ERG/200704

Response to P-887 Adoption of a Fuel Adjustment Mechanism (FAM) for Nova Scotia Power Incorporated

Larry Hughes and Mandeep Dhaliwal

Energy Research Group
Electrical and Computer Engineering
Dalhousie University, Halifax, Nova Scotia, B3J 2X4

email: larry.hughes@dal.ca

15 November 2007

Introduction

The twenty-first century has ushered in an age of price volatility in energy markets. How long this will last is anyone's guess, although the events of the past decade have many energy analysts suggesting that this will be a long-term phenomenon. The reasons behind the price volatility are widespread and complex, with some of the more notable drivers being the growth of new energy markets in China and India, major energy exporters experiencing a decline in production, and geopolitical problems leading to instability in many energy exporting countries.

Energy companies that rely on imported energy are particularly vulnerable to price volatility: spot market prices can change rapidly, shippers can refuse to carry cargo, and long-term contracts can be broken by suppliers. Not surprisingly, energy companies must pass the cost of energy on to their consumers.

Electrical utilities that rely on imported energy are not immune to price volatility. However, unlike other energy companies, regulated utilities are often intended to set rates that will remain in effect for lengthy periods. Since fuel costs drive the price of electricity, incorrectly estimated fuel costs can impact both the consumer and the utility (see Table 1).

Table 1: Effects of incorrectly estimating fuel costs

	Fuel costs as estimated by utility	
	Less than estimated	**Higher than estimated**
Consumer	Pays more per unit of electricity than projected.	Pays less per unit of electricity than projected.
Utility	Unwarranted revenues due to overestimating fuel costs.	Lower revenues due to underestimated fuel costs.

In a time of rising fuel costs and potential supply shortfalls, consumers should be charged for the energy they use—this should hold true for all types of energy, from gasoline to electricity. As the cost of energy increases, people should be expected to pay more for it; however, they should not be penalized for reducing their demand nor should they be expected to subsidize the energy consumption of others. In short, consumers should be expected to pay for what they consume—in the case of electricity, they should be expected to pay for the cost of the energy used to create the electricity they use.

This report is a response to Nova Scotia Power's proposal for a Fuel Adjustment Mechanism (FAM) and considers whether it meets the criteria of expecting consumers to pay for the energy they use.

Fuel Adjustment Mechanism

One approach to addressing the problem of volatile fuel costs is for the utility to implement a Fuel Adjustment Mechanism or FAM. Although there are a number of different approaches to FAM, all are intended to ensure that the cost of the fuel used to generate electricity is reflected in the price of electricity paid by the consumer. Rather than periodic rate cases, the utility passes fuels costs to consumers without the usual regulatory lag. This means that there is less likelihood of consumers being overcharged or the utility carrying the expenses associated with increased fuel costs. Ideally, FAM works "both ways" in that decreasing fuel costs will lower the price of electricity paid by the consumer.

On the surface, FAM seems fair because it more closely reflects the cost of electricity over the billing period. It clearly benefits the utility as rates can be adjusted at regular intervals, reflecting the cost of fuel. However, unlike the utility, the consumer will only benefit from FAM if the charges associated the electricity reflect the cost of fuel used to generate electricity for each consumer. Two of the more common billing techniques are flat-rate and time-of-use.

Flat-rate billing

In flat-rate billing, all consumers are billed at a single rate per unit of electricity consumed (typically per kWh). Flat-rate billing is usually associated with induction meters that simply tally the total electricity consumed during the billing period.

The following two examples show the inherent unfairness of flat-rate billing with FAM. Both examples refer to a utility with two consumers; on a certain day they both consume 96 kWh. The utility's fuel costs and their associated cost per kWh are shown in Table 2.

Table 2: Fuel costs for sample utility

Volume of electricity produced	Cost per kWh
0 to 8 kWh	$0.01
More than 8 to 12 kWh	$0.02
More than 12 kWh	$0.03

In the first example, Consumer 1's demand of 96 kWh is spread evenly over the day, at 4 kWh per hour, while Consumer 2's demand of 96 kWh occurs for one hour at 1900 (7pm). Figure 1 shows the hourly demand and the hourly fuel cost. The total fuel cost in this example is $3.72 for 192 kWh or $0.01938 per kWh. Since both consumers used the same volume of electricity, under flat-rate billing FAM, both would be charged the same amount, $1.860. In this example, Consumer 1 must pay for the additional generation required to meet Consumer 2's demand.

