Screening DSM: When the TRC Blocks Efficiency, What's Next?

Philippe Dunsky and François Boulanger, Dunsky Energy Consulting
Patrick Mathot, BC Hydro

ABSTRACT

The Total Resource Cost (TRC) test has long been held up as a sort of theoretically optimal method for screening demand-side management (DSM) programs and opportunities. Yet the test is increasingly coming under fire as an impediment to new DSM, leading some Program Administrators (PAs) to either temper their use of the TRC, or revisit it altogether.

This paper begins by examining some of the challenges that PAs are increasingly up against when forced to use the TRC as a "go/no-go" screen. In particular, we discuss the problems that arise when the TRC ignores and implicitly contradicts consumer preferences; when it impedes the attainment of binding savings goals; and when it runs counter to longer-term market transformation objectives. We further present the case of BC Hydro, faced with an implacable dilemma: to abide by the TRC and elect *not* to encourage high-efficiency new homes, or to listen to its sole shareholder, the government of B.C., and encourage the next generation of residential new construction practices, beyond the requirements of an anticipated new code.

Finally, the paper presents and discusses solutions to the TRC conundrum, including (1) modifying the way we calculate incremental costs, (2) modifying the TRC algorithm to account for non-energy benefits (NEBs), (3) replacing the TRC with the Program Administrator Cost test, (4) raising the level at which standardized tests are applied as hard screens, and (5) allowing policy goals to supersede standardized tests. We also note the risk that failing to address these problems may lead to an undesirable sixth option, as administrators and planners are left to "fudge" the numbers in order to square the circle they are faced with.

Introduction

In the early 1980s, following on the heels of the second energy crisis, California's utilities moved to encourage improved customer energy efficiency. In order to provide a framework for judging the appropriateness of utility DSM spending, the California Energy Commission and California Public Utilities Commission jointly developed a series of standardized "tests", published in what is commonly referred to as the Standard Practice Manual (SPM).[1] The tests provided an analytical framework designed to reflect five different perspectives, namely:

- **Participants:** The Participant Cost Test (PCT) compares participants' contributions, net of incentives, with the present value of savings they would see on their energy bills;

[1] The second version of the original 1983 manual, published in 1987, included a series of changes that were primarily limited to semantics (the names of various tests were changed); this was again largely the case with the 2001 edition (California Public Utilities Commission and California Energy Commission, 1987 and 2001).

- **Non-Participants:** The Rate Impact Measure (RIM) test assesses the impact on rates – and therefore on non-participants – from the combination of utility DSM spending *and* utility lost revenues (aka participant benefits), net of utility savings;

- **Utility:** The Utility Cost test, later renamed the Program Administrator Cost Test (PACT), compares the utility's savings (present value of long-run avoided costs) to its DSM expenditures. This effectively compares its cost of procuring DSM with the alternative cost of procuring supply;

- **Society:** The Total Resource Cost (TRC) test is designed as a sort of combination of the participant and non-participant perspectives, seeking to compare all direct costs (both utility and participant contributions) to all direct benefits. Its variant, the Societal Cost Test (SCT), takes a more holistic view by accounting for other benefits to society, primarily environmental.

For much of the late 1980s and early 1990s, debate was waged primarily around the value of two approaches: the restrictive RIM, which treats participant savings as a cost, and the broader TRC, believed by advocates to provide a more holistic and fairer view of DSM as compared with new supply. Some advocates further argued for the inclusion of societal benefits such as environmental externalities, i.e. the SCT.

Through the vagaries of time and the shifting importance given to DSM, most states and provinces that give it serious consideration have, in the end, landed on the use of the TRC test as either the primary or sole indicator of cost-effectiveness. This has often been considered a reasonable compromise between the very restrictive RIM test[2], on the one hand, and the broader but more difficult SCT variant discussed above.[3,4]

Concerns Going Forward

While the TRC appeared to be a reasonable compromise, in recent years we have witnessed – and contributed to – a small but growing challenge to its choice as the primary or sole indicator of DSM value.[5] A number of concerns are behind this challenge, the most significant of which include:

---

[2] While the RIM test reflects an important perspective (that of non-participants), its use as a required hurdle will often ensure that no one loses *only by allowing nearly no one to gain* from significant savings opportunities, hardly an optimal approach. We note that the degree of restriction it imposes can be dependent on local context: extreme where rates are high and avoided costs low, it can be less problematic where rates are low and avoided costs high.

[3] Throughout the 1990s, significant effort was put to quantifying and indeed monetizing DSM's environmental benefits, with a view to using the SCT variant. With some notable exceptions, much of this effort has been for naught, given the difficulty in arriving at agreeable dollar values meant to translate the *environmental cost* (as opposed to the abatement cost) of such things as local and regional air pollution, changes to ecosystems, and global climate change.

