DSM Best Practices in Natural Gas Distribution Utilities: The Canadian Experience

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December 10, 2006

Background

Canadian natural gas local distribution companies ("LDCs") have long been active proponents of energy conservation and energy efficiency both in their own utility operations, and, since the early 1990's in many cases, through formal initiatives to encourage their customers to utilize natural gas wisely.

Under the characterization of Demand Side Management ("DSM") customer programs were designed and launched.[1] DSM was defined as any action that would affect customer demand, whether conservation and efficiency or load addition, although in general most LDCs and their regulators began to view DSM solely as a gas usage reduction exercise. Initial programs concentrated on consumer education and awareness with communication to customers about the types of measures that could be taken to reduce their consumption. Subsequent efforts looked at adding more direct ways of influencing customer actions, often with the provision of financial incentives. As DSM has matured, some utilities have added market transformation programs to their DSM program offerings.

Early success in helping to reduce customer demand for natural gas led to a view within LDCs that these demand side efforts could be an important offset to growing supply side requirements (and perhaps as a method of avoiding or delaying the need for certain utility distribution facility upgrades), and as a means of customer retention. More recently, DSM has found a following among customers as a way of reducing operating costs, dampening the effect of rising natural gas prices, improving competitiveness (in the case of commercial and industrial customers), and reducing emissions.

The Canadian Gas Association ("CGA"), the business association of the Canadian natural gas industry, commissioned IndEco Strategic Consulting Inc in 2005 to identify those practices – documented strategies and tactics – in DSM in the Canadian natural gas industry that should be considered 'best in class'. An ultimate objective of this work is to engage CGA member companies and other stakeholders in a discussion of how customer energy savings might be increased. The study terms of reference relate to energy efficiency and conservation and therefore, this work does not address in depth those activities of LDCs that might be described as fuel choice or fuel switching or load building, except to the extent that such activities may have an energy efficiency element.

The research involved the examination of DSM practices between 2000 and 2004 among the CGA's Canadian natural gas utility members and, based on the research conducted and the advice from these LDC DSM practitioners identifies those practices that should be considered 'best in class'. Best in class is the concept of 'Best Practice' that is defined in this

[1] Terasen's DSM activities are part of an Integrated Resource Planning framework. In Ontario, DSM was intended to be part of a similar IRP framework; however, the integration portion has yet to be determined by the Ontario Energy Board.

study as "documented strategies and tactics employed by successful organizations and programs. The objective was not, however, to identify best organizations or best programs; only to identify best practices that exist within organizations and programs".[2]

Sixteen best practices, both leading edge as well as those that have been adopted more widely, were identified in the following areas: organization and management, program planning, program delivery, and monitoring, verification and reporting. To qualify as a best practice, the practice had to be practical and achievable by other local distribution companies and had to materially contribute to the objective of reducing customer energy usage.

Study approach

To complete this study a team was formed by the Canadian Gas Association (CGA) under the auspices of members of CGA's DSM Task Force:

- ATCO Gas ("ATCO")
- Enbridge Gas Distribution (also representing Enbridge Gas New Brunswick) ("Enbridge")
- Société en Commandite Gaz Métro ("Gaz Métro")
- Manitoba Hydro
- SaskEnergy (also representing Heritage Gas)
- Union Gas Limited ("Union")
- Terasen Gas Inc. (also representing Terasen Gas Vancouver Island) ("Terasen")

Financial support for the study was provided by CGA member companies and by CGA under a Letter of Cooperation with Natural Resources Canada. This study forms part of a broader federal-provincial-industry (includes gas and electricity energy industries) DSM initiative that includes: DSM potential, regulatory frameworks, and monitoring/reporting. The consulting team includes IndEco Strategic Consulting Inc. of Toronto, Canada (as lead consultant) and B. Vernon & Associates of Vancouver, Canada. Work on the study was conducted between March and June 2005.

Methodology

This report is based on the results of Requests for Information (RFIs) to each of the Canadian gas LDCs actively pursuing DSM and a series of face to face and telephone interviews

[2] The definition of best practice that was adopted for this study was taken from the U.S. National Energy Efficiency Best Practices Study. Source: www.eebestpractices.com

conducted with them, along with secondary research conducted by the consulting team. While DSM programs have been offered by several utilities over the last decade, most current programs have been in place for five years or less. To simplify the data collection and in recognition of the difficulty obtaining data for the entire program life, the focus of the data collection was on a five year period, from 2000 to 2004.

