Exhibit C1

Before the Ontario Energy Board

EB-2012-0337

Issues Pertaining to Union Gas' 2013-2014 Demand Side Management Plan for Large Volume Customers

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December 14, 2012

INTRODUCTION

In late August 2012, Union Gas filed its proposed Demand Side Management (DSM) Plan for Large Volume Customers for the years 2013 and 2014. This report critiques Union's proposed plan and recommends modifications that the Board instruct Union to make or adopt. The report focuses on three related issues:

1. the reasonableness of the Company's proposal to continue to offer DSM services to large volume customers;
2. the reasonableness of the Company's proposed "self direct" program design; and
3. the reasonableness of the company's proposed performance metrics and shareholder incentive proposal for the Plan.

Mr. Neme, the author of this report, has previously filed testimony on DSM/CDM issues before the Ontario Energy Board on numerous occasions over the past two decades (EBRO 487, EBRO 493/494, EBRO 497, EBRO 499, RP-1999-0001, RP-1999-0017, RP-2001-0029, RP-2001-0032, RP-2002-0133, RP-2003-0063, RP-2003-0203, EB-2005-0211, EB-2005-0001, EB-2005-0523, EB-2006-0021, EB-2008-0346, EB-2010-0279), as well as before similar regulatory bodies in Quebec, Connecticut, Illinois, Maine, Maryland, Michigan, New Jersey, Ohio and Vermont. He also played a lead role in negotiating the settlement agreement between Enbridge Gas and stakeholder groups on Enbridge's 2012-2014 DSM Plan and the settlement agreement between Union Gas and stakeholder groups on Union's 2012-2014 DSM Plan.[1] A copy of Mr. Neme's curriculum vitae is provided as Appendix A to this document.

[1] That agreement covered all budget and key performance aspects of Union's DSM programs for all customers other than large volume customers for 2012, 2013 and 2014. With respect to large volume customers, it addressed only 2012. The latter two years – 2013 and 2014 – were left to be addressed in a subsequent proceeding. This is that subsequent proceeding.

I. Continuing DSM Service for Large Volume Customers

1. Summary of Union's Proposal

Union is proposing to continue to offer a DSM program to what were previously called "large industrial customers" and what the Company is now calling "large volume customers". Both terms refer to customers currently served under Rate T1 or Rate 100.

The Company notes that it has proposed in a different proceeding (EB-2011-0210) that T1 customers be split into two groups: a new Rate T1 mid-market service and a new Rate T2 large market service. The Company's DSM plan for large volume customers covers all three possible future rate classes. However, the design of the service is different for the new T1 customers than it is for the new T2 and Rate 100 customers.

Union's proposed DSM program offering to the new T1 customers would have similar characteristics to what is offered to other commercial and industrial rate classes. Specifically, there would be a "pooled" budget that the Company could use to provide financial incentives, technical assistance and other services to customers. However, Union is proposing that the budget for new T1 customers be treated much more restrictively than the budget for other commercial and industrial rate classes is treated – with respect to both (1) potential budget shifts from or to other rate customer classes and (2) the application of additional DSMVA funds.[2]

The Company's proposed DSM program offer to new T2 and Rate 100 customers would be fundamentally different than its offerings to any other customers. In particular, it would essentially give each customer "direct access" to the portion of the program's financial incentive budget which they fund in their rates. Customers would be required to submit an Energy Efficiency Plan to Union for approval by April 1st. Once the plan is approved, a customer would have until August 1st to spend or earmark that year's direct access funds for efficiency projects that it would commit to complete by December 31st. Any program budget that wasn't spent or committed by August 1st would go into a "pool" which Union would use to support additional efficiency projects that Rate T2/Rate 100

[2] For example, only $0.5 million of additional funding (about 30%) can be shifted to the new T1 customers and that can come only from the new T2/Rate 100 offering. The Company can also access a 15% DSMVA and apply it to the new T1 customers, but the additional DSMVA funds would be limited to just 15% of the new T1 budget. Thus, under its current proposal, the Company can increase spending on T1 customers by a maximum of 45% - but even then only if it shifted resources from a relatively small T2/Rate 100 budget and accessed a class specific DSMVA. In contrast, the Company can shift up to 100% additional funds to other rate classes – including other commercial and industrial classes – covered by its Resource Acquisition programs. Moreover, that 100% does not need to include the DSMVA and could come from a much larger and more diverse budget pool (making it easier to shift if desired). On the other, if desired, it could potentially come entirely from the 15% DSMVA because the 15% is applied to the entire resource acquisition budget (rather than from the much narrower, class specific DSMVA proposed for T1).

customers wish to pursue (and which presumably they have not already committed to fund using their direct access funds).

This approach is what is commonly referred to in the efficiency industry as a "self direct" program. That means that customers are provided access to DSM funds raised through rates and are given discretion over how to use them as long as they meet certain criteria (the need to have savings evaluated, the need to demonstrate savings are cost-effective, and/or others). Union's program has similarities to a "self-direct" program in the northwestern U.S. (Puget Sound Energy) that has been touted by experts in the efficiency community as an innovative and appealing self direct model.[3]

Union has proposed that the same $0.5 million budget shifting limitation that would apply to Rate T1 (referenced above) would also apply to Rate T2 and Rate 100 customers. Unlike for the new Rate T1, Union has proposed that there would be no ability to access or spend additional DSMVA funds for the new Rate T2 and Rate 100 customers.

2. Union's Rationale for Its Proposed Program

Some stakeholders have proposed that large volume customers be offered an "opt out" of DSM. Under such a provision, individual customers would have the option of both not receiving DSM services and not paying DSM fees (or a significant portion of them). Union makes the following arguments for proposing a "self direct" program instead of an "opt out":

- **Feedback from large volume customers suggests a majority prefer continued DSM**. The Company held a variety of meetings with customers in the affected rate classes. The Company has summarized the results of those discussions as follows: "The majority of customers value Union's technical resources, would like increased flexibility to access incentives and want to avoid large one-time deferral charges….Some customers would like to not participate in the program and avoid associated costs."[4]
- **Significant untapped efficiency potential remains**. One of the common arguments for an "opt out" provision is that large businesses are sufficiently sophisticated that they will identify and pursue cost-effective efficiency on their own. However, the Company has noted that both recent Ontario studies and its own DSM experience suggest that significant cost-effective efficiency potential remains within the industrial sector.[5]

[3] Anna Chittum, "Follow the Leaders: Improving Large Customer Self-Direct Programs", Report Number IE112, published by the American Council for an Energy Efficiency Economy, October 2011.
[4] Exh B5.3, p. 2.
[5] Exh B5.6.

- **The approach proposed is consistent with that of other leading jurisdictions**. Union states that it has found no Canadian jurisdiction that offers either a "self direct" or "opt out" option to large customers. It further states that among the top 20 leading U.S. jurisdictions only Vermont offers any form of opt out, but 10 others offer self direct programs.
- **It is important to treat all customers in a rate class consistently**. Union argues that allowing individual customers to opt out of paying DSM costs would result in "intra-class subsidy" and that is "inconsistent with the principles of class rate-making."

I cannot speak to the accuracy of Union's characterization of the feedback it received from its large volume customers. I also cannot speak to the reasonableness of Union's argument with respect to the principles of class rate-making. However, the other two arguments are both accurate and compelling.