[4] Over time, alternative tests have also been proposed, including the Low-Income Public Purpose Test (meant to address a broad array of benefits associated with low-income programs) among others. None has gained generalized acceptance.

[5] Most recently, Neme and Kushler (2010) argued against continued reliance on the TRC based on two considerations: (1) it is inherently lopsided in that it typically does not or cannot account for a large portion of DSM's (non-energy) benefits, despite accounting for all of its costs, and (2) its inclusion of participant costs is unfair insofar as the same treatment is not reserved for power generation options like combined heat and power. Our

1. The TRC may contradict consumer preferences;
2. The TRC may impede the achievement of specific, near-term targets; and
3. The TRC may impede broader, long-term objectives.

We address each of these primary concerns below.

#1: The TRC May Contradict Consumer Preferences

The Total Resource Cost test is meant to account for all costs and all benefits of a DSM measure or program, irrespective of who bears the cost or to whom the benefits accrue. The test does a good job – perhaps *too good* a job – at accounting for all costs, since they are tangible.[6] Yet on the other side of the equation, the TRC, at least as it was initially designed, is able to account for only a portion of benefits. Three perspectives help to illustrate the problem: program marketing, non-energy benefits (NEB) studies, and market valuation studies.

a) **Program Marketing:** While theoreticians may argue amongst themselves as to the importance of "non-energy benefits" and the theoretical basis for valuing them, they need look no further than DSM PAs – those with their "ear to the ground" – to end the debate. Polls, focus groups, and one-on-one discussions with facilities managers, operations VPs and others have made clear time and again what good DSM marketers and account managers know intuitively: many DSM measures can be sold on their non-energy benefits as, or more, convincingly than on their energy-related economics alone. For example, most home retrofit programs are sold first and foremost on increased comfort and health of occupants; installation of compact fluorescents in hotels and in buildings with high ceilings are sold on reduced maintenance costs; adoption of solar hot water or solar photovoltaics is often motivated primarily by a deep commitment to "green" consumption and/or purchase of "bragging rights" more than on net present value of the investment. Yet while those tasked with selling efficiency understand how significant these non-energy benefits are to customers, the TRC values them at zero.

b) **NEB Literature:** In the past decade, there has been a small but growing literature that seeks to quantify and indeed monetize the value of participant non-energy benefits.[7]

---

paper seeks to build on theirs, both by expanding on the former point, and addressing additional concerns related to (3) conflicts with near-term (often binding) DSM targets and (4) conflicts with broader, longer-term (market transformation) objectives.

[6] Indeed, the TRC accounts for the full incremental cost of a DSM measure relative to its baseline counterpart, even when a part of that incremental cost may include the cost of *other* features that are merely bundled with the higher-efficiency option. For example, the higher-efficiency models of clothes washers may cost an extra $500 because, aimed as they are at a higher-end niche market, they include both a more efficient design *and* additional, unrelated features. This problem of "bundled facets" is well-understood in the literature regarding market barriers to energy efficiency (Dunsky Energy Consulting, 2005), but awareness does not make it any easier to properly isolate the costs associated with non-efficiency features.

[7] The authors of these studies have used an array of methods to derive these values, including computational approaches using primary estimations (e.g. for valuing water bill savings), secondary estimations (e.g. to compute the value of reduced fire risk), and regression analysis (e.g. to estimate productivity gains or increased retail sales associated with daylighting); as well as survey methods using simple contingent valuation (e.g. direct willingness to pay surveys), labeled magnitude scaling (in which participants are asked to compare a NEB to another more tangible

While the literature is by no means mature[8], findings consistently point to significant NEBs values across a broad spectrum of measures and sectors. For example, for new, energy efficient homes, studies have evaluated participant NEBs at between 0.5 to 3.6 times the energy savings (~$5k-$30k in present value terms) (Ujjwal Bhattacharjee, 2009). Again, while these studies find the value of non-energy benefits to be equal to or greater than the direct energy savings themselves, the TRC neglects them entirely.

c) **Markets:** Partly as a result of the efforts of policymakers and PAs over the past twenty-plus years, some markets have begun to show signs of valuing energy efficiency far more than in the past, especially where strong labeling policies are in place. For example, we recently reviewed three studies that analyzed the market price premium fetched for homes with high-energy efficiency labels in three regions of the globe: Australia (specifically the Canberra region), the Netherlands, and the U.S. cities of Portland and Seattle. In all three cases, homes with higher energy performance, as communicated through a label or rating, were sold at a premium that varied between $12,090 and $29,315 (after controlling for other variables). Of course, markets' ability to value efficiency may point to opportunities to reduce incentives in certain circumstances, yet the TRC cares neither about incentives nor about homebuyers' motivations; markets could value efficiency at $20,000, but if the discounted value of energy bill reductions is only half that, then the TRC effectively says "the market is wrong, period."

