

MEETING ENERGY MANAGEMENT CHALLENGES FOR SOCIAL HOUSING OPERATORS[†]

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ABSTRACT

This paper discusses the special problems posed by rising energy prices for operators of social housing (e.g., non-profit rental or cooperative housing). Operators in Canada's Province of Ontario face at least seven challenges, all in an environment of extreme cost awareness:

1. Natural gas and heating oil prices are rising steeply, and there is a strong expectation that electricity prices in Ontario will soon rise steeply and be subject to time-of-day pricing.
2. To save construction costs, much of the social housing stock was built with electric heating.
3. Also to reduce construction costs, much social housing was built to minimum acceptable standards, with inflexible mechanical systems and limited insulation.
4. Few social housing units have individual metering for electricity and other fuels.
5. Social housing developments are municipally or cooperatively owned. Both types have residents receiving rent subsidies; the latter type also has residents paying market 'rents' who function to a degree in a rental market.
6. Rent subsidies are in effect of two kinds: direct rent subsidies geared to household incomes, and social assistance (welfare) payments that include a rent component. A social housing tenant may benefit from one or both kinds of subsidy. Each kind is subject to a set of rules that allow little flexibility in charging for delivered energy.
7. There are few good data on most of the above matters that could help social housing operators respond to new energy pricing regimes.

For the most part, social housing tenants are not exposed to energy costs and have little incentive to reduce energy consumption. Time-of-day electricity pricing will exacerbate this problem. There could be as much as a 12-fold difference in the variable component of the electricity charge between the highest and the lowest prices that are charged, but with little to encourage tenants to change their behaviour so as to avoid building operators incurring the highest charges.

Perceived approaches to this set of problems involve changes in the ways in which rent subsidies are provided and corresponding changes in the ways in which use of fuels is monitored and charged for.

SOCIAL HOUSING IN ONTARIO

A working definition of social housing is housing that is financially assisted by government, directly or indirectly.[1]

The best known examples of social housing in Ontario are the 47 Local Housing Corporations (LHCs) occupied almost entirely by low-income tenants receiving social assistance. Municipalities own LHCs

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and supplement their tenants rents, which are set according to a provincially determined ‘rent-geared-to-income’ (RGI) program.

The term social housing also embraces buildings owned and operated by private, not-for-profit corporations, including cooperatives. Many low-income residents of these buildings qualify for the RGI program, but there are also residents who pay ‘market’ rents and thus attract no subsidy. Confusing the definition further is application of the RGI program to some low-income residents of buildings operated on a for-profit basis. Such buildings are not generally regarded as social housing.

Thus, social housing is rental housing that is owned and operated by the public or not-for-profit sector and, for the most part, receives financial assistance in the form of rent supplementation. Ontario has about 1,660 providers of social housing, although the LHCs manage a disproportionately large share of the approximately 250,000 social housing units. About half a million Ontario residents live in social housing, about 12 per cent of the provincial population.

Financial assistance for social housing can also include additional resources from federal, provincial, and municipal governments and from faith-based and other organizations. However, the provincial-municipal RGI programs are the main source of support.

Energy costs are factored into RGI assessments and the supplements provided to providers of social housing. They are based on historical information, and do not reflect current energy prices well in an era of price increases. Shortfalls have to be met by housing providers.

ENERGY PRICES

Figure 1 shows how the residential prices of the three fuels used for heating have changed since 1990.

