Cost-Effectiveness - Implication for Bonneville and Utility Programs

Background

The Council's 5th Plan conservation targets are comprised of measures that were found to be cost effective if the electric system paid all the costs. Council plan conservation targets are based on availability of conservation that passes this Total Resource Cost (TRC) test. Since its first Plan the Council has interpreted the Act definition of cost-effectiveness as requiring comparison of the economics of alternative resources considering all costs and benefits to determine cost-effectiveness of conservation compared to generating resources. Bonneville has indicated that in its Post 2006 conservation programs it will not provide funding for measures that were not identified as cost-effective in the Council's 5th Plan. This policy is consistent with the Act, the Council plan and with regional utility conservation efforts over the last 20 years. This policy does not however, limit utility investments in conservation or other resources that the Council did not find to be cost-effective.

The practical impact of Bonneville's proposed application of cost-effectiveness for conservation programs is to limit the scope of the conservation measures that can be installed under Bonneville's Conservation and Renewable Resources Rate Discount Program (C&RD). The original purpose of the C&RD program was to encourage utilities to "re-engage" conservation efforts that had lapsed or to maintain their conservation infrastructure. As part of the effort to initiate the rate discount program in 2001-2006, Bonneville did not require that measures installed through C&RD be cost-effective. The proposal to fund only cost-effective conservation eliminates some of the measures that many utilities had been installing under the original C&RD program. As a result, there has been significant utility resistance to implementing this "cost-effectiveness" limit. Some utilities are also concerned that by restricting the list of measures that are eligible for rate discount credits they will not be able to acquire sufficient savings in their service territories to obtain all of the rate credits they are eligible for and thus end up paying Bonneville more money.

In order to continue to secure savings from measures that do not pass the Council's cost-effectiveness screen, some utilities are asserting that Bonneville and the Council's should adopt an alternative Total Resource Cost definition of cost-effectiveness used by the Council. These utilities assert that this definition and approach to determining whether a measure is cost-effective is too broad because it counts "all costs and benefits" not just those paid for or received by the power system. They argue that a conservation measure's cost-effectiveness should be based on a "Utility Cost Test" (UCT). That is, only those costs paid by utility rate revenues and only those benefits the power system receives in the form of electricity savings should be considered in the analysis. Using the UCT, a measure is cost-effective if the present value of the administrative cost and financial incentives paid by utilities are less than present value of the avoided cost of alternative electricity resources avoided by the measure.

The remainder of this memo discusses some of the major issues and implications associated with altering the Council's approach to determining the cost-effectiveness of conservation savings. Accompany this memo are several reference documents. Attachment A is a paper that provides an overview of the five major approaches that have been used to determine the cost-effectiveness of conservation investments across the country. Attachment B is a summary of the Northwest and California state utility regulatory commission and legislative policies regarding the issue of how to determine cost-effectiveness of conservation resources. Attachment C contains statutes and regulatory commission orders on conservation cost effectiveness in the four Northwest states and in California.

The Council's Interpretation of the Act's Definitions

The Act defines "cost-effective" as follows:

"Cost-effective", when applied to any measure or resource referred to in this chapter, means that such measure or resource must be forecast--

> *to be reliable and available within the time it is needed,*[1] *and*
> *to meet or reduce the electric power demand, as determined by the Council or the Administrator, as appropriate, of the consumers of the customers at an estimated* <u>*incremental system cost*</u> *(emphasis added) no greater than that of the least-cost similarly reliable and available alternative measure or resource, or any combination thereof.* [2]

The Act provides further guidance on what "cost" should be considered in the cost-effectiveness determination process by defining "system cost" as follows:

For purposes of this paragraph, the term "system cost" means an estimate of <u>*all direct costs*</u> *(emphasis added) of a measure or resource over its effective life, including, if applicable, the cost of distribution and transmission to the consumer and, among other factors, waste disposal costs, end-of-cycle costs, and fuel costs (including projected increases), and such quantifiable environmental costs and benefits as the Administrator determines, on the basis of a methodology developed by the Council as part of the plan, or in the absence of the plan by the Administrator, are directly attributable to such measure or resource.*[3]

