Better Buildings, Better Economy: An Economic Impact Analysis of a Federal Retrofit Program

Matthew Koson, Evergreen Economics, Portland, OR
Stephen Grover, Evergreen Economics, Portland, OR
Sarah Monohon, Evergreen Economics, Portland, OR
Edward Vine, Lawrence Berkeley National Laboratory, Berkeley, CA

ABSTRACT

This paper presents the results of the economic impact analysis conducted as part of the final impact evaluation of the Better Buildings Neighborhood Program (BBNP).[1] Sections of the paper describe BBNP, key economic impact metrics associated with the program, our analysis methodology, model inputs, and detailed findings. Our analysis indicates that BBNP generated positive economic impacts that exceeded the cost of program implementation under two counterfactual spending scenarios. The results of this analysis will be of interest to government policy makers, and energy service industry professionals that are interested in understanding the economic implications (and estimation methods) associated with energy efficiency programs, including job creation.

Introduction

The Better Buildings Neighborhood Program was an energy efficiency program administered by the U.S. Department of Energy's (DOE's) Office of Energy Efficiency and Renewable Energy and funded through the American Recovery and Reinvestment Act of 2009 (ARRA). Beginning in 2010, the program allocated approximately $508 million among 41 grantees representing state and local governments, as well as local community organizations throughout the United States. In turn, these entities worked with nonprofits, energy efficiency professionals, financial institutions, and utilities to develop community-based programs and incentives for residential and non-residential building upgrades. All grant recipients' programs were broadly designed around three common purposes: (1) to obtain high-quality retrofits resulting in significant energy improvements (retrofits also described as whole building or comprehensive), (2) to incorporate a viable strategy for program sustainability, which DOE defined as continuing beyond the grant period without additional federal funding, and (3) to fundamentally and permanently transform energy markets to make energy efficiency and renewable energy the options of first choice. On a grantee level, energy upgrade goals varied from 200 to 35,000 upgrades and grants ranged from one to forty million dollars. Likewise, total energy savings varied among grantees; however, the program required that each grantee attain an overall level of energy savings greater than or equal to fifteen percent of pre-retrofit consumption. This paper presents the results of a final economic impact analysis of the BBNP on the United States' economy.

In order to quantify key metrics including employment effects, economic output, income (personal and business), and tax revenue, we used the IMPLAN input-output model and data furnished by BBNP grantees and the National Renewable Energy Laboratory (NREL). The NREL data largely drew from grantee submitted documents, but corrected for erroneous entries where possible.

For this analysis, gross impacts are calculated and then compared against two feasible counterfactual spending scenarios. The first assumes the funds that were used to support program activities and incentives are spent on other non-defense government expenditures. The second base case scenario assumes that all funds are returned to taxpayers and spent according to historical household

[1] Peer review group members, please note that our team is currently revising the final impact evaluation for this program, as such, the numbers presented here only provide a rough estimate of the total economic impacts attributable to BBNP.

spending patterns. The difference in economic impacts attributed to the BBNP and the base case scenario are referred to as net impacts.

In addition to the economic benefits that occur with the initial equipment expenditures, energy bill savings will continue to benefit program participants beyond the first year of measure implementation. Consequently, this analysis also estimates the economic and fiscal impacts associated with energy savings that continue in the future.

Key Findings

Our analysis indicates that BBNP investments in energy efficiency have resulted in energy savings, increased economic output, personal income, jobs, and state, local and federal taxes over the program evaluation period. As shown in Table 1, between Q4 2010 and Q3 2013 we estimate that the program resulted in the following net impacts using the government spending counterfactual:

- Over $1.3 billion in economic output, including $230.2 million in wages to laborers and $129.4 million in increased tax revenues;
- Over 10,000 full-time equivalent (FTE) years of employment over the program period;

Using the alternate, taxpayer counterfactual scenario, we estimate that BBNP resulted in:

- Over $1.3 billion in economic output, including $398.1 million in wages to laborers and $143.9 million in increased tax revenues;
- Over 9,000 full-time equivalent years of employment over the program period;

Table 1: Total Gross and Net Economic Impacts ($ millions)

		Net	
Impact Measure	Gross	Government Spending Counterfactual	Taxpayer Spending Counterfactual
Output	$2,097.1	$1,345.0	$1,385.1
Personal Income	$631.5	$230.2	$398.1
Jobs (FTEs)	13,333	10,191	9,189
State and Local Taxes	$83.8	$48.6	$40.1
Federal Taxes	$160.7	$80.8	$103.8

The remainder of this paper documents the analysis that was completed to develop these economic impact estimates including analysis methodology, model input data, detailed results, and ending with a brief conclusion.

