Infrastructure Canada

Canada

RESEARCH NOTE

THE IMPORTANCE OF WATER METERING AND ITS USES IN CANADA

Introduction

The federal government's role in water infrastructure involves activities such as funding water infrastructure projects and research and policy development to ensure that Canada meets its modern infrastructure needs. Infrastructure Canada (INFC) funds water infrastructure through its funding programs including the Infrastructure Canada Program, the Canada Strategic Infrastructure Fund, and the Municipal-Rural Infrastructure Fund. In 2004, to inform future funding and policy decisions, the INFC Research and Analysis Division reviewed current research on water infrastructure and published a report that highlighted, among other issues, the importance of water metering (http://www.infrastructure.gc.ca/research-recherche/infraresearch/reports/wirppd_e.shtml).

This research note examines water metering in more detail. Its objective is to explain the importance of water metering and some of its advantages and disadvantages, and to provide an overview of metering practices and recent developments related to water metering in Canada and the United States.

The Importance of Water Metering and Its Use in Canada

Water is the most capital-intensive of all utilities, yet in Canada water treatment and distribution are under-priced, and water infrastructure is under-funded. The price of water in Canada is one of lowest in the developed world,[1] and per-capita consumption levels are one of the highest in the world, second only to the United States.[2] Most water in Canada is heavily subsidized: "Canadians enjoy the cheapest water prices in the industrialized world, and Canada has been repeatedly chastised by the Organisation for Economic Co-operation and Development (OECD) for our profligate, heavily subsidized use of water, and our refusal to charge prices that reflect, at a minimum, the costs of water supply infrastructure."[3] Water metering can help to ameliorate these problems.

Water metering enables utilities to measure the amount of water used by customers. It is essential for implementing volume-based water charges,[4] and its use is increasing in Canada. The percentage of metered households served by municipal water systems

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[1] Klas Ringskog, "International Trends in Water Pricing and Use." World Bank, 2000. http://lnweb18.worldbank.org/mna/mena.nsf/0/2421f467c2c026268525695100660e9/$FILE/Riyadh-Final.ppt

[2] Government of Canada. "Atlas of Canada." http://atlas.gc.ca/maptexts/map_texts/english/freshwater_domestic_consumption_e.html

[3] David R. Boyd, *Unnatural Law: Rethinking Canadian Environmental Law and Policy.* (Vancouver, BC : UBC Press, 2003), p.47.

[4] Volume-based pricing reflects the amount of water used, which is in contrast to a flat rate where users pay the same amount regardless of how much water they use.

increased only slightly during the 1990s, from 52% in 1991 to 56% in 1999, but jumped to 61% in 2001.[5]

Residential water users who pay a flat or fixed rate – a static fee independent of water use– used an average of 474 litres/person/day in 2001, which was 74% more water than Canadians who were charged a volume-based rate.[6] When used with an effective pricing system, water metering is an effective incentive to reduce water consumption, and as the use of water metering has increased in Canada, water use has decreased. From 1999 to 2001, residential average daily water consumption decreased from 343 litres/person to 335 litres/person, the second lowest rate since 1991.[7]

According to T. Duncan Ellison, Executive Director of the Canadian Water and Wastewater Association, the use of water metering continues to increase gradually in Canada, mainly in new housing developments. Virtually all newly constructed housing developments in major urban areas are metered, but water metering is not increasing in smaller communities that are not experiencing growth. To implement water metering there must be a decision by the municipal council and, in smaller communities, the decision is not always favoured because councilors do not want to increase water rates. Individual metering or "sub-metering" for units of multi-dwelling buildings or office buildings is also increasing slowly. The difficulty of retrofitting buildings for this type of metering limits its implementation.[8]

The Pros and Cons of Metering

A survey of 65 Canadian municipalities that had undertaken water conservation initiatives showed that "metering has proven to be a primary component of an effective water conservation program."[9] High levels of water consumption create huge volumes of wastewater, which increases maintenance and operation costs of sewage treatment plants. Therefore, by reducing water consumption, water metering helps to reduce water infrastructure costs. Decreasing the demand for water also decreases the energy required for pumping and heating water and conveying and treating wastewater, thereby reducing energy infrastructure costs.[10] Metering also helps to quantify unaccounted water demand such as leakage of potable water from the system, fire hydrant use, water main flushing and other system uses as well as unauthorized uses.[11]

One of the most important benefits of water metering is the revenue it provides for water and wastewater operations. Water meters are necessary for implementing full-cost pricing. Full-cost pricing is based on the economic principle that utilities should charge