The conclusion that significant untapped efficiency potential remains is indeed supported not only by recent efficiency potential studies, but also by the Company's own DSM experience. In 2011 alone, nearly two-thirds of customers (weighted by annual gas consumption) in the new T1 and T2 rate classes participated in its program; the comparable number for Rate 100 was 83%.[6] Those are remarkably high numbers for just one year. Moreover, Union has estimated that those customers' 2011 efficiency projects produced lifetime savings of over 1.4 billion m^3 of gas – even after adjusting for substantial free rider effects.[7] Such high levels of participation in efficiency programs offered to large industrial customers is consistent with my own direct experience supporting the delivery of Efficiency Vermont's programs. As the following citations make clear, Union's experience is also consistent with numerous other assessments of and expert conclusions regarding energy efficiency potential across North America:

> *"Numerous analytic studies have found that abundant, low cost efficiency opportunities exist in all parts for the industrial sector. These savings projections have been corroborated by actual evaluated program results in regions that have implemented robust programs and also at individual companies."*[8]

> *"It is frequently argued that the opportunities to improve efficiency in industry have been exhausted, and that the free market dictates that efficiency improvements will be made when they are cost-effective…(but) industrial market data…indicate that there still is significant potential for improving energy*

[6] Exh. B2.5 Note that the unweighted percentages are also high – roughly 60% for T1/T2 and over 70% for Rate 100
[7] Exh B5.6
[8] Shipley, Anna and R. Neal Elliott, "Ripe for the Picking: Have We Exhausted the Low-Hanging Fruit in the Industrial Sector?", published by the American Council for an Energy Efficient Economy, Report Number IE061, April 2006, p. iii.

efficiency… Does low-hanging fruit still exist in the industrial sector? We believe that the answer is yes."[9]

"Recently, an unprecedented volume of public and utility ratepayer funds have been poured into energy incentive and assistance programs for the manufacturing sector (Chittum and Nowak 2012). While assistance programs frequently reveal improvement opportunities of all kinds and magnitudes, many facilities tend to favor solutions that involve low- and no-cost improvements to existing assets. Meanwhile, a sluggish economic recovery combined with uncertain future tax and regulatory consequences have discouraged many companies from making strategic capital investment in energy-intensive systems. In sum, great potential remains for industrial energy improvement."[10]

"Not all energy efficiency is equally cost-effective or equally beneficial. The industrial sector in particular offers some of the most cost-effective efficiency savings available to any given utility (see Goldberg et al. 2009, Energy Trust of Oregon 2011, Kushler et al. 2004)…Therefore maximizing industrial energy efficiency is a priority for utility resource planning and resource acquisition, and for maximizing ratepayer benefits."[11]

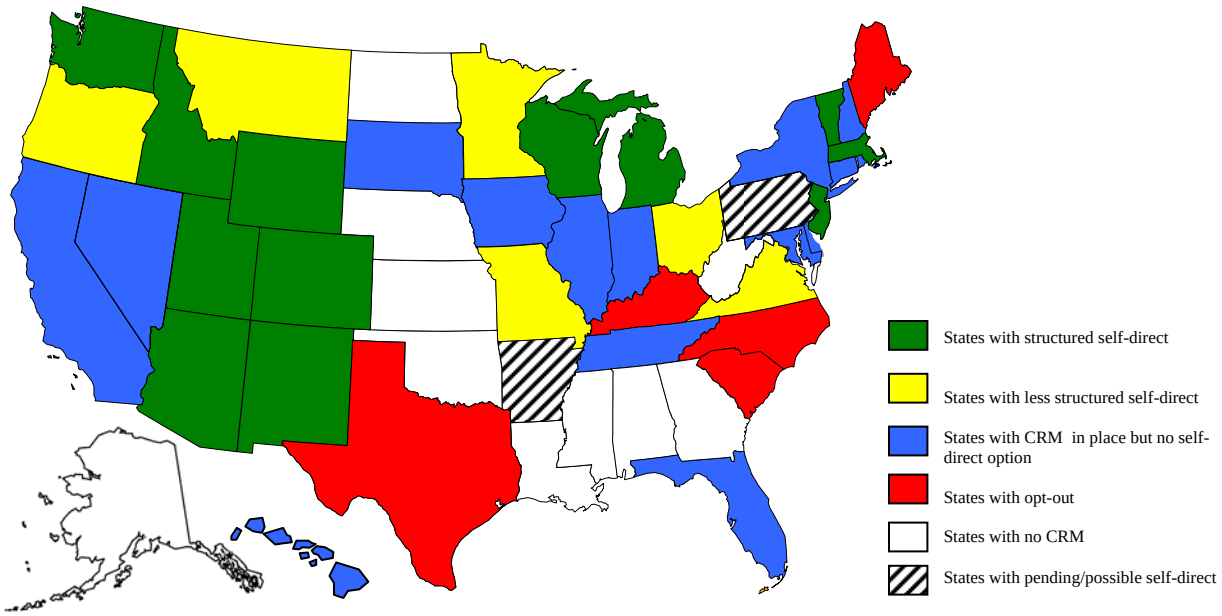
Further, it is worth noting that several jurisdictions – Utah, Wyoming and Oregon – permit customers to opt out of all or part of their DSM charges if they can demonstrate that they have addressed all cost-effective efficiency opportunities. As stated in a recent ACEEE report, "no company has taken advantage of these exemptions in any of these states, because there is always some cost-effective projects that could be identified during an energy audit."[12]

The Company is also correct in stating that it's preference for a "self direct" approach rather than offering an "opt out" is consistent the approach taken in leading North American jurisdictions. As Figure 1 shows, only a handful of states have DSM opt out provisions. None of those states – Texas, Kentucky, South Carolina, North Carolina and Maine – were ranked by ACEEE in its most recent State Energy Efficiency Scorecard

[9] Ibid, p. viii.
[10] Russell, Christopher and Rachel Young, "Understanding Industrial Investment Decision-Making", published by the American Council for an Energy Efficient Economy, Report Number IE124, October 2012, p. 2.
[11] Anna Chittum, "Follow the Leaders: Improving Large Customer Self-Direct Programs", Report Number IE112, published by the American Council for an Energy Efficiency Economy, October 2011, p. 5.
[12] Ibid., p. 17. Corroborated by a recent analysis presented to the Ohio Public Utilities Commission by Merrian Borgeson, Lawrence Berkeley National Laboratories, November 15, 2012. (http://emp.lbl.gov/sites/all/files/LBNL_Self-Direct_Program_Presentation_PUCO_111412_PUBLIC.pdf?utm_source=BenchmarkEmail&utm_campaign=Self%20Direct%20PPT%20Email&utm_medium=email) – see slide 20.

(2011)[13] as among the top 16 states in terms of utility funded efficiency programs; only Maine (17th) was among the top 28 states. Only a half dozen other jurisdictions had what ACEEE calls "less structured self-direct programs", and most of those were also relatively low ranked states.

Figure 1: Opt-Out and Self-Direct Program Options in the United States[14]



It is worth noting that Union's identification of Vermont as being the one leading jurisdiction that has an "opt out" for large volume customers could be misleading. It really depends on how one defines "opt out". While Vermont does allow one participating customer (IBM) to avoid paying the statewide DSM surcharge, there is a substantial quid pro quo. Specifically, that customer must demonstrate in exchange that it is making substantial efficiency investments on its own. Indeed, it must document spending a minimum of $3 million over three years on cost-effective efficiency,[15] report its savings to the state regulators, be subjected to external review of its savings claims (to ensure cost-effectiveness) and meet several other criteria. Thus, Vermont's "opt out" option is, in many ways, more akin to a "self direct" option (which may be why ACEEE

[13] Sciortino, Michael et al., "The 2011 State Energy Efficiency Scorecard", published by the American Council for an Energy Efficient Economy, Report Number E115, October 2011, pp. 6-7.
[14] Anna Chittum, "Follow the Leaders: Improving Large Customer Self-Direct Programs", Report Number IE112, published by the American Council for an Energy Efficiency Economy, October 2011, p. 5.

[15] That is almost as much as it would have paid into the statewide efficiency fund had it not "opted out".

identifies it as a state with a structured self-direct program) and may be very different than what some Ontario stakeholders are seeking.

Finally, it is also worth noting that roughly half of the leading states – including both New York and California – had neither an opt out or a self direct program. In other words, they relied exclusively on the kind of traditional DSM programs that Union has offered to its large volume customers in the past.