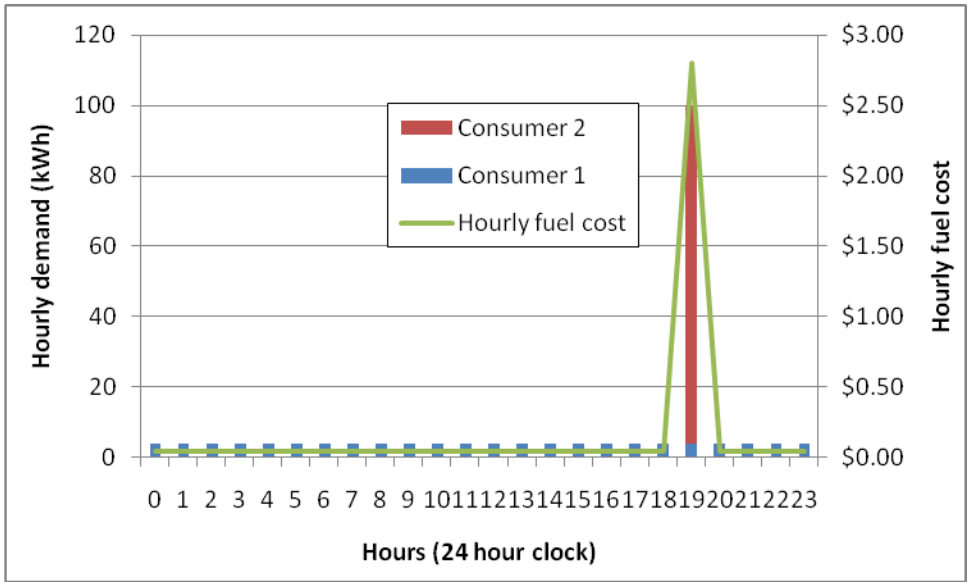

Figure 1: Effect of demand on hourly fuel costs (example 1)

In the second, somewhat more realistic example, both consumers use 96 kWh a day, with Consumer 1 using 4 kWh per hour and Consumer 2 varying hourly consumption from a low of 2 kWh to a high of 12 kWh. Figure 2 shows the hourly demand and hourly fuel cost. The total fuel cost in this example is $2.36, or $0.01229 per kWh. As in the previous example, since both consumers use the same volume of electricity, they are charged $1.180.

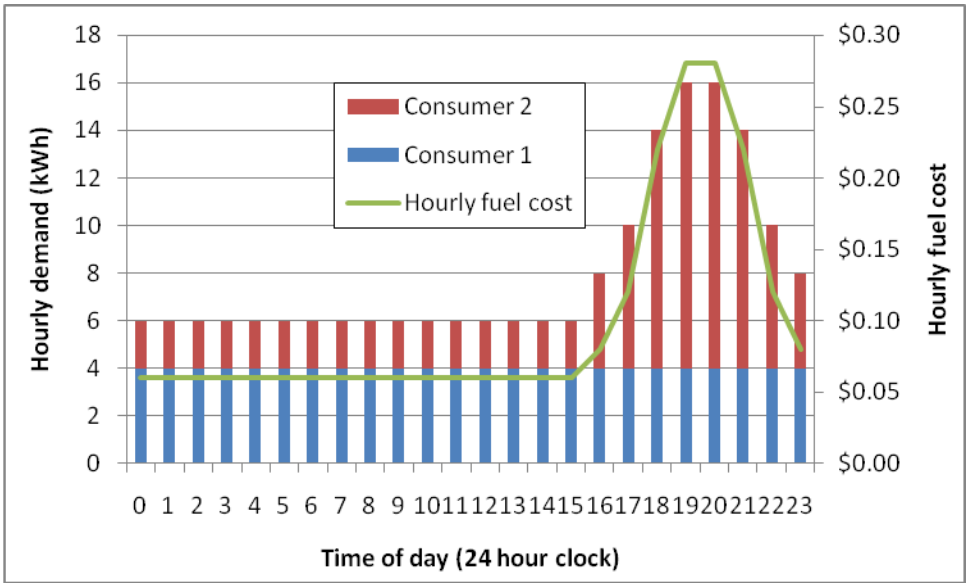

Figure 2: Effect of demand on hourly fuel costs (example 2)

Had both consumers used 4 kWh per hour throughout the day, the charge would have been $0.96 each. Since flat-rate billing with FAM makes no distinction between consumers, all are charged the same rate, determined by the total fuel costs over the billing period and the total volume of electricity consumed. As these examples show, with flat-rate billing, FAM does not protect low-volume consumers from the consumption of high-volume consumers—in fact, low-volume consumers subsidize the electricity consumption of high-volume users.