During the development of its first Plan, the Council interpreted the Act's requirement that "all direct cost" be considered when determining resource cost-effectiveness.[4] The Council concluded that this provision of the Act meant that the *total cost* of conservation measures must be used in its evaluation, regardless of whether all or only a fraction of those cost were borne by the power system. The region's utilities strongly endorsed this interpretation because they argued that failure to consider the share of conservation costs paid for by their customers would systematically underestimate the true cost of energy savings when compared to other similarly available and reliable resource alternatives. Using TRC to estimate conservation costs and savings potential also avoids double-counting savings, avoids promoting measures that may impose non-electricity costs on others and allows consideration of measures with quantifiable non-electricity benefits. Each of these attributes is discussed below. All succeeding Council Plans, including the recently adopted 5th Plan have employed this same interpretation.

Total Resource Cost versus Utility Cost-- Why Not Consider Only What Utilities Pay for Savings?

Setting aside the Act's provisions, are there other reasons for including <u>only</u> utility system costs (and benefits) in the Council's determination of "cost-effectiveness?" The "Total Resource Cost" test is designed to ascertain whether an investment is economically justified when all of its costs and benefits are included. However, since the power system does not pay all of these costs, nor does it accrue any of the non-electricity benefits, why should the utilities account for them when

[1] Northwest Power Act, §3(4)(A)(i), 94 Stat. 2698
[2] Northwest Power Act, §3(4)(A)(ii), 94 Stat. 2698
[3] Northwest Power Act, §3(4)(B), 94 Stat. 2698-9
[4] Northwest Power Planning Council, 1983 Northwest Conservation and Electric Power Plan, Volume 1, Chapter 7, p 7-1.

determining whether a measure produces cost-effective saving? Why not just consider the utility costs and the utility benefits? There are several reasons considering Total Resource Cost perspective avoids undesirable results of using only a Utility Cost perspective.

1) Avoids double-counting savings
2) Directs investment toward measures that optimize investment for the utility and the customers
3) Avoids promoting measures that may impose non-electricity costs on others
4) Allows consideration of measures with quantifiable non-electricity benefits
5) Reduces likelihood of overestimating cost-effective conservation potential

First, by ignoring the share of the cost paid by program participants, we create the possibility that the region will pay twice for the same savings. For example, assume that an industrial customer is considering whether to install a more efficient electric motor costing $5000 and that saves 5000 kWh per year. The local utility determines that the maximum incentive it can offer and still be cost-effective is $2500 towards the cost of the more efficient electric motor. The industrial customer, after determining that reducing its power bill by 5000 kWh per year will save $2500 agrees to buy and install the more efficient motor and claims the utility rebate of $2500. Both the utility and the customer each believe they made an economic investment (i.e., saving 5000 kWh for just $2500). However, "the region" spent $5000 to save 5000 kWh. Since the region's consumers have a limited amount of money, the less money they spend on electric energy services the more they can afford to invest in other goods and services that may be of higher value to them or to the region. By ignoring what participating consumer's spend to procure savings the region runs the real risk of over-allocating money to the purchasing electric energy services.

Second, use of the TRC test ensures that the funds collected from all customers are invested in actions that reduce the long-run cost for all customers[5]. Whereas, use of the Utility Cost test can lead to one group of customers "subsidizing" another group's investments in measures that do not benefit all customers in the long run. In addition, using Utility Cost can lead to allocating utility funds to purchase savings from measures that displace those in the Council's plan as cost-effective using Total Resource Cost. This displacement leaves less funding to accomplish the Plan's conservation targets. During times of budget limitations and rate pressures this displacement is a less valuable outcome for society. Plus, if utility costs for the chosen measure are higher than utility costs for the measure displaced, the utility and its ratepayers are also worse off.