Methodology

This analysis estimates the short-term economic impacts associated with the BBNP efficiency programs. These impacts are driven by changes (both positive and negative) in final demand, and are estimated within a static input-output modeling framework that relies on data for an economy at a point in time and assumes that program spending does not affect the evolution of the state economy. Energy efficiency programs may have longer lasting effects, and this is clearly the case for continued energy savings beyond the end of the program, however, these long-term, dynamic effects are not estimated in this analysis.

Input-output analysis employs specific terminology to identify the different types of economic impacts. Energy efficiency programs affect the country *directly*, through the purchases of goods and services within the US, and *indirectly*, through the purchases of intermediate goods and services from related sectors of the economy. Specific direct impacts include spending by staff administering the

energy efficiency programs, manufacturers and contractors that produce and install the energy efficient equipment, and changes in spending or output attributed to energy bill savings for households and businesses participating in the BBNP. In addition, the direct and indirect increases in employment and income enhance overall economic purchasing power, thereby inducing further economic impacts as households increase spending and businesses increase investment. This cycle continues until the spending eventually leaks out of the regional economy as a result of taxes, savings, or purchases of non-locally produced goods and services.

Within this framework, the IMPLAN model reports impact measures including the following:

- *Output* is the value of production for a specified period of time. Output is the broadest measure of economic activity, and includes intermediate goods and services and the components of value added (personal income, other income, and indirect business taxes).
- *Personal income* includes workers' wages and salaries, as well as other benefits such as health and life insurance, and retirement payments, and non-cash compensation.
- *Business income* is also called proprietor income (or small business income) and represents the payments received by small-business owners or self-employed workers[2]
- *Jobs* include both full- and part-time employment. These job impacts are measured in person-years of employment, and reported as FTEs.

Given the static nature of the input-output model used in this analysis, it is important to note that the cumulative impacts presented do not take into account changes in production and business processes that businesses make in anticipation of future increased energy prices and/or competition to increase production efficiency. To the extent that US businesses are already adjusting in anticipation of these factors, the cumulative impacts presented here may be overstated, as the overall market would become more efficient due to factors outside program influence.

The cumulative numbers also rely on the critical assumption that each dollar saved will translate into a dollar of increased economic output for those businesses adopting conservation measures. This assumption conforms to findings in previous research conducted by Evergreen staff,[3] and is reasonable in the short run. In the long run, however, it is likely that a dollar of energy savings will translate to less than a dollar of increased economic output as the businesses adopt more efficient production practices. Despite these caveats, there is a strong case that the ongoing and cumulative effect of conservation due to energy efficiency program activities is nevertheless a significant net benefit to the national economy.

Gross and Net Economic Impacts

For this analysis, gross impacts refer to economic impacts that do not include a counterfactual base case scenario that compares alternative uses of program funding. The gross impacts are calculated based on the annual program spending and energy savings discussed below. These input parameters are then compared against a counterfactual spending scenario that assumes all program funding is spent on an equivalent amount of other government expenditures or household goods following historical purchase patterns. These historical purchases patterns are derived from 2010 data published by federal government agencies (including the Bureau of Economic Analysis and Bureau of Labor Statistics) that summarize all domestic economic activity in a "social accounting system". The social account systems describe transactions that occur between producers, and intermediate and final consumers using a Social Accounting Matrix. The difference between the gross economic impacts resultant to the BBNP and the base case scenario impacts is referred to as net impacts.

[2] Large businesses are difficult to keep track of as corporations are owned by shareholders not necessarily located in the US, and often have complex corporate structures. Therefore much like imports and taxes, corporate profits are treated as a leakage in IMPLAN.

[3] For more information please see "Washington Western Climate Initiative Economic Impact Analysis" http://www.ecy.wa.gov/climatechange/docs/20100707_wci_econanalysis.pdf.

For the portfolio of BBNP grantee programs, specific gross spending impacts include:

- Program administration as program implementers incur administrative costs and purchase labor and materials to carry out energy efficiency programs.
- Purchases of efficiency measures.
- Reductions in energy consumption and the associated increase in household disposable income and lower operating costs for businesses.
    - For residential program participants, lower energy costs will increase household disposable income, which is assumed to be spent following historical purchase patterns from 2010.
    - For businesses, energy savings lowers production costs, which, in the short run, leads to increases productivity.
- Energy savings begin to accrue on a quarterly basis after energy efficiency measures have been installed and continue into future quarters.
- The efficiency gains result in a loss of utility revenues due to lower fuel sales.