As we have seen, the TRC accounts for all participant costs, but for only a portion of participants' benefits. Yet our experience suggests that in many markets, participants are increasingly driven to spend their money on EE options *because of those very NEBs* that we do not account for. This leads to both theoretical and practical problems:

- *Analytical Bias*: As Neme and Kushler have pointed out, the asymmetrical treatment of DSM measures' costs and benefits in the context of DSM screening "fundamentally biases regulatory decisions against efficiency investments." (Neme and Kushler, 2010) In the past, this bias may have had only a marginal real-world impact, as an abundance of low-hanging fruit meant that direct TRC benefits were typically double or triple the full costs of measures anyhow. In other words, few measures were screened out as a result of the test's bias. However, the combination of increasingly aggressive DSM goals *and* improving baselines (whether by regulatory fiat or market interest) is turning a largely theoretical bias into a practical – and increasingly significant – barrier (we discuss this below on page 8).

- *Practical Dichotomy*: As consumer interest in energy efficiency grows, the TRC's inability to account for consumer preferences creates a growing conflict. Indeed, DSM practitioners are increasingly at risk of substituting our judgments and valuations for that of consumers. With the TRC valuing non-energy benefits at zero, we may be unwittingly

value like bill savings), ranking, hedonic regression and others. An excellent review of these approaches is presented in (Skumatz, 2009).

[8] In one review of NEBs values, the authors found that "[...]the literature has become a veritable echo chamber, where the few published values are repeated in subsequent reviews" (Ujjwal Bhattacharjee, 2009). Our research corroborates this.

entering into an argument with customers, effectively saying that they are wrong to be interested in some of the very "next-generation" measures we are promoting (even if not incenting).

Take, for example, the hypothetical case of a near-zero energy new home that achieves its performance from a combination of passive solar orientation and design, significantly above-code attic and wall insulation (as well as continuous insulation framing techniques), solar hot water and two photovoltaic panels on the roof. Its proud owners may have been motivated by a combination of factors: their personal dedication to environmental responsibility, their belief that their young children would grow up in a healthier and more comfortable home environment, and their calculation that the incremental mortgage payments are expected to be nearly offset by reduced energy bills over time. Most DSM PAs and advocates would likely want to showcase the project, and many policymakers would be glad to be associated with it in one way or another. Yet by considering only the utility's avoided costs (often lower than utility rates) and none of the other decision motivators, the TRC result would likely be negative. If the utility were strictly tied to the TRC, it would be able to neither incent the project nor, conceptually at least, even promote it. Taken to its logical (though unlikely) extreme, one could argue that the utility should perhaps actively speak out *against* the project, undesirable as it we are told it is.

While this may seem a marginal example, the number of such cases we have been coming across has been growing at an alarming pace. In the past two years alone, clients of ours with aggressive DSM targets have faced situation after situation – solar hot water, deep energy retrofits, ground source heat pumps, high-efficiency new construction, solar PV, etc. – in which measures they want to promote – indeed often *need* to promote to achieve their energy savings targets – fail the TRC, despite clear consumer interest.

No test is perfect, and it is understandable that advocates and others overlooked this failing in the past, when NEBs were not considered as significant and TRC thresholds were easier to pass. But today, thanks to the very programs the TRC previously allowed, NEBs are more prevalent, and their exclusion from one side of the equation has created a fundamental imbalance that can no longer be ignored, among others for the reasons explained below.

#2: The TRC May Impede the Achievement of Binding, Near-Term Targets

Throughout the 1990s, when the TRC first took on prominence as the pre-eminent DSM screen, most PAs were working against growing but still modest DSM goals. As a percent of total demand (a commonly used, if imperfect, indicator of DSM aggressiveness), incremental annual energy savings during that period tended to be in the range of 0.25-0.75% for the reasonably aggressive regions, with a small handful of outlier regions aiming slightly higher.

Today, DSM goals (and in some cases, legislated requirements) have by and large shifted upward, to the point where we can count a large number of states and provinces with goals in the 1-2% range, with a few outliers aiming even higher still. Indeed, the 2011 ACEEE Scorecard reported more than a dozen U.S. states with *binding* requirements in the 1 to 2.25% range, with

yet others holding similar but non-binding targets (Sciortino, et al., 2011).[9] This alone requires a fairly steep climb up the per-kWh cost curve. Yet the higher relative savings are only a part of the picture.