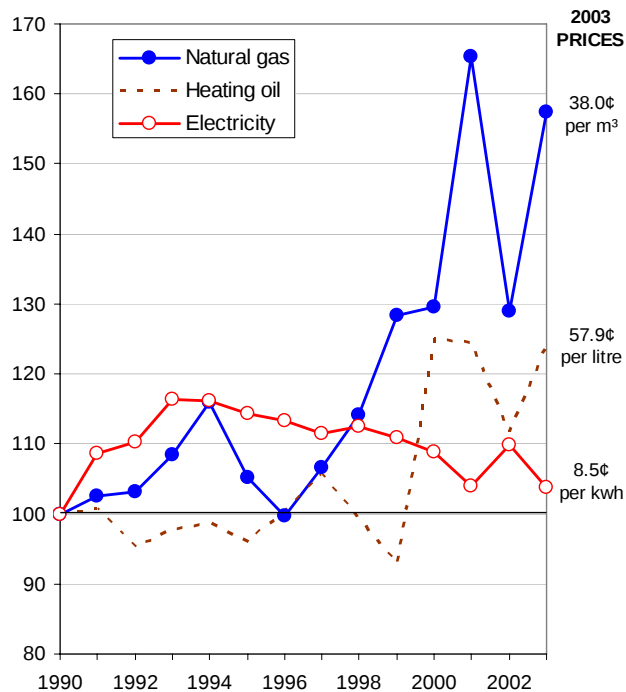


FIGURE 1. RELATIVE PRICES OF HEATING FUELS, CANADA, 1990-2003

[2] Actual prices in 2003 are shown at the right of the chart, in Canadian cents, each now worth about 0.8US¢. The data in Figure 1, and in Figure 2 on the next page, are for Canada. Ontario has about 40 per cent Canada’s 32 million population, and thus average fuel prices in Ontario likely differ little from average prices throughout Canada.

Overall, about 12 per cent per cent of Ontario’s households have electric heating. For households in the lowest income quintile, which includes nearly all social housing tenants, the share is about 24 per cent. [3] A firm estimate of how much social housing is electrically heated is being developed; available estimates range from 20 to 55 per cent. Most homes in Ontario are heated by natural gas; few are heated by oil.

Figure 1 shows that after rising rapidly at the beginning of the 1990s, electricity prices have fallen in real terms. However, they are likely to experience rapid increases during the next few years, particularly in Ontario, for these reasons: (i) Ontario’s

power generation capacity now lags behind peak demand and will likely lag more as coal-burning plants, which provide about 25 per cent of generated power, are closed down across the period until 2009; (ii) the cost of imported power, chiefly produced from coal, is set to rise steeply largely because of increases in the price of coal and natural gas; (iii) additions to Ontario's generation capacity are likely to produce expensive power, chiefly from natural gas and renewables; and (iv) conservation programs and price increases will likely reduce consumption below what it would have been, but not enough to bridge the growing gap between demand and supply.

Natural gas prices changed little until late in the 1990s, and since then have increased substantially. This reflects the peaking of North American production in 2003 and lack of available imports—e.g., in the form of liquefied natural gas—to bridge the growing gap between supply and demand. Further price increases can be expected unless demand is moderated by conservation or by demand destruction.

Heating oil prices have followed a similar pattern although the extent of the recent increase has been less. Further prices can be expected because world production is about to peak and because Canada is exposed to world oil prices.

Figure 2 shows the data in Figure 1 represented as prices per unit of useful heat. Electricity is much more expensive than natural gas, with the price of heating oil between the two. These unit prices have been converging, but this trend will not continue if electricity prices rise substantially.

CHALLENGES POSED BY BUILDING STOCK

Ontario is a generally cold place in winter but with a considerable range of climate. The range includes, for example, Timmins in the north, which typically has 117 days a year when the thermometer does not rise above the freezing point and Windsor in the south west (across the river from Detroit), which has 'only' 46 such days. There are also hot days. Timmins and Windsor have, respectively, 6 and 21 days a year on average when the temperature rises above 30°C (86°F). [4]

Ontario's social housing is spread throughout the province, but with a concentration in the major population centres of the south and south west. Effective heating systems are essential for all buildings in the province. Social housing rarely has air conditioning.

Heating systems

In building construction, the lowest costs can be achieved using thermal electric heating, usually in the form of baseboard heaters. Such heating is usually considerably more costly to operate than heating fuelled by oil or natural gas (see Figure 2). A posited advantage of baseboard heaters is that they allow