Data

Outlays

For this analysis, data relating to the BBNP were provided by program grantees, in the form of quarterly submissions, and by NREL, who provided cleaned datasets based on the grantee submissions. The data were then aggregated into three general outlay categories to facilitate our modeling efforts. For contextual purposes, Table 2 shows the distribution of program spending for residential and non-residential customers through the program period. Between Q4 2010 and Q3 2013, total program outlays by BBNP grantees amounted to approximately $445.2 million (87.6 percent of total funds granted).

Table 2: Total Grantee Outlays During Program Period ($ millions)

Quarter / Year	Marketing & Outreach (M&O)	Labor & Materials Cost (L&M)	Other	Total Outlays
Q4 2010	$2.1	$2.1	$12.1	$16.3
Q1 2011	$4.3	$1.5	$12.2	$18.1
Q2 2011	$6.4	$10.9	$26.1	$43.5
Q3 2011	$6.7	$6.9	$26.8	$40.4
Q4 2011	$6.7	$6.0	$32.1	$44.8
Q1 2012	$12.9	$5.8	$23.8	$42.5
Q2 2012	$6.4	$9.8	$25.3	$41.4
Q3 2012	$5.4	$14.1	$22.4	$41.9
Q4 2012	$5.4	$15.0	$25.4	$45.7
Q1 2013	$3.7	$12.4	$17.1	$33.2
Q2 2013	$5.7	$15.4	$20.4	$41.5
Q3 2013	$5.3	$16.9	$13.8	$36.0
Total All Quarters	$71.0	$116.7	$257.3	$445.2

The data and modeling assumptions for each major outlay category is discussed below.

- **Marketing and Outreach (M&O)** outlays amounted to $71 million over the Q4 2010 through Q3 2013 time period. This represents 16 percent of total outlays over the 12 quarters. M&O outlays consist of "grant outlays for communications activities designed to identify, reach and motivate potential program participants to take actions to either learn more (e.g. audit or other informational activity) energy efficiency or initiate an energy efficiency retrofit at the

PROGRAM level."[4] Total M&O outlays are reported by grantee for each quarter. These are summarized and reported in Table 2.

- **Labor and Materials (L&M)** outlays totaled $116.7 million (or 26.2 percent of total outlays) over the Q4 2010 through Q3 2013 period. According to BBNP reporting instructions, L&M outlays are "Outlays incurred as part of an audit or retrofit directly associated with the installation of more energy efficient equipment, appliances, or building components (e.g. insulation, windows, etc.) at the PROGRAM level."[5]
- **Other** outlays totaled $257.3 million (or 57.8 percent of total outlays) between Q4 2010 and Q3 2013. Other outlays consist of "Other program grant outlays at the PROGRAM level not classified as materials, labor, marketing, or outreach…(they) represent actual grant funds spent on program delivery and any associated incentives or loans issued during the quarter." BBNP reporting includes total other outlays, by grantee and quarter. It does not, however, include additional information that would enable us to divide outlays among program incentives and program delivery costs, or to better understand the exact nature of program delivery costs. As such, this analysis relies on energy efficiency program cost data from the US Energy Information Administration for 2012.[6]

Measure Spending

Our analysis also considered equipment spending by residential and commercial program participants. Table 3 summarizes the BBNP retrofit activities including the number of, and total spending on retrofits by residential and commercial program participants.

Table 3: Summary of Measure Spending for Residential and Commercial Retrofits

	Residential Retrofits			Commercial Retrofits			All Retrofits
Quarter / Year	Number of Retrofits	Weighted Average Invoiced Cost	Total Invoiced Costs ($ millions)	Number of Retrofits	Weighted Average Invoiced Cost	Total Invoiced Costs ($ millions)	Total Invoiced Costs ($ millions)
Q4 2010	4,195	$8,575	$36.0	45	$10,181	$0.5	$36.4
Q1 2011	4,247	$7,339	$31.2	107	$7,748	$0.8	$32.0
Q2 2011	4,060	$6,266	$25.4	134	$17,796	$2.4	$27.8
Q3 2011	4,579	$7,352	$33.7	219	$72,120	$15.8	$49.5
Q4 2011	5,177	$6,989	$36.2	370	$54,545	$20.2	$56.4
Q1 2012	6,108	$7,173	$43.8	355	$48,073	$17.1	$60.9
Q2 2012	8,862	$6,275	$55.6	357	$37,752	$13.5	$69.1
Q3 2012	10,319	$6,493	$67.0	409	$62,928	$25.7	$92.7
Q4 2012	14,195	$6,313	$89.6	465	$58,197	$27.1	$116.7
Q1 2013	13,834	$6,487	$89.7	517	$85,267	$44.1	$133.8
Q2 2013	14,042	$6,432	$90.3	393	$63,652	$25.0	$115.3
Q3 2013	15,167	$5,950	$90.2	353	$83,037	$29.3	$119.6
Total All Quarters	104,785	$6,573	$688.8	3,724	$59,452	$221.4	$910.2