The study team used two main criteria to select the best practices:

- **Actionable.** To be included as a best practice, the practice has to be practical and achievable by other LDCs.

- **Results Oriented.** Such practices must materially contribute to the objective of reducing customer energy use.

On examination it became clear that the suggested best practices were of two types:

- **Industry wide** - those that have already been adopted by four or more Canadian gas LDCs.

- **Leading edge** – those practices that are not in widespread use, i.e. by fewer than four Canadian gas LDCs.

This distinction does not suggest that leading edge best practices are in some sense more important than those that are characterized as industry wide. It suggests only that some practices are more broadly adopted than others and therefore, that some may be more difficult to adopt (because of cost or other barriers), or that the lack of adoption more broadly of some practices may be a reflection of the maturity of the DSM industry.

The consulting team placed an emphasis on those best practices (whether industry wide or leading edge) that are practical, useful, and suitable for adoption by others. The best practices are numbered, for easy reference only. The numbering is not indicative of either the relative priority or importance of each best practice.

Limitations to data collected

While the responses to the information request were very complete in most respects, and the study team is appreciative of the significant time and effort applied to their completion, there are a few limitations that are worthy of note:

Some responses to the RFI included program information in the aggregate (grouped by program type or sector) by virtue of the large number of programs offered during the study period. Although this is not a major concern (given that the objective of this study is not to provide a 'best program' determination), it has made calculation of certain program metrics problematic:

- Energy saving and cost data have been utilized on an 'as-provided' basis. Only a simple test of reasonableness has been applied to verify responses.

- Portions of the information received are unavailable or partially incomplete, most notably annual target data by program.

- Certain requested information received is not characterized the same way by each LDC. For example, the distinction between categories of commercial customers is not uniform across all LDCs. Therefore portions of the data do not allow for an 'apples to apples' comparison.

The participating Canadian gas utilities

The companies included in this study are all unique organizations, with individual corporate structures, goals and policies. As seen in Table 1, the companies vary with respect to their ownership, throughput and customer base. The majority of companies are investor-owned utilities. The ownership structure may influence how a company implements and manages its DSM activities. For example, shareholder incentive mechanisms for DSM performance have not historically been made available to publicly-owned natural gas utilities. However, vertically integrated LDCs, including crown corporations, may have the incentive of increased revenues where energy saved through DSM can be exported on the open market for a profit.

Other important factors to consider when comparing DSM programs and results across utilities are the size of the utility (e.g. throughput of gas per year and number of customers) as well as the breakdown of customers by sector. For example, Gaz Métro has a significantly smaller proportion of residential customers in their total customer base, compared to the other utilities. This reflects the fact that electricity is the dominant residential heating fuel in Quebec. SaskEnergy's proportion of residential customers is also slightly lower than the other utilities, but not to the same extent as Gaz Métro. Having a smaller proportion of residential customers will 'skew' certain DSM performance metrics, such as 'DSM expenditures per customer' or 'energy savings per customer', when comparing companies.

Table 1 General characteristics of natural gas utilities in Canada (2004)

LDC	Owner	Annual throughput[1] 10^6 m^3	Annual throughput[1] 10^6 GJ	Customers Total	Customers Residential
ATCO	Investor	4,937	187	906,550	92%
Enbridge	Investor	11,838	448	1,671,442	92%
Gaz Métro	Investor	5,312	201	158,527	66%
Manitoba Hydro	Crown	2,148	81	258,713	90%
SaskEnergy	Crown	3,827	145	326,985	82%
Terasen	Investor	6,035	229	885,200	90%
Union	Investor	14,135	535	1,223,584	91%

1. Based on RFI responses.

There are also significant differences among the provinces with respect to the provincial fuel mix available, the dominant residential heating fuel and the relative price of natural gas and electricity. The average residential tariffs for natural gas are quite similar across the

companies, with the exception of SaskEnergy and ATCO, which are somewhat lower due in part to low transportation and storage costs.[3]

With the exception of Enbridge and Union, every company in this study is located in a different province, meaning that nearly all companies face different energy regulations and energy efficiency policies.

As Table 2 shows Enbridge, Gaz Métro, Terasen and Union all operate in a 'regulated-DSM' environment, where DSM is expected by the regulator, DSM plans are approved by provincial regulators and DSM is funded through ratepayers. SaskEnergy's expenditure on DSM program incentives is taken off of its dividend payment to the Provincial Government and is approved by the Crown Investment Corporation. While SaskEnergy's DSM activities are not approved by an 'arms-length' regulator, as in Ontario, BC and Quebec, it is still considered 'regulated DSM' for the purposes of this study. ATCO's EnergySense program is the only example of non-regulated DSM in this study, as it is conducted as a quasi 'non-utility' program.

