Department of Energy

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ENERGY EFFICIENCY

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The Bonneville Power Administration's Energy Efficiency organization is dedicated to providing value to its utility customers since it is you that make it possible to accomplish public power's efficiency targets. From regional programs, to technical assistance for custom projects, BPA is always looking for ways to facilitate the acquisition work of our customers.

The realities we as a region are faced with have created headwinds to the pursuit of energy efficiency:

- The region is still reeling from the economic crash of 2007-2008. Many customers are experiencing no or slow load growth with conservation potentially putting upward pressure on retail rates.
- For the first time, customers, on average, are expected to deliver 25 percent of public power's regional programmatic savings target, meaning some have to justify efficiency beyond BPA funding
- Some customers have Tier 1 "head room" and are not facing price signals from Tier 2 rates or the market; and,
- Some customers have significantly higher BPA energy efficiency budgets than their historical expenditures.

BPA has created some analyses that we believe may assist with making a "Case for Conservation."

The economic case for conservation can be made at many levels and we have examined the impact of efficiency from the regional, utility customer, and end-use consumer perspectives.

1. To address the regional perspective, we have developed an analysis of the value of energy efficiency achievements over the past 10 years against the cost of purchasing power (using the region's Mid-Columbia spot market price point). By posing the hypothetical alternative of purchasing from the market the equivalent amount of power that was saved through energy efficiency investments from 2001 through 2011, the analysis demonstrates conservation acquisition has led to reduced costs.

2. To address the retail utility perspective, "A Utility Business Case for Conservation" was created as a *general* utility economic case for conservation. It establishes a framework for a utility to analyze individual financial and rate situations using its own costs and assumptions. Supporting the economic conclusions made in the analysis, a separate supporting document has been developed to address many elements of conservation that cannot be captured in a general business case analysis.

3. Addressing both the retail and end-use consumer perspectives, BPA is working to develop a financial impact model based on utility-specific inputs and assumptions to help customers think about the quantitative impacts of conservation investments. The model is undergoing testing and will be available for use by customers in early autumn.

All elements of the “Case for Conservation” package except for the financial impact model are available on Energy Efficiency’s website. If you are interested in reviewing and potentially using the financial impact model, I encourage you to reach out to your Energy Efficiency Representative and Power Account Executive team so that they can offer assistance and address any questions you may have.

This initiative is the result of collaboration between the Energy Efficiency organization and other groups within Power Services. I believe this work does a great job linking two worlds—power and conservation. Though this work will not be applicable to all customers, and only represents part of the value of energy efficiency, it tells a compelling story.

I look forward to hearing how these initiatives provide value to our customers and stakeholders.

Best regards,

Richard Génecé

Richard Génecé

B O N N E V I L L E   P O W E R   A D M I N I S T R A T I O N

Case for Conservation

An examination of the regional, utility, and consumer perspectives of the economic impact of energy efficiency

Contents

Overview of the Energy Efficiency vs. Mid-C Analysis

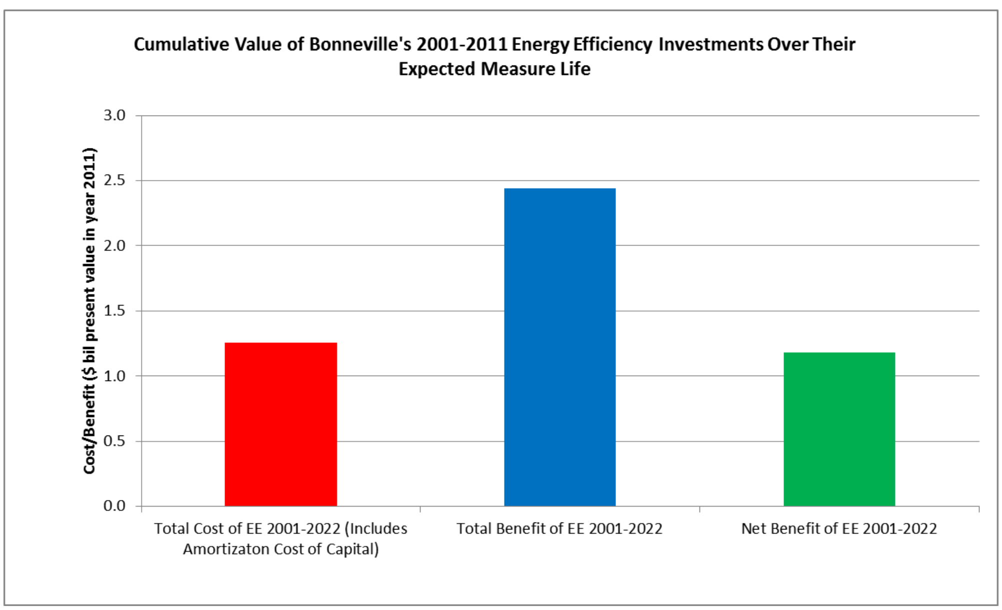
Introduction

What if, instead of investing in energy efficiency from fiscal year (FY) 2001 through FY 2011, BPA had instead purchased power from the Mid-Columbia spot market equivalent to the energy saved through efficiency investments during that period? BPA set out to answer this question by developing the “Energy Efficiency vs. Mid-C Analysis.” Below is an overview of the analysis BPA performed to assess the impact of its energy efficiency investments from FY 2001 through FY 2011. The following document and Excel file, located on BPA’s Energy Efficiency Home Page, provide specific details.