[4] From the Quarterly Programmatic spreadsheet of the Detailed Quarterly Program Reports.
[5] Ibid.
[6] U.S. Energy Information Administration's (EIA's) *Annual Electric Power Industry Report*, 2012, Survey Form EIA-861, File 3A. According to the EIA, direct costs are "The cost for implementing energy efficiency programs (in thousand dollars) incurred by the utility." Incentive costs or payment represent a "Payment by the utility to the customer for energy efficiency incentives. Examples of incentives are zero or low-interest loans, rebates, and direct installation of low cost measures, such as water heater wraps or duct work." Lastly, indirect costs are "A utility cost that may not be meaningfully identified with any particular DSM program category. Indirect costs could be attributable to one of several accounting cost categories (i.e., Administrative, Marketing, Monitoring & Evaluation, Utility-Earned Incentives, Other)."

According to calculations made using data from the Quarterly Summary Reports, we estimate that the BBNP supported approximately $688.8 million in residential retrofits and $221.4 million in commercial retrofits by program participants.

Energy Savings

Taking into account verified energy savings for both residential and business customers from energy efficiency measures installed by program participants, BBNP will generate an estimated $41.5 million in annual net energy cost savings. These savings values were verified using a blend of M&V and billing regression analysis activities.

Table 4: Energy Savings, by Fuel Type, and Estimated Annual Cost Savings

Quarter / Year	Electricity (kWh)	Natural Gas (therms)	Heating Oil (gallons)	LPG (gallons)	Kerosene (gallons)	Estimated Annual Cost Savings ($ millions)
Q4 2010	1,965,348	347,884	430,472	966	0	$2.3
Q1 2011	4,010,656	536,584	126,545	1,589	0	$1.6
Q2 2011	4,763,523	415,534	153,531	3,462	338	$1.7
Q3 2011	9,409,680	538,530	197,876	8,928	194	$2.5
Q4 2011	12,058,105	747,971	40,537	52,809	66	$2.6
Q1 2012	17,438,294	937,618	47,379	12,218	152	$3.3
Q2 2012	13,940,213	835,641	106,818	10,488	295	$3.0
Q3 2012	16,631,263	950,782	123,958	23,465	503	$3.6
Q4 2012	22,148,032	1,504,441	276,690	20,399	774	$5.5
Q1 2013	24,363,939	1,658,274	275,201	15,889	460	$5.9
Q2 2013	16,607,331	1,338,261	201,952	24,242	211	$4.3
Q3 2013	28,057,508	1,241,777	92,943	10,662	482	$5.1
Total All Quarters	171,393,894	11,053,295	2,073,901	185,115	3,475	$41.5

Detailed Findings

Gross, Counterfactual, and Net Economic Impacts

Table 5 shows the total gross economic impacts resulting from program and measure spending on residential and commercial efficiency programs within BBNP from Q4 2010 to Q3 2013. Over this twelve-quarter program period, we estimate that the program had the gross effect of increasing economic output by over $2.1 billion. This includes $631.5 million in personal income and 13,333 person years of employment. Additionally, Table 5 illustrates the increasing trend of all key metrics due to increases in program and measure spending over time.

Table 5: Total Gross Economic and Fiscal Impacts by Quarter ($ millions)

Quarter / Year	Output	Personal Income	Jobs (FTEs)	State and Local Taxes	Federal Taxes
Q4 2010	$90.2	$26.4	707	$3.9	$7.8
Q1 2011	$100.4	$29.8	636	$4.3	$7.8
Q2 2011	$108.8	$35.2	725	$4.6	$8.8
Q3 2011	$156.2	$48.6	1,006	$6.7	$12.3
Q4 2011	$181.5	$56.8	1,169	$7.8	$14.3

Q1 2012	$195.4	$60.4	1,276	$8.3	$15.3
Q2 2012	$180.5	$54.8	1,131	$7.7	$14.1
Q3 2012	$197.4	$58.8	1,217	$7.6	$14.7
Q4 2012	$230.8	$67.9	1,423	$8.7	$17.1
Q1 2013	$239.1	$69.2	1,442	$8.9	$17.5
Q2 2013	$215.5	$64.2	1,343	$8.0	$16.1
Q3 2013	$201.3	$59.5	1,257	$7.3	$14.9
Total All Quarters	$2,097.1	$631.5	13,333	$83.8	$160.7

Similarly, Table 6 shows the economic impacts resulting from a counterfactual scenario where BBNP does not exist and instead program funding is allocated to other, non-defense federal expenditures. If spent according to historical purchase patterns, the $445 million in BBNP funds results in an estimated $752 million in economic output, including $401.4 million in personal income, and over 3,100 jobs. The difference between the gross impact estimates and counterfactual impacts is referred to as net impacts, and these estimates are presented in Table 7.