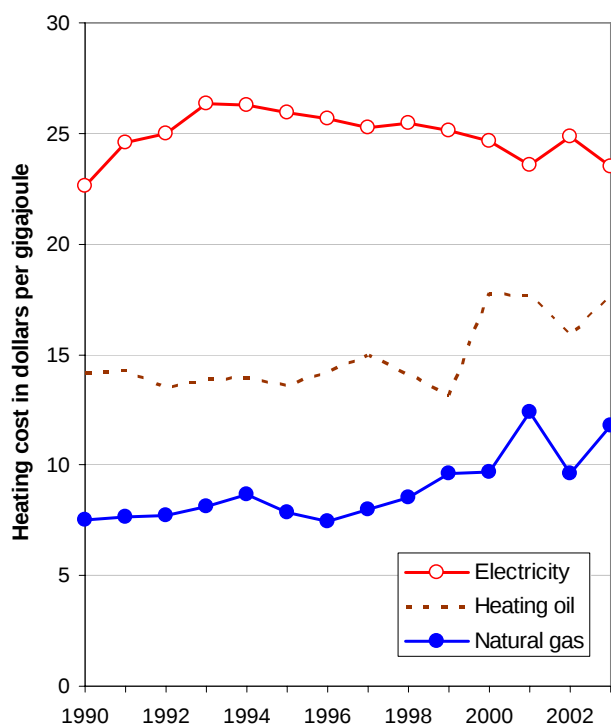


FIGURE 2. PRICES OF HEATING FUELS PER UNIT OF EFFECTIVE HEAT YIELD, CANADA, 1990-2003

resident control over heating. However, if residents are not responsible for fuel costs, their ability to control heating levels could increase a building's energy bills.

Data are few, but it seems that a disproportionately large number of the social housing units in Ontario have electric baseboard heating.

Building fabric

The limited budgets available to developers of social housing meant that much of it was built to minimum acceptable standards, including standards for insulation and weather-proofing. Again, this achieved short-term gain but longer-term financial pain, pain that is becoming more evident as energy prices increase.

Several programs have been available over the years to upgrade buildings, including the Social Housing Energy Retrofit Program (SHERP) of the early 1990s. For the most part, these programs addressed common spaces and shared systems, and did not upgrade the heating systems or insulation of the residential units.

The Social Housing Services Corporation (SHSC) is mandated by provincial legislation to provide collective services to Ontario's social housing sector. It has instituted an Energy Management Program to help address what have been described as "spiralling" energy costs. The program collects data on energy use in Ontario's social housing sector and helps with the following:

- Standardized energy audits
- Resident education
- Staff training
- Financing of investments to reduce energy use
- Coordinated implementation
- Information sharing, including best practices.

The goal of the Energy Management Program is to facilitate investments in energy efficiency in social housing that can be funded by savings in fuel bills. To this end, SHSC is establishing a revolving loan fund that operators can access to pay for independently certified energy conservation projects. The target is to reduce building energy use by 15 per cent by 2010. The Program's ongoing pilot study suggests that this target may be too conservative.

Metering

Data are few, but there are indications that up to a quarter per cent of social housing units in Ontario have individual metering of electricity or another heating fuel. A substantial number of units could have unmetered electric baseboard heating.

The Government of Ontario wants all electricity customers to receive electricity via 'smart meters' by 2010. An implementation report by the Ontario Energy Board (OEB), [5] recommends that these devices should allow two-way communication between users and electrical utilities that could be used to charge different prices for electricity according to time of day or other factors. The devices could also allow utilities to monitor and control what happens within buildings, for example, by turning a water heater off or to a low setting when overall power demand is in danger of not being met.

The main reason for introducing smart metering is to implement time-of-day pricing. An OEB proposal notes that a typical time-of-day pricing rate schedule provides for three rates, off-peak, shoulder, and peak, with the peak rate being about three times that of the off-peak, and the shoulder rate—i.e., the ‘normal’ rate—being about twice the off-peak rate. [6]

In practice, the spread has been both smaller and larger. For example, in 2001, Puget Sound Energy’s pilot program had a spread of only about 1.35 times between its peak and off-peak rates. In 1995, Toronto Hydro’s pilot program had a spread of 5.65 times between its peak and off-peak rates.

The effectiveness of a time-of-day pricing program is a function of the spread between rate extremes and several other factors. Time of day pricing can also reduce overall consumption. [7]

Smart meters would also allow for the introduction of dynamic pricing whereby prices are adjusted according to the overall load on electricity grid. Dynamic pricing has been found to be more effective in inducing load shifting and reductions in overall use. [7]

However, except in one respect, the OEB has not recommended dynamic pricing. The exception is a proposal for ‘critical peak pricing’ whereby an even higher than peak rate would be charged, perhaps six times higher than the shoulder rate, when the system is stressed or when expensive imported electricity has to be purchased. ‘Critical peaks’ would be announced a day in advance and would last no more than a few hours.

