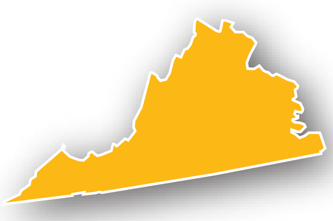
SEEA
SOUTHEAST ENERGY EFFICIENCY ALLIANCE

PROGRESS
PRODUCTIVITY
PROSPERITY

The Economic Impact of EE Investments in the Southeast



ENERGYPRO³ REPORT

PRODUCTIVITY PROGRESS PROSPERITY

VIRGINIA SUMMARY

About the Southeast Energy Efficiency Alliance (SEEA)

The Southeast Energy Efficiency Alliance (SEEA) is one of six regional energy efficiency organizations in the United States working to transform the energy efficiency marketplace through collaborative public policy, thought leadership, outreach programs and technical advisory services. SEEA promotes energy efficiency as a catalyst for economic growth, workforce development and energy security across 11 southeastern states. These states include Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee and Virginia.

Visit SEEA online at www.seealliance.org.

Our Partners

BETTER BUILDINGS U.S. DEPARTMENT OF ENERGY

RECOVERY.GOV

ADECA Alabama Department of Economic and Community Affairs Energy Division

DMME Virginia Department of Mines Minerals and Energy

Energy Pro3:
The Economic Impact of Energy Efficiency Investments in the Southeast

This report is titled "Energy Pro3: The Economic Impact of Energy Efficiency Investments in the Southeast." It provides an independent analysis by the Cadmus Group of the economic performance of SEEA's 16-city, U.S. Department of Energy-funded energy efficiency retrofit consortium from 2010 to 2013.

To create this analysis, the Cadmus Group applied SEEA's program data to an economic modeling program known as Impact Analysis for Planning (IMPLAN) v3.1, a widely used and well known platform for predicting economic impacts. Cadmus then calculated the net impacts of SEEA's energy efficiency programs on the economy of the southeast region as a whole, and on the economies of the states with participating programs.

This report provides a detailed description of the methodology used by the Cadmus Group, as well as regional and state-level findings. These are presented in the form of a total economic impact summary, employment impacts and return on investment, by region and by state. Participant states include Alabama, Florida, Georgia, Louisiana, North Carolina, South Carolina, Tennessee and Virginia.

About the Cadmus Group, Inc.

The Cadmus Group is an employee-owned consultancy committed to helping clients address complex challenges by applying diverse skills and experiences in a highly collaborative environment. By assisting clients in achieving their goals, Cadmus creates social and economic value today and for future generations. Founded in 1983, Cadmus leverages exceptional expertise across a staff of more than 400 professionals in the physical and life sciences, engineering, social sciences, strategic communication, architecture and design, law, policy analysis, and the liberal arts who provide an array of research and analytical services in the United States and abroad.

Visit Cadmus online at www.cadmusgroup.com.

"MAKING OUR BUILDINGS MORE ENERGY EFFICIENT IS ONE OF THE FASTEST, EASIEST AND CHEAPEST WAYS TO SAVE MONEY, COMBAT POLLUTION AND CREATE JOBS RIGHT HERE IN THE UNITED STATES OF AMERICA." - PRESIDENT BARACK OBAMA "WE'RE INNOVATING AND TRYING TO IDENTIFY THE BEST APPROACHES." - DANIELLE SASS BYRNETT, BETTER BUILDINGS NEIGHBORHOOD PROGRAM DIRECTOR, U.S. DEPARTMENT OF ENERGY "NOLA WISE IS A TREMENDOUS RESOURCE FOR THE PEOPLE OF NEW ORLEANS, HELPING FAMILIES SAVE MONEY AND ENERGY, TRAINING AND EXPANDING THE LOCAL GREEN WORKFORCE, AND IMPROVING OUR ENVIRONMENT. WITH SUPPORT FROM A DEDICATED NETWORK OF PARTNERS, THE PROGRAM HAS SUCCEEDED IN CHANGING THE CONVERSATION IN OUR CITY, DEMONSTRATING THAT SMART ENERGY USE CAN BUILD A STRONGER, MORE RESILIENT NEW ORLEANS."- NEW ORLEANS MAYOR MITCH LANDRIEU "THE SHINE PROGRAM WILL ASSIST RESIDENTS IN REDUCING ATLANTA'S CARBON FOOTPRINT AND HELP THE CITY REACH THE GOAL OF BECOMING A TOP 10 SUSTAINABLE CITY IN THE UNITED STATES. IT WILL ALSO CREATE A SURGE IN GREEN JOBS, AND MOST IMPORTANTLY, I HOPE THIS WILL SHOW RESIDENTS THE IMPORTANCE OF SUSTAINABLE INITIATIVES AS THEY EXPERIENCE FIRSTHAND THE IMPACT OF IMPROVEMENTS AND COST SAVINGS IN THEIR OWN HOMES." - ATLANTA MAYOR KASIM REED "THROUGH THE ALABAMA WISE PROGRAM, NEXUS ENERGY CENTER HAS TRANSFORMED THE RESIDENTIAL RETROFIT MARKET IN KEY COMMUNITIES STATEWIDE. MORE IMPORTANTLY, THEY'VE BUILT LOCAL CAPACITY TO SUSTAIN THIS KIND OF WORK LONG INTO THE FUTURE, THANKS TO EXTENSIVE WORKFORCE EDUCATION, CONTRACTOR AND REALTOR TRAINING, AN INNOVATIVE SUITE OF FINANCING OPTIONS AND TARGETED CONSUMER OUTREACH." - ELIZABETH GRIMES, ENERGY PROGRAM MANAGER, ALABAMA DEPARTMENT OF ECONOMIC AND COMMUNITY AFFAIRS