EE Saves the Region Money

By investing in energy efficiency, BPA lowers power demands throughout the region. This reduced demand for power means that, in times of high regional demand, BPA has to buy less power on the market to serve its customers needs, and, in times of low demand, BPA has more power to sell on the spot market. So, if investments in efficiency savings cost less than the market price of energy, BPA’s costs are reduced. It turns out this has been the case.

BPA’s analysis demonstrates that, in the absence of the energy efficiency efforts from FY 2001 through FY 2011, the agency’s costs would be higher by approximately $750 million to $1.36 billion (net present value in year 2011) over a 20-year period. This range is based on historic and forecast Mid-C prices and accounts for a variety of assumptions, including about the time of day conservation occurs. For example, assuming flat Mid-C prices and flat annual energy savings, the graph below demonstrates a net benefit of approximately $1.2 billion. Thus, from FY 2001 through FY 2022, BPA customers could pay over a billion dollars less than they would otherwise pay had BPA not invested in energy efficiency.



Note the analysis looks only at cost savings and not rate impacts, i.e., the analysis does not attempt to determine the rate impact of BPA’s FY 2001-2011 efficiency investments.

EE Provides a Lasting Benefit

Energy efficiency provides long-term value. Every kilowatt-hour of energy efficiency acquired today is a kilowatt-hour that does not need to be purchased or generated tomorrow, the next day, or any day throughout the life of the measure. This multiplier effect provides much of the value of investing in energy efficiency and creates long-term cost savings for BPA's customers.

EE Avoids Market Volatility

Energy prices are inherently volatile. The Mid-C market price can vary dramatically. During the period of the analysis, wholesale heavy load hour Mid-C prices varied from $22 per megawatt-hour to over $215 per MWh (in real 2006 dollars). The price of energy efficiency, on the other hand, is relatively consistent, ranging from a levelized cost of $11 to $19 per MWh (in real 2006 dollars) during the same period.[1] This consistency allows BPA to provide more reliability in our rates and avoids the dramatic rate swings potentially necessary to recover highly variable market costs.

1 Tom Eckman, Northwest Power and Conservation Council, http://www.aceee.org/files/pdf/conferences/mt/2013/Tom%20Eckman_Welcome%20and%20Plenary.pdf, slide 11.

Energy Efficiency vs. Mid-C Analysis

The Value of BPA's Energy Efficiency Investments (2001-2011)

Objective

Determine if BPA's costs were lower as a result of investing in energy efficiency from fiscal year 2001 through FY 2011 rather than purchasing the equivalent amount of energy from the market.[2]

Conclusion of Analysis

The analysis concludes that BPA's estimated costs will be lower by approximately $750 million to $1.36 billion (net present value in year 2011) for the period 2001-2022 as a result of investing in energy efficiency from 2001-2011 rather than purchasing the equivalent amount of energy from the market. [3] Said another way, in the absence of energy efficiency investments made in 2001-2011, BPA's revenue requirement would be increased by approximately $750 million to $1.36 billion (net present value in year 2011) for the period 2001-2022, depending on which assumptions are used. A primary assumption underlying the range of cost savings is a measure savings persistence rate of zero, i.e., the analysis assumes efficiency savings "expire" after 12 years. In actuality, for many measures, the savings "persist" as end-users reinstall the measure with something as efficient or better.[4] Assuming instead a persistence percentage of 50% changes the range of cost savings from $1 billion to $1.7 billion (net present value in year 2011).

Thus, BPA's energy efficiency investments from 2001-2011 were in fact cost effective and helped contribute to lower agency costs.

Depending on a number of variables, a range of cost savings is possible. The analysis uses heavy load hour, light load hour, spring and summer Mid-C prices to demonstrate the range of impact from extreme assumptions about the time of day and seasonality of conservation. Each of the following scenarios assumes a 6 percent nominal interest rate and a 12-year average measure life.

- Flat (all hours) Mid-C prices and flat energy savings for 2001-2022: $1.18 billion
- Heavy load hour (HLH) Mid-C prices and HLH energy savings for 2001-2022: $1.34 billion
- Light load hour (LLH) Mid-C prices and LLH energy savings for 2001-2022: $978 million
- Fiscal year third quarter (Q3) Mid-C prices and Q3 energy savings (approximating a spring load shape) for 2001-2022: $813 million
- Fiscal year Q4 Mid-C prices and Q4 energy savings (approximating a summer load shape) for 2001-2022: $1.18 billion

To estimate the worst feasible outcome, the analysis assumes a 12 percent nominal interest rate (doubled from 6 percent) and a 10-year average measure life (reduced from 12) with flat Mid-C prices and flat energy savings. This scenario results in cost savings totaling approximately $750 million. To estimate the best feasible outcome, the

2 "Purchasing the equivalent amount of energy from the market" is the inverse of "selling the equivalent amount of surplus power into the market." Therefore, the analysis considers as equivalent BPA's ability to avoid power purchases or sell surplus power as a result of energy efficiency investments.

3 All years are BPA fiscal years and for ease of reading a dash between dates denotes "through the end of the fiscal year."

4 For example, commercial lighting is not allowed by federal standards to go back to T12 after it has been switched to T8 electronic; and all white goods such as refrigerators are as efficient or better in subsequent installs.

analysis assumes flat Mid-C prices increase to $40.50 per megawatt-hour in FY 2015 and remain at that price until 2022 (instead of assuming $30). This scenario results in cost savings totaling approximately $1.36 billion.