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[5] Environment Canada, "2004 Municipal Water Use Report: Municipal Water Use 2001 Statistics." 2004. http://www.ec.gc.ca/water/en/info/pubs/sss/e_mun2001.htm
[6] Environment Canada. 2004.
[7] *Ibid.*
[8] T. Duncan Ellison, Canadian Water and Wastewater Association (CWWA), communication, October 27, 2003 and May 5, 2005.
[9] Canadian Mortgage and Housing Corporation (CMHC), "Research Highlights: Canadian Municipal Water Conservation Initiatives." http://www.cmhc-schl.gc.ca/publications/en/rh-pr/tech/01-121-E.htm
[10] Community Energy Association. "Energy Ideas for Municipal and Regional Facilities & Infrastructure Planning." http://www.energyaware.bc.ca/tk_e_infrastructure.htm
[11] CMHC, *Provision of Municipal Infrastructure Through Demand Management: Guidebook and Case Studies.* (Ottawa, ON: CMHC,1999).

water and wastewater rates that reflect the total cost of providing water and wastewater services including all capital and operating costs and the costs of replacing and upgrading infrastructure.[12] This method of pricing influences water demand by alerting Canadians to the amount of water they are consuming and also provides municipal governments with revenue for maintaining, operating and renewing water and wastewater infrastructure.[13]

Water metering can be detrimental if water prices are too high. An unaffordable rate structure can threaten the health and welfare of economically disadvantaged populations if they cannot afford to pay for a necessary amount of water. This has not yet been an issue in Canada where the cost of water is probably not high enough to affect economically disadvantaged customers. One way to try to avoid this problem is to calculate an average monthly consumption rate needed to cover key human needs and then charge a basic rate for this amount and a higher price for any consumption above that amount. Water use above the basic amount would presumably be for luxury uses such as car washing or landscaping. In other words, an increasing block rate (IBR)[14] could be used to charge a certain amount for the first block (i.e., volume needed for basic needs) and a higher amount for additional blocks.[15] Measurement Canada refers to a similar rate structure as a "constant rate with minimum consumption" and describes it as a utility charge for a minimum consumption (used or not) such as $75 for 225 m^3 of water, with charges for all consumption above 225 m^3 based on other billing practices.[16]

Practices in Canada and the United States

In Canada, many high-rise office and apartment building owners bill tenants for water use as part of rent and as a percentage of the building's total water use. This billing system does not encourage water conservation, since tenants are not billed directly for water use and residents are forced to compensate the highest users. Individual metering or "sub-metering" of each tenant space separates water bills from rent and from the common building costs. This benefits the building owner, who no longer absorbs the risk of non-payment by the tenant. In addition, tenants can be charged on a more equitable

[12] Environment Canada, "Water Conservation – Every Drop Counts." http://www.ec.gc.ca/water/en/info/pubs/FS/e_FSA6.htm; and Ontario SuperBuild Corporation, "A Study of Best Practices in the Water and Wastewater." Final Report prepared by The Cadmus Group, Inc., KPMG LLP, and NuWater Ltd. 2002. http://www.pir.gov.on.ca/userfiles/page_attachments/Library/4/BestPracticesComplete.pdf?N_ID=4

[13] David R. Boyd, *Unnatural Law: Rethinking Canadian Environmental Law and Policy.* (Vancouver, BC : UBC Press, 2003), p.49; Canada Mortgage and Housing Corporation (CMHC). *Provision of Municipal Infrastructure Through Demand Management.* (Ottawa, ON: CMHC, 1999).

[14] Increasing block rates are a type of volume-based pricing. The unit cost increases as consumption increases.

[15] T. Duncan Ellison, CWWA, communication, October 27, 2003 and May 5, 2005.

[16] Measurement Canada, "Canadian Water Utilities Trade Sector Water Meter Survey." 2003. http://strategis.ic.gc.ca/epic/internet/inmc-mc.nsf/vwapj/20030605editedfinalreportH2Osurvey.pdf/$FILE/20030605editedfinalreportH2Osurvey.pdf

basis according to water use.[17] Tenants in metered buildings reduce consumption by 18% to 36% compared to buildings that do not have metered user fees.[18]

Sub-metering is common in buildings that have separate mechanical systems for each unit and where meters are easily located outside each unit. These tend to be low-rise buildings such as townhouses, and commercial and industrial strip malls. In contrast, high-rise buildings do not accommodate most types of sub-metering.[19] Automated meter reading (AMR) is one development that has increased the feasibility of sub-metering. AMR eliminates the need for a meter reader to come to the building to read the meters. Meters are connected to a telephone line, cable line, or via radio waves and utility readings are automatically sent to the utility for billing. One disadvantage for tenants is the monthly meter charge on their utility bill (in addition to their volumetric rate) necessitated by sub-metering.[20]

Sub-metering is more common in the United States. A California-based company, Wellspring, has found a way to sub-meter in high-rise buildings that cannot be retrofitted for sub-metering: it uses wireless meters at every point of water use (i.e., water appliance) within a unit. Wellspring calculates water consumption by adding the water use for each appliance. According to Brian Brittsan, the president of Wellspring, "We've installed 88,000 wireless water meters in 11,000 units to date, and we have a backlog of 7,500 units to go."[21] While sub-metering is expanding more rapidly in the United States than in Canada, about 85% of multi-family residents in the United States still pay for their water and wastewater as part of their rent (i.e., at a flat rate).[22] The growing market in the U.S. is estimated to be worth $17 billion.[23] Companies such as Wellspring rank Toronto as #2 in North America's multi-family market, after New York.[24]