In order to acquire conservation savings, a utility collects funds from all of its customers and distributes these funds (in the form of rebates, low interest loans, or other financial incentives) to those customers who participate in their conservation programs. For example, a utility might collect $600 to pay towards the cost of installing a solar photovoltaic (PV) system that produces 1200 kilowatt-hours a year in savings. The levelized cost to the utility (UCT) of these savings is about 3.4 cents/kWh. From the utility's perspective these savings appear to be cost-effective.[6] However, by spending this $600 on a PV system the utility cannot allocate these funds to the purchase of less expensive savings. For example, instead of purchasing the PV savings, the utility could have bought about 40 compact fluorescent light bulbs (CFLs) to produce savings equivalent to the PV system for around $160. Alternatively, with the same $600 incentive it is offering for the solar PV system it

[5] These investments also are designed to reduce long-term risks as well.

[6] However, from a total resource cost (TRC) this PV system's levelized cost of approximately 35 cents/kWh is far from cost-effective.

could have purchased 150 CFLs to produce nearly 5,000 kilowatt-hours a year in savings. In the first scenario, the utility would not need to collect an additional $440 from other ratepayers to produce the identical savings. In the second scenario, the utility would have secured four times the savings for the same investment by other ratepayers. Unless utility payments for savings from measures that do not pass the TRC test are limited to less than the difference between current retail rates and the marginal cost of new electricity supplies some consumers will be charged more for savings that do not reduce their long term costs.[7]

A third aspect of the Total resource Cost test is that it avoids promoting measures that may impose non-electricity costs on others. The Utility Cost perspective ignores costs to others. Funding measures that ignore others' costs can lead to bad outcomes for society. For example, installing wood stoves was at one time, in the 1980s, considered a potential renewable resource that could save electricity. But the cost of air pollution from wood burning stoves was soon recognized as highly undesirable, despite the fact that electric system costs were lower.

Fourth, in practice, using Total Resource cost allows consideration of measures with quantifiable non-electricity benefits, expanding the list of qualifying measures. Non-electricity benefits figure prominently both in developing conservation estimates and in designing conservation programs. On net, more conservation savings are added to the list of cost-effective measures than removed by the consideration of quantifiable non-electricity costs and benefits. This is primarily because resource potential estimates actively seek measures that save electricity and provide non-electricity benefits. Measures with significant non-electricity benefits include clotheswashers and dishwashers with water, sewer, and detergent savings, and lighting with reduced lamp replacements due to the longer life of efficient models. Program operators take advantage of large non-electricity benefits to reduce electric system costs by getting end-use customers to contribute more to measure installation.

Fifth, if the Council were to use Utility Cost to establish the Plan's conservation targets, these targets would be significantly higher. If the Council were to consider only that share of the cost of conservation that was paid for out utility revenues, then many more measures would become "cost-effective." Historically, utilities have typically paid less than 70 percent of the total cost of conservation measures and in many cases they have paid less than 50% of these costs. Using 70 percent "cost-sharing" would increase the target by approximately 20% or from 700 to 840 average megawatts over the period from 2005 through 2009. The drawback of using "utility cost" for determining cost-effectiveness is that it is impossible to forecast exactly what share of each measure's cost will be borne by the utility system over the course of the Plan. In many cases, utilities may pay higher fraction of a measure's cost in the near term and less over time, particularly if the measure is adopted into state code or federal standards. In other cases, they may find it necessary to pay a higher fraction of a measure's cost in order to achieve higher market penetration over time.

Usefulness of the Utility Cost Test

The arguments for using Total Resource Cost do not mean that the Utility Cost perspective is not important or useful. First, Utility Cost is a direct indicator of the value of a conservation effort to the

[7] The Rate Impact Measure test (RIM) is designed to limit investments in conservation to those measures that do not increase the rates of consumers who do not directly participate in a program. This is done by constraining investments to the difference between the marginal cost of electricity and current retail rates. The RIM test's primary disadvantage is that when retail rates exceed current marginal prices no conservation investments pass this test, even those that can be shown to decrease long-term costs and risks.

utility system. The lower the cost the better provided overall conservation targets are met. Second, most regulatory commissions use the Utility Cost test as an upper limit for utility incentives for cost-effective measures with high non-electricity benefits. For example, a measure like efficient clotheswashers passes the Total Resource Cost test in large part because of significant quantifiable non-electricity benefits in water, sewer and detergent savings. But these non-electricity benefits do not flow to the electricity system. In cases were non-electricity benefits are significant, utility incentives payments are typically limited to no more than the electricity system energy and capacity benefits.