In addition to the cost savings finding, the analysis also concludes that the relatively stable cash flow associated with a capitalized energy efficiency program helps insulate ratepayers and mitigates risk from the volatile energy market.

Note the analysis considers only cost savings and not rate impacts, i.e., the analysis does not attempt to determine the rate impact of BPA's FY 2001-2011 efficiency investments.

Analysis Methodology

Time Period:

The analysis covers investments from 2001 through 2011 for two reasons.[5]

1. BPA's data on expenditures prior to 2001 are not congruent with the expenditure data from 2001 and beyond because a new financial system (PeopleSoft) was adopted around 2000.
2. The 2000 fiscal year – an anomalous year because of the power crisis – was left out of this analysis to avoid that year's high average market price, which would slightly over emphasize the aggregate benefit of BPA's energy efficiency investments.
3. Fiscal year 2011 is the last year of the analysis because BPA's Tiered Rate Methodology took effect at the start of fiscal year 2012 and the analysis is not applicable under the new rate structure (and for this reason, cannot be replicated going forward).

Key Assumptions:

The analysis is based on the following assumptions/inputs.

1. Nominal dollar amounts are used for annual calculations and a nominal 6 percent discount rate is used to convert nominal dollar figures into present value in year 2011
2. Average life of the energy efficiency measures is 12 years (corresponds to the average measure life from the 6th Power Plan)
3. The number of years for capitalization of energy efficiency investments is pursuant to BPA's capitalization policy, and a nominal interest rate of 6 percent is used (this is the rate used in the BPA Energy Efficiency Action Plan)
4. Only programmatic energy savings (i.e., BPA-funded, utility-funded, market transformation and building codes for 2001-2004[6]) are included
5. Actual Mid-C wholesale prices are used for 2001-2011 (nominal, Dow Jones) and are varied, such as flat, HLH, LLH, and quarterly, to arrive at different cost savings results
6. The shape of the savings from energy efficiency measures are matched to the chosen Mid-C prices
7. Mid-C wholesale prices for 2012-2022 are conservatively assumed to be $20-$30/MWh (nominal)
8. No new energy efficiency investments are made after 2011 but savings continue through 2022

5 The analysis period includes savings thru 2022 because 2011 investments in efficiency measures keep producing energy savings.

6 Cumulative savings from building codes total 33.5 average megawatts for 2001-2004. An explanation for why savings from building codes are no longer considered to be part of programmatic savings after 2004 is provided on page 8 of the 2010 Resource Energy Data (RED book).

9. Price elasticity in the market is assumed to be zero, i.e., the analysis does not consider the market price impact if, in reality, the amount of energy saved had actually been purchased from the Mid-C.
10. Savings persistence rate of zero

Steps Followed:

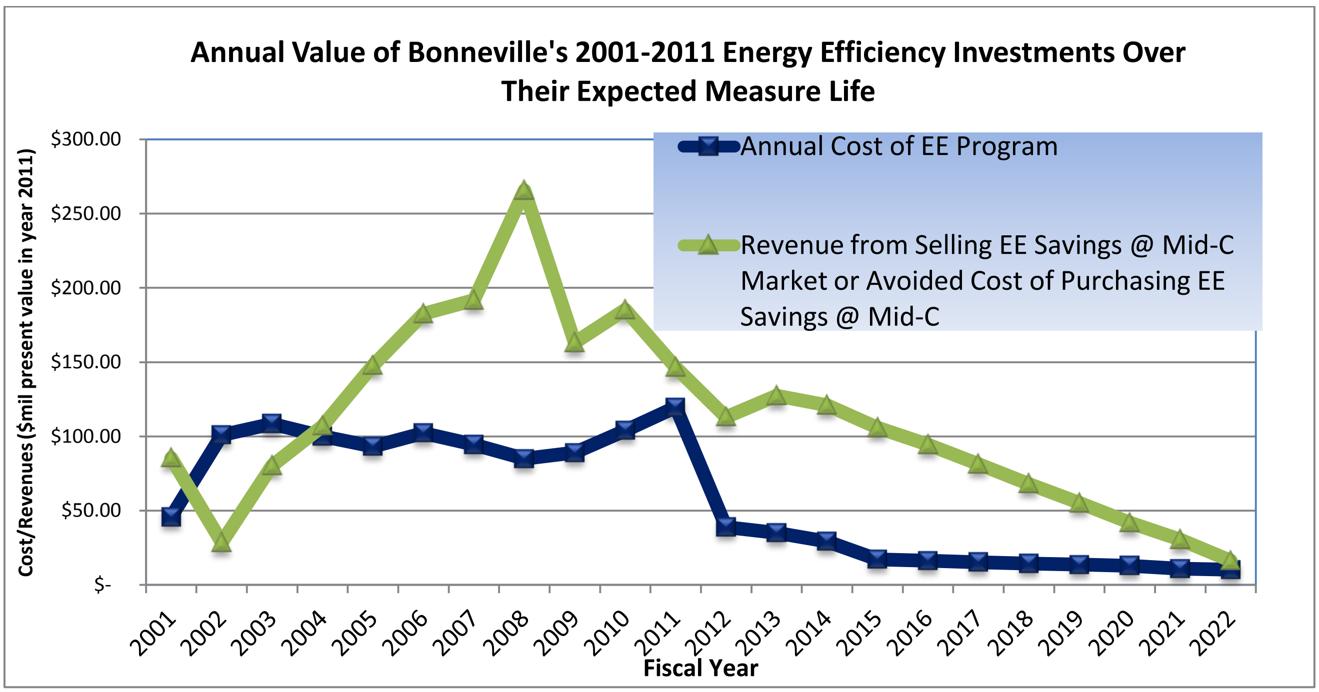
1. Determine the annual cost of BPA's Energy Efficiency program (data provided by Finance). On the capital side, the analysis includes yearly principal and interest paid on EE borrowings since 2001. On the expense side, the analysis includes:
    a. BPA's annual program costs (including acquisition, technology development, net federal reimbursables, low income funding, and market transformation). Debt service and legacy costs are excluded because the analysis ignores the costs for investments made prior to 2001. For this reason, program costs do not line up with costs in EE's Resource Energy Data (RED) book.
    b. BPA's annual staff costs for EE staff (not including supporting staff such as those in personnel and budget or costs associated with leasing workspace and utilities).
2. Determine the cumulative programmatic energy savings from EE investments (aMW per fiscal year). EE's Planning group provided each year's *total* energy savings for 2001-2011 (from BPA's Conservation Resource Energy Data, or the "RED book"). The analysis converts these into cumulative savings for 2001-2022 by assuming a 12-year average measure life, e.g., the 28.8 aMW programmatic savings booked in 2001 are included in the annual cumulative totals for 2001-2012 (12 years).
3. Convert cumulative programmatic energy savings from aMW/year to MWh/year. Cumulative savings are divided by 8,760 for non-leap years and 8,784 for leap years.
4. Determine the fiscal year average Mid-C wholesale price ($/MWh).
    a. Market Analysis and Pricing provided the 2001-2011 annual nominal averages using *Dow Jones* as the source.
    b. For 2012-2022, the analysis uses an assumed $20/MWh for 2012 for a flat block of power for all months and escalates over five years to $30/MWh in 2016-2022. Prices are in nominal dollars and are based loosely[7] on an AURORA price forecast for 2012-2016 and held flat at $30/MWh thereafter.
5. Determine the annual value of the annual cumulative energy savings. The annual value can be thought of as 1) revenue from selling EE savings into the Mid-C wholesale market or 2) avoided cost of purchasing the equivalent amount of power from the Mid-C wholesale market. The analysis calculates the value by multiplying the cumulative energy savings (MWh/yr) by the average Mid-C wholesale price ($/MWh). *This analysis does not attempt to quantify any savings associated with avoided transmission costs, e.g., for transmission infrastructure, or the cost of power purchases if supplied by new generation resources.*
6. Determine the impact on revenue due to the EE program (nominal dollars). The analysis subtracts the annual cost of the EE program from the annual value of the energy saved.
7. Calculate the annual discount factor for converting nominal dollar amounts into present value in year 2011. The analysis uses the assumed nominal 6 percent interest rate.
8. Determine the impact on revenue due to the EE program (net present value in year 2011). The analysis multiplies the annual revenue nominal amount by the annual discount factor.

7 Prices in the analysis are changed slightly from the AURORA price forecast to avoid false precision and to make it clear that the market prices in future years are only estimates for the purposes of this analysis.

9. Determine the net present value *total* impact on revenue due to the EE program (in year 2011). The analysis first calculates the annual impact to BPA's revenue due to the EE program. Then the analysis applies an annual nominal rate of 6 percent a year to bring historic dollars to 2011 values and to discount future dollars to 2011 values.
10. Determine the yearly cost of EE savings ($/MWh). The analysis divides the annual cost of the EE program by the cumulative amount of annual energy savings. This is the final calculation.

Commentary

The graph below compares the annual cost of BPA's EE program and investments to the avoided cost/excess power revenue provided by annual EE savings. The cumulative difference between the two results is a forecast cost savings of approximately **$1.18 billion** (net present value in year 2011, assuming a nominal 6 percent interest rate, flat annual average Mid-C prices, and flat energy savings).[8]



Outliers:

1. The spike of the Revenue (green) line in 2008 is a result of a) a spike in the average Mid-C price to $61.4/MWh and b) eight years of cumulative savings during a year of a high average market price.
2. The spike of the Revenue line in 2010 is a result of being close to the overall peak in cumulative energy savings combined with a higher market price in 2010 than in 2011 or 2012.
3. The spike of the Cost (blue) line in 2010-2011 is a result of the increase in capital costs (vs. expense costs) for savings acquisition.

8 Assumes no new energy efficiency investments after 2011 but savings continue through 2022.

4. The drop off of the Cost line in 2012 is a result of the analysis for 2012 onward containing only decreasing principal and interest paid on EE borrowings since 2001, i.e., no expense costs are included.
5. The Revenue line drops in 2012 due to an assumed market price of $20/MWh, climbs in 2013 and 2014 due to assumed rising market prices of $25 and $28, respectively, and then begins to decline after 2014 as 1) market prices are assumed to stabilize around $30/MWh (nominal dollars) and 2) cumulative energy savings decline after their peak in 2012.

Sensitivity Analysis

High Scenario: If Mid-C prices are changed to $40.5 (i.e., the historical average Mid-C price for 2002-2011) for 2015 to 2022, the absence of energy efficiency investments in 2001-2011 would increase BPA's revenue requirement by approximately $1.36 billion for the 2001-2022 period in real 2011 dollars, assuming a nominal 6 percent interest rate. This result could be considerably higher if carbon prices are adopted regionally or nationally resulting in higher Mid-C prices than the historical average.