CONTENTS

To read the full report, please go to www.seealliance.org/pdfs/SEEA_EnergyPro3_CadmusROIReport.pdf


DEPENDENCE OF PROFIT FROM ADVERTISING IN LAST FIVE QUARTERS

INTRODUCTION

Cadmus performed macroeconomic analyses of the U.S. Department of Energy (DOE) Better Buildings Neighborhood Programs (BBNP) implemented by the Southeast Energy Efficiency Alliance (SEEA). These programs were supported by American Recovery and Reinvestment Act (ARRA) funds delivered through both DOE Energy Efficiency and Conservation Block Grants (EECGB) and DOE State Energy Programs (SEP).

Cadmus estimated net employment and other economic impacts resulting from the programs' operation. We conducted state- and region-level analyses with the Impact Analysis for Planning (IMPLAN) v3.1 modeling software, an input/output (I/O) tool that characterizes spending patterns and relationships between households and industries.[1] Table 1 presents the BBNP programs included in Cadmus' analyses.

Table 1. BBNP Programs Implemented by SEEA, 2010-2013

BBNP Program	State	City / Cities	Target Market
Alabama WISE	AL	Birmingham, Huntsville	Residential
Huntsville WISE	AL	Huntsville	Residential
ShopSmart/InvestSmart	FL	Jacksonville	Residential, Commercial
Atlanta SHINE Gold/Silver	GA	Atlanta	Residential, Multifamily
DecaturWISE	GA	Decatur	Residential
NOLA WISE	LA	New Orleans	Residential
CarrborroWISE	NC	Carrboro	Residential, Commercial, Multifamily
Chapel Hill WISE	NC	Chapel Hill	Residential, Multifamily
Charlotte Multifamily	NC	Charlotte	Multifamily
CharlestonWISE	SC	Charleston	Residential
Nashville Energy Works	TN	Nashville	Residential, Multifamily
CAFE2	VA	Blacksburg, Roanoke, Christiansburg	Residential
LEAP (SEP)	VA	Arlington, Charlottesville	Residential
LEAP (EECGB)	VA	Charlottesville	Residential, Commercial, Multifamily
NEXT STEP	VA	Hampton Roads	Residential
Richmond REA	VA	Richmond	Residential

In this report, we discuss our methodology and economic impact findings. We first review our analysis methods, including an overview of the IMPLAN model, a discussion of the types of economic impacts modeled, and details regarding the data used in this analysis. Findings are then presented in the following order: (1) Southeast Region, (2) Alabama, (3) Florida, (4) Georgia, (5) Louisiana, (6) North Carolina, (7) South Carolina, (8) Tennessee, and (9) Virginia. Finally, a summary analysis of returns on investment concludes the report.

