October 13, 2014

Kirsten Walli

Board Secretary

Ontario Energy Board

P.O. Box 2319

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Dear Ms. Walli

RE: EB-2014-0134

Please find attached my submission with respect to the above proceeding.

Yours truly,

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Submission of Russ Houldin in respect of EB-2014-0134

This submission makes two main points: Demand Side Management (DSM) programs, as the dominant institutional form of Energy Efficiency (EE), is flawed; and, while the Board is constrained in its ability to address these flaws, the Board can improve the situation going forward by adding a requirement to carry out retrospective studies of consumer participants and non-participants in DSM program as a means of checking assumptions made in Estimation, Measurement and Verification (EMV) protocols. In addition, the Board should consider conducting a study of the historical performance of the DSM programs of Enbridge and Union Gas.

The submission is organized, as follows: first, I provide some brief background on my own perspective on DSM and on the evolution of DSM; then I briefly discuss DSM's flaws; and finally, present recommendations on how the Guidelines should be modified and on a study that the Board should undertake.

From Soft Paths to DSM

The roots of DSM lie in an approach to energy policy promoted by a number of young radical energy policy analysts in the 1970s, the foremost of whom is Amory Lovins. In his seminal article "Energy Policy: the road not taken", Lovins coined the term "soft energy path" to denote an energy policy centered on energy efficiency and small-scale, renewable supply options. [1]Opposed by all governments at first, Soft Paths have moved, as Lovins himself predicted, from a Heretical Idea to Superstition. Focussing on the energy efficiency aspect of soft paths, almost all OECD jurisdictions now give prominence to energy efficiency (EE). Unfortunately, however, the focus of these EE policies is DSM (also known as Conservation and Demand Management, CDM), which has become the preferred institutionalized form of EE. This is not the place to speculate on why this is the case but there is no doubt that this is the case.

By CDM/DSM, I mean programs delivered by utilities, under regulatory supervision, that seek to reduce the demand for the product sold by the utility. In this proceeding, this means programs that reduce the demand for natural gas by the customers served by Enbridge, Union Gas and NRG[2]. A non-exhaustive list of alternative programs includes: public and private energy service companies (ESCOs); government-run incentive programs; and changes to energy standards, such as appliance standards and Building Code energy standards.

[1] Lovins, A.B., Energy Strategy; The Road Not Taken, **Foreign Affairs**, November 1976.
[2] NRG has so far declined to participate in DSM

As a policy analyst and advisor at the Ontario Ministry of Energy in the 1980s one of my responsibilities was energy end-use modelling, especially in the residential and commercial sectors, for the purpose of supporting the Ministry's long-term forecasts. The models used were essentially the same as those currently used to estimate "savings" from CDM/DSM. Technological assumptions about tertiary energy use were made for several categories of end-use. Forecasts were developed by assuming the replacement of current technologies by more energy efficient technologies. For example, the demand for natural gas for residential space heating was forecast by assuming average GJ per type of housing, broken into four structural types (semi-detached, detached, row housing and apartments) and five vintages. Just as, current targets for CDM for the Natural gas utilities are set by aggregating the best-guess technology for each type of end-use program for each relevant demographic group.

I was able to carry out a study which sought to compare the model's base assumptions with a major subset of housing types, i.e. a study of natural gas consumption in the City of Toronto. This was possible because of the cooperation of Consumers Gas (the forerunner to Enbridge) and of the City of Toronto's Planning department.(At that time there were no EE programs). The availability of the study now is unknown so, I will not quote any results. However, it is this type of study that I recommend be carried out by the Board.

DSM's flaws

DSM has three key flaws. First, its economics are problematic. Second, DSM savings cannot be measured directly. Thirdly, DSM sets up utilities to both sell and not-sell the same good.

Bad Goods: the Economics of CDM/DSM

The most fundamental principle of the modern discipline of economics is that "goods are good", often rendered as the phrase "the insatiability of wants". This means that more consumption is always preferred to less, even though the satisfaction or "utility" of consumption may have declining marginal value. The third bag of potato chips no longer tastes as good as the first. Natural gas DSM involves spending money to get people to buy less natural gas. This is incomprehensible from the point of view of economic theory. All of the familiar economic principles that apply to orthodox private goods collapse if goods are not good. Setting price equal to marginal cost, for example, would not guarantee that economic efficiency is approached, much less achieved.