Table 2 Regulatory environment of natural gas companies conducting DSM in Canada

LDC	DSM approval agency	DSM since
ATCO	n/a	2002
Enbridge	Ontario Energy Board	1995
Gaz Métro	Régie de l'énergie Québec	1999
Manitoba Hydro	Manitoba Public Utilities Board	n/a
SaskEnergy	Crown Investment Corporation	2001
Terasen	British Columbia Utilities Commission	1997
Union	Ontario Energy Board	1997

The DSM regulatory environment influences the primary drivers for DSM, the programs that are selected for implementation and the preferred outcome of DSM activities. In jurisdictions with DSM regulated by an arms-length agency, the primary driver for DSM tends to be achieving cost effective energy savings. The Total Resource Cost (TRC) test is used to screen programs and to calculate total societal benefits from the programs. At SaskEnergy, on the other hand, the primary driver for its DSM program is residential customer satisfaction and retention. As such, programs are screened based on the cost and benefits to individual program participants (i.e. the Participant Cost Test).

[3] Residential average tariff rates range from 0.29 $/m3 to 0.42 $/m3.

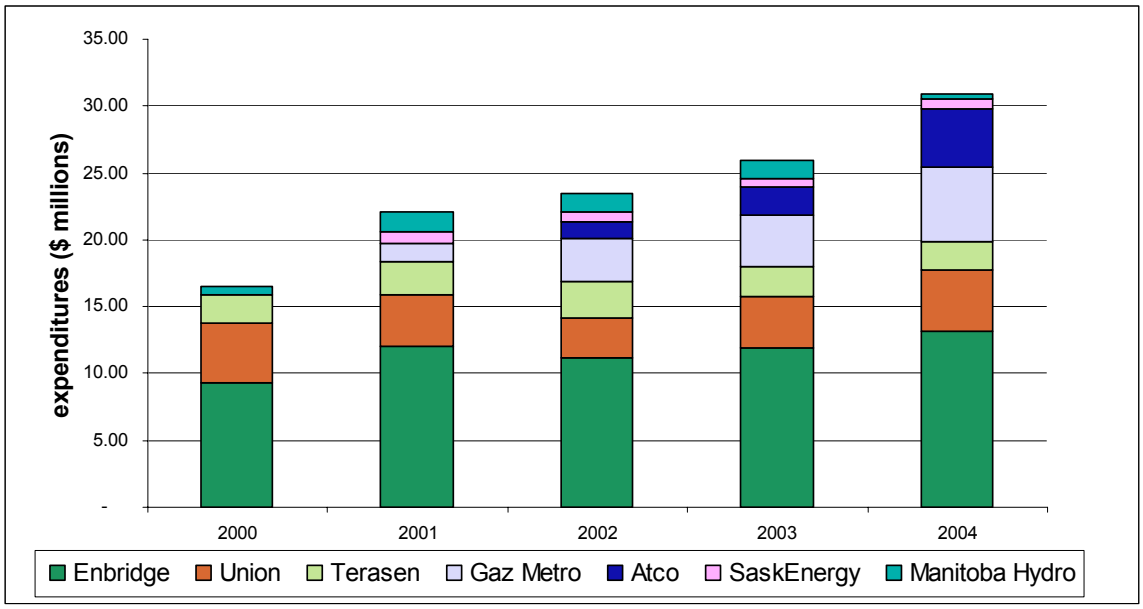

Figure 1 DSM expenditures by company (2000 - 2004)

Figure 1 displays the DSM expenditures by company from 2004-2004. The first-year annual energy savings from utility DSM investments is summarized in Table 3. This table clearly illustrates that while annual DSM expenditures and energy savings have been increasing since 2000, the cost per cubic metre of natural gas savings has been very stable throughout the entire period.

Table 3 DSM expenditures and energy savings (2000-2004)

	2000	2001	2002	2003	2004
Number of utilities with DSM programs	4	6	7	7	7
LDC DSM expenditures (millions of $)	$ 16.6	$ 22.1	$ 23.4	$ 26.0	$ 30.9
Natural gas annual end-use savings from LDC DSM programs (millions of m^3/yr)	91.8	138.2	150.2	153.4	170.9
Cost per m^3	$ 0.18	$ 0.16	$ 0.16	$ 0.17	$ 0.18
Natural gas annual end-use savings from LDC DSM programs (millions of GJ/yr)	3.48	5.24	5.69	5.81	6.47
Cost per GJ	$ 4.76	$ 4.22	$ 4.12	$ 4.47	$ 4.78

In 2004, the natural gas distribution companies invested a total of more than 30 million dollars in DSM. Table 4, below, shows the 2004 DSM expenditure of each company and the percent of the company's gas revenue it represents (both including and excluding commodity costs). While the largest DSM budget is more than 15 times that of the smallest DSM expenditure, the percent of revenue that DSM expenditures represent is much more consistent across the companies, suggesting that much of the variance in DSM budgets is explained by variance in company size.

Table 4 2004 DSM expenditures, by company, as a proportion of revenue

LDC	DSM expenditure[1] ($ millions)	Total utility revenue ($ millions)	% of total utility revenue	Utility revenue less cost of gas ($ millions)	% of utility revenue less cost of gas
ATCO	$ 4.30	1,550[2]	0.28%	407[2]	1.06%
Enbridge	$ 13.09	2,408[1]	0.54%	987[3]	1.33%
Gaz Métro	$ 5.11	1,783[4]	0.29%	436[5]	1.17%
Manitoba Hydro	$ 0.46	494[6]	0.09%	119[6]	0.39%
SaskEnergy	$ 0.73	317[7]	0.23%	167[1]	0.43%
Terasen	$ 2.20	1494[8]	0.15%	609[8]	0.36%
Union	$ 4.60	1,791[9]	0.26%	885[9]	0.52%

1. Based on RFI responses.
2. www.ATCOgas.com/Regulatory/03-04_AG_GRA/APPL_UPDATED/SCH_REV.xls
3. www.cgc.enbridge.com 2004 Annual Report.
4. http://www.gazmetro.com/english/surveiller/faits.htm
5. Régie de l'énergie, cause tarifaire 2004, R-3510-2003, SCGM-12, document 7, page 1, column 21, row 48
6. http://www.hydro.mb.ca/about_us/ar_2003/ar_2003_report.shtml
7. http://www.saskenergy.com/about_saskenergy/annual_report/2004AnnualReport.pdf
8. http://www.terasen.com/reports/2004/pdf/finanStatements.pdf
9. RP-2003-0063 Statement of utility income. http://www.oebdocs.oeb.gov.on.ca/pdf/Schedules_19March2004.pdf

Figure 2 illustrates the type of DSM programs that the gas utilities carry out. All seven companies offer residential programs, five of them offer commercial/institutional programs and only three offer industrial programs. Equipment replacement (e.g. upgrading to a high efficiency furnace) is the most common type of residential program, while energy audits and feasibility studies are among the most common commercial/institutional program. Industrial programs are predominantly ‘custom projects’, where the specific energy efficiency measures installed are identified based on the individual needs of each customer.

	ATCO	Enbridge*	Gaz Métro	Manitoba Hydro	SaskEnergy	Terasen	Union**
Residential							
Audit/assessment	✓	✓	✓	✓			
Building retrofit		✓		✓		✓	✓
Equipment replacement		✓	✓		✓	✓	✓
New construction – envelope		✓		✓			✓
New construction – equipment		✓	✓			✓	✓
Education				✓	✓		✓
Commercial/Institutional							
Audit/assessment	✓	✓	✓			✓	✓
Building retrofit		✓					✓
Equipment replacement		✓	✓			✓	✓
New construction - envelope		✓	✓				
New construction - equipment		✓	✓				✓
Custom projects		✓	✓				✓
Education		✓				✓	✓
Industrial							
Equipment replacement		✓	✓				
New construction - equipment			✓				
Custom projects		✓	✓				✓
Education		✓					✓

*BASED ON 2002 M&E REPORT
** BASED ON 2003 M&E REPORT

Figure 2 Types of DSM programs offered in 2004, by company

Findings – DSM organization and management

Organization and management of DSM is an important determinant of DSM success. Integration of DSM as a core business practice is key. Five best practices in DSM organization and management were identified:

- BP1 Integrate DSM throughout the company as a part of routine business practice (leading edge)
- BP2 Create a defined process for external stakeholder involvement in DSM outside of the formal regulatory process (leading edge)

- BP 3 Develop appropriate, effective shareholder performance incentives to motivate DSM excellence (leading edge)

- BP4 Instil a corporate culture of innovation (leading edge)

The leading edge best practices in DSM organization and management reflect the maturity of the DSM programs of these organizations and the ability of the regulatory environments to support them. It is anticipated that other natural gas utilities in Canada will adopt these leading edge best practices as their programs mature. Regulators need to be encouraged to continue to support and foster innovation in DSM organization and management in the utilities they regulate.

The CGA can play a role in supporting DSM innovation across Canada. Research and development into innovative technologies and the development and piloting of new programs can be resource intensive, potentially making it difficult for some of the smaller LDCs. There would be a benefit to having increased collaboration and information sharing among the Canadian natural gas companies with respect to R&D and program development. It would likely be more cost-effective and would avoid duplication of effort. The facilitation of such information sharing and collaboration is a potential role for the Canadian Gas Association.

Findings - DSM planning

Good planning is critical to successful DSM. The study team has identified five best practices in planning:

- BP5 Minimize planning uncertainty through multi-year approach (industry wide)

- BP6 Develop programs that minimize lost opportunities (industry wide)

- BP7 Design programs in collaboration with industry (leading edge)

- BP8 Assess market as part of program design (leading edge)

- BP9 Provide programs for 'hard to reach' customers (leading edge)

- BP10 Extend DSM efforts beyond natural gas conservation/efficiency (leading edge)

While DSM planning has been one of the strengths within the industry, significant opportunities remain to achieve additional customer savings through new approaches to collaboration with industry, to composition of the DSM portfolio, and to understanding customer needs. Multi-year planning and budgeting of DSM increases the ability of LDCs to capture these significant opportunities.

The CGA could facilitate the sharing of information and best practices on DSM planning, among its members. Utilities should be encouraged by their regulators to cooperate with their electric utility counterparts on achieving net energy savings and efficient load building.

Findings – DSM program delivery

Canadian natural gas LDCs are experienced and effective deliverers of DSM programs. Program delivery is the only DSM activity directly seen by customers and prospective participants. The method of program delivery, how it is positioned and how it is branded helps determine the success of programs. Three existing best practices in program delivery were identified in this study:

- BP11 Deliver programs in partnership with other agencies and stakeholders (industry wide)
- BP12 Position LDC as a provider of unbiased energy solutions (industry wide)
- BP13 Brand DSM (leading edge)

Currently, LDCs approach the issue of partnerships on an independent basis, even though many of their potential partners are national in scope (e.g. retailers, appliance manufacturers). There is an opportunity for development of collaborative approaches to establish these types of partnerships. The CGA DSM taskforce could potentially act as a catalyst for this purpose.

Findings – DSM monitoring, evaluation and reporting

Monitoring and evaluating the results of DSM is essential to the continual improvement of these programs. DSM reporting has uses beyond regulatory compliance, including stakeholder buy-in and stimulating internal management support for DSM. The best practices identified with respect to monitoring, evaluation and reporting are:

- BP14 Ensure there is an effective feedback loop between monitoring & verification and program design (industry wide)
- BP15 Develop a formal methodology for verifying energy savings (industry wide)
- BP16 Create a concise annual report on DSM activities and results that is available and easily accessible to the public (leading edge)

Monitoring and evaluating the results of DSM is essential to the continual improvement of these programs. DSM reporting has uses beyond regulatory compliance, including stakeholder buy-in and stimulating internal management support for DSM.

While the cost-benefit tests used by various LDCs may be similar, the input assumptions often differ, making it hard to compare program results. The values used for input assumptions can also be a very contentious issue with stakeholders, particularly where there is a utility incentive. There is value in having a consistent industry wide approach for determining the value of input assumptions to cost-benefit tests.

Conclusion

In the study sixteen best practices were identified covering four categories: DSM organization and management, DSM planning, DSM program delivery and DSM monitoring, evaluation and reporting and are of two types: industry wide and leading edge. To qualify as a best practice, the practice had to be practical and achievable by other local distribution companies and had to materially contribute to the objective of reducing customer energy usage. A key goal of this work is that these best practices will be adopted on a more widespread basis in Canada and will stimulate further discussion on DSM best practices. Some success has been achieved; to date these best practices have been presented in several industry forums in Canada and have influenced the design of the new regulatory framework in Ontario, Canada for the introduction of DSM for the more than ninety electric utilities in the province.

It is important to note that it may not be an appropriate goal for a utility to adopt every one of these "best practices". There may be very valid reasons to pursue only some of them due to individual circumstances. Each utility should adopt the best practices that best meet the needs of the utility and its customers, while taking into account the regulatory environment in which it operates. These practices are meant to be a guide and to create opportunities for ongoing improvement in DSM.