1. http://implan.com

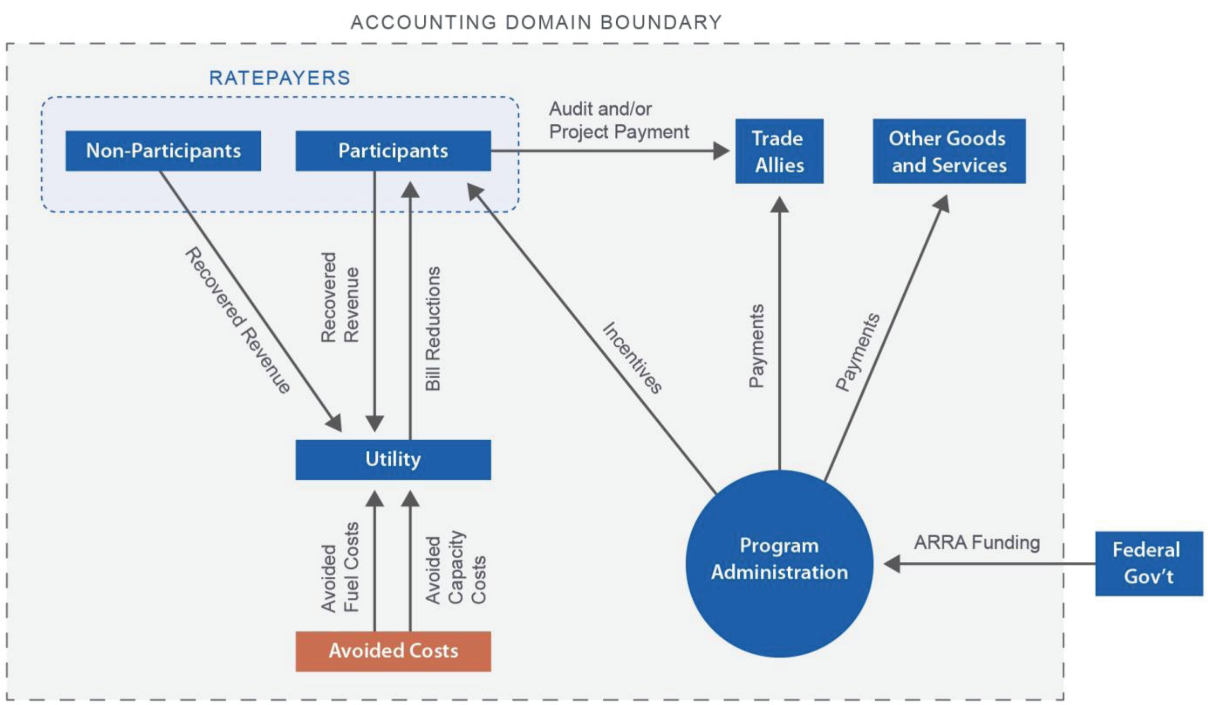
METHODOLOGY

This section explains the methodology Cadmus used to analyze the economic impacts attributable to SEEA's BBNP programs. It contains a description and overview of the IMPLAN model, a discussion of the types of economic impacts modeled, and details regarding the data used in this analysis.

BBNP programs that promote investments in energy efficiency impact local economies in various ways. Funding for BBNP programs comes from the American Recovery and Reinvestment Act (ARRA) and is delivered to states in SEEA territory through both DOE Energy Efficiency and Conservation Block Grants (EECBG) and DOE State Energy Programs (SEP). SEEA and its subcontractors, acting as administrators of local BBNP programs, then use that funding to support residential, multifamily, and commercial investments in energy-efficient retrofit projects. Funds move from program administrators to providers of goods and services as well as to program participants. These funds act to alter the flow of cash through the local economy.

The IMPLAN model utilizes built-in assumptions about the state-level economies within SEEA territory, including assumptions about industrial and household purchasing patterns. Cadmus customized IMPLAN so that it modeled the flow of program-related funds among stakeholders. Figure 1 depicts these cash flows for the BBNP programs in SEEA territory.

Figure 1. BBNP Program Stakeholder Cash Flow



Modeling Economic Impacts with IMPLAN v3.1

Changes in final demand (e.g., purchases) drive the IMPLAN model. IMPLAN utilizes matrix math to capture the impacts that a change in final demand in one industry can have on other industries or sectors using built-in economic multipliers.[2] The program describes how a $1.00 change in final demand would affect given industries' output.[3] In other words, an increase or decrease in production and employment within a local area has a "multiplier" effect as changes in local spending affect other sectors of the economy.