Low Scenario: If a) the nominal interest rate is changed to 12 percent instead of 6 percent, b) the average measure life is decreased to 10 years instead of 12 and c) Mid-C prices are held flat at $25 for 2013 and beyond, the absence of energy efficiency investments in 2001-2011 would increase BPA's revenue requirement of approximately $750 million for the period 2001-2022 in real 2011 dollars, assuming a 12% nominal interest rate.

Savings Persistence: A primary assumption underlying the range of cost savings is a measure savings persistence rate of zero, i.e., the analysis assumes efficiency savings "expire" after 12 years. In actuality, for many measures, the savings "persist" as end-users reinstall the measure with something as efficient or better.[9] Assuming instead a persistence percentage of 50%, changes the range of cost savings from $1 billion to $1.7 billion (net present value in year 2011). Assuming instead 90% changes the range of cost savings from $1.2 billion to $1.9 billion.

Other Factors Not Included in the Analysis

The analysis is purposively simplistic and straightforward. As a result, there are a number of factors that could have been taken into consideration that would have impacted the results, mostly in a positive way in terms of showing increased cost savings from energy efficiency. Below are some of those factors not included in the analysis:

- Load shaping. The calculation of cost savings is simplified by utilizing average Mid-C prices in each scenario, but this ignores the load shaping benefit of energy efficiency measures, which tend to reflect positive high load hour benefits (based on 6th Power Plan cost shape curves).
- Transmission and distribution savings. Line losses from transmission and distribution are included in the energy savings totals, but the analysis does not consider the cost savings associated with having to deliver the power that would have been needed in the absence of BPA's investments in energy efficiency, i.e., avoiding any build out of transmission and distribution infrastructure.
- Carbon and other environmental benefits. The analysis does not include carbon dioxide (or other greenhouse gas) reduction benefits from energy efficiency. It also leaves out other environmental benefits.
- Capacity savings. The analysis calculates energy savings, but does not include the capacity savings benefits of energy efficiency, such as any that might be associated with holding fewer reserves.

9 For example, commercial lighting is not allowed by federal standards to go back to T12 after it has been switched to T8 electronic; and all white goods such as refrigerators are as efficient or better in subsequent installs.

A Utility Business Case for Conservation

Introduction:

Many of BPA's utility customers are still examining the implications of the agency's new Tiered Rate Methodology. This makes good business sense under the best of economic conditions. It is even more important when some utilities are facing increased cost pressures and reduced or even negative load growth.

What are the economics of pursing conservation in the Northwest (especially using utility funds above and beyond the amount paid in their Tier 1 rate)?

BPA's analysis below demonstrates the value its utility customers can achieve from investments in conservation under two basic situations a utility typically faces: 1) meeting its entire net requirement at Tier 1 rates and, 2) either purchasing power at a Tier 2 rate from BPA or purchasing nonfederal resources to serve load above what it can purchase at a Tier 1 rate.[10]

This analysis was created as a *general* utility business case for conservation. It is meant to establish a framework for a utility to use to analyze individual financial and rate situations using its own costs and assumptions.[11]

Key Assumptions:

1. The shape of the conservation savings is assumed to avoid a flat block of power.

   Implication: The shape and timing of the conservation may have very significant effects on the rate benefits (or losses) under BPA's Tiered Rates Methodology. Few energy efficiency measures are in a flat block of power so a utility could receive a larger or smaller net benefit depending on the average load shape of the acquired savings. To increase the net benefit, a utility could target conservation measures that tend to save energy during heavy load hours. This flat conservation shape assumption also leads to no change to the utility's demand charge as peak and heavy load hour energy are assumed to be reduced by the same amount. If the conservation is not flat, a utility's net benefit could also be impacted (positively or negatively) by the conservation's impact on the demand charge. For example, if a customer reduces heavy load hour power but does not reduce the demand peak, the customer's demand charge may increase.

2. The utility is paying the costs of conservation acquisition.

   Implication: Given that conservation costs are collected in the Tier 1 rate, 'Situation One' below could show BPA with a levelized cost of conservation (approximately $21 per megawatt-hour) and the utility with the overhead (approximately $6/MWh) for a total of $27.17/MWh. Instead, the example has the utility paying all the costs of conservation, i.e., utility self-funded conservation.

3. BPA PF rates are consistent with the BP-14 Initial Proposal.

   This includes the Tier 1 rate, the weighted average Tier 2 rate, and the load shaping rates.

10Load reduction achieved through conservation would save the utility power purchases at Tier 2 rates if the load were included in the Rate Period High Water Mark process that identifies above-RHWM load. Conservation achieved within the rate period that was not forecast in the RHWM process would be credited at the market forecast load shaping rates.

11 The analysis is primarily relevant to a utility that serves its entire retail load with Tier 1 and/or Tier 2 PF power and is not subject to state regulations that establish a penalty for not doing conservation. In the case of I-937 Washington utilities, the penalty for not meeting conservation goals would substitute for their Tier 1 or Tier 2 rates.