The other part involves baselines. Indeed, in many regions today, baselines have improved considerably from where they were twenty years ago. In some markets and market segments, this is due primarily to consumer awareness and interest, whether driven by high energy prices and price swings, or a wave of "green" consumerism, or still by increased awareness of the value of (and access to) energy savings opportunities, thanks in part to twenty years of DSM programs. In other markets and segments, this is due to new codes and standards affecting everything from home and building construction, to appliances, motors, and most recently and significantly, lighting.[10]

The combined result of significantly more efficient baselines *and* significantly higher savings targets are squeezing DSM administrators, pushing them toward options with higher incremental cost than in the past. Among these, in the residential sector we note a recurring focus on such measures as deep envelope retrofits, solar hot water, advanced construction techniques, and solar PV, among others needed to secure deeper, long-term energy savings.[11]

This is not a theoretical issue. In fact, we are increasingly finding that in order for our clients to achieve their savings targets, these "TRC-negative" measures are not only worth considering, but are often essential – without them, the goals simply cannot be met. **As a result, we anticipate an increasing number of situations in which regulators and/or policymakers set clear, often binding energy savings goals, yet require PAs to operate within the confines of a test that makes achievement of these goals either more difficult, or practically impossible.**

#3: The TRC May Impede Broader, Long-term Objectives

As political awareness continues to grow regarding the multiple benefits offered by DSM – be they economic, environmental or geopolitical – a similarly growing number of regions are embracing broad, long-term goals that are fundamentally about transforming markets to *super*-efficiency options.

The goal of transforming markets must begin with an understanding of *how* markets get transformed, and in particular how the adoption of new technologies (or services, or practices) can become the norm. To this effect, it is worthwhile returning to Everett Rogers' classic Diffusion of Innovations theory (Rogers, 2003) and the subsequent Crossing the Chasm by Geoffrey Moore (Moore, 1991).

Rogers identified five steps – or customer types – in the diffusion of innovations, and associated rough market shares to each. Essentially, he posited that innovations are taken up in a

[9] Another indicator of the rapid growth in requirements can be seen in comparing ACEEE's 2006 and 2011 scorecard methodologies: while the latter reserved its top score to states with binding requirements in excess of 1.5%/yr. (Sciortino, et al., 2011), the former reserved its top score for states that had *any* binding requirement (Eldridge, et al., 2007).

[10] While codes and standards will typically result in higher official baselines, market preferences may result in either increased baseline efficiencies *or* lower net-to-gross (or higher free-ridership) assumptions. The net effect is the same from the perspective of tightening the scope of net program savings opportunities.

[11] Another increasingly important option involves fuel switching, including to biomass. In the past year, we have had several clients come to us somewhat dumbfounded by the counterintuitive "answers" they believed their TRCs were providing regarding measures that resulted in fuel switching.

typical 'S' curve, first by a small group of Innovators, then by a larger group of Early Adopters, and then by equally-sized subsequent groups that form the Early Majority, the Late Majority and, at last, the Laggards. Confirming Rogers' categories, Moore (see Figure 1) found not only that marketers should focus on these groups one at a time, but also that they should pay special attention to a potential chasm as innovations try to move from the Innovators and Early Adopters (the visionaries) to the Early Majority (the pragmatists) market shares. In the case of disruptive or discontinuous innovations – for example, advanced framing techniques for continuous insulation, or solar PV for electric power generation (our examples) –innovations often fail to make the transition.

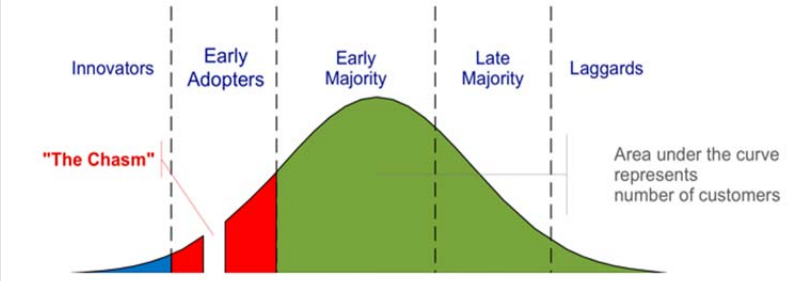

Figure 1. Without Innovators and Early Adopters, DSM's Future Is Bleak (shown: a Typical Rogers' curve with Moore's chasm overlayed)

PAs can help innovative DSM options to take hold and/or gain market share faster by being present at every step of the way.

If we take as an example the goal of moving new homes toward something approaching "net-zero energy", we find that in many markets we need not merely to add more insulation (continuous improvement), but to adopt entirely new practices such as advanced framing, integrating solar panels (for hot water and/or electricity), and using blower doors and other diagnostic equipment both during and after construction. In this case, PAs can play a critical role throughout the diffusion curve: assisting innovative builders with knowledge and capacity-building; showcasing its value; enticing (e.g. through labels, marketing, incentives and awards) Early Adopter builders *and buyers* to offer or request it; continuing to encourage demand through a variety of channels, including by working with the Early and Late Majorities; and finally, working with government, through adoption of new building codes, to impose the new standard on Laggards.