Recent Developments

- In Canada, although metering of industry water use is not new, metering of the return flow to the sewer system is new (particularly as it relates to the industrial sector).[25]

- Increasingly Canadian municipalities are applying sewer surcharges to residential water bills.[26]

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[17] CMHC, 1999.
[18] Lawrence Solomon, "Plumb Crazy." *Canadian Environmental News Network*, August 7, 2003. http://www.cenn.ca/cenn/index.cfm?DSP=content&ContentID=8076
[19] Advanced Buildings Technologies and Practices, "Utility Sub-metering." http://www.advancedbuildings.org/_frames/fr_t_load_utility_sub_metering.htm
[20] *Ibid.*
[21] Lawrence Solomon.
[22] Aquacraft, Inc. and the East Bay Municipal Utility District. "National Multiple Family Submetering and Allocation Billing Program Study," Prepared by: Peter W. Mayer, Erin Towler, William B. DeOreo, Erin Caldwell, Tom Miller, Edward R. Osann, Elizabeth Brown, Peter J. Bickel, and Steven B. Fisher. Boulder, CO, 2004. http://www.aquacraft.com/Download Reports/SUBMETER FINAL REPORT - limited graphics NO APPENDIX.pdf
[23] *Ibid.* US dollars.
[24] Lawrence Solomon.
[25] Environment Canada, "Water Conservation – Every Drop Counts." http://www.ec.gc.ca/water/en/info/pubs/FS/e_FSA6.htm

- The federal government of the United States and state governments have recently revised legislation and adopted new policies to encourage water metering, including sub-metering.[27]

Case Studies

Kamloops, B.C.

In 2001, the Water Use Efficiency Committee for the City of Kamloops decided to implement universal water metering. The City had one of the highest per capita water consumption rates in Canada (more than twice as high as the country's average per capita water demand). After reviewing the costs and benefits of metering, the committee unanimously decided to implement universal, mandatory water metering:

> The financial benefits of a universal metering program can also be portrayed as utility fund savings. The largest and highest-profile projects from the City's water and sewer utility fund capital plans were selected in order to conduct an analysis of savings stemming from universal metering. Operating cost savings were also considered. At the completion of its deliberations, the Committee was unanimous in its support for universal water metering of all utility customers (including residential) as the single most cost-effective method of achieving more efficient water use in Kamloops. Metering would also create an equitable system for all users….. Savings will be significant and are projected to be between $0.7 and $1.5 million annually.[28]

Calgary, Alberta

The City of Calgary first tried to gain public support for universal water metering in the late 1950s. It recently succeeded. In 1959, 1966, and 1989 residents were asked to approve universal metering, but all three plebiscites were unsuccessful. After the 1989 plebiscite, the City implemented a voluntary metering program. The program lowered water consumption levels, and households taking part in the program showed the greatest level of reduction; however, the program had high installation costs, and it was difficult to administer. Furthermore, the program was not able to postpone costly expansion projects.[29] Finally, in 2002, City Council passed a by-law to phase-in

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[26] Environment Canada, "The Management of Water: Metering." http://www.ec.gc.ca/water/en/manage/effic/e_meter.htm

[27] The EPA changed its regulatory policy under the Safe Drinking Water Act to encourage submetering. See EPA, "National News, EPA Press Advisory." http://yosemite.epa.gov/opa/admpress.nsf/0/a06e842cb6f8983885256e050074bd16?OpenDocument; for information on state governments, see individual state documents such as State of Washington, "Conservation Tax Incentives Water Savings Report to the Governor and Legislature." 2002. http://www.ofm.wa.gov/reports/water/savings.pdf

[28] Water Use Efficiency Committee, City of Kamloops, "Final Report," January 2001.

[29] *Ibid.*

universal metering. The by-law requires that all residential customers be billed on a water meter by 2014.[30]

Other Cities and Towns that Have Recently Installed or Upgraded Existing Meter Systems:

- New Brunswick: City of Miramichi, CFB Gagetown;
- Ontario: City of Hamilton, Town of Orangeville, City of Niagara Falls, Region of Durham, Town of Richmond Hill, Town of Markham, City of Vaughan, Region of Peel, Town of Georgina, City of Kenora;
- Manitoba: City of Brandon;
- Alberta: Town of Athabasca, Town of Picture Butte;
- British Columbia: City of Langley, City of Vernon.

[30] City of Calgary, "Water Meter Bylaw Frequently Asked Questions." http://content.calgary.ca/CCA/City+Hall/Business+Units/Waterworks/Water+Meters/Water+Meter+Bylaw+FAQ.htm - decision