Situation One – Utility A has its entire net requirement served at Tier 1 rates

The retail and wholesale economics of conservation are shown in the table below.[12]

Retail	
Utility A	$/MWh
Levelized Cost of Conservation[/a]	$ (27.17)
Transmission Savings	$ 2.58
Distribution Losses Savings	$ 1.70
Customer Charge Savings (critical shape)[13]	$ 32.03
Load Shaping Credit/(Cost)[/b]	$ (0.24)
Utility Net Benefit	$ 8.90
Wholesale	
BPA Savings	$/MWh
Customer Charge Revenue Change	$ (32.03)
Load Shaping Revenue Change	$ 0.24
Change in Balancing Costs	$ (0.24)
Transmission Revenue Change	$ (2.58)
Forecast Mkt Value of Flat Block[/c]	$ 28.85
BPA Net Benefit[/d]	$ (5.76)
Total Net Benefit	$ 3.14

/a Assumes a levelized cost of conservation of $2.3 million per average megawatt amortized over 12 years at 3.5 percent financing, which is a regional estimate of the utility cost of conservation consisting of: a) utility overhead to administer conservation programs and b) incentives to end-users. Using a levelized cost of conservation allows comparison to BPA or power purchase costs on an annualized basis over the resource life.

/b Assumes conservation is acquired as a flat block.

/c Valued at BP-14 Initial Proposal load shaping rates. Savings could be observed through reduced augmentation costs, which are a slightly different value.

/d This cost/benefit would be shared with all PF customers through a higher/lower Composite Customer Rate or through increased cash reserves and the Slice true-up.

This analysis assumes that Utility A pays $27.17 per megawatt-hourfor conservation. The price of Tier 1 power sold in the shape of BPA's critical system is $32.03/MWh (calculated with BP-14 Initial Proposal rates).[14] Because conservation costs less than Tier 1 power, conservation purchased in place of power sold at Tier 1 saves the utility

12 Retail revenue loss is not factored into the analysis. BPA's utility specific financial impact model does address revenue loss and, therefore, may be a better tool for those utilities interested in understanding the connection between conservation investments and revenue loss.

13 Utility A would experience a decrease in the amount paid to BPA through BPA's customer charges; in this example, BPA's Composite and Non-Slice customer charges.

14 This is an estimated utility "levelized" cost of conservation per MWh assuming a cost of $2.3 million per first year aMW amortized over 12 years at 3.5 percent financing.

money. Additionally, investing in conservation leads to transmission savings of $2.58/MWh and distribution losses savings of $1.70/MWh (assumed to be 5 percent).

The calculation is not that simple, however. The shape of the conservation (the times during the day and year when conservation reduces load) must also be considered in this calculation because conservation will likely not reduce the utility's load in a shape equal to BPA's critical water generation shape (presently 1937 water). BPA uses 24 shaped energy rates (one heavy load hour and one light load hour rate for each month of the year) and 12 demand rates (one for each month of the year) to distinguish the price paid for differently shaped purchases of power at BPA's Tier 1 rates.

Assuming the conservation reduced the utility's load in a flat annual block, the utility would see no impact to its demand charge and a $0.24/MWh increase in its load shaping costs.[15] The increase in load shaping cost occurs because the market price forecast[16] established in the BP-14 rate case results in a flat block of power that has a lower value than an equivalent amount of power sold in the shape of BPA's critical water generation.

Summing these amounts results in a retail net benefit of $8.90/MWh for Utility A.

This $8.90/MWh represents the direct savings for the utility, but there are also *indirect impacts* that result in an increase to the PF Tier 1 rate. While BPA loses a power sale to the utility at the PF Tier 1 rate, all BPA customers observe a benefit or loss based on BPA's ability to sell the conserved power into the market. This results in net benefit if the market value of that power is greater than the lost PF revenue, which has been the case historically. However in this case, because the market forecast used here is less than the Tier 1 rate, the result is a loss.

With the BP-14 market forecast lower than Tier 1, the net cost to Tier 1 rates, as calculated in the table above, is ($5.76)/MWh. This cost would be shared with all public utilities purchasing power at the Tier 1 rate through a higher composite customer rate (if included in the rate case forecast) or through decreased cash reserves and the Slice true-up (if not included in the rate case forecast).

The total net benefit to the utility, if every utility spent the same proportional amount on conservation, is $3.14/MWh. If that spending assumption is not correct, utilities that spend proportionally more on conservation would receive a higher net benefit than those that spend less (as explained in point #4, above).

15 For an explanation of BPA's rate structure, please see our fact sheet: http://www.bpa.gov/news/pubs/FactSheets/fs-201204-bpa-new-tiered-rate-structure-offers-greater-control-over-power-costs.pdf.

16 Market price forecast consistent with the posted Load Shaping rates.

Situation Two – Utility B is exposed to Tier 2

The retail and wholesale economics of conservation that displaces Tier 2 power is shown below:

Retail		
Utility B	$/MWh	
Levelized Cost of Conservation/a	$	(27.17)
Transmission Savings	$	2.58
Distribution Losses Savings	$	2.10
Above RHWM Savings/b	$	39.82
Load Shaping Credit/(Cost)/c	$	-
Utility Net Benefit	$	17.33
Wholesale		
BPA Savings	$/MWh	
TOCA Revenue Change	$	-
Load Shaping Revenue Change	$	-
Tier 2 Costs	$	39.82
Tier 2 Revenue	$	(39.82)
Transmission Revenue Change	$	(2.58)
BPA Net Benefit	$	(2.58)
Total Net Benefit	$	14.75

/a Assumes a levelized cost of conservation of $2.3 million per average megawatt amortized over 12 years at 3.5 percent financing, which is a regional estimate of the utility cost of conservation consisting of a) utility overhead to administer conservation programs and b) incentives to end users. Using a levelized cost of conservation allows comparison to BPA or power purchase costs on an annualized basis over the resource life.

