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Why some utilities hate energy efficiency

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ABSTRACT

The prevalence of low wholesale electricity prices and low load growth has altered the distribution of net benefits from energy efficiency. Measuring the effect of these factors on the distribution of net benefits among program participants, nonparticipants, utilities, and society can enhance discussions of the challenges and opportunities that arise.

1. Introduction

Analysts have developed sophisticated methods to calculate the quantity, value, and cost-effectiveness of energy efficiency for a wide variety of measures. But despite the consistent finding that efficiency is cost-effective and often the least-cost resource with no emissions, it is not particularly popular with some utilities. One obvious reason is that efficiency can cause utilities to lose revenue and sometimes the ability to recover fixed costs. This is a known problem with known remedies, including decoupling.[1] The analysis in this article takes this issue one step further to identify the characteristics of utilities that are most adversely affected by efficiency and to explore the effect on customers, both those who participate in efficiency programs and those who do not.

The fact that energy efficiency may be cost-effective doesn't guarantee benefits to all parties; there can be winners and losers. The following analysis compares the allocation of costs and benefits for a variety of different types of utilities – with and without load growth – when they acquire energy efficiency as well as other energy. In most cases, the allocation of net benefits does not stop with utilities. They often respond to lost revenue with higher rates, which in turn affect the allocation of net benefits between participants and nonparticipants in efficiency programs.

This analysis explores the distribution of net benefits from efficiency for three different types of utilities: public utilities that buy power from a federal power marketing agency (PMA), public utilities that engage directly in the wholesale market, and regulated investor-owned utilities (IOUs). While the type of utility affects the distribution of net benefits, the overall pattern is similar for all three. A more important factor is load growth. It makes a significant difference whether a utility is growing and able to sell energy savings to other retail customers or is not growing and is forced to sell energy savings into the wholesale market. This factor has become increasingly important as electricity sales growth nationwide has plateaued in recent years.[2]

Even though the overall cost-effectiveness of efficiency is not affected by whether utility loads are growing or declining, the allocation of net benefits is. There can be a relatively high net cost of energy efficiency for utilities with declining loads and that cost is likely to be passed on to all customers. An additional finding shows that the magnitude of the costs paid by nonparticipants can be large or small depending on the rate of participation in efficiency programs.

The distribution of benefits from energy efficiency among customer participants, nonparticipants, utilities, and society is important and should be considered as programs are developed. A few specific policy recommendations are included consistent with this analysis.

2. The model

The analysis is based on a simple model that allocates the costs and benefits of acquiring energy efficiency or other energy to utilities, consumers, and society.[3] The base case is a public utility that buys power from a federal PMA and sells to retail customers. Additional cases are later added that apply to an independent public utility – not dependent on a PMA – and an investor-owned utility. The results follow the same general pattern regardless of the type of utility.

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[1] See Sullivan, Wang, and Bennet (2011).

[2] See U.S. Energy Information Administration, U.S. electricity sales have decreased in four of the past five years. http://www.eia.gov/todayinenergy/detail.cfm?id=14291

[3] Lazar and Colburn (2013).

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1040-6190/

Table 1
Assumptions for costs and benefits.

Parameters	$ per kWh
Power costs (new resources)	0.085
Wholesale power costs (spot market)	0.040
Capacity value	0
Risk premium	0
Retail power	0.085
PMA power price	0.030
PMA costs: energy efficiency	0.010
PMA costs: transmission	0.005
PMA efficiency incentives	0.015
Utility costs: energy Efficiency	0.005
Utility costs: distribution	0.005
Utility efficiency incentives	0.015
Customer costs: energy efficiency	0.025
Customer: other benefits	0
Carbon costs	0.020
IOU rate of return	0.100

In the base case, the wholesale supplier (PMA) participates in a spot market and if necessary builds new generating resources. This supplier sells at cost to a public utility, which in turn sells at cost to retail customers.[4] Those retail customers can include both savers who conserve electricity and buyers who contribute to higher loads. Societal costs of carbon emissions are also included.

Every energy efficiency measure is unique but this analysis uses a generic measure with approximate values for costs and benefits. Table 1 summarizes the values that are assumed in this work. While these specific values may not apply precisely to any particular efficiency measure or utility, they should fall within a plausible range, at least for the Pacific Northwest. All units are in terms of dollars per kilowatt-hour and represent the levelized cost of energy.