3. Other Arguments for Continued DSM and Against "Opt Outs"

There are several other reasons to support the continued offer of DSM services to large volume customers and reject calls for "opt out" provisions.

A. System Benefits of Efficiency

Energy efficiency investments do not just benefit those customers who participate in the programs. They have the potential to provide system benefits that help all gas rate-payers as well. For example, market clearing prices for gas can drop as demand drops. Thus, to the extent that demand drops below where it otherwise would be due to energy efficiency investments, all gas ratepayers could benefit. For example, a study in New York State several years ago concluded that savings from running substantially less aggressive gas efficiency programs than Ontario's current programs[16] would still produce average annual reductions in the price of gas of 0.2% over the 2007 to 2016 time period. The price reductions for industrial customers were estimated to be even a little better than that.[17] To my knowledge no comparable study has been conducted for Ontario. The gas market has also changed substantially in the past several years. Thus, the numerical results of the New York study should not be used to estimate price effects today in Ontario. However, they support the conceptual notion that there can be benefits that accrue to all gas consumers as a result of DSM efforts.

There may also be long term transportation and/or storage investment costs that can be avoided or deferred due to efficiency investments. However, that is a potentially complex issue that I have not analyzed. I am also unaware of any other recent efforts by others to analyze it.

[16] The price effects were estimated for a scenario in which five years of programs generated average incremental annual savings of about 4000 MDth, the equivalent of about 114 million m3. In contrast, in 2011 the combined incremental annual savings of Union Gas and Enbridge Gas were more than twice that amount despite serving a province whose population and gross domestic product are substantially less than New York's.

[17] Optimal Energy et al., "Natural Gas Energy Efficiency Resource Development Potential in New York", Final Report, Prepared for the New York State Energy Research and Development Authority (NYSERDA), October 31, 2006.

B. Environmental Benefits of Efficiency

Reduction in the use of natural gas by any customer, including large volume customers, will reduce emissions of environmental pollutants. Those benefits also accrue to all Ontarians (and to others as well). It is worth emphasizing that the externality costs of such pollutants are not fully reflected in the price that Union's customers, including its large volume customers, currently play for gas.

C. Ontario Policy Direction on Efficiency

Ontario government policy is strongly supportive of energy efficiency. The OEB Act itself includes a specific objective for the Board in regulating the natural gas sector to "promote energy conservation and energy efficiency in accordance with the policies of the Government of Ontario..."[18] No distinction is made between efficiency from large customers and efficiency from smaller customers.

Another relevant policy is the government's 2007 Climate Change Action Plan, which set an objective of a 15% reduction in greenhouse gas emissions by 2020. Ontario Environmental Commissioner Gordon Miller released his annual review of the government's program earlier this week and reported that progress towards these targets has now stalled after initial gains from phasing out coal-fired electricity generation. New initiatives are required to close the gap and achieve the reduction goal by 2020. A move to allow any fossil fuel consumers to opt-out of cost-effective energy efficiency programs – particularly those that have historically accounted for a very large fraction of Union's efficiency savings – would be highly inconsistent with the government's emission reduction goal.[19]

Provincial policy on energy efficiency in the electricity sector is also illustrative of government support specifically for programs addressing large industry. For example the Ministry of Energy's Long Term Energy Plan currently guides the Ontario Power Authority's (OPA) electricity system planning activities. The conservation section specifically requires that energy efficiency programs be provided and relied upon to meet conservation targets for all sectors including "very large industrial customers".[20]

Further guidance to the OPA on how to meet electricity CDM targets is found in the Directive to OPA on CDM initiatives under the Green Energy Act. The Directive requires OPA to work with the electric utilities to support their obligation to meet CDM targets by designing and funding province-wide CDM programs over the current 4 year

[18] S.O. 1998, c. 15, Sched. B, s. 2.5
[19] http://www.eco.on.ca/uploads/Reports-GHG2/2012/Climate-Change-Report-2012.pdf
[20] http://www.mei.gov.on.ca/en/pdf/MEI_LTEP_en.pdf p.40.

implementation period and in all sectors including industrial.[21] The Directive also expects OPA to seek opportunities to coordinate the delivery of the province-wide electricity CDM programs with other entities "such as natural gas distributors".

D. Majority of Past Concerns of Large Customers Already Addressed

One of the major concerns expressed by some large volume customers about DSM is the uncertainty regarding how much DSM costs will eventually be included in their rates. That concern appears to have been particularly sharp in response to the Rate T1 customers' experience with Union's 2011 DSM programs. In that year, the total DSM cost eventually allocated to Rate T1 customers was 440% higher than expected. There were two main reasons for the dramatic increase. The first was the DSMVA through which Union spent 172% more on efficiency for Rate T1 customers than it forecast. The second was the SSM allocation which, by itself, was 263% of what was budgeted for DSM. Although those two impacts were more dramatically felt in 2011 than in other years, their combined impact in previous years was also substantial.

However, it is important to note that such large increases in DSM costs included in rates can no longer occur.

First, the 2012 settlement agreement, which the Board approved, put in place significant limitations on how much DSM spending could increase (i.e. through the DSMVA). Rate T1 customers were allocated an initial budget of $3.567 million; Rate 100 customers were allocated an initial budget of $1.529 million. Union was permitted to shift up to $0.5 million between those two customer groups. It could also access a maximum of an additional 15% of total Rate T1/Rate 100 budget (i.e. $0.764 million) from the DSMVA. Thus, in a worst case scenario, the Company could increase DSM spending on Rate T1 customers by no more than $1.264 million or 35% - far lower than the 172% experienced in 2011.[22] Union's proposal for 2013 and 2014 would retain the maximum budget shift between large volume customers of $0.5 million. However, it would eliminate the ability to access any additional funds through the DSMVA (concerns regarding this proposal are presented below). If that provision had been in effect for 2012, the maximum amount by

[21] http://www.powerauthority.on.ca/sites/default/files/page/16600_MEI_Directive_CDM_Initiatives_under_GEA_Apr_23_10.pdf

[22] The worst case increase for Rate 100 customers is the same in absolute dollars, but higher – 83% - in percentage terms. However, the worst case scenario appears particularly unlikely for Rate 100 customers as the $0.5 million shift could only come from Rate T1. Moreover, from 2008 to 2011 DSMVA costs allocated to Rate 100 customers have never exceeded 25% of budgeted DSM. Finally, it is important to understand that the worst case scenarios presented here for both T1 and Rate 100 are mutually exclusive. They could not occur at the same time because the potential increases for each class would come from the same funds. Indeed, in order for the worst case to occur for one of the classes, DSM spending would actually have to go down for the other class.

which the Company could increase spending on Rate T1 customers would have been only 14%.

Second, in its 2011 gas DSM guidelines, the Board fundamentally changed how the utilities' shareholder incentives (the SSM in the past) would be allocated. In previous years, shareholder incentives were dominated by rewards for performance on the metric of the net economic benefits achieved (as measured using the Total Resource Cost (TRC) test). Incentives earned on this metric were then allocated to rate classes in proportion to the TRC net benefits each rate class produced. Under the new 2011 gas DSM guidelines, shareholder incentives are to be paid in proportion to DSM spending rather than in proportion to TRC net benefits. That makes a big difference to large volume customers because their share of TRC net benefits – nearly 50% came from Rate T1 customers in 2011[23] – is much greater than their share of DSM spending – no more than 16% was spent on T1 customers in 2011.[24] Thus, had the new gas DSM guidelines been in place for 2011, the amount of shareholder incentive borne by Rate T1 customers would have been reduced by two-thirds or more.