The model's underlying assumptions are based on real 2011 economic data relating local and regional industries to one another.[4] IMPLAN compares the effects of program-related spending on the economy to a hypothetical baseline picture of the economy in which the BBNP programs would not exist. IMPLAN then calculates the *net* impacts of the BBNP programs on the economy.

The IMPLAN I/O model takes user-specified inputs (see Appendix B. State-Level Model Input Values by IMPLAN Sector Code and Appendix C. Region-Level Model Input Values by IMPLAN Sector Code) and generates outputs of economic impact through matrices based on actual historical economic data. The outputs include three types of economic effects:

- ***Direct effects*** are perhaps the most intuitive type of economic impact. They are driven by program spending and represent production changes brought by increases in final demand. For example, program marketing expenditures increase final demand for advertising services.

- ***Indirect effects*** result from changes in the demand for "factor inputs" caused by program activities. Factor inputs are the main goods and services necessary for operation of any given program, such as equipment used to install energy-efficient retrofits. Indirect effects account for any additional materials purchased by the administrators and implementation contractors to run a program. IMPLAN's I/O matrices capture these changes in demand and model the effects on all related industries.

- ***Induced effects*** result from the ways households and workers spend newfound money on general consumer goods and services. The term "induced" refers to the fact that these effects reflect impacts on industries that were not directly involved with the program or in supplying a program's factor inputs. For example, a program participant may spend his or her energy bill savings on a concert ticket. In this case, dollars flow to a completely unrelated industry (the entertainment industry) but are still attributed as an effect of the program.

IMPLAN generates key indicators showing the economic impacts of the programs:

- ***Jobs*** include both full- and part-time employment for one year. A job in IMPLAN is equivalent to the annual average of monthly jobs in a given industry.[5] Thus, one job lasting 12 months equals two jobs lasting six months each and equals three jobs lasting four months each, etc. IMPLAN offers sector-specific conversion factors to convert jobs identified in model outputs to full-time jobs.[6] *All employment impacts presented in this report have been adjusted to represent full-time employee (FTE) jobs.*

- ***Labor income*** represents the total payroll cost of the employee paid by the employer. This includes wages and salary, all benefits (e.g., health and retirement), and payroll taxes (both sides of Social Security, unemployment taxes, etc.). Labor income also includes income earned by proprietors and self-employed professionals.

- ***Total value added*** represents all profits (operating surpluses), indirect business taxes, and payments to households that result from model inputs.

- ***Output*** represents the value of industry production. In IMPLAN, these are annual production estimates for the year of the dataset and are presented as producer prices. For manufacturers this would be sales plus or minus change in inventory. For service sectors, production equals sales. For retail and wholesale trade, output equals gross margin.

2. "Matrix math" is the application of common mathematical functions (e.g., addition, subtraction, and multiplication) to rectangular arrays of numbers.
3. Lindall, S., and Olson, D. *The IMPLAN Input-Output System*. MIG Inc. Available at: ftp://199.141.121.35/Economics/NatImpact/implan_io_system_description.pdf
4. Cadmus purchased 2011 state-level baseline economic data from IMPLAN Group LLC on September 5, 2013.
5. This is the same definition used by the Quarterly Census of Employment and Wages (QCEW), the U.S. Bureau of Labor Statistics (BLS), and the Bureau of Economic Analysis (BEA).
6. Conversions to full-time employee (FTE) jobs vary by economic sector; conversion factors are available from IMPLAN at http://implan.com/V4/index.php?option=com_multicategories&view=article&id=628:628&Itemid=14.

Economic Impacts Modeled

Cadmus organized IMPLAN model input data into four categories: (1) program spending; (2) utility avoided fuel and capacity costs; (3) spending by local, affiliated programs and lenders; and (4) customer contributions to project costs. Table 2 shows the BBNP-related positive and negative cash flows accounted for in the models.[7]

Table 2. BBNP-Related Cash Flows

Positive Impacts Modeled	Negative Impacts Modeled
Program Spending	Affiliated Program Spending (e.g., utility programs)
Utility Avoided Fuel and Capacity Costs	Customer Contributions to Project Costs

Each of these data inputs affects households or industries within the region, as described below:

- ***Program Spending (Industries and Households):*** Program spending refers to monies spent on all aspects of program implementation, including administration, marketing, support services, office supplies, field equipment, and financial incentives. Using available line item program budgets,[8] Cadmus allocated program expenditures to specific IMPLAN model industry codes.[9]
    - BBNP program expenditures are supported by ARRA funds, which are assumed to originate entirely outside of SEEA's territory. These expenditures were therefore modeled as increases to household and local industry income; for households, Cadmus distributed incentive payments equally among the nine income categories recognized in the IMPLAN software.
- ***Utility Avoided Fuel and Capacity Costs (Industries):*** When program participants implement energy-saving retrofit projects, they use less energy from local electric and gas utilities. This decrease in energy consumption results in fewer fuel and capacity costs for local utilities. Using electric and gas utility information included in program data, Cadmus allocated avoided utility fuel and capacity costs to the following economic sectors:
    - Electric power generation, transmission, and distribution
    - Natural gas distribution
    - State and local government electric utilities
- ***Affiliated Program Spending (Industries):*** Depending on specific BBNP program designs and rules, participants also leveraged financial incentives from local utilities and lenders when paying for energy-saving retrofit projects. Since these incentives are not supported by ARRA funds, which are assumed to come entirely from outside SEEA territory, they are instead assumed to be supported locally. Cadmus modeled these payments as transfer payments from local programs to households. Again using electric and gas utility information included in program data, Cadmus allocated affiliated program spending to the following economic sectors:
    - Electric power generation, transmission, and distribution
    - Natural gas distribution
    - Local lending institutions
    - Grant making, giving, and social advocacy organizations
    - State and local government electric utilities

  In some cases, affiliated program spending was supported by local government loan pools or federal grants and tax credits. Money from local government loan pools was assumed to originate from local households via local taxing mechanisms. Similar to the incentives supported by ARRA funds, federal grants and tax credits were assumed to originate entirely from outside SEEA territory and therefore are only modeled as positive cash flows to households.

7. Cadmus also noted reductions in ratepayer utility bills and resulting utility revenue recovery efforts. We assumed that all revenue lost through reductions in ratepayer utility bills is eventually recouped by local utilities through revenue recovery mechanisms and/or future rate cases. For the sake of simplicity, these opposing positive and negative cash flows are assumed to be exactly equal, and Cadmus did not include them as model inputs.

8. Line item program budgets were available only for the following four SEP programs: (1) LEAP (SEP) Arlington, (2) LEAP (SEP) Charlottesville, (3) CAFE2, and (4) Richmond REA. SEEA provided an aggregated line-item budget for all EECGB programs combined.

9. Cadmus referenced RSMeans (http://rsmeans.reedconstructiondata.com/) when making decisions about which economic sectors were relevant to retrofit project costs. Cadmus staff used their best judgment when allocating other budget line items to various economic sectors.

- ***Customer Contributions to Project Costs (Households):*** Energy-saving retrofit projects require some level of customer contribution. Cadmus used known financial incentive data wherever possible to determine customer contributions to project costs. Where financial incentives were missing from project-level data, Cadmus used program descriptions and rules to make reasonable assumptions about the delivery of financial incentives. As with program spending cash flows, Cadmus distributed customer contributions to project costs equally among the nine income categories recognized in the IMPLAN software.

All economic impacts modeled at the state level are presented by IMPLAN sector code in Appendix B. State-Level Model Input Values by IMPLAN Sector Code.

All economic impacts modeled at the regional level are presented by IMPLAN sector code in Appendix C. Region-Level Model Input Values by IMPLAN Sector Code

For a complete list of IMPLAN sector codes and associated descriptions, see Appendix A. IMPLAN Sector Codes and Descriptions.

Data Sources

Program Spending Data

Cadmus completed two levels of analysis: (1) state and (2) regional. There were differences in the amount and granularity of program spending data available for these two levels of analysis. For the state-level analyses, Cadmus relied on available program-level budgets. A discussion of program spending data used for state-level analyses is presented in the following section.

Program Spending Data Used for State-Level Analyses

To identify state-level program spending, Cadmus worked with SEEA staff to secure individual BBNP program budgets.[10] Table 3 presents the total budget for each BBNP program administered in SEEA territory, as well as total program spending in each state. SEP program administration budgets are also presented wherever possible.