Most economics textbooks mention a peculiar type of good known as a "Giffen Good", which is a good for which demand rises as the price goes up. The poor in Victorian England were observed to consume more bread even as the price rose because they had insufficient income to buy meat. Does it make sense to view natural gas as a type of Giffen good? Another

alternative is that natural gas is a public good but if this were the case why would it be delivered by private utilities?

We are left with no satisfactory account of the economics of DSM at all. Rather it is assumed, for example in this proceeding, without substantiation, that DSM "savings" of natural gas may be treated like an orthodox private good. Viewed in this way "DSM Savings" could be treated as a **substitute good** for natural gas usage. While there is a private market for DSM savings – by ESCOs – this market is more than an order of magnitude smaller than utility DSM. The reasons for the need for subsidization of DSM is may be inferred from usual rationale given for DSM programs, that there are "barriers" to DSM, which all turn out, at root, to be forms of imperfect information. While I am not aware of any jurisdiction in which this is used as an explicit rationale for DSM, this would be a logical use of orthodox economic principles.

The Cheshire Cat: the Measurement of CDM savings

In Lewis Carroll's **Alice in Wonderland,** we are introduced to a Cheshire Cat whose smile is visible but not the body. By analogy, we only observe the actual consumption of natural gas (the smile) but not the consumption that would have occurred without energy efficiency measures (the body). EMV programs attempt to address this problem by establishing "baseline" consumption against which actual consumption is compared, to derive "savings" or by assumed differences between existing and "more efficient " technologies. Nevertheless, savings are always inferred not observed. Some may argue that the "Cheshire Cat effect" is small. But how do we know that this is the case if there are no attempts to check statistically if reported savings match the observed consumption of non-participants?

I note that the Draft Filing Guidelines[3] addresses the issue of "input assumptions" in Chapter 3.1;

"*Where feasible and economically practical, the preference to determine LRAM and shareholder incentive amounts should be to use measured actual results, instead of input assumptions. For example, it may be feasible and economically practical to measure the natural gas savings of weatherization programs based on the results of the pre- and post-energy audits conducted by certified energy auditors on a custom basis, as opposed to input assumptions associated with the individual measures installed."* (p11)

The Staff report does not elaborate on what determines feasibility of such audits. I submit that the only way to check input assumptions is to carry out retrospective studies of participants and non-participants since the only actual data from participants is data with the DSM programs

[3] **Draft Filing Guidelines to the Demand Side Management Framework for Natural Gas Distributors**, September 15, 2014

(weatherization) in the example above. The counterfactual consumption, with no weatherization, always remains unknown, hidden behind the Cheshire Cat's grin. As to practicality, the Board is now in a position, under its new role as coordinator of DSM evaluation process (a change of which I am strongly supportive), to determine the extent to which the checking of input assumptions is of value.

Incentive Compatibility

Modern economics has focused considerable attention on "incentive compatibility". This is the idea that rules governing economic behaviour should seek mechanisms whereby each agent knows that the best strategy is to follow the rules, no matter what the other agents will do. Market behavior is the prime example of incentive compatibility: by following the rules of market behaviour – responding to price signals – individuals create an overall public good, improved economic efficiency. Asking the same company both to sell and discourage consumption of natural gas is a poor example of incentive compatibility.

Recommendations

A continuation of policies that assume away the flaws in DSM runs the risk of an eventual public backlash and a consequent reduction in political support for EE in all of its forms. In addition, such continuation ensures that future energy policy will be shrouded in an irreducible uncertainty.[4] In planning for future supply, this uncertainty arises from the ambiguity over "natural" conservation or EE and the contribution of CDM/DSM or other programs and from the Cheshire Cat effect. For those, like myself, which think that Lovins' original analysis was essentially correct, the optimal potential of energy efficiency will remain elusive.

The Board does not have the authority to correct these flaws but it can begin a process of increasing the accountability of DSM programs by requiring that utilities EMV programs be supplemented with studies that seek to check underlying assumptions about the assumed energy efficiency of technologies promoted by DSM programs. More specifically, the Board should itself conduct retrospective statistical studies of natural gas by consumers who have participated in DSM programs with similar consumers who have not. The period of the studies should depend on data availability but should cover at least five historical years. The results of these studies should be used to inform the future setting of targets, the design of programs and the setting of lost revenue recovery. To be clear, the focus of the proposed retrospective studies is to provide additional information on the assumptions that underlie the existing calculations of savings and on the aggregate savings attributable to DSM programs. There

[4] I anticipate that Ontario Long Term Energy Plan (LTEP), assuming that it will be subject to public review, will be criticized, *inter alia*, for its assumptions about the reliable contribution of CDM/DSM.

remain outstanding uncertainties with regard to the issues of free riders, attribution, retention rates, etc. but these are addressed in the Board Report and proposed Guidelines.