[23] Rate T1 customers paid $4.402 million in SSM (Exh. B6.2) out of a total SSM of $9.243 million (Exh B5.10, Attachment 1, p. 3).
[24] DSM in rates plus DSMVA was about $4.5 million for Rate T1 (Exh B6.2). It is unclear if this is all spent on Rate 1 customers or if some of that amount was an allocation in rates for low income spending. Total DSM spending was $28.0 million (Exh B5.10, Attachment 1, p. 4)

II. Proposed Refinements to Union's Approach

Once one reaches the conclusion that it is appropriate and beneficial to continue to offer DSM services to large volume customers, one should determine the best program design for serving those customers. While it is possible that a self direct approach would be better than the types of DSM programs and services the Company has offered in the past, it is far from clear whether that will be the case with Union's proposed program design.

One indicator of DSM success is the portion of customers taking advantage of DSM services. As discussed above, Union's current programs appear to already be quite successful in attracting broad participation. Arguably the most important indicator is the amount of cost-effective savings that will be generated. As also discussed above, Union's current programs also appear to have been quite successful in that regard as well.

One expert has suggested that self direct programs may be able to out-perform more conventional DSM programs:

> *"It appears that in some cases, self-direct programs can yield greater savings from certain customers than would have been achieved through traditional…programs. They can also leverage a facility's internal technical expertise to multiply the impact of the program dollars dedicated to energy efficiency, perhaps even at a lower cost when compared to (traditional DSM) programs."*[25]

However, as discussed in more detail below, Union is arguing that its savings targets for T2/Rate 100 customers should be lower because the self direct program design it has proposed will necessarily generate fewer savings. If that is indeed the case, it is problematic and suggests either that Union's proposed self-direct approach needs to be changed or it should be rejected altogether, with the current programs continuing instead.

In the event that the Board decides to approve a self direct approach, it should consider requiring modifications to several provisions of the Company's proposal that are problematic. I discuss each of these below.

1. Multi-Year Plans Instead of One-Year Plans

Union has proposed that the "direct access" budget that it sets aside for the T2/Rate 100 customers be an annual budget that must be used within the calendar year. A customer that identifies a project in 2013 would have to plan to fund it out of some combination of

[25] Anna Chittum, "Follow the Leaders: Improving Large Customer Self-Direct Programs", Report Number IE112, published by the American Council for an Energy Efficiency Economy, October 2011, p. 11.

its 2013 direct access DSM budget and its own internal resources.[26] The customer would not be able to "borrow" from its 2014 direct access DSM budget – i.e. to combine its 2013 and 2014 direct access funds – to pursue the project. Nor would the customer be able to defer the project until 2014 and still use 2013 direct access funds.

This one year limitation on the use of the direct access funds is less than ideal. For some projects – particularly smaller ones – it may work well. The contribution from the customer's direct access budget may be sufficiently large to induce the customer to pursue them. However, for other potential projects – particularly larger ones – the proposed one year limitation could constrain the ability or willingness of customers to pursue efficiency. Put simply, a one year direct access budget may not be large enough to overcome other internal barriers to the investment. The end result of this program design feature is that the Company may artificially constrain the amount of savings and even the cost-effectiveness of the savings that are realized.

Consider a hypothetical example in which a customer has an annual direct access DSM budget of $50,000, has an internal criterion that efficiency investments must have a payback of two years or less before they will be pursued, and is considering for potential implementation in 2013 and/or 2014 the set of three different potential efficiency projects presented in Table 1.

Table 1: Impact of Annual Direct Access DSM Budget on Project Choices

	Efficiency Measure Cost	Efficiency Measure Annual Savings (M^3)	Efficiency Measure Lifetime Savings (M^3)	Annual Savings	Direct Access DSM Budget Available	Payback w/o DSM (years)	Payback w/DSM (years)
Project 1	$400,000	1,000,000	15,000,000	$150,000	$50,000	2.7	2.3
Project 2	$60,000	60,000	900,000	$9,000	$50,000	6.7	1.1
Project 3	$60,000	60,000	900,000	$9,000	$50,000	6.7	1.1

None of the projects has a payback of two years or less without DSM support. The first project, which is also the largest, is by far the best in that it yields more savings per dollar spent than the other two and, as a result, has the shortest payback absent any DSM support (2.7 years, compared to 6.7 years for the other two). However, a one-year direct access budget would only buy down the payback period for that project to 2.3 years – still

[26] The customer could potentially apply for any "pooled" DSM funds remaining if some customers do not use all their "direct access" budgets. However, any such pooled funds would appear to be available only for new projects (rather than to further defray the cost of projects already committed under the direct access element of the program. Further, customers cannot count on the availability of pooled funds.

above the threshold requirement to make an investment. In contrast, a one-year direct access budget would buy down the payback period for the other two projects to 1.1 years – well below the internal business threshold requirement. Thus, Union's proposal to give customers only one year's worth of direct access budget and to not allow combining of direct access funds across multiple years would drive this customer to pursue the two least desirable projects (one in each year).[27]

In contrast, if Union gave customers a two-year direct access budget (i.e. if it gave this hypothetical customer $100,000 it could spend over two years, instead of $50,000 it must spend each year), the customer would be able to pursue the more attractive larger project (because the two-year budget would enable the buy-down of the payback to two years).

Multi-year direct access budgets also offer other advantages to customers. For example, they make it easier to allow sufficient time for planning, to fit efficiency investments into capital investment cycles and/or to schedule installations during sometimes infrequent times that a plant is planned to be shut down.[28]

In short, a multi-year direct access budget gives customers greater flexibility to plan and pursue projects that provide the biggest bang for the buck and/or make the most sense for their business. It is worth emphasizing that such a multi-year perspective is the norm in DSM, including Union's DSM efforts to date. Under the program designs the Company is delivering in 2012 and is proposing for all commercial and industrial customers other than T2 or Rate 100 customers in 2013 and 2014, a customer can identify a custom project it wants to pursue and potentially receive a financial incentive from Union that is greater than what it contributes in rates to DSM in that year. That approach works because customers do not typically take on such large projects every year. In other words, the program can afford to spend more on some customers in one year because it will often spent less on many of those same customers the following year (when more may be spent on a different set of customers). Union's proposed change to its program design for large volume customers – to move away from a completely pooled DSM budget to a direct access budget that can only be accessed one year at a time – significantly reduces that flexibility.

Put another way, the Company and its customers would be much better served if the direct access budget was a two-year budget for 2013 and 2014. Ideally, it could be expanded to three years in the next cycle of DSM planning. This would require some other changes, including the development of a multi-year performance incentive metric (with the Company only getting paid in 2014 if it achieved its combined 2013/2014 savings goals for large volume customers) and a mechanism for allowing the utility to deal with the potential "lumpiness" of customers' use of funds (e.g. if more than half of

[27] They would still be cost-effective, just not as cost-effective as the larger project not chosen.
[28] Anna Chittum, "Follow the Leaders: Improving Large Customer Self-Direct Programs", Report Number IE112, published by the American Council for an Energy Efficiency Economy, October 2011, p. 13.

the two-year budget was accessed in either the first year or the second year) without causing rate spikes. However, those issues are eminently solvable.

2. Maintaining a 15% DSMVA for T2/Rate 100

Union has proposed eliminating its ability to over-spend its budget by 15% for the T2/Rate 100 program in order to "provide greater rate certainty for these customers."[29] That proposal unnecessarily sacrifices potentially important benefits to ratepayers. Further, I question whether the "rate certainty" it provides is appreciably different than what could be provided while still retaining the 15% flexibility.

The ability to over-spend budgets by 15% was put in place long ago by the Board to enable the utilities to respond to stronger than expected market demand for efficiency. The Board's 2011 DSM Guidelines reinforced the Board's long-standing position on the issue, noting that "the option to spend 15% above the approved annual DSM budget is meant to allow the natural gas utilities to aggressively pursue programs which prove to be very successful."[30] Eliminating that option for large volume customers, which typically have some of the most cost-effective savings, eliminates the potential for system benefits that all gas ratepayers would realize (see discussion above) as well as significant environmental benefits that all Ontario residents (and others) would realize. It also hurts those individual businesses that might be able to take advantage of additional funds. Finally, it reduces the Union's flexibility to deal with the potential "lumpiness" of demand for efficiency support.