The root cause of low-consumption consumers subsidizing high-consumption consumers is the application of flat-rate billing to consumer's electrical consumption. If the utility uses flat-rate billing, the application of fuel adjustments in the form of FAM will not ensure that consumers are charged the actual price of the energy used to generate the electricity they consume.

Time-of-use billing

Utilities that use single-register induction metering technology cannot determine when a consumer uses electricity. An alternative to induction meters is the multiple-register electronic interval meter that records when a given volume of electricity is consumed, allowing the utility to correlate consumption with generation.

Interval meters, when used with time-of-use billing, means that the utility knows the volume of electricity consumed by a consumer at a given time. By knowing the fuel mix and fuel costs

each hour of the day, time-of-use billing lets the utility charge the consumer for the actual energy used to generate the electricity consumed. As a result, time-of-use billing with FAM ensures that low-consumption consumers do not subsidize high-consumption consumers. Consumers pay for the energy used to create the electricity they use.

In the examples of flat-rate billing with FAM given in the previous section, both consumers paid the same amount for consuming equal volumes of electricity, despite the fact that Consumer 2 was responsible for increasing the unit price of electricity. Table 3 compares flat-rate with FAM and time-of-use billing with FAM. In flat-rate with FAM, because of cross-subsidies, both consumers pay the same amount for the electricity consumed, whereas time-of-use billing with FAM (and interval meters), consumers pay for the energy required to produce the electricity they consume.

Table 3: Comparing flat-rate billing with FAM and time-of-use billing with FAM

	Flat-rate billing	**Time-of-use billing with interval meters**	
		Consumer 1	**Consumer 2**
Example 1	$1.860	$1.032	$2.688
Example 2	$1.180	$1.082	$1.278

By implementing FAM with interval meters and time-of-use billing, both the utility and the consumer receive the maximum possible benefits. Furthermore, there are significant advantages associated with replacing single-register induction meters with multiple-register electronic interval meters, notably:

- The occurrences of cross-subsidization are greatly reduced.
- Consumers pay the actual cost of the fuel associated with their electricity consumption during any given interval.
- Consumers' electricity consumption has been shown to decrease when interval meters are used.
- It allows for the implementation of effective and efficient demand management programs that can be properly monitored and measured.
- The utility has an accurate indication of the consumption habits of consumers, allowing for targeted education programs.

- Load shaping and price-signaling can be introduced by the utility.
- Meters can be read remotely.

Recommendations

By itself, FAM has the following advantages:

- Reducing the burden on the utility of carrying increased fuel costs for unduly long periods.
- Allowing the consumer to benefit from fuel costs decreases.

However, FAM does not protect the consumer from rising fuel costs.

An objective of FAM should be to have the consumer pay for the energy costs associated with the electricity they consume. As it stands, FAM is simply an extension of NSPI's existing flat-rate billing system. Flat-rate billing—in which the cost of electricity is constant, regardless of the volume used by the consumer—are inherently biased towards to those energy consumers who purchase disproportionately more electricity during times when the utility must use more expensive fuels to meet demand. As shown in this report, low-consumption consumers can—and do—subsidize high-consumption consumers. Since NSPI will apply FAM without changing its billing structure, low-consumption consumers will continue to subsidize high-consumption consumers.

It can be argued that meters and billing have nothing to do with FAM. This view overlooks the fact that ultimately, consumers pay for the fuel used by NSPI to generate electricity—and it is the metering and billing that determine who-pays-what. Time-of-use billing with FAM is the best way to ensure that the consumer pays for the energy used to create the electricity consumed and the utility is not burdened with the expense of carrying fuel costs.

This report has shown that combining FAM with NSPI's existing flat-rate billing does little to ensure that consumers pay the fuel costs associated with the energy required to generate the electricity consumed. In a time of increasing volatility in world energy markets, everything must be done to give consumers the true cost of the energy they use—in the electricity sector, this is best achieved using time-of-use billing with FAM.

Unless NSPI plans to install interval meters with each of its consumers and implements time-of-use billing with FAM, NSPI's FAM proposal should be rejected.