Table 3. BBNP Program and State Budget Totals

State	BBNP Program or Spending Category	Program Budget ($)	State-Level Program Spending ($)
Alabama	Alabama WISE – Birmingham	481,000.00	3,222,803.07
Alabama	Alabama WISE – Huntsville	354,000.00	
Alabama	Huntsville WISE	1,007,005.00	
Alabama	SEP Program Administration	1,380,798.07	
Florida	ShopSmart with JEA	1,200,000.00	1,200,000.00
Georgia	Atlanta SHINE	1,200,000.00	1,382,010.00
Georgia	Decatur WISE	182,010.00	
Louisiana	NOLA WISE	1,633,327.00	1,633,327.00
North Carolina	Carrboro WISE	310,605.00	1,867,610.00
North Carolina	Chapel Hill WISE	950,000.00	
North Carolina	CBRetro	607,005.00	
South Carolina	CharlestonWISE	937,005.00	937,005.00
Tennessee	Nashville Energy Works (NEW)	887,005.00	887,005.00
Virginia	Arlington LEAP (SEP)	449,280.00	5,383,005.00
Virginia	CAFE2	485,913.00	
Virginia	Charlottesville LEAP (SEP)	224,350.00	
Virginia	Charlottesville LEAP (EECGB)	2,707,005.00	
Virginia	NEXT STEP Program	500,000.00	
Virginia	Richmond REA	486,000.71	
Virginia	SEP Program Administration	530,456.29	
Total		**16,512,765.07**	**16,512,765.07**

10. All program budget information was secured through e-mail correspondence with SEEA staff during August and September 2013.

For all BBNP programs receiving funding through the DOE SEP in Virginia,[11] budgets included line item breakouts. However, for all other BBNP programs included in the state-level analysis, budgets did not include line item breakouts. Cadmus therefore used aggregated line item totals from all Virginia SEP program budgets to calculate how much money from each program's overall budget went to different economic sectors. See Appendix D. IMPLAN Code Breakouts for Program Budgets for the IMPLAN code breakouts developed from this analysis.

None of the EECGB program budgets used for the state-level analyses included program administration spending by SEEA. Program administration spending data for EECGB programs was available only at the regional level. As a result, Cadmus was able to account for *all* program administration spending only in the region-level analysis. A discussion of spending data used for the regional analysis is presented in the following section.

Program Spending Data Used for Regional Analysis

Program administration spending data was available at the program level for these six SEP programs: (1) Alabama WISE – Birmingham, (2) Alabama WISE – Huntsville, (3) Arlington LEAP (SEP), (4) Charlottesville LEAP (SEP), (5) CAFE2, and (6) Richmond REA. Program administration spending attributable to the 12 EECGB programs was available only at the aggregated, regional level.

While Cadmus organized program spending data by state for each state-level analysis (Table 3), the lack of granularity in EECGB program administration spending data warranted a different organizational structure for the regional analysis. Table 4 presents regional program spending according to these segments: (1) the two SEP programs administered in Alabama, (2) the four SEP programs administered in Virginia, and (3) the 12 EECGB programs administered throughout the region.

Table 4. Regional Spending

Segment	Spending ($)
Alabama SEP Programs	2,215,798.07
Virginia SEP Programs	2,176,000.00
EECGB Programs	15,820,869.49
Total	**20,212,667.56**

Again, the regional spending data presented above includes EECGB program administration spending that was not accounted for in the state-level analyses. The difference of approximately $3.7 million between the regional spending total presented in Table 4 and the aggregated state-level spending total in Table 3 represents the EECGB program administration spending that was not accounted for in the state-level analyses due to a lack of granularity.

11. BBNP programs receiving funding through the DOE SEP in Virginia include: (1) Arlington LEAP (SEP), (2) Charlottesville LEAP (SEP), (3) CAFE2, and (4) Richmond REA.

Utility Avoided Fuel and Capacity Costs

Cadmus conducted a separate cost-effectiveness analysis for all BBNP programs that received funding through a DOE EECGB. As part of that analysis, Cadmus calculated avoided fuel and capacity costs. Data sources for each calculation are discussed below.

Avoided Fuel Costs

Cadmus used natural gas delivered prices, collected from the 2013 Annual Energy Outlook report on the Energy Information Administration (EIA) web site,[12] as the basis for the avoided fuel costs associated with electric generation. Nominal prices were adjusted for on- and off-peak heat rates (also obtained from the EIA web site), monthly variations (using Henry Hub natural gas futures prices), and spark spreads.[13] Two sets of avoided costs were developed, one for South Atlantic states (all SEEA participating states except Alabama, Tennessee, and Louisiana) and one for East South Central states.