It should be emphasized that the Company had already put in place in 2012 – following a settlement agreement with most stakeholders – an important constraint on the potential impacts of the 15% DSMVA on large volume customers. In the past, Union could access 15% of its total DSM budget (provided that it exceeded its total TRC/savings target) and could spend all of the 15% on any subset of its customers, no matter how small, including those in the two rate classes (T1 and Rate 100) of concern. Put another way, the DSMVA costs allocated to a particular rate class could be far more than a 15% increase in the DSM budget for that rate class. Indeed, that flexibility has historically resulted in substantial increases in DSM costs allocated to large volume customers.[31] For example, as noted above, in 2011 alone, the DSMVA impact on the rates of large volume customers was 172% of the budgeted DSM impacts.[32] However, for 2012, Union and most stakeholders agreed – and the Board approved – a new approach that limited the amount of DSMVA funds the Company could access and spend on T1 and Rate 100 customers to just 15% of the budget allocated to those customers.

[29] Exh A, Tab 1, pp. 7-8.
[30] Demand –Side Management Guidelines for Natural Gas Utilities, EB-2008-0346, June 30, 2011, p. 34.
[31] It should be emphasized that those customers also realized substantial increases in benefits – in the form of support for very cost-effective efficiency investments.
[32] Exh B6.2, Attachment 1.

In other words, concerns about rate impact certainty and stability associated with the DSMVA have already been substantially addressed through Union's 2012 DSM plan (more than 90% of the rate impact increase that took place as a result of the DSMVA in 2011 would have been eliminated under the 2012 plan). However, that plan prudently continued to allow some limited flexibility to Union to address unanticipated needs and demands of its customers. Eliminate that remaining limited flexibility is going too far. Some flexibility is important and beneficial.

Thus, in the context of the Company's proposed plan, I would suggest that Union be able to increase the pooled DSM budget – i.e. the budget that is remaining if not all direct access budget funds are used – by 15% of the total T2/Rate 100 budget if the Company exceeds its savings target.

3. Moving the T1 Rate Class into the General Resource Acquisition Budget

Based on the Board's 2011 gas DSM guidelines, the Company's 2012 DSM portfolio treated what were then called the two large industrial rates classes (the current T1 and Rate 100) differently than the rest of the portfolio. In particular, a separate budget was indentified for those classes, significant constraints on the ability to shift or add to those budgets were imposed and a separate shareholder incentive scorecard was created.

As noted above, the Company has proposed in a separate proceeding that its current Rate T1 be split into two new rate classes: a new Rate T1 mid-market service and a new T2 large market service. The Company has further proposed that the new T2 and Rate 100 customers have a fundamentally different DSM program design to reflect their unique needs as very large customers. As Union itself has stated, the Company's proposed DSM program for the new Rate T1 customers "is consistent with the DSM program structure in Union's bundled contract rate classes that serve other similarly sized customers"[33] and that new Rate T1 customers "will receive the same program offerings in 2013 as similar type customers in other rate classes."[34] However, there is an important difference. Specifically, Union is proposing to continue place much tighter budget flexibility constraints for the new T1 customers than it has for other similarly sized commercial and industrial customers.

When asked why it is proposing to maintain these constraints even after the rate class is changed, the Company essentially gave two related reasons. First, it cited the Board's 2011 gas DSM guidelines that suggested special consideration for T1 and Rate 100 customers. Second, it referenced the 2012 settlement agreement which followed through on the Board's guidance and established different rules for those two rate classes.[35]

[33] Exh A, Tab 1, p. 7.
[34] Exh B2.2
[35] Exh B2.2.

That response is problematic. It is reasonable to presume that when the Board identified both T1 and Rate 100 as classes serving large industrial gas customers that merited special consideration it did so based on the composition of those rate classes at the time the 2011 gas DSM guidelines were written. When one of those classes is split into two groups, with one group getting the large customers and the other getting the smaller customers (average annual consumption 94% lower than new T2 customers),[36] it would seem eminently appropriate that the class with the smaller customers no longer be treated differently than other rate classes of commercial and industrial customers. The fact that the class with the smaller customers still bears the same name as the class identified by the Board in its 2011 gas DSM guidelines should be irrelevant. Similarly, the fact that the settlement agreement for 2012 provided special treatment for customers in the old Rate T1 should have no bearing on whether that treatment should be extended to the new Rate T1 which is now fundamentally different because it has lost approximately 90% of its collective annual consumption.[37]

III. Proposed Revisions to Shareholder Incentive Scorecard

Union has proposed a new shareholder incentive structure – or scorecard – for its new large volume customer DSM programs. The proposed mechanism would have three metrics, summarized as follows for 2013:

Metric	Metric Level			Weight
	Lower Band	Target	Upper Band	
T2/100 Lifetime m3	75% of Target	(2012 m3 per incentive $) * (2013 incentive budget) * 70%	110% of target	20%
T2/100 % Customer incentives spent	60%	70%	80%	20%
T1 Lifetime m3	75% of Target	(2012 m3 per incentive $) * (2013 incentive budget)	125% of Target	60%

Key features of this proposal are:

- The savings metrics are entirely a function of the 2012 program performance, which is unknown at this point.
- The savings metric for T2/Rate 100 customers is reduced by 30% (relative to 2012 performance).
- The upper band for the T2/Rate 100 savings metric is only 110% of the target, rather than the 125% value typically used for resource acquisition programs, to account for the proposed absence of a DSMVA for T2/Rate 100 customers.
- The proposal deviates from the 2012 resource acquisition scorecards in that the metrics are not just related to energy savings. Rather, there is a new metric –

[36] Exh B5.1
[37] Exh B5.1

which is assigned 20% of total weight and half of the weight assigned to T2/Rate 100 customers – related to spending of customers' DSM budgets.
- 60% of the weight is assigned to performance on T1 customers, only 40% to performance on T2/Rate 100 customers.
- The 2014 scorecard metrics are pegged to 2013 results, with no required increases for the savings metrics (i.e. if the 2014 result is the same as the 2013 result, the Company would meet its target).

Each of these features is addressed below.

1. Pegging 2013 Metrics to 2012 Program Performance

Union has proposed that both 2013 savings metrics – for both T1 and T2/Rate 100 customers – be pegged entirely to the Company's DSM performance with those customers in 2012. Pegging goals to one year of performance results is problematic because, as Table 2 shows, savings per incentive dollar can vary substantially from year to year. That should not be surprising given that these are large customers and that there are relatively few of them, so the effects of outlier projects can be substantial.

Table 2: Union Gas' Historic Savings (Lifetime m^3) per Incentive $

	2009	2010	2011	3-Yr Total
T2/100	190	699	480	452
T1	964	173	185	336

The suggestion that the goals should be pegged to one year is particularly problematic when the Board and other parties do not yet know what the results for that year will be. It could be that 2012 will be a "down year" for reasons that are easily addressed by Union in 2013. In other words, it is possible that the 2012 results will be such that Union could earn a large shareholder incentive without actually demonstrating "exemplary performance", which the Board's 2011 gas DSM guidelines state is the objective of the shareholder incentive mechanism. Put another way, Union could be indirectly rewarded in 2013 if it had a poor performance in 2012.

It would be much better to peg the savings metrics to the average of the 2009 to 2011 results, or at least to the average of the 2010 to 2012 results. Moreover, to demonstrate exemplary performance, the target should be set at 5% above such a three-year average (after any "direct access program design adjustment" discussed below).