Diurnal patterns of electricity use in Ontario’s social housing are not known. It’s possible that a more-than-average amount of the use occurs during peak hours. Thus, housing providers’ costs could rise substantially with the introduction of time-of-day pricing if tenants are not exposed to and respond to price changes and differences.

DATA CHALLENGES

Lack of relevant data has been noted above in several instances. SHSC’s Energy Management Program is closing data gaps in respect of building fabric, fuel supply, and the extent to which units are individually metered.

More information about the details of energy use across the day and within units will be required to help determine whether and how individual metering should be applied. Overall diurnal patterns could be determined from centrally located smart meters. Securing information about the range of household consumption would require some metering of individual social housing units.

MEETING TIME-OF-DAY CHALLENGES

Social housing tenants are among the poorest people in society. Their incomes are for the most part tightly controlled by provincial and municipal regulations that provide little leeway to accommodate increased energy costs or to benefit from savings.

Nevertheless, these regulations appear today to accommodate instances where low-income social housing tenants are exposed directly to some energy costs. How the regulations could be adapted to accommodate time-of-day pricing of electricity and its implicit incentives and disincentives requires detailed investigation.

An equally large challenge is the nature of the social housing stock, notably what may be a relatively large dependence on electricity for heating and the lack of individual metering.

SHSC's Energy Management Program may indicate that in some cases conversion away from electric baseboard heating can be justified. Uncertainty about the future prices of other fuels—but with strong indications that prices will be higher—makes such conversion a less feasible proposition. One exception could be where social housing complexes can benefit from inclusion within larger district heating systems that reduce costs through cogeneration of electricity and hot water.

Individual metering of social housing units with smart meters is likely to be an expensive proposition unless there are dramatic breakthroughs in technology. The cost could be unsupportable if it has to be born by tenants or building operators. On the other hand, if time-of-day pricing is introduced, and tenants are heavy users of electricity during peak periods, social housing operators will face unacceptable increases in fuel bills.

A simple solution would be to exempt social housing from the emerging time-of-day pricing regime. This should be done only if the social and financial costs evidently outweigh the benefits. SHSC will explore in detail whether and how to expose social housing tenants to energy price changes and differences.

REFERENCES

- 1 Panzer RW, *Municipal Service Manager Social Housing Network Two-Year Pilot Project*. Report to the Community and Protective Services Committee, City of London, Ontario, Canada, February 28, 2005.
- 2 The data in Figures 1 and 2 are from several sources, chiefly Statistics Canada's *Energy Statistics Handbook*, 4th quarter, 2004. The prices for heating oil are actual prices, as reported by Statistics Canada. The prices for natural gas and electricity were computed by respectively dividing household expenditures by residential consumption. Estimates of the heating value per (Canadian) dollar assume that the heat content of one kilowatt-hour is 3.6 megajoules, of one litre of heating oil is 38.7 megajoules, and of one cubic metre of natural gas is 38.0 megajoules; and moreover that electric baseboard heating is 100-per-cent efficient while natural gas and oil furnaces have an average efficiency of 85 per cent.
- 3 Data on heating type are from Low-income Energy Network, *Regulated Price Plan and low-income consumers*. Presentation at a consultation session of held by the Ontario Energy Board, September 10, 2004, available at the URL below.
http://www.oeb.gov.on.ca/documents/rpp_lien_presentation_051004.pdf. Accessed July 22, 2005.
- 4 Environment Canada, *Canadian Climate Normals, 1971-2000*, available at the URL below.
http://www.climate.weatheroffice.ec.gc.ca/climate_normals/index_e.html. Accessed July 22, 2005.
- 5 Ontario Energy Board, *Smart Meter Implementation Plan*, January 2005, available at the URL below.
http://www.oeb.gov.on.ca/documents/press_release_sm_implementationplan_260105.pdf. Accessed July 22, 2005.
- 6 Ontario Energy Board, *Regulated Price Plan for Energy Consumers*, December 2004, available at the URL below.
http://www.oeb.gov.on.ca/documents/rpp_proposal_071204.pdf. Accessed July 22, 2005.
- 7 Langmore M, Duffy G, *Domestic electricity demand Elasticities, Issues for the Victorian Energy Market*, St. Vincent de Paul Society, Victoria, Australia, available at the URL below.
<http://www.vinnies.org.au/files/VIC.2004%20June%20-%20Domestic%20Electricity%20Demand%20Elasticities.pdf>. Accessed July 22, 2005.