This is a long process that could roll out over 10 or 20 years. But what if advanced new homes do not currently pass the TRC? What if we are incapable of valuing the added comfort they could offer? What if we are overestimating their incremental cost simply because industry has not yet gained enough familiarity with the requisite techniques to efficiently adapt their processes? What if we don't bother to assess the value that Innovators, whether buyers or builders, would apply to owning or selling a certified, "green" home, even if elsewhere we know that markets are beginning to offer premiums for more efficient homes? And ultimately, what if our inability to consider any of these things means that we are not allowed to assist the Innovators and the Early Adopters, and in so doing, we not only fail to speed up the diffusion process, but run the risk of losing the opportunity to effectively cross Moore's chasm?

The contradiction between the short-view TRC test and the longer view of market transformation is commonplace. In some regions it is even more acute, especially where policymakers and/or regulators have adopted specific, binding or non-binding goals, such as ensuring that all new homes and commercial buildings achieve net zero energy by a certain date.[12] This is even more glaring still in cases (more common in Canada) where utilities are

[12] For example, in California, the CPUC's 2008 "Big & Bold" Strategic Plan calls for all new homes to achieve

state-owned, and are simultaneously told by their policymaker shareholders to promote things that their independent regulator says cannot be promoted, *TRC oblige*.

Case Study: British Columbia

In the past five years, the Canadian province of British Columbia has adopted a series of policies and regulations aimed at achieving ambitious energy and greenhouse gas emissions reductions. These have included both broad (and binding) energy efficiency targets, as well as specific (non-binding) efficiency goals.

Portfolio Level: Overall Targets vs. TRC Conundrum

The province's Clean Energy Act established an objective that BC Hydro, the provincially-owned electric utility, meet 66% of load growth through improved energy efficiency (Queens Printer, 2010).[13] This is a significant target in a province with strong growth prospects; indeed, it represents projected savings of some 13 TWh/yr by 2020, about 25% *more* than the highest, "economic achievable" scenario defined in the utility's most recent, TRC-bounded potential study (Marbek Resource Consultants, 2007).[14] At the same time, the utility must submit its DSM plans to the provincial regulator, the BC Utilities Commission (BCUC) which, until just a few short months ago, used the TRC as a hard screen.

In other words, BC Hydro was caught in an implacable conundrum: required to meet a target that the provincial *legislature* (also its sole shareholder) had defined as the preferred choice for society; yet in all likelihood, not able to do so in a way that could meet the *regulator's* definition of society's interests, i.e. the TRC test.

Program Level: Residential New Construction Targets vs. TRC

Beyond broad targets, British Columbia also focused on increasing the energy efficiency of new homes built in the province. In 2005, the province announced its intent to implement a new code requirement that would reduce energy use in new homes by 32% by 2010 (BC Ministry of Energy, Mines and Petroleum Resources).[15] Building on this anticipated new baseline, the province further announced additional savings targets, notably a 20% reduction *across the entire residential sector* by 2020, which would notably require that the energy performance of new homes considerably surpass the anticipated new code (British Columbia's Energy Efficient Buildings Strategy, 2010). In other words, the province established a sector-specific target that would require significant savings from voluntary programs aimed at new home construction, above and beyond an already-improved code.

Achieving these goals pushed the utilities to assess new program options for residential new construction, in a context of diminishing returns. Indeed, the measures needed to move

---

NZE by 2020, and for all new commercial buildings to be NZE by 2030 (California Public Utilities Commission, 2008).

[13] This is up from the initial 50% requirement adopted in the provinces 2007 Energy Plan (BC Ministry of Energy, Mines, and Petroleum Resources, 2007). It is notably part of a broader plan, the Greenhouse Gas Emissions Reductions Targets Act, that seeks to reduce the province's total GHG emissions by 33% below 2007 levels by 2020. While not formally binding, it is treated as such by BC Hydro since it is a Crown corporation.

[14] We note that the target can be achieved from a mix of programs, codes and more progressive rate structures.

[15] The energy performance target was defined as equivalent to an 80 on the Canadian Energuide scale (under which 100 equates to a net-zero home). Adoption of the code provision has since been pushed back to 2013 or later.

beyond the anticipated code would require new technologies – e.g. structured insulated panels – or entirely new building practices, such as advanced framing technique. The cost-effectiveness of such voluntary programs, in an environment with significantly higher energy performance baselines due to the anticipated new code, faced considerable challenges from the TRC perspective: increased costs, reduced incremental savings, and additional non-incentive program costs related to industry training, technical assistance and quality assurance.

In fact, a Dunsky Energy Consulting assessment found that the measures alone could not pass the TRC test. And so once again, utilities were caught in a squeeze: either neglect to put forward the program strategies needed to achieve explicit policy goals, or submit a program that would fail the TRC.