Program Implementation Issues Can Be Addressed Without Altering the Definition of Regional Cost-effectiveness

The staff has identified four issues that have been raised by some utilities that are behind their request to consider an alternative definition of "cost-effectiveness." These are:

1. *Application of Cost-Effectiveness Eliminates Measures Needed to Meet Targets* - Eliminating non-cost-effective measures, which are currently allowed, increases the risk that Bonneville will fail to reach its conservation goal as well as increases the risk that an individual utility will not be able to claim its entire rate credit.
2. *Application of Cost-Effectiveness is Too Specific* - Programmatically, trying to exclude specific applications of measures that are not cost-effective when other very similar applications are cost-effective may result in higher program administration cost as well as consumer confusion.
3. *Application of Cost-Effectiveness is Too General* - The cost-effectiveness of measures in the 5th Plan are based regional averages, due to local conditions (climate, prices) some measures may be cost-effective in specific utility service territories but they are not identified as such in the plan.
4. *Application of Cost-Effectiveness Ignores Consumer Non-electricity Benefits* - The customer's "willingness-to-pay" for what appears to be a non-cost-effective measure implies that there is a non-electricity benefit not being captured in the Council's Total Resource Cost test. Furthermore, it does not take marketing advantage of customer willingness to pay for non-electricity benefits that are not quantified.

Staff believes that there are solutions to these problems that do not require the use of an alternative definition of cost-effectiveness. Bonneville has set forth a process for working through these and other issues during the development of its fiscal 2007 - 2009 conservation program designs. While staff believes that these issues are best resolved during that process, possible options for addressing these issues are set forth below.

Issue 1 - *Application of Cost-Effectiveness Eliminates Measures Needed to Meet Targets*. Utilities are concerned that there may not be enough cost-effective conservation measures in their service territories to qualify recoup the full value of their rate discount. There are at least two possible solutions to this problem. First, since the targets are based on regional conditions such as the mix between residential, commercial, industrial and irrigation sector loads, it is quit possible that individual utilities do not have an equal share of the remaining conservation potential in their service territory. Therefore, arrangement should be permitted to allow groups of utilities to "pool" their program activity, such as is permitted under Bonneville's current C&RD program rules. Alternatively, a "trading system" could be established that permits utilities with less potential to “market” their C&RD credits to other utilities with greater opportunities.

In addition to permitting pooling and/or trading, Bonneville plans work with individual utilities to assist them in identifying the conservation opportunities that they do have in their service territory. Bonneville also plans to develop a menu of program designs to aid utilities capture savings from markets (e.g. lighting in small commercial buildings) which have had limited program offerings to date.

In addition to these solutions we note that Bonneville is proposing that the rate discount will target somewhat less than half of its conservation target. That remainder will come from utility and third-party contracts or Bonneville programs.

Issue 2 - *Application of Cost-Effectiveness is Too Specific.* This issue can be best illustrated by a measure such as the conversion of a home with a forced air furnace to a new high efficiency heat pump combined with sealing of the homes duct system to reduce leaks. In homes where much if the duct system is inside (e.g., in the basement) sealing the ducts does not produce energy savings. On the other hand, in homes where the duct system is mostly outside (e.g. in a crawlspace) sealing the ducts can produce significant savings. Based on the analysis in the 5th Plan, it is cost-effective to convert the home with crawlspace to a high efficiency heat pump when the furnace needs replacement, but it is not cost-effective to do so if the home has a basement. While it is possible that this could present difficulty in the marketing of this measure to consumers, staff believes that consumers are already presented with “eligibility” requirements for many utility offers (e.g., electric heat, minimum existing insulation levels). Therefore, conditioning of an offer on the basis of whether a home’s ductwork is inside or outside should not be viewed as overtly confusing.

Issue 3 - *Application of Cost-Effectiveness is Too General.* This issue can also be best illustrated by a measure such as the conversion of a home with a forced air furnace to a new high efficiency heat pump. The 5th Plan contains only one of three possible scenarios where this measure might be used. Each of these scenarios requires a different cost-effectiveness analysis. The simplest and most conservative case (and that used in the 5th Plan) assumes that the existing forced-air furnace is functioning, but that it might be cost-effective to replace it with a high efficiency heat pump. In this case an investment of approximately $4500 for the new heat pump.

