms of encouraging further CDM activities.

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Appendix A: Ethics Materials

Information Letter: Milton Hydro Customer Interviews

<*information letter was sent on Milton Hydro letter head*>

Dear Milton Hydro Customer,

Today's rising electricity prices and the environmental concerns associated with the generation and use of electricity affect all of us in Ontario, including organizations operating in Milton. Conservation and Demand Management (CDM) programs are being considered as a serious option for addressing these issues.

In an effort to understand how large electricity consumers are motivated to undertake CDM activities, Milton Hydro has recently developed a partnership with researchers from the University of Waterloo. The purpose of the research is to improve CDM program design to allow greater participation from organizations both in Milton and throughout Ontario.

Throughout the summer of 2006 we will be conducting interviews of Milton Hydro customers to get valuable feedback as per their decisions regarding electricity-related CDM activities. The interview questions will be open-ended as to allow for as much feedback as possible. Please note that your involvement in Milton Hydro's CDM programs does not require you to be a part of the University of Waterloo study.

We would like to include your organization as one of several to be interviewed. We believe your involvement in the decision making regarding your organization's participation in CDM activities, makes you best suited to speak to these issues.

Stephen Mooney, one of the researchers from the University of Waterloo, will be arranging and conducting the interviews. The interviews are voluntary, 30-60 minutes in length and will be conducted at a location convenient for you. You may decline to answer any of the interview questions if you so wish. Further, you may decide to withdraw from this study at any time, without any negative consequences, by advising the researcher. With your permission, the interview will be recorded to facilitate collection of information, and later reviewed for analysis.

All information you provide is considered confidential. Neither your name nor your company's name will appear in any report resulting from this study; however, with your permission anonymous quotations may be used. The interview results will be stored in electronic format and kept indefinitely in a secure location. As such, there are no known or anticipated risks related to your participation in this study. However, if you have any questions or you would like additional information to assist you in reaching a decision to participate, please feel free to contact Mary-Jo Corkum at Milton Hydro at 905-878-3483 ext. 236, or Stephen Mooney at 416-786-6366 or by email at smooney@fes.uwaterloo.ca. You can also contact Stephen's supervisor, Dr. Ian Rowlands at the University of Waterloo at 519-888-4567 ext. 2574 or email irowland@fes.uwaterloo.ca.

Finally, I would like to assure you that, in addition to receiving approval from Milton Hydro, this study has been reviewed and received ethics clearance through the Office of Research Ethics at the University of Waterloo. Should you have any comments or concerns resulting from your participation in this study, please contact Dr. Susan Sykes in the Office of Research Ethics at 519-888-4567 ext. 6005.

Thank you in advance for your interest in this project. If you are willing to participate in the interview please contact Stephen Mooney at 416-786-6366 or by email at smooney@fes.uwaterloo.ca so he can arrange a time that works best for you.

Yours sincerely,

D.R. Thorne, P. Eng.
President/CEO

Consent Form: Milton Hydro Customer Interviews

I have read the information presented in the information letter about a study being conducted by Stephen Mooney of the Department of Environment and Resource Studies at the University of Waterloo and in partnership with Milton Hydro. I have had the opportunity to ask any questions related to this study, to receive satisfactory answers to my questions, and any additional details I wanted.

I am aware of the following:

1. That I have the option of allowing my interview to be recorded to ensure an accurate collection of my responses.

2. That excerpts from the interview may be included in the thesis and/or publications to come from this research, with the understanding that the quotations will be anonymous.

3. That I may withdraw my consent at any time without penalty by advising the researcher.

This project has been reviewed by, and received ethics clearance through, the Office of Research Ethics at the University of Waterloo. I was informed that if I have any comments or concerns resulting from my participation in this study, I may contact the Director, Office of Research Ethics at (519) 888-4567 ext. 6005.

With full knowledge of all foregoing, I agree to participate in this study. (circle either YES or NO below)

YES NO

I agree to have my interview recorded. (circle either YES or NO below)

YES NO

I agree to the use of anonymous quotations in any thesis or publication that comes of this research. (circle either YES or NO below)

YES NO

Participant Name: ____________________________ (Please print)

Participant Signature: ____________________________

Witness Name: ________________________________ (Please print)

Witness Signature: ______________________________

Date: ____________________________

Interview Guide

The main topic areas that were covered throughout the interviews were:

- CDM activities undertaken and impact factors as well as CDM activities not undertaken
- Reasons as to why activities undertaken or not

The interview questions related to activities and reasons are designed to be open-ended as to allow for the greatest feedback from the participant.

The following definitions were provided to set the context for the interview:

Electricity conservation and demand management (CDM) includes any activity undertaken to reduce electricity demand and/or consumption. This includes reduction in electricity usage, shifting usage to off-peak times, selection of efficient equipment, switching equipment to operate on a different 'fuel' than electricity and/or participation in demand response activities.