Natural gas avoided fuel costs were based on regional city gate prices from the EIA. The gas avoided fuel costs were split into the same regions, East South Central and South Atlantic, as they were for electric avoided fuel costs.

Electric avoided fuel costs were estimated by month and peak/off-peak hours, for a total of 24 unique values per year. Gas avoided costs were estimated monthly for a total of 12 unique values per year.

Table 5 shows the electric and gas avoided fuel costs for 2013 (avoided costs were developed for 2010 through 2040).

Table 5. 2013 Avoided Fuel Costs

Month	South Atlantic			East South Central		
	Electric ($/MWh)		Gas ($/therm)	Electric ($/MWh)		Gas ($/therm)
	Off-Peak	On-Peak		Off-Peak	On-Peak	
1	39.84	56.55	0.47	32.99	47.63	0.47
2	34.63	49.77	0.45	28.71	42.07	0.47
3	36.26	51.88	0.45	30.05	43.80	0.46
4	37.00	52.85	0.41	30.65	44.59	0.41
5	39.99	56.74	0.43	33.11	47.79	0.40
6	42.82	60.43	0.48	35.44	50.82	0.40
7	41.84	59.15	0.42	34.63	49.77	0.44
8	43.08	60.77	0.51	35.66	51.10	0.45
9	39.37	55.94	0.49	32.61	47.14	0.43
10	32.97	47.61	0.45	27.35	40.29	0.45
11	32.23	46.65	0.45	26.74	39.50	0.47
12	30.75	44.72	0.47	25.53	37.92	0.46

12. www.eia.gov

13. The spark spread is the theoretical gross margin of a gas-fired power plant from selling a unit of electricity, having bought the fuel required to produce that unit of electricity.

Avoided Capacity Costs

Avoided capacity costs are multiplied by capacity savings. These costs represent the reduction in generation capacity needed to meet peak hour loads that results when BBNP program participants use less energy.

Cadmus used PJM residual auction capacity prices as the source for the avoided capacity prices. Table 6 shows the annual avoided capacity prices ($/kw-year) for 2010 to 2026.[14]

Table 6. Avoided Capacity Costs, 2010 – 2026

Year	$/kW-year
2010	63.62
2011	63.62
2012	40.15
2013	6.01
2014	10.12
2015	45.97
2016	49.14
2017	49.80
2018	50.43
2019	51.20
2020	51.93
2021	52.65
2022	53.39
2023	54.14
2024	54.91
2025	55.68
2026	56.47

Load Shapes

In cost-effectiveness analysis, load shapes are used to allocate the annual energy savings to specific hours of the year. For example, heating measures produce energy savings mostly during winter peak and off-peak hours, while cooling measures produce energy savings mostly during summer on-peak hours. As shown in Table 4 above, the magnitude of the avoided cost benefits of the energy savings varies by season and hour, so utilizing load shapes allows for more accurate estimation of avoided cost benefits.

Cadmus developed 8760 load shapes (8760 representing the number of hours in a non-leap year) using building simulation software. The load shapes are unique by:

- Climate zone – Baltimore, Houston, Memphis, Miami
- Fuel type – electric, natural gas
- Sector – residential, commercial
- Building segment – single-family and multifamily for residential, various segments for commercial
- End use – varies by sector (heating, cooling, water heating, large appliances, etc.)

14. In keeping with other cost-effectiveness analyses completed by Cadmus, all measure lives were capped at 16 years. As a result, all projected energy and cost savings last through the year 2026 at a maximum. All future costs and benefits in this analysis were discounted using the July 3, 2013, Long-Term Treasury rate of 3.19% (retrieved from http://www.treasury.gov/resource-center/data-chart-center/interest-rates/Pages/TextView.aspx?data=longtermrateYear&year=2013).

Modeling Avoided Fuel and Capacity Costs for Economic Impact Analysis

Again, Cadmus conducted a separate cost-effectiveness analysis for all BBNP programs in SEEA territory that received ARRA funding through an EECGB. Cadmus' cost-effectiveness analysis results were used as model inputs wherever possible. For BBNP programs that received funding through a DOE SEP, however, we needed to make assumptions about the avoided costs.

Having access to reported *ex ante* savings for all programs, regardless of ARRA funding stream, we were able to put all known avoided fuel and capacity costs into the following terms:

Avoided Costs ($) / *ex ante* savings (kWh or therms) = cost per unit energy

Cadmus developed these ratios for three states