Table 6: Total Counterfactual Economic and Fiscal Impacts by Quarter ($ millions)

Quarter / Year	Output	Personal Income	Jobs (FTEs)	State and Local Taxes	Federal Taxes
Q4 2010	$27.5	$14.7	120	$1.5	$3.8
Q1 2011	$30.5	$16.3	129	$1.6	$3.3
Q2 2011	$73.4	$39.2	311	$3.3	$7.6
Q3 2011	$68.2	$36.4	289	$3.3	$7.2
Q4 2011	$75.6	$40.4	320	$3.8	$8.0
Q1 2012	$71.8	$38.3	299	$3.7	$7.7
Q2 2012	$70.0	$37.3	291	$3.7	$7.6
Q3 2012	$70.8	$37.8	295	$3.0	$7.3
Q4 2012	$77.3	$41.2	322	$3.3	$8.0
Q1 2013	$56.0	$29.9	230	$2.4	$5.8
Q2 2013	$70.1	$37.4	287	$3.0	$7.2
Q3 2013	$60.7	$32.4	249	$2.6	$6.3
Total All Quarters	$752.0	$401.4	3,142	$35.3	$79.9

Much like gross impacts, net impacts include program spending by grantees, measure spending by program participants, and energy savings resulting from the implementation of efficiency measures as inputs, however, net impacts also take into account the next best use of funds and deduct the impacts resulting from this counterfactual from the total. Table 7 notes the net impacts of BBNP between Q4 2010 and Q3 2013. In total, we estimate that BBNP supported over $1.3 billion in increased economic output, including $230.2 million in personal income, and 10,191 jobs.

Table 7: Total Net Economic and Fiscal Impacts by Quarter ($ millions)

Quarter / Year	Output	Personal Income	Jobs (FTEs)	State and Local Taxes	Federal Taxes
Q4 2010	$62.7	$11.7	586	$2.4	$4.0
Q1 2011	$69.9	$13.5	507	$2.7	$4.4
Q2 2011	$35.4	-$3.9	414	$1.3	$1.2
Q3 2011	$88.0	$12.2	717	$3.3	$5.1
Q4 2011	$105.9	$16.4	849	$4.0	$6.3
Q1 2012	$123.6	$22.1	977	$4.7	$7.7
Q2 2012	$110.6	$17.4	840	$4.0	$6.5
Q3 2012	$126.6	$21.0	923	$4.5	$7.4
Q4 2012	$153.5	$26.6	1,101	$5.4	$9.1

Q1 2013	$183.0	$39.3	1,213	$6.5	$11.7
Q2 2013	$145.4	$26.8	1,056	$5.0	$8.9
Q3 2013	$140.5	$27.0	1,008	$4.7	$8.6
Total All Quarters	$1,345.0	$230.2	10,191	$48.6	$80.8

Alternate Counterfactual Scenario Impacts

As the ARRA funds used to support BBNP were ultimately financed by tax revenue, the team modeled net impacts with an alternate counterfactual scenario where the moneys used to fund the program were instead re-distributed to taxpayers and spent according to 2010 spending patterns. As it was unclear which income bracket households belonged to, total program spending was redistributed to households of all income levels. The net impacts estimated using this alternate counterfactual scenario are reported in Table 8.

Table 8: Total Net Economic and Fiscal Impacts using Alternate Taxpayer Counterfactual ($ millions)

Quarter / Year	Output	Personal Income	Jobs (FTEs)	State and Local Taxes	Federal Taxes
Q4 2010	$64.1	$17.9	548	$2.1	$4.8
Q1 2011	$71.5	$20.3	465	$2.3	$5.4
Q2 2011	$39.3	$12.4	315	$0.5	$3.4
Q3 2011	$91.6	$27.4	625	$2.6	$7.2
Q4 2011	$109.9	$33.3	747	$3.1	$8.6
Q1 2012	$127.4	$38.2	882	$3.8	$9.9
Q2 2012	$114.3	$33.0	747	$3.2	$8.6
Q3 2012	$130.3	$36.8	829	$3.7	$9.6
Q4 2012	$157.6	$43.9	999	$4.5	$11.5
Q1 2013	$186.0	$51.8	1,139	$5.8	$13.4
Q2 2013	$149.2	$42.4	964	$4.2	$11.0
Q3 2013	$143.8	$40.6	929	$4.1	$10.5
Total All Quarters	$1,385.1	$398.1	9,189	$40.1	$103.8