Union has argued that pegging the results to 2012 performance is preferable to pegging them to a 3-year rolling average because (1) the 2013 performance metric for other resource acquisition programs was pegged to the 2012 results; and (2) a 3-year rolling

average "would introduce additional complexity" because it would require adjustments savings from years prior to 2012 to reflect the absence of the budget transfer limitations in those years and, in setting the target for 2014 for T2/Rate 100 the direct access program design adjustment (which Union proposes be 30%) would have to be applied to 2011 and 2012 results.[38]

Neither of these arguments is compelling. First, there would be no need to adjust savings from prior years to reflect the absence of the budget transfer limitation. The main effect of that limitation is on the absolute magnitude of savings that can be achieved. It could even affect savings per dollar of *total* DSM spending (because fixed program costs could be spread over a bigger volume of savings if a large amount of money was transferred from elsewhere in the DSM budget to serve a particular customer class). However, it is not likely to significantly affect savings per *incentive* dollar. Put another way, because my proposed three-year rolling average savings metric is a function of savings per incentive dollar spent, it already controls for the effects of any budget limitations.

Second, the math required to compute the effects of any adjustment factor (30% or otherwise) on previous year's performance is incredibly simple.

2. 30% Savings Reduction for "Direct Access" Program Approach

As discussed above, Union's argument that the savings per dollar will likely be 30% lower under the direct access approach is also problematic. To begin with, the Company has offered no empirical basis for its choice of 30% as the adjustment factor. Obviously, the Company does not have any direct experience on which to base such an adjustment. Nor has it provided any evidence from other jurisdictions to support its position. Absent such evidence, there should be no adjustment factor. Indeed, as suggested above, if an adjustment factor of any substantial magnitude is indeed necessary, then that is an argument for rejecting the self direct approach altogether (and continuing the existing program approaches instead).

3. Upper Band Savings Metric of 110% of Target for T2/Rate 100

The Company's proposal to make the upper band savings metric for T2/Rate 100 customers equal to 110% of the "target" is predicated on the assumption that its proposal to eliminate the 15% DSMVA for those rate classes is accepted. That is a reasonable rationale. However, as discussed above, the underlying premise that there should be no 15% DSMVA for those rate classes is flawed. If, as suggested above, the Board rejects the Company's proposal to eliminate the 15% DSMVA for those rate classes, the upper band of the performance metric for those rate classes should be increased to 125% of the target (as it is for other resource acquisition performance metrics).

[38] Exh B6.7

4. Addition of Metric on Customer DSM Budget Spending

Union's proposed additional metric on customer DSM spending is problematic. Union's rationale for proposing the metric is that it "ensures Union balances the objectives of maximizing natural gas savings with maximizing individual customer value and participation in the program."[39] However, the very design of Union's program should ensure that second objective – maximizing individual customer value and participation – is addressed. Moreover, perhaps the most important element of customer value will be the identification and acquisition of cost-effective energy savings. Put simply, this additional metric appears to serve Union's interest in mitigating its risk of earning shareholder incentives than it serves ratepayers' interest.

5. Allocation of Weights between T1 and T2/Rate 100

The Board's 2011 gas DSM guidelines provide relatively clear direction with respect to allocation of shareholder incentives. As the following excerpts make clear, at every turn, the guidelines suggest that the allocations should be based on budget levels:

> *"To the extent that the approved DSM budgets deviate in magnitude from the Board proposed budgets, the Annual Cap should be scaled accordingly."*[40]
>
> *"The Annual (Shareholder Incentive) Cap should be allocated among the three generic program types…based on their approved DSM budget shares."*[41]
>
> *"Likewise, incentive amounts paid to the natural gas utilities should be allocated to rate classes in proportion of the amount actually spent on each rate class."*[42]

That guidance has generally been closely followed in all other aspects of Union's and Enbridge's DSM shareholder incentive mechanisms.

Union's proposal to allocate 60% of the weight of its shareholder incentive metrics to performance with T1 customers violates this basic tenet because the Company is proposing to allocate only 32% of the Large Volume Customer budget to T1 customers. Moreover, historic performance data suggest that the T1 customers will not produce an appreciably greater savings per incentive dollar will be produced by the other two rate classes included in Union's Large Volume Customer proposal.[43]

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[39] Exh B1.3.
[40] Demand –Side Management Guidelines for Natural Gas Utilities, EB-2008-0346, June 30, 2011, p. 31.
[41] Demand –Side Management Guidelines for Natural Gas Utilities, EB-2008-0346, June 30, 2011, p. 31.
[42] Demand –Side Management Guidelines for Natural Gas Utilities, EB-2008-0346, June 30, 2011, p. 31.
[43] The three year average (2009 through 2011) savings per incentive dollar for T1 customers is 74% of the weighted average for T2/Rate 100. The 2012 year-to-date figure is 68% (based on analysis of data provided in Exh. B2.5). Thus, even if one accepts the 30% savings reduction proposed by Union for its T2/Rate 100 metric, the savings per incentive dollar will be comparable between the two groups. That, in

The rationale that Union has offered for this unbalanced approach to weighting its metrics is that "there is a lack of historical information upon which to base the Rate T2/Rate 100 cost-effectiveness."[44] It is unclear why cost-effectiveness should be a criterion for weighting of performance metrics. If by cost-effectiveness Union means savings per incentive budget dollar then, as noted above, its own historic data suggest that the returns for T2/Rate 100 would be comparable even after adjusting them down 30% as Union has proposed.

In short, the weight allocated to the T1 metric should be 32% rather than 60%, with the balance allocated to T2/Rate 100 metrics.

6. Pegging 2014 Metric to 2013 Program Performance

As discussed above, pegging a performance metric to just one year's worth of program experience is problematic, particularly for a small group of large customers. The variation from year to year is too substantial. Thus, it would be much more appropriate to peg the 2014 performance metric to the average of the three previous years. Moreover, to demonstrate "exemplary performance", the metric should be 5% higher than the average of the three previous years.

IV. Recommendations

Based on the analysis outlined above, I recommend that the Board do the following:

1. Policy on Large Volume Customer DSM

A. Require the continued offering of DSM programs to large volume customers
B. Accept a self direct approach for T2/Rate 100 customers only if it can be expected to generate as much savings as current program designs. The adoption of a savings target that is based on Union's previous years of DSM experience with large volume customers, without any downward adjustment, would be a reasonable proxy for such an expectation.

2. Specifics of Union's Program Proposal

C. If a self direct approach is approved, require that the program budgets cover the entire two year period addressed in this filing (2013 and 2014) so that customers can have the flexibility to use two years' worth or budget at one time and can choose the best

turn, suggests that the distribution of total savings will not be much different than the distribution of total budget.
[44] Exh A, Tab 1, p. 15.

time over the two year period to make their efficiency investment. Thus, the deadline for spending or committing the two years' worth of direct access funds would be August 1, 2014, with any uncommitted funds after that date being made available for additional projects by other customers. For the next DSM filing, a three year self-direct approach should be expected, unless program experience in the next two years identifies unanticipated problems.

D. Maintain the 15% DSMVA that exists today for T2/Rate 100 customers.
E. Move the new T1 customers out of the "large volume customer" group and its related scorecard and into the broader resource acquisition portfolio. The budget and savings target for the resource acquisition portfolio should be adjusted accordingly. If the Board is concerned about any complexities associated with such a change in the middle of a three year DSM plan, it should at least require that it occur as part of the next three year DSM plan (i.e. for 2015 to 2017).

3. Shareholder Incentive Performance Scorecard

F. Base the lifetime m^3 savings target for 2013 and 2014 on a rolling average of the previous three years' experience with the affected customer classes (rather than the one year proposed by Union).
G. Eliminate the 30% downward savings adjustment Union has proposed for its T2/Rate 100 savings target.
H. Increase the upper band threshold for the T2/Rate 100 savings target to 125% if the recommendation to maintain the current DSMVA for those customers is adopted.
I. Eliminate Union's proposed metric on customer DSM spending.
J. Require that the weight assigned to DSM performance with T2/Rate 100 customers be proportional to the budget for those customers, consistent with Board guidelines.