Electricity demand refers to the amount of electrical energy that is consumed at any one time. An organization's electricity demand is measured in kW and fluctuates based on the organization's electricity consuming activities.

Electricity consumption refers to the amount of electrical energy that is consumed over a period of time. Consumption is measured in kWh and is equal to the summation of all hourly demand readings throughout a month.

An example:

The electricity demand of a 15W light bulb is 15W.

The electricity consumption of the light bulb depends on how long it is on. If the light bulb is on for 3 hours/day then the consumption will be:

3 hours x 15 W = 45 Wh (Watt-hours)

<u>Interview Participant #:</u>

<u>Section 1: Facility and Operations Basics</u>

Each interview participant was asked specific questions related to their facility size and operations to aid in the quantitative analysis of the CDM activity impact.

Q1.1 What is the size of the facility?

Q1.2 What is the ratio of office to industrial space? (if applicable)

Q1.3 What are the size and/or ratio of industrial process loads vs. office loads?

Q1.4 What primarily dictates electricity usage within the organization?

(e.g. weather, process operation, operating schedule)

Q1.5 What changes were there, other than CDM activities, to the organization's electricity usage since 2001?

Were there changes in occupancy? What were they?

Were there changes in production? What were they?

Were there changes to the facility such as contractions, expansions and renovations, equipment additions/subtractions or other changes that may have impacted electricity consumption and demand? What were they?

<u>Section 2: CDM Activities</u>

CDM activities can be grouped into a number of categories. For the purposes of the research CDM categories are identified as: conservation, efficiency, and demand response.

Conservation activities are defined as operational activities that can lead to reduced demand and/or consumption.

Efficiency related activities are those that relate to the design and build of a system or equipment selection. Efficiency activities include switching equipment to operate using a 'fuel' other than electricity. The most common example is providing heating using natural gas rather than electricity.

Demand response activities are those aimed at reducing peak demand frequently in conjunction with a demand response program. These may be economic and/or emergency response programs.

Q2.1 What CDM activities, if any, has the organization undertaken since 2001?

Following initial responses the following sub-questions were asked of interview participants.

Q2.1.1 Have any conservation activities been undertaken, that is, operational activities that should reduce electricity demand and/or consumption?

Q2.1.2 Have any efficiency activities been undertaken, that is, design and/or equipment activities that should reduce electricity demand and/or consumption?

Q2.1.3 Have any demand response activities been undertaken, that is, as part of a demand response program such as the Energy Drill Program offered by Milton Hydro?

Where necessary, further explanation of each of conservation, efficiency and demand response activities were provided to help the participant identified if such an activity was undertaken by the organization.

For each of the CDM activities identified, where applicable, interview participants were asked:

When was the activity undertaken?

How long was it undertaken for?

How often was it undertaken?

Q2.2 What CDM activities have been considered, but not acted on?

The results of the questions above were captured in the format of the table below.

CDM Activity	**Activity Timeframe: When, How long, How often**	**Anticipated Impact of Activity (on-peak and/or off-peak demand and/or consumption)**	**Notes**

Section 3: Decision Factors

Gather information related to motivational and contextual factors involved in the CDM activity decision-making.

Q3.1 Why did the organization undertake the identified CDM activities?

(Q3.1 was asked on per activity basis where applicable)

Following the interview participant's initial response to Q3.1 the following probes were used to understand the reasons further.

Probes:

Were finances an important consideration in the decision?

Efficiency activity specific: Was the payback period an important consideration in the decision? What was the required payback period?

Are CDM activities of overall importance in ensuring the competitiveness of your business? If so, how are they?

Are CDM activities common in your industry? If so, was this a factor in your decision-making?

Are CDM activities in-line with any organizational policies? Which policies?

Were environmental concerns a factor in the CDM activity decision-making?

Was electricity system reliability a factor in the CDM activity decision-making?

Is there someone internal to the organization that champions the undertaking of CDM activities?

Is electricity management a significant issue within the organization? Who is responsible for these sorts of energy management activities? Have you got a team or someone dedicated responsible for energy and electricity management?

Are there efficient technologies available to meet your requirements?

Did any internal practices or technologies help in the undertaking of the activities?

Do you publicly promote the results of these sorts of activities? Are CDM activities important to your customers?

Demand Response activity specific: Was the promotional opportunity part of the Milton Hydro Energy Drill Program a factor in the decision-making?

Demand Response

Did the Milton Hydro Energy Drill Program financial incentive influence your decision to participate?

Was the technical support from Milton Hydro helpful in planning the CDM activity?

If the interview participant identified CDM activities that were considered, but not undertaken, the following question was used.

Q3.2 Why were those CDM activities that were considered but not undertaken, not undertaken?