Utilizing this alternate counterfactual, the team found most of the net impacts were greater using than in the previous model where BBNP funds were spent on other federal non-defense spending. The differences in economic impacts were largely due to households importing relatively more goods and services on a per dollar basis than an equivalent amount of federal spending. This means that the economic multipliers associated with spending by the federal government are, on average, larger than those associated with households. This results in larger counterfactual impacts and smaller net impacts. The exception to this trend is employment, which is significantly higher in the government spending counterfactual scenario (11,191 jobs) than in the alternate, taxpayer spending scenario (9,189 jobs). This is due to fewer workers employed per dollar spent by the federal government, than in the private sector, and may be due to factors such as more comprehensive benefits, or higher overhead costs. Regardless, each scenario yields positive net impacts, which indicates that BBNP was a more efficient use of funds than either counterfactual. As we demonstrate in the next section, the economic benefits associated with energy savings are one of the key factors driving these net impacts.

Cumulative Energy Savings and Energy Savings Economic Impacts

Project installations occur in the same year that the equipment and program costs are incurred, energy savings from the new equipment will extend into future years beyond the initial installation. As a consequence, the energy cost savings for homes and businesses also extend into future years (with some degradation as equipment ages). These energy cost savings continue to benefit the economy as

households spend less on electricity and more on other consumer products, and businesses are able to produce goods and services more efficiently. As this suggests, the net economic impacts from the first year, when the equipment and program spending occur, only capture a fraction of the overall economic impacts of these programs. The following section presents the economic impacts resulting from the implementation of efficiency measure and consequent energy savings accrued by program participants.

Figure 1 shows the cumulative estimated annualized cost savings, by quarter, for efficiency upgrades completed between Q4 2010 and Q3 2013. By the end of the twelve-quarter time period, it is estimated that efficiency upgrades will lower energy costs by $41.5 million annually.

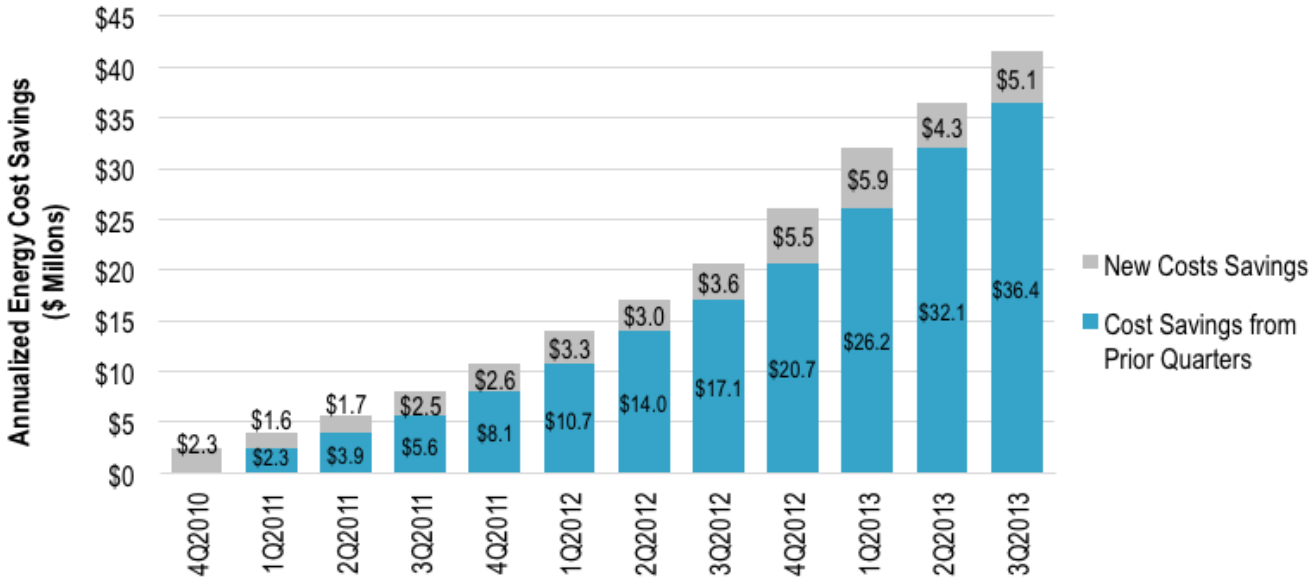

Figure 1: Cumulative Energy Cost Savings of Efficiency Upgrades by Quarter

Table 9 shows the net economic and fiscal impacts associated with the estimated energy cost savings from efficiency measures installed between Q4 2010 and Q3 2013. These estimates were calculated using the input-output model to estimate the economic impacts of reduced energy costs while setting all other costs (i.e., equipment purchases and program implementation costs) equal to zero. To truly isolate the impact of the energy cost savings, we also assumed that there was no loss of utility revenues resulting from the measures installed and that utilities (and others) would be able to sell the unused power/fuel to other customers or recuperate lost revenues through decoupling or a lost revenue adjustment mechanism. This forms the basis of energy efficiency benefits in future post-installation years based solely on the reduced energy costs to the economy and excludes any additional benefits due to the spending on these programs and measures.[7]

[7] Future net energy savings were not adjusted to account for the EULs of installed measures.