/b Assumes savings at weighed average Tier 2 rate for BP-14 Initial Proposal. Actual observed savings would depend on above-RHWM election and the cost of the power purchased consistent with that election.

/c Assumes conservation is acquired as a flat block.

As in the first situation, Utility B pays $27.17/MWh for conservation, which, in this case, avoids Tier 2 cost of power. The weighted average Tier 2 rate in the BP-14 Initial Proposal is $39.82/MWh. Additionally, investing in conservation leads to transmission savings of $2.58/MWh and distribution losses savings of $2.10/MWh (assumed to be 5 percent).[17]

Assuming the conservation is a flat annual block, the utility would see no impact to its demand or load shaping charges. (The load shaping charge remains unchanged because above rate period high water mark load is served with a flat annual block.)

17 Distribution costs are different between the two situations because of the different price of power between the two, i.e., power in the first is valued at PF Tier 1 and power in the second is valued at PF Tier 2.

Summing these values results in a retail net benefit of $17.33/MWh for Utility B.

Unlike the first situation, BPA would gain no indirect benefits or losses from the avoided power sale. BPA loses a sale of power at the PF Tier 2 rate but foregoes a market purchase at the same cost. BPA, however, would experience a transmission revenue loss of $2.58/MWh.

Note: The added total net benefit observed in Situation Two is a result of using two different market values. The market value used in Situation One uses the load shaping rates; the market value used in Situation Two uses the average Tier 2 rate. If those market values were equal, the total net benefit in the two cases would be the same.

BPA's point of view

From BPA's perspective, in Situation One, utility investment in conservation leads to a net loss for BPA when market prices are below the PF rate, as forecast in the BP-14 Initial Proposal. However, when market prices are above the PF rate and a utility still purchasing power at Tier 1 rates acquires conservation, BPA is able to avoid a purchase or is able to sell as surplus the power its customers save. When BPA suffers a net loss – even though utilities acquiring conservation benefit and the total net benefit remains positive – there is a wholesale rate impact. The implications of this impact are dependent upon market price assumptions and to what degree conservation is seen as a form of insurance against future higher market prices.

In Situation Two, BPA receives zero power benefit or cost (and suffers a loss of transmission revenue) when customers purchasing at the Tier 2 rate acquire conservation because the utility keeps any savings BPA might derive from avoiding Tier 2 purchases or any income the agency might make from selling surplus power produced by conservation. This makes the price incentive to customers stronger because they don't have to "share" the benefits with other customers as they do in the first case.

Retail rate impact of conservation

Cost effective conservation will lower a utility's costs but may put upward pressure on retail rates depending on the relative cost of conservation compared to power supply costs as well as how rates and charges are constructed for revenue requirements.

As with the wholesale impact, the potential increase in retail rates should not detract significantly from end-user customers' overall cost savings.

Supporting Points for: A Utility Business Case for Conservation

BPA's "A Utility Business Case for Conservation" analysis considers conservation investments from a retail and wholesale *economic* perspective. This document contains additional points in support of investing in conservation that should be considered alongside the "Business Case" analysis. This paper can also act as a stand-alone document in support of conservation.

1. Market price expectations. Unless the wholesale power market has prices below the cost of conservation, which has rarely been the case,18 investing in conservation provides an economic net benefit to the utility and retail consumers. If future power prices increase, conservation becomes an even better financial investment. In this way, conservation can be viewed as an insurance policy/hedge against higher power market prices in the future.
2. Customer satisfaction. Utility end-use consumer satisfaction is driven by many factors, primarily service reliability and price (the size of the power bill). However, offering and promoting energy efficiency programs can have a demonstrable impact on overall customer satisfaction. As stated in a 2011 technical brief by the State and Local Energy Efficiency Action Network:

"The available data consistently indicate that utility customer satisfaction increases as customers become more familiar with efficiency programs offered by the utility, even when the customer does not actually participate in those programs…Utilities, consumer advocates, and regulators should become familiar with the evidence that energy efficiency programs and services contribute significantly toward higher customer satisfaction."[19]

Furthermore, price satisfaction (one of six factors examined by J.D. Power and Associates during its annual Electric Utility Residential Customer Satisfaction Study20) is driven by monthly bill amounts, not rates, which most consumers do not track or fully understand. Conservation can lead to improved customer satisfaction by lowering bill amounts. The availability of utility conservation programs can also provide consumers with a sense of control over the size of their power bills and, therefore, with a higher satisfaction with their service provider.

3. Lost revenues. Historically, the "lost revenue" impact has been seen as a disincentive to acquire conservation. Utilities have several options for addressing the loss of revenues used to cover fixed costs. Utilities could adjust their forecast of future revenue requirements based on expected retail sales after accounting for conservation. This minimizes the potential for revenue shortfalls caused by conservation because it recognizes expected reductions before rates are set. Alternatively, utilities can adjust their rate designs so that most, or all, of their fixed costs are covered by the meter fees or customer charge and/or kilowatt-hour charges for the first rate blocks in a tiered rate construct (this is, however, often easier said than done).

18 Tom Eckman, Northwest Power and Conservation Council, http://www.aceee.org/files/pdf/conferences/mt/2013/Tom%20Eckman_Welcome%20and%20Plenary.pdf, slide 11.

19 State and Local Energy Efficiency Action Network, "Impacts of Energy Efficiency Programs on Customer Satisfaction," Technical Brief, October 2011, http://www1.eere.energy.gov/seeaction/pdfs/ratepayer_efficiency_customersatisfaction.pdf.