Interestingly, the analysis found yet more counterintuitive anomalies. Based on their past experience with the Power Smart New Homes program, PAs felt that participants would be willing to pay a part of the incremental cost themselves, since they benefit not only from reduced energy bills but also in other ways (a recent survey conducted by Dunsky of Power Smart New Homes buyers corroborates this, as have surveys in other jurisdictions). This meant that BC Hydro could obtain the savings at reasonably low cost – a fact that is reflected in the PAC test but is overlooked by the test that mattered most to regulators: the TRC.

Yet another anomaly: our analysis found a significant opportunity for the voluntary program, by raising market share of higher-efficiency homes, to contribute to adoption of a higher code requirement in the future, which would lead to market transformation. From a program efficiency perspective (reflected by the PACT test), this is viewed positively: a small program investment today could yield significant savings in the future. Yet because the TRC does not distinguish between program incentives and participant investments, it found the opposite: more of an apparently "bad" thing only compounds the problem, leading to an even lower TRC score. From the perspective of a Program Administrator seeking to encourage energy savings that policymakers have established as beneficial, the result only reinforces the concern that the TRC may be answering the wrong question.[16]

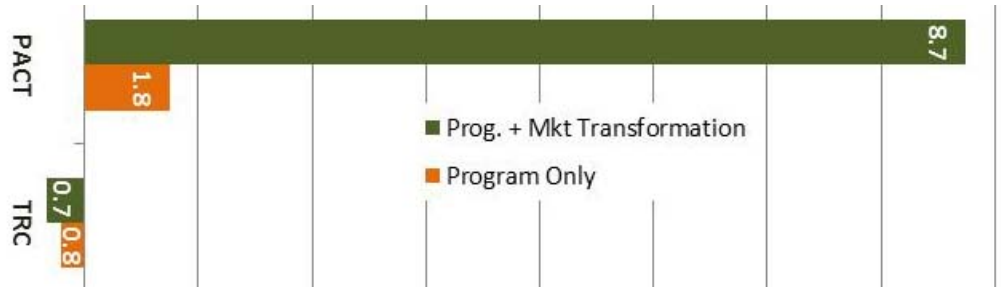

Figure 1. Anticipated B/C from the perspectives of the PACT (program efficiency) and TRC (intended to reflect societal view). The program's ability to generate long-term market transformation (by enabling a future code increase) is viewed as immensely positive from the program efficiency (PACT) perspective, but as a negative from the TRC perspective. *(Note: data are presented for illustrative purposes; they reflect two among a much larger set of scenarios and assumptions.)*

[16] A similar situation happened when attempting to avoid silos and account for natural gas savings: because natural gas' avoided costs are lower than electricity's, the combination of a comprehensive, silo-free program approach and a holistic analytical framework only made matters worse.

Options Going Forward

The TRC is currently the most used of the standard benefit/cost tests. If this test is increasingly leading to conflict with targets, policies or even consumer preferences, then what should be done?

Neme and Kushler, rooted in their own concerns about the TRC (failure to address NEBs and potential inconsistencies with certain supply-side options), propose three possible solutions: using only the "energy portion" of measure costs in the TRC, quantifying and accounting for all benefits in the TRC, or replacing the TRC with the PAC (their preferred solution, for the reasons discussed below in Option 3). While not disagreeing, we note three additional options as well – limiting application of the TRC as a go/no-go screen to the portfolio level, downgrading the use of tests altogether, and finally, "fudging" the numbers. We discuss all six below.

Option 1: Using Only the "Energy Portion" of Measure Costs in the TRC

We do not believe the first option is workable – it would be excruciatingly difficult, prohibitively costly, and likely too inaccurate to apply to the broad array of DSM measures.

Option 2: Quantifying and Accounting for all NEBs in the TRC

We believe the second option presents risks – NEBs are often difficult to quantify with reasonable precision, and experience with their analysis remains very limited – but these may be manageable. Indeed, if the TRC construct must be maintained, then there may be reasonable ways to include NEBs while avoiding the perils of false precision.

One interesting approach was taken recently by British Columbia (after the work presented in the case study was complete). The province amended the regulation that directs the BC Utilities Commission in its approval process for DSM (Muncaster, 2011). Among the important amendments, the BCUC is now instructed to measure cost-effectiveness using a modified version of the TRC[17] that most notably accounts for NEBs. NEBs are to be valued in one of two ways: either at a deemed rate equal to 15% of long-run avoided costs, or at a specific rate that the utilities can request based on program- or measure-specific studies. Through this approach, NEBs are no longer implicitly valued at zero, but can instead be accounted for either explicitly, when it is possible and worthwhile to do so, or implicitly, through a relatively conservative adder.[18]

Option 3: Replacing the TRC with the PACT

The third option – relying more on the PACT test – is entirely viable as well, and indeed in many cases may be the preferred approach. Using the PACT test provides a far more accurate measure of a program's performance from a yield perspective. As such, it may be more

[17] Other components of the amendment include: allowing the BCUC to reject DSM that does not pass the PACT; requiring that DSM's electric avoided costs be based on the long-run marginal cost of clean or renewable resources only; requiring that DSM's natural gas avoided costs be set at half the avoided costs of electric; setting the deemed NEBs value for low-income programs at 30% of avoided costs; and establishing conditions for the treatment of long-term codes and standards as well as public awareness programs.