Table 9: Net Economic Impacts Due to Annualized Energy Savings Alone ($ millions)

Impact Measure	Annual Net Impacts
Output	$92.8
Personal Income	$29.6
Jobs (person-years)	661
State and Local Taxes	$5.4
Federal Taxes	$7.5

As shown in Table 9, the $41.5 million in estimated annual energy savings associated with efficiency upgrades between Q4 2010 and Q3 2013 is linked to $92.8 million in economic output, including $29.6 million in personal income, and 661 jobs (FTE) annually. These estimated annual energy savings and net economic impacts form the basis of annual energy savings and economic impacts in future post-installation years. However, both energy savings and net economic impacts will decline in future years depending on the EULs for measures installed in between Q4 2010 and Q3 2013.The following figures illustrate how the effects of energy efficiency might accumulate in the future, assuming that energy cost savings continue at the levels observed from 2010-2013. These figures highlight the fact that the incremental benefit of any single year is only a fraction of the cumulative effect of efficiency gains achieved in prior years.

Figure 2 shows the cumulative effect for the economic activity (output) in subsequent post-installation years that results from efficiency upgrades accomplished between Q4 2010 and Q3 2013. In the first year, economic output is estimated to increase an additional $92.8 million based on energy cost savings achieved in that year. The energy cost savings are projected to continue in future years and generate additional economic impacts. By the end of the fifth year, output could have increased by as much as $464 million solely due to efficiency upgrades accomplished between Q4 2010 and Q3 2013.

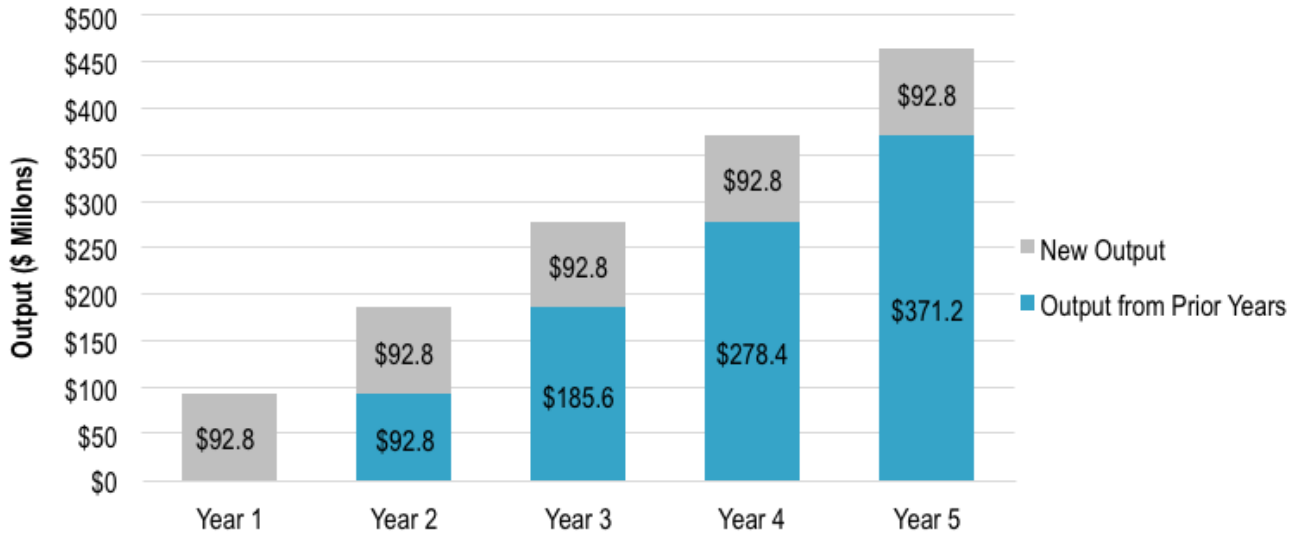

Figure 2: Cumulative Output Effects in Post-Installation Years (Five Year Period)

If energy cost savings can be sustained over time, then the employment impacts should persist as well, at least in the short term. The energy savings associated with BBNP efficiency upgrades between

Q4 2010 and Q3 2013, will have sustained 3,304 FTE jobs over the following five-year period. This figure may represent 661 individuals employed in the same position for five years, 661 individuals employed for one year each (i.e. 3,304 jobs), or a midpoint between these two estimates.