CHRISTOPHER NEME, PRINCIPAL

EDUCATION

M.P.P., University of Michigan, 1986
B.A.., Political Science, University of Michigan, 1985

EXPERIENCE

2010-present: Principal, Energy Futures Group, Hinesburg, VT
1999-2010: Director of Planning & Evaluation, Vermont Energy Investment Corp., Burlington, VT
1993-1999: Senior Analyst, Vermont Energy Investment Corp., Burlington, VT
1992-1993: Energy Consultant, Lawrence Berkeley National Laboratory, Gaborone, Botswana
1986-1991: Senior Policy Analyst, Center for Clean Air Policy, Washington, DC

PROFESSIONAL SUMMARY

Chris Neme leads a variety of consulting projects for clients across the United States, Canada, and Europe. He specializes in analysis of markets for energy efficiency measures and the design and evaluation of programs and policies to promote them. Prior to co-founding Energy Futures Group, he served as Director of the Vermont Energy Investment Corporation's 30-person consulting division. During his more than 20 years in the energy efficiency industry, Mr. Neme has conducted analyses of efficiency potential in five states; reviewed or developed efficiency programs in more than 20 states and provinces and in Europe; supported utility-stakeholder "collaboratives" in eight states, and defended expert witness testimony before regulatory commissions in ten different states and provinces. Mr. Neme has led several different training courses on the elements of good efficiency program design. He has also published papers and/or presented assessments of efficiency markets, programs and policies through a wide variety of publications, conferences, Consortium for Energy Efficiency Technical Committees, ENERGY STAR working groups and other forums. Mr. Neme recently served as Co-Chair of NEEP's EM&V Research and Evaluation Committee.

SELECTED PROJECTS

- ***Regulatory Assistance Project - U.S.*** Providing on-going technical support on efficiency policy and program design, including drafting a report on the U.S. experience using efficiency programs to cost-effectively defer transmission and distribution system investments; providing technical assistance and training to Arkansas and Connecticut regulators; and helping to administer an initiative to provide technical support on efficiency program planning and evaluation to Energy Foundation grantees and regulatory staff. (2010 to present)

- ***Regulatory Assistance Project - Europe.*** Providing on-going technical support on efficiency policy and program design to RAP and its partners in the United Kingdom, Germany, Belgium and other countries. This has included reviewing draft European Union policies on Energy Savings Obligations, EM&V protocols and other related issues. Drafted a policy brief on policy and design considerations for an efficiency feed-in-tariff. Also drafted (and presented at 2011 ECEEE conference in France) a 64-page report that reviewed leading residential retrofit programs in North America and Europe and proposed a "roadmap" for achieving deep retrofits in half of the building stock. Reviewing and draft (2009 to present)

- ***Natural Resources Defense Council (Illinois & Michigan).*** Critically reviewed multi-year DSM plans filed by Commonwealth Edison, Ameren, Detroit Edison and Consumers Energy. Drafted and defended regulatory testimony on critiques. Represent NRDC in monthly stakeholder-utility collaborative meetings in both Illinois and Michigan to discuss program designs, evaluation priorities, draft evaluation reports and other related topics. (2010 to present)
- ***Green Energy Coalition (Ontario).*** Representing a coalition of environmental groups in various regulatory proceedings. Present recommendations on DSM policies, critically review and negotiate with utilities on proposed DSM Plans, serve (elected by non-utility stakeholders) on utility Evaluation/Audit Committees which oversee an annual savings verification process and evaluation planning, and defend expert witness testimony. (1993 to present)
- ***Northeast Energy Efficiency Partnerships.*** Managing Regional EM&V forum project to develop savings estimates for emerging technologies. Responsibilities include drafting RFP to hire a contractor to perform the work, managing the contractor's work, and facilitating a committee of program administrators overseeing the project. Also serve as Senior Advisor on the development of a Technical Reference Manual for Mid-Atlantic States. (2009 to present)
- ***Ohio Sierra Club.*** Filed and defended expert witness testimony on the implications of not fully bidding all efficiency resources into the PJM capacity market. Also critically reviewing First Energy's and other utilities' multi-year DSM plans. Participating in periodic stakeholder-utility collaborative meetings. (2012 to present)
- ***DC Department of the Environment (Washington DC).*** Part of VEIC team administering the DC Sustainable Energy Utility (SEU). Primary responsibilities are characterizing the DC efficiency market and supporting the design of efficiency programs that the SEU will be implementing. (2011 to present)
- ***Iowa Consumer Advocate.*** Critically reviewed several electric and gas utilities' DSM plans and savings claims. Assisted with the development of regulatory testimony. Currently serve as technical advisor to statewide collaborative process, occasionally providing input on utility evaluation plans and other topics. (1994 to present)
- ***Ontario Power Authority.*** Developed and presented assessment of future efficiency policy and program trends for OPA's Advisory Council on Energy Efficiency. (2012)
- ***Regulatory Assistance Project – Global.*** Assisted RAP in framing several global research reports. Co-authored the first report – an extensive "best practices guide" on government policies for achieving energy efficiency objectives, drawing on experience with a variety of policy mechanism employed around the world. (2011)
- ***Tennessee Valley Authority.*** Assisted CSG team providing input to TVA on the redesign of its residential efficiency program portfolio to meet aggressive new five-year savings goals. (2010)
- ***Efficiency Vermont.*** Oversaw residential program planning, input to the VT Department of Public Service on evaluation planning, input to NEEP's regional EM&V forum, and development of M&V plan and other aspects of bids of efficiency resources into New England's Forward Capacity Market (FCM) from March 2000 through Spring 2010.

- ***Ohio Public Utilities Commission.*** Senior Advisor to a project to develop a web-based Technical Reference Manual (TRM). The TRM includes deemed savings assumptions, deemed calculated savings algorithms and custom savings protocols. It is designed to serve as the basis for all electric and gas efficiency program savings claims in the state. (2009 to 2010)
- ***New Jersey Clean Energy Program.*** Oversaw support of Honeywell-led team delivering all statewide residential efficiency and renewable energy programs. Led work on program design, regulatory filings, savings algorithms, and evaluation planning. (2006 to 2010)
- ***New York State Energy Research and Development Authority (NYSERDA).*** Led several analyses of residential electric and gas efficiency potential (over 20 years) for New York State. Scenarios included continuation of existing initiatives, new budget constraints and a least-cost approach to meeting greenhouse gas emission reduction targets. (2001 to 2010)
- ***NSTAR Collaborative***. Oversaw all technical assistance on the design and implementation of six residential DSM programs. Personally led work on two programs (high use retrofit & low income). This involved negotiations with NSTAR on goals, budgets and program designs, and technical assistance on selection of delivery contractors, development of field protocols to guide measure installation decisions, and review of program results. All work was conducted on behalf of the Massachusetts Non-Utility Parties. (1999 to 2005)
- ***Oregon Energy Trust***. Part of a team that developed case studies of successful community-based efficiency or renewable energy efforts across North America, synthesized lessons learned from those examples, and developed recommendations for how the trust might more effectively advance its mission through community-based approaches to promoting efficiency. (2004-2005)
- ***Natural Resource Defense Council – New Jersey Utilities Collaborative.*** Oversaw all technical assistance on the design of and implementation planning for eight statewide residential DSM programs and one statewide renewable energy program. Personally led work on two of the programs (Electric HVAC and Gas HVAC). This involved facilitation of monthly meetings with all seven electric and gas utilities in the state; negotiations with the utilities on budgets, goals, and program designs; and extensive technical assistance on a variety of programmatic issues, including the development of marketing plans and evaluation plans. (1994 to 2003)
- ***Long Island Power Authority Clean Energy Plan.*** Led team that designed the four major residential programs (three efficiency, one PV) incorporated into the plan in 1999. Oversaw extensive technical support to the implementation of those programs. This involved assistance with the development of goals and budgets, development of savings algorithms, cost-effectiveness screening, and on-going program design refinements. (1998 to 2009)
- ***Northeast Energy Efficiency Partnerships Residential HVAC Initiative.*** Served as NEEP's Residential HVAC Program Manager. Responsible for promoting NEEP's program design concept to utilities in the Northeast, providing technical support to efforts to implement the design, and promoting the adoption of improved federal efficiency standards (and ENERGY STAR standards) for central air conditioners. (1997 to 2005)
- ***Southern Maryland Electric Cooperative.*** Led review and feedback on residential efficiency program portfolio. Also led impact evaluation of residential new construction and home retrofit programs. (1994 to 1998)