In the base case the cost of energy efficiency ($0.04) is paid by the PMA ($0.01), the utility ($0.005), and the customer ($0.025). In addition the PMA provides incentives to the utility ($0.015) which in turn passes on an equivalent incentive to the retail customer. It is also assumed that there is a small savings attributed to the fact that efficiency reduces the need for transmission ($0.005) and distribution ($0.005). The PMA can sell into or buy from the spot market ($0.04) or build new resources at a higher long term cost ($0.085). It also sells power to public utilities based on its average cost for all existing resources ($0.03). Efficiency is carbon-free and includes a credit based on the presumption that it displaces gas generation that does emit carbon. The carbon value ($0.02) is based on the federal government's social cost of carbon with a 3 percent discount rate and average carbon emissions from a gas plant (Department of Energy: Energy Information Agency). There are additional benefits of efficiency for capacity, risk reduction, and other customer benefits that are not quantified here.

3. Results

The results for the first four scenarios report net benefits for the acquisition of 100 kWh of efficiency (net costs are negative). The total value in Fig. 1 represents the total net cost of acquiring energy efficiency before it is resold. The measure is particularly inexpensive, $1 for 100 kWh ($0.01/kWh) because the cost is partially offset by benefits for transmission, distribution, and carbon.

The total however masks the important fact that the impacts are unequally distributed. The PMA and the utility pay the majority of the costs while the saver and society (climate improvement) accrue the benefits. Of course the PMA and the utility do not generally absorb these costs but instead pass them on to their customers: the PMA costs are absorbed by all PMA customers and utility costs are passed on to all utility customers.[5] These costs will be passed back to savers and non-savers alike.

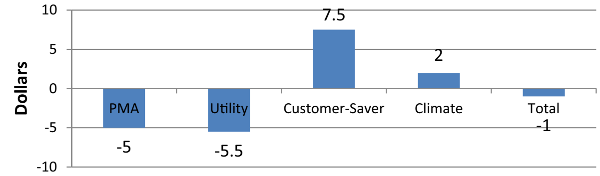

Fig. 1. Net benefit of acquiring 100 kWh of energy efficiency.

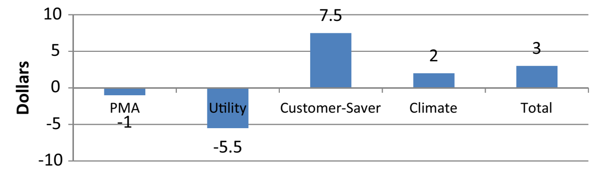

Fig. 2. Net benefit of 100 kWh of energy efficiency sold at wholesale.

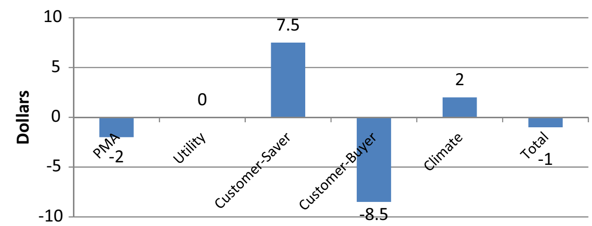

Fig. 3. Net benefit of 100 kWh of energy efficiency sold at retail.

The next series of results build on this finding. In the second scenario (Fig. 2) the PMA sells the saved energy in the wholesale market. This is essentially what would happen if the utility and other PMA customer utilities did not have any load growth. Because the total net benefit now includes an energy value for the savings, this is the only scenario that is equivalent to a cost-effectiveness test.[6] The fact that it is positive ($3) indicates that it is cost-effective. As evident in Fig. 2, the PMA's net cost is reduced (from −5 to −1) by selling the savings in the market. Other results are unchanged: the utility continues to bear major costs with high rewards for the saver.

The third scenario assumes load growth so the savings is sold to another retail customer of the same utility. This creates a significant improvement for the utility as its net costs ($5.50) decrease to zero. In this case the utility has no net costs to pass on to customers.[7]

It is also possible for efficiency to be acquired by a non-growing utility and sold to a customer of a growing utility. Both utilities are

[4] An example of this model would be the Bonneville Power Administration selling power at cost to publicly owned utilities.

[5] This assumes that program implementation costs and lost revenue are passed on to customers which must be approved by elected officials for a public utility or by a regulatory commission for an investor-owned utility. Decoupling and power cost adjustment clauses ensure that these costs (or savings) will be automatically passed on to customers.

[6] This is essentially a societal cost effectiveness test. If the climate value is excluded it is essentially the total resource cost test and is still cost effective.

[7] Also note that the total is again equal to the total cost of the energy saved. This is because the consumer who buys the energy is included along with the utility that collects the revenue, thus netting out the value of the sale.