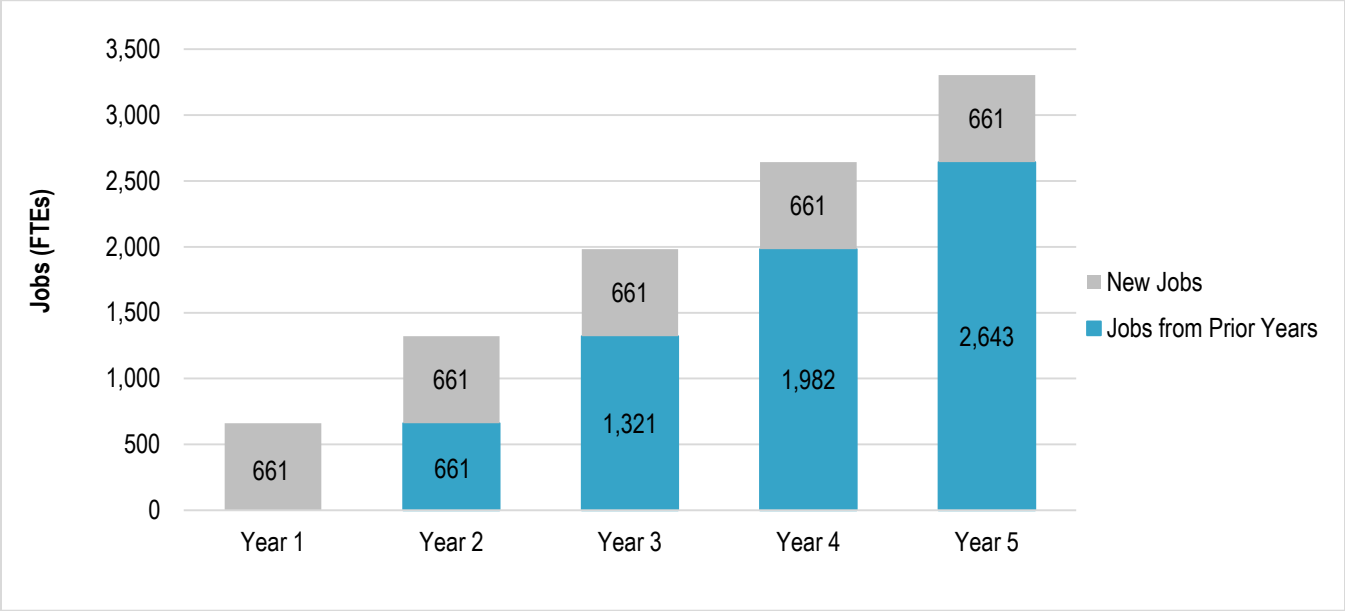

Figure 3: Cumulative Employment Effects in Post-Installation Years (Five Year Period)

In addition to the EULs for installed energy efficiency measures, there are other economic factors that could cause the economic impacts to decline over time, in which case the economic impacts reported above would be overstated. The cumulative impacts do not take into account changes in production and business processes that US businesses make in anticipation of future higher energy prices and/or increased market pressure from international competition to increase production efficiency. To the extent that US businesses are already adjusting in anticipation of higher costs and/or tougher competition, then cumulative impacts presented here are overstated, as the overall market would become more efficient due to factors outside of BBNP influence. Although over 70 percent of the energy cost savings accrue to households, the cumulative numbers also rely on the critical assumption that each dollar saved will translate into a dollar of increased economic output for those businesses undergoing efficiency upgrades. This assumption is reasonable in the short run, but in the long run it is likely that a dollar of energy savings will translate to less than a dollar of increased economic output as the overall market adopts more efficient production practices in anticipation of increased competition and higher energy costs. Consequently, the cumulative impacts shown here likely represent an upper bound. Despite these caveats, the ongoing and cumulative effect of energy savings due to the BBNP is nevertheless a continuing benefit to the US economy.

Conclusion

In this paper, we examined the effects of the Better Buildings Neighborhood Program on the United States economy. We found that the BBNP program, administered by state and local grantees, and overseen by the U.S. Department of Energy, has supported an increased number of person years of employment, economic output, business income, and tax revenue. While energy efficiency programs should not be primarily seen as an economic development tool, our analysis of the BBNP finds evidence

of economic benefits that far outweigh the direct costs associated with the conservation efforts. Spending on the BBNP is also shown to demonstrate significant net economic benefits relative to two feasible base case scenarios, which represent the most likely alternative use of program funds.

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