[18] The amendment also limits the cumulative impact that NEBs are allowed to have, through a formula that adjusts the deemed values downward to the extent that specific values for certain programs are much higher.

meaningful to both the utility and ratepayers, for whom maximizing value for the DSM dollar is a common goal.[19]

Some also argue that the PACT may even be a more accurate reflection of the societal perspective, in that the non-energy benefits that drive a part of customers' decisions and are not accounted for may be offset by the test's non-inclusion of participant costs. While the argument can be made from a directional standpoint, we do not find it compelling in that both the direction and the extent of the offset remain entirely unknown. Ultimately, DSM administrators, advocates and regulators may have to accept that determining the societal value of individual DSM measures must be left to policymakers' judgments.

Option 4: Limiting Application of the TRC as a Go/No-Go Screen to the Portfolio Level

This fourth option is not independent of the previous three; in all cases, it can be useful to use the TRC – or the PACT – as a decision-making *guide* for individual measures and programs, while using them as a go/no-go at the portfolio level only. This allows more room for the sort of professional judgment needed to accommodate a multiplicity of goals –equity (including for low-income and other *hard-to-reach* customers) and long-term market transformation among them – while ensuring that the portfolio as a whole remains cost-effective.

Applying the tests too harshly at the measure or even the program level can also have unintended consequences: it can eliminate measures that play a key role for others – as a loss-leader, for example, or to reinforce brand positioning – despite not hitting the cost-effective threshold individually (this is commonly the case with certain Energy Star products). Similarly, new opportunities may be worth promoting in the short term despite high initial costs, where there is a reasonable expectation that economies of scale – due to uptake driven by program incentives – will drive costs down over time. In some cases, strict application of the TRC at the measure level, because it ignores consumer preferences, can lead PAs to pursue measures that consumers value less, and therefore require higher incentives and produce lower yields than their alternative, TRC-negative counterparts.[20]

Irrespective of the choice of test, we strongly encourage using tests for their original purpose – as decision aides – rather than as mathematical go/no-go formulae.

Option 5: Downgrading the Use of Tests Altogether

Bringing option 4 further, it may make sense under certain circumstances to lift the go/no-go application of test screens altogether – even at the portfolio level. This is the case where legislated or otherwise binding DSM targets are at play.

Indeed, when targets were lower and relied more on low- or mid-hanging fruit, the potential for conflict between the constraints of standardized tests and the legislated goals and objectives rarely, if ever, was raised. But where the potential for conflict exists, what should take

[19] We note that use of the PACT raises an important concern: programs aimed at ensuring equity (e.g. for low-income house-holds that cannot contribute) commonly fail it. This can be addressed through specific exceptions.

[20] Yet another problem arises as PAs increasingly try to avoid program silos and/or ensure cross-promotion across program areas. We have witnessed situations in which certain measures which more sensibly belong in one program area are instead shifted to another area to ensure the program-level TRC is met.

precedence: the tests, or the binding targets? In such instances, we believe the tests can provide guidance (e.g. to choose among options or pathways), but should not serve as substitutes for the binding targets themselves.

Option 6: Fudging the Numbers

It should go without saying that we neither support nor condone "fudging the numbers", and have never engaged in this practice ourselves. However, it is important to note that, where the conflicts described above are left unaddressed and the TRC requirement left unchanged, well-meaning program administrators may be pushed to "tweak" inputs (e.g. costs, savings, lifetimes, attribution keys) as the only remaining solution to an otherwise impossible quandary.[21]

We raise this for one reason and one reason only: because *not* addressing the shortcomings of the TRC may invariably lead to this most undesirable of options.

Conclusion

Nearly thirty years after it was initially devised, the TRC is finally starting to show its age. As DSM targets grow and baselines move forward, the TRC's limitations, once considered largely inconsequential, are proving increasingly worrisome. It is now considered to create undue bias by accounting for all costs but only a share of benefits; is leading to conflict with both binding, near-term targets and longer-term goals; and may be creating other problems that affect the efficiency of DSM program design and implementation.

We have discussed some of the approaches that can be taken, whether modifications to the TRC or shifting emphasis to the PACT, but have also emphasized an equally important point: that standardized tests should be used with more discernment, as a guide and decision aid rather than as a hard go/no-go.