As an example, both Enbridge and Union offer programs that upgrade the insulation and other weatherproofing of residential dwellings. Existing savings are calculated by the use of models of the heating characteristics of the dwellings. Retrospective comparisons of dwellings that participated in the programs versus those that did not would allow for the modelling assumptions (e.g average reductions in space heating due to a certain increase in wall and ceiling R-values) to be checked and for an independent estimate of savings from such programs over the relevant periods. By "independent" I mean that Enbridge and Union have provided estimates of total savings by participants for, say, a five-year period based on participation rates, dwelling characteristics and modelling assumptions. By using data from non-participants with statistically matched dwelling characteristics (semi-detached, detached, row or apartments; vintage) over the same period an independent estimate of savings is possible which may then be compared with the "official" estimated savings. I recognize that such studies may be more difficult for "custom" DSM projects in the commercial and industrial sectors because of the larger number of statistical factors that need to be considered. These difficulties are, however, not different in kind from those addressed by existing protocols for sampling custom DSM projects for the purposes of estimating DSM savings.[5] For extremely individual projects in the industrial sector, perhaps a moratorium on such essentially unverifiable sources of DSM savings would be appropriate until the Board has conducted retrospective studies of the kind recommended herein.

As a caveat, I note that the study for the Ministry of Energy of which I was co-author, described above, was carried out before the enactment of **the Freedom of Information and Protection of Privacy Act** (FIPPA) and the **Municipal Freedom of Information and Protection of Privacy Act** (MFIPPA). The methodology relied on the use of street addresses to match building characteristics with natural gas consumption. There may now be privacy concerns that need to be addressed but I am confident that the Board would be able to satisfy these.

In addition, I recommend that the Board conduct a longitudinal historical study of natural gas DSM that would allow the construction of the table below (Table 1). (Consumption values should be weather-normalized.) Ideally, the same table should be produced for sectoral DSM but I recognize that there may be issues of sector definition between Union and Enbridge. I am not aware of any public sources of data that would allow the compilation of such a table. A time-consuming search of previous Board proceedings could be done but it would be simpler

[5] For example, Navigant Consulting, **A Sampling Methodology for Custom C&I Programs**, **Prepared for: Sub-Committee of the Technical Evaluation Committee,** Nov 12, 2012

for the Board to request that Union and Enbridge provide the relevant data. Such a study would shed light on whether or not Ontario natural gas DSM is running into diminishing returns, which would be valuable to ascertain in setting targets and budgets. Above, I note that an economic logic that could support DSM (but has not been advanced by anyone to my knowledge) would treat DSM as a substitute good for natural gas consumption. The rationale for DSM versus private ESCOs would be the existence of the information "barriers" discussed in all extant rationales for DSM. Over an almost twenty year period[6], if DSM were a substitute good (albeit not paid for by consumers), it would be expected that there would be diminishing marginal returns to expenditures on DSM.

Table 1

Year	Natural gas consumption (m3)	Incremental Estimated DSM Savings (m3)	Incremental DSM Costs ($)	DSM Savings Cost/m3
2014				
2013				
2012				
2011				
2010				
2009				
2008				
2007				
2006				
2005				
2004				
2003				
2002				
2001				
2000				
1999				
1998				
1997				
1996				
1995				
1994				

Specific Responses to the Board's Questions

[6] The Board's involvement with natural gas DSM goes back to 1993 although I believe that Enbridge's programs go back to 1995 and Union's to 1997.

In Chapter 4 of its Report the Board asks:

3) What information, other than what is listed above, should the utilities/Board consider when developing the long-term targets?

My recommendation is that the Board:

1. supplement its planned EMV evaluations with retrospective studies of the kind described above; and,
2. request that Enbridge and Union provide the data to be able to fill out Table 1.

Similarly, Chapter 5 asks;

"3) What information, other than what is listed above, should the utilities/Board consider when developing the long-term budgets?"

My recommendation is the same as for Chapter 4.

In Chapter 7 the Board asks:

"*3) Are DSM programs for large volume customers appropriate and should both gas utilities be permitted to offer these programs*?"

I recommend that a moratorium on such programs be established pending the results of the two types of study that I have already recommended.

All of which is respectfully submitted.