SELECTED PUBLICATIONS

- "An Energy Efficiency Feed-in-Tariff: Key Policy and Design Considerations", published by the Regulatory Assistance Project, March/April 2012 (with Richard Cowart)
- "U.S. Experience with Efficiency as a Transmission and Distribution System Resource", published by the Regulatory Assistance Project, February 2012 (with Rich Sedano)
- "Achieving Energy Efficiency: A Global Best Practices Guide on Government Policies", published by the Regulatory Assistance Project, February 2012 (with Nancy Wasserman)
- "Residential Efficiency Retrofits: A Roadmap for the Future", published by the Regulatory Assistance Project, May 2011 (with Meg Gottstein and Blair Hamilton)
- "Is it Time to Ditch the TRC?" Proceedings of ACEEE 2010 Summer Study on Energy Efficiency in Buildings, Volume 5 (with Marty Kushler).
- "A Comparison of Energy Efficiency Programmes for Existing Homes in Eleven Countries", prepared for the United Kingdom Department of Energy and Climate Change on behalf of the Regulatory Assistance Project, 19 February 2010 (with Blair Hamilton et al.).
- "Energy Efficiency as a Resource in the ISO New England Forward Capacity Market", in *Energy Efficiency*, published on line 06 June 2010 (with Cheryl Jenkins and Shawn Enterline).
- "Energy Efficiency as a Resource in the ISO New England Forward Capacity Market", Proceedings of the 2009 European Council on an Energy Efficient Economy Summer Study, pp. 175-183 (with Cheryl Jenkins and Shawn Enterline).
- "Playing with the Big Boys: Energy Efficiency as a Resource in the ISO New England Forward Capacity Market", Proceedings of ACEEE 2008 Summer Study Conference on Energy Efficiency in Buildings, Volume 5 (with Cheryl Jenkins and Blair Hamilton)
- "Recommendations for Community-Based Energy Program Strategies", Final Report, developed for the Energy Trust of Oregon, June 1, 2005 (with Dave Hewitt et al.)
- "Shareholder Incentives for Gas DSM: Experience with One Canadian Utility", Proceedings of ACEEE 2004 Summer Study Conference on Energy Efficiency in Buildings, Volume 5 (with Kai Millyard).
- "Shareholder Incentives for Gas DSM: Experience with One Canadian Utility", Proceedings of ACEEE 2004 Summer Study Conference on Energy Efficiency in Buildings, Volume 5 (with Kai Millyard).
- "Cost Effective Contributions to New York's Greenhouse Gas Emission Reduction Targets from Energy Efficiency and Renewable Energy Resources", ACEEE 2004 Summer Study Proceedings, Volume 8 (with David Hill et al.).
- "Opportunities for Accelerated Electric Energy Efficiency Potential in Quebec: 2005-2012", prepared for Regroupement national des conseils regionaux de l'environnement du Quebec, Regroupement des organisms environnementaux energie and Regroupement pour la responsabilite sociale des enterprises, May 16, 2004 (with Eric Belliveau, John Plunkett and Phil Dunsky).

- "Review of Connecticut's Conservation and Load Management Administrator Performance, Plans and Incentives", for Connecticut Office of Consumer Counsel, October 31, 2003 (with John Plunkett, Phil Mosenthal, Stuart Slote, Francis Wyatt, Bill Kallock and Paul Horowitz)
- "Energy Efficiency and Renewable Energy Resource Development Potential in New York State", for New York Energy Research and Development Authority, August 2003 (with John Plunkett, Phil Mosenthal, Stave Nadel, Neal Elliott, David Hill and Christine Donovan).
- "Assessment of Economically Deliverable Transmission Capacity from Targeted Energy Efficiency Investments in the Inner and Metro-Area and Northwest and Northwest/Central Load Zones", for Vermont Electric Power Company, Final Report: April 2003 (with John Plunkett et al.).
- "Residential HVAC Quality Installation: New Partnership Opportunities and Approaches", Proceedings of ACEEE 2002 Summer Study Conference on Energy Efficiency in Buildings, Volume 6 (with Rebecca Foster, Mia South, George Edgar and Put Murphy).
- "Using Targeted Energy Efficiency Programs to Reduce Peak Electrical Demand and Address Electric System Reliability Problems", published by the American Council for an Energy Efficient Economy, November 2000 (with Steve Nadel and Fred Gordon).
- "Energy Savings Potential from Addressing Residential Air Conditioner and Heat Pump Installation Problems", American Council for an Energy Efficient Economy, February 1999 (with John Proctor and Steve Nadel).
- "Promoting High Efficiency Residential HVAC Equipment: Lessons Learned from Leading Utility Programs", Proceedings of ACEEE 1998 Summer Study Conference on Energy Efficiency in Buildings, Volume 2 (with Jane Peters and Denise Rouleau).
- PowerSaver Home Program Impact Evaluation, report to Potomac Edison, February 1998 (with Andy Shapiro, Ken Tohinaka and Karl Goetze).
- "PowerSaver Home Program Impact Evaluation", prepared for Southern Maryland Electric Cooperative, December 9, 1997 (with Andy Shapiro, Ken Tohinaka and Karl Goetze).
- "A Tale of Two States: Detailed Characterization of Residential New Construction Practices in Vermont and Iowa", Proceedings of ACEEE 1996 Summery Study Conference on Energy Efficiency in Buildings, Volume 2 (with Blair Hamilton, Paul Erickson, Peter Lind and Todd Presson).
- "New Smart Protocols to Avoid Lost Opportunities and Maximize Impact of Residential Retrofit Programs", in Proceedings of ACEEE 1994 Summer Study on Energy Efficiency in Buildings, pp. 9.147-9.157 (with Blair Hamilton and Ken Tohinaka.
- "Economic Analysis of Woodchip Systems" and "Finding Capital to Pay for a Woodchip Heating System", Chapters 6 and 8 in *Woodchip Heating Systems: A Guide for Institutional and Commercial Biomass Installations*, published by the Council of Northeastern Governors, July 1994.
- "PSE&G Lost Opportunities Study: Current Residential Programs and Relationship to Lost Opportunities", prepared for the PSE&G DSM Collaborative, June 1994 (with Blair Hamilton, Paul Berkowitz and Wayne DeForest).

- "Long-Range Evaluation Plan for the Vermont Weatherization Assistance Program", prepared for the Vermont Office of Economic Opportunity, February 1994 (with Blair Hamilton and Ken Tohinaka).
- "Impact Evaluation of the 1992-1993 Vermont Weatherization Assistance Program", prepared for the Vermont Office of Economic Opportunity, December 1993 (with Blair Hamilton and Ken Tohinaka).
- "Electric Utilities and Long-Range Transport of Mercury and Other Toxic Air Pollutants", published by the Center for Clean Air Policy, 1991.
- "Coal and Emerging Energy and Environmental Policy", in *Natural Resources and Environment*, 1991 (with Don Crane).
- "Acid Rain: The Problem", in EPA Journal, January/February 1991 (with Ned Helme)
- "An Efficient Approach to Reducing Acid Rain: The Environmental Benefits of Energy Conservation", published by the Center for Clean Air Policy, 1989.
- "The Untold Story: The Silver Lining for West Virginia in Acid Rain Control", published by the Center for Clean Air Policy, 1988.
- "Midwest Coal by Wire: Addressing Regional Energy and Acid Rain Problems", published by the Center for Clean Air Policy, 1987.
- "Acid rain: Road to a Middleground Solution", published by the Center for Clean Air Policy, 1987 (with Ned Helme).