British Columbia, faced with a number of the issues raised in this paper, has chosen an expanded version of Option 2, adopting a modified TRC that attempts to account for non-energy benefits, within a broader set of related changes to its DSM regulatory framework. Others may find that another path is more sensible for their context.

Ultimately, while we do not hold to a single solution for all regions, we believe that failure to address the shortcomings of the TRC will lead to continued conflict between regulatory practice, on the one hand, and both policy goals (including in some cases binding targets) and consumer preference on the other. This is not a tenable way forward for DSM.

References

BC Homeowners Protection Office. 2010. *Building Smart #12 Seminar: Changes to Part 10 of the BC Building Code and Emerging Green Technologies.* Vancouver, BC : s.n., 2010.

BC Ministry of Energy, Mines and Petroleum Resources. Energy Efficient Building Strategy - Homes, Commercial and Institutional Buildings factsheet. Victoria, BC, Canada : s.n.

BC Ministry of Energy, Mines, and Petroleum Resources. 2007. *The BC Energy Plan: A Vision for Clear Leadership.* Victoria, BC : s.n., 2007.

[21] To be clear, this is not the case in British Columbia, nor have any of the authors done this.

British Columbia's Energy Efficient Buildings Strategy. **Pape-Salmon, Andrew, Muncaster, Katherine and Kaye, Erik. 2010.** Las Vegas, Nevada : s.n., 2010. ASHRAE 2011 Winter Conference.

California Public Utilities Commission and California Energy Commission. 2001. *California Standard Practice Manual: Economic Analysis of Demand-Side Programs and Projects.* 2001.

—. 1987. *Standard Practice Manual - Economic Analysis of Demand-Side Management Programs -- Staff Report.* 1987.

California Public Utilities Commission. 2008. *California Long Term Energy Efficiency Strategic Plan.* 2008. p. 108.

Commission, California Public Utilities. 2008. *California Long Term Energy Efficiency Strategic Plan.* s.l. : California Public Utilities Commission, 2008. p. 108.

Dunsky Energy Consulting. 2005. *Getting Results: Review of Hydro-Quebec's Proposed 2005-2010 Energy Efficiency Plan.* 2005.

Eldridge, Maggie, et al. 2007. *The State Energy Efficiency Scorecard for 2006.* Washington : ACEEE, 2007.

—. 2007. *The State Energy Efficiency Scorecard for 2006.* Washington : American Council for an Energy Efficient Economy, 2007.

Is It Time to Ditch the TRC? Examining Concerns with Current Practice in Benefit-Cost Analysis. **Neme, Chris and Kushler, Marty. 2010.** Washington, D.C. : ACEEE, 2010. Proceedings of the ACEEE 2010 Summer Study. pp. 5-299 - 5-310.

—. **Neme, Chris and Kushler, Marty. 2010.** Washington, D.C. : American Council for an Energy Efficient Economy, 2010. Proceedings of the ACEEE 2010 Summer Study. pp. 5-299 - 5-310.

Kelly, Liz. 2006. *Energy Efficient Buildings: A Plan for BC.* Victoria, BC, Canada : s.n., 2006.

Laitner, John A., et al. 2012. *The Long Term Energy Efficiency Potential: What the Evidence Suggests.* Washington : ACEEE, 2012.

—. 2012. *The Long Term Energy Efficiency Potential: What the Evidence Suggests.* Washington : American Council for an Energy Efficient Economy, 2012.

Marbek Resource Consultants. 2007. *BC Hydro 2007 Conservation Potential Review.* 2007.

—. 2007. *BC Hydro 2007 Conservation Potential Review - The Potential for Electricity Savings, 2006-2026: Residential, Commercial and Industrial Sectors in British Columbia - Summary Report.* 2007.

Moore, Geoffrey A. 1991. *Crossing the Chasm: Marketing and Selling High-Tech Products to Mainstream Customers.* s.l. : Harper Business Essentials, 1991.

Muncaster, Katherine. 2011. *Demand Side Measures Regulation -- Workshop.* s.l. : BC Ministry of Energy and Mines, 2011.

Queens Printer. 2010. Clean Energy Act - Bill 17 -2010. 2010.

Rogers, Everett M. 2003. *Diffiusion of Innovations.* Fifth. New York : Free Press, 2003. p. 551.

Sciortino, Michael, et al. 2011. *The 2011 State Energy Efficiency Scorecard.* Washington : ACEEE, 2011.

—. 2011. *The 2011 State Energy Efficiency Scorecard.* Washington : American Council for an Energy Efficient Economy, 2011.

Skumatz, Lisa A. 2009. *Lessons Learned and Next Steps in Energy Efficiency.* 2009.

Ujjwal Bhattacharjee, Steven Drake, Eric Rambo, Bryan Ward,. 2009. *A Review and Update of NEBS Values for Residential Programs.* s.l. : PA Consulting Group, 2009.