Similarly, following the interview participant's initial response to Q3.2 the following probes were used to understand the reasons further.

Probes:

Were finances an important consideration in the decision?

> Efficiency activity specific: Was the payback period an important consideration in the decision? What was the required payback period?

Are CDM activities of overall importance in ensuring the competitiveness of your business? If so, how are they?

Are CDM activities common in your industry? If so, was this a factor in your decision-making?

Are CDM activities in-line with any organizational policies? Which policies?

Were environmental concerns a factor in the CDM activity decision-making?

Was electricity system reliability a factor in the CDM activity decision-making?

Is there someone internal to the organization that champions the undertaking of CDM activities?

Is electricity management a significant issue within the organization? Who is responsible for these sorts of energy management activities? Have you got a team or someone dedicated responsible for energy and electricity management?

Are there efficient technologies available to meet your requirements?

Did any internal practices or technologies limit the ability to undertake the CDM activities?

Do you publicly promote the results of these sorts of activities? Are CDM activities important to your customers?

Demand Response activity specific: Was the promotional opportunity part of the Milton Hydro Energy Drill Program a factor in the decision-making?

Demand Response

Did the Milton Hydro Energy Drill Program financial incentive influence your decision to participate?

Was the technical support from Milton Hydro helpful in planning the CDM activity?

Appendix B: Transitional Demand Response Program (TDRP)

The Transitional Demand Response Program (TDRP) was a program administered by the Independent Electricity System Operator (IESO) in Ontario from the year 2004 through to April 15, 2007. The name of the program implies that it was a transitional program until the demand response programs of the Ontario Power Authority came into effect.

Overview of the program taken from:
http://www.miltonhydro.com/main.php?section=commercial&sub1=bus_energymanagement&sub2=tdrp (Accessed April 21, 2009)

Transitional Demand Response Program

The Transitional Demand Response Program, or TRDP, is a voluntary program that pays you on a monthly incentive to reduce your load during a high price period determined by the Independent Electricity System Operator (IESO) three hour ahead pre-dispatch price.

How It Works

The IESO publishes its three hour ahead pre-dispatch price every hour. When the three hour ahead pre-dispatch price reaches or goes above $120.00 per megawatt hour, a curtailment event is triggered. Participating customers are then sent notification via email, text message, or pager. A response to the notification must be sent prior to the curtailment event.

Incentives

For participating in the curtailment event, participants will receive a credit that is equal to the product of the qualified energy reduction and the three hour ahead pre-dispatch price. Energy reduction will be determined as the difference between the customer's adjusted baseline and the customer's actual energy usage. Adjusted baseline is determined on an hourly basis as the greater of the following:

- The average of the highest 10 of the previous 11 days same hour non-response hours.
- The average of the two most recent non-response hours.

Equipment Requirements

You must have an interval meter installed and operational for 30 days prior to program participation.

For more information about how your business can benefit from demand response programs, contact Milton Hydro at (905) 876-4611.

For detailed information on the program visit the IESO at www.ieso.ca/imoweb/consult/econDRPP.asp

Appendix C: Billing Types

For the General Service > 50 kW customers in the Milton Hydro service area, two distinct billing types exist: Regulated Price Plan (RPP) and Spot Market. All participants had interval meters installed since 2001 so were either billed based on the RPP interval rates or the Spot Market rates. A brief overview of each billing type is included below. Milton Hydro's most recent customer rate card can be found on their website at www.miltonhydro.com

Regulated Price Plan (RPP)

Table: Reproduction of Milton Hydro RPP rates effective May 1, 2006

Interval Meters (Smart Meters)		
Time	Time-of-Use	Price
Weekends & Holidays		
All Day	Off-peak	$0.035/kWh
Summer Weekdays (May 1 – Oct 31)		
7am to 11am	Mid-peak	$0.075/kWh
11am to 5pm	On-peak	$0.105/kWh
5pm to 10pm	Mid-peak	$0.075/kWh
10pm to 7am	Off-peak	$0.035/kWh
Winter Weekdays (Nov 1 – Apr 30) (subject to change)		
7am to 11am	On-peak	$0.105/kWh
11am to 5pm	Mid-peak	$0.075/kWh
5pm to 8pm	On-peak	$0.105/kWh
8pm to 10pm	Mid-peak	$0.075/kWh
10pm to 7am	Off-peak	$0.035/kWh

Spot Market

The Hourly Ontario Energy Price is the wholesale market price that fluctuates throughout the day. This is the price local utilities pay when purchasing electricity on behalf of their customers. Customers that pay the wholesale price and have an interval meter that can track how much electricity they use each hour may choose to pay this hourly price.

Taken from http://www.ieso.ca/imoweb/siteShared/understanding.asp?sid=ic

Accessed April 21, 2009