In the second scenario, the existing forced-air furnace is no longer functioning. In this case either a new forced-air furnace or the purchase a high efficiency heat pump can replace the old furnace. Since the cost of the furnace replacement is approximately $750, the “incremental” cost of converting to a heat pump is only $3750.

The third scenario, and in the areas of the region that have very hot summers the most likely, is the case where the home has a forced-air furnace and central air conditioning system. In this scenario, the air conditioning system fails and is about to be replaced. Under this scenario, the homeowner could spend $3000 to $3500 just to replace the air conditioning system or $4500 to replace both the furnace and air conditioner with an efficient heat pump. In this case, the incremental cost of the heat pump is only $1000 to $1500 over an existing forced-air furnace plus an air-conditioning system.

All of these cases represent legitimate possibilities and are not specifically called out in the Council's plan. However, each should be analyzed for cost-effectiveness in Bonneville's program implementation. The staff believes that through the mechanisms provided for by the Council's Regional Technical Forum (RTF), any utility can request that specific applications be analyzed for cost-effectiveness. Moreover, Bonneville has stated that it will continue to rely on the RTF to perform these analyses and to develop analytical tools that utilities can use to conduct their own "case specific" cost-effectiveness tests.

Issue 4 - *Application of Cost-Effectiveness Ignores Consumer Non-electricity Benefits.* There is always the possibility that significant non-electricity benefits have been overlooked or under-valued in the application of the TRC test. For example, some utilities have asserted that because some consumers are willing to invest nearly $4000 to install a solar water heating system that they must perceive other "non-electricity" benefits because the energy savings alone would not justify the investment. They believe they should be able to offer a small incentive towards the installation of these systems to assure that they are at least installed properly. Staff believes that if significant non-electricity benefits have been overlooked or under-valued they should be incorporated in the cost-effectiveness analysis. However, when a measure's cost-effectiveness is derived largely from its non-electricity benefits, the utility system's "willingness to pay" should be limited by the measure's energy savings benefits.

Continuing with the previous example. A residential solar water heating system has a total present value cost to the region of $4650, including annual operation and maintenance cost. As a result of its energy savings this system provides approximately $1015 in present value benefits to the power system over its lifetime. Therefore, in order be cost-effective from a TRC perspective in must produce at least $3635 ($4650-$1015) in present value non-electricity benefits. Since the power system does not accrue these non-electricity benefits, utility investments in this solar water heating system should be limited to $1015, with the balance to be paid by the owner of the system.

It should be noted that in this example, if the power system were to invest $1015 in the solar water heating system its "cost of conserved energy" is exactly equal to the cost of purchasing the equivalent amount of power from the market. That is, the regional power system's economic benefits are equal to its costs (benefit-to-cost ratio 1.0). In contrast, a major portion of economic benefit that conservation provides in the 5th Plan is derived from the fact that its estimated ***total*** resource cost (not just that portion paid for by the power system) is approximately two-thirds the cost of market power purchases. This means, that in order to produce the same economic benefit to the power system, utility investment in measures that derive their cost-effectiveness from large non-electricity benefits must be constrained to less than their present value to the power system.

The rationale for this additional constraint can be illustrated by comparing the solar water heater to a heat pump water heater. A solar water heater must be assumed to have large non-electricity value in order to cost-effective. A heat pump water heater is cost-effective based on its energy savings alone. The 5th Plan estimates that the savings from a solar water heater and heat pump water heater are roughly equivalent (about 1900 kWh/yr). However, the total present value cost of a heat pump water heater is only $925 compared to $4650 for the solar water heater. Therefore, in order for the power system to be indifferent as to whether it saves 1900 kilowatt-hours per year, utility investments in solar water heaters should be limited to $925 (rather than

$1015), since the heat pump water heater at that cost could produce the identical savings at lower cost.[8]

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[8] This also assumes that the consumer who purchases the solar water heating system attributes no value to its energy savings. If the consumer also attaches value to the energy savings, utility investments must be further constrained to avoid double counting these benefits.