20 http://www.jdpower.com/content/press-release/d7cFGW5/2012-electric-utility-residential-customer-satisfaction-study.htm

One strategy used by many utilities is to offer a wide range of conservation measures to their customers. In this way, the utilities help encourage participation rates and diminish the number of nonparticipants. It is essentially only those who do not take advantage of conservation measures who are disadvantaged by lost revenues.[21]

4. Participants and nonparticipants. On both the wholesale and retail levels, benefits and costs accrue differently between participants and non-participants. On the retail level, in times when the avoided cost, or value of the saved power is low, such as in today's market conditions, investing in conservation can result in upward rate pressure. For participants, (i.e., those end-use consumers that either invest in conservation on their own or through a utility program), the higher rate is mitigated by not having to purchase as many kWhs. Nonparticipants (i.e., those end-use consumers (or utilities) that neither invest in conservation on their own nor through a utility program), on the other hand, purchase the same amount of kWhs but at a higher rate.

   Similarly, on the wholesale level, when the market price of power is lower than BPA's PF rate (and, therefore, there is a net cost to BPA from utilities purchasing less from Tier 1), retail utilities are faced with the same participant and nonparticipant impacts. If the PF rate increases and the utility does not invest in conservation, the utility will be paying a higher rate for the same amount of MWhs. Participant utilities, on the other hand, will be purchasing fewer MWhs from BPA but at a higher rate.

5. Lost opportunities. Even if a utility has slow or no load growth and expects to have Tier 1 headroom for the foreseeable future, the acquisition of energy efficiency measures – especially those with long measure lives that have a levelized cost below the expected cost of tomorrow's Tier 1 and Tier 2 – can still be justified. For example, new residences and commercial buildings can be expected to survive 50 to 100 years. Ensuring that such structures are energy efficient makes economic sense because they will be consuming electricity for many years beyond the time the utility exceeds its Tier 1 allocation (assuming the same rate design post-2028).

6. Cumulative benefits of conservation. If the utility's levelized cost of conservation is lower than the Tier 1 rate or Tier 2 market prices, acquiring conservation allows a utility to meet its load obligations with the cheapest resource. Additionally, there is a cumulative benefit in acquiring conservation. For example, 1 MWh of conservation acquired today translates into 1 MWh that does not need to be purchased for the duration of the life of the measures while market purchases of the 1 MWh would have to be made every year. This cumulative effect helps the utility justify the high first year costs of conservation if the utility expenses conservation because, at some point, cumulative market purchases will surpass the first year costs of acquiring the initial conservation. The utility would want to perform a net present value analysis to fully assess the benefits.

7. Carbon impacts. Since baseload power generation resources at the margin are often fossil fueled, conservation avoids carbon emissions and, therefore, helps avoid future carbon costs imposed by regulators. Plus, because BPA's power is very clean, our sales into California, which does have a carbon market, fetch a premium indirectly based on the price of carbon determined by regular auctions. Those auctions have a floor price of about $10.60/ton (increasing each year) and have recently cleared at a few dollars per ton above that. A price of $12/ton translates into roughly a $6/MWh premium. Any premium increases BPA's secondary

21 Because most utilities charge large commercial and industrial consumers separate energy and capacity costs, there are few lost revenues from EE done with these customers, but the issue may be relevant for smaller end users. Large commercial and industrial retail rates generally have separate charges for energy, demand, and fixed facilities (meter and other delivery) costs. The energy charge typically doesn't include distribution costs. Because large commercial and industrial consumers take power at high voltages, they also have much lower distribution costs per MWh than do small consumers. When large consumers' use declines, most if not all, of the utility's fixed costs are still paid. This is not completely true, as some fixed costs may be in the energy charge that may not be recovered from fuel savings or surplus sales when the market is low. Regardless, the issue is of less concern for large consumers. Small consumers' rates, on the other hand, collect most revenues for distribution system costs in the kWh rate, so reduced use by these customers causes revenue loss to the utility.

revenues, which, in turn, helps to offset BPA costs that otherwise would appear in PF rates. This benefit is, however, spread across all customers so the net benefit to the customer investing in the conservation may be small.

8. Other benefits of conservation.
    a. Operations & Maintenance savings – Many conservation measures reduce end-users' O&M costs, such as longer replacement times for lighting.
    b. Improved living/work conditions — Conservation measures can improve productivity in businesses and improve health and comfort for residential customers.
    c. Service territory economic development – Consumers' savings on energy are returned to the community as extra spending on other activities that boost the economy. Furthermore, support for and installation of conservation measures has direct employment benefits.
    d. Transmission and distribution savings – Conservation may allow more consumers per feeder or substation and can avoid new transmission and distribution construction.
    e. Avoided losses – Electrical losses are included as part of energy savings. However, reduced losses during peak hours are generally much higher than the average loss factors used in BPA's calculations and may be as much as 25% of the energy saved. This benefit will show up as reduced load shaping charges to the customer.
    f. Staying out of Tier 2 – Conservation acquisition can allow utilities to "stretch" their Tier 1 power and avoid having to pay higher priced Tier 2 power.
    g. Reduced Renewable Portfolio Standard (RPS) compliance costs – For utilities with RPS compliance obligations, now or in the future, each kWh of conservation will avoid a percentage amount of more expensive purchases of renewable power. This is a direct savings to utilities and consumers. In addition, special provisions in Washington State's I-937 allow utilities to use a lower threshold for satisfying state RPS requirements if a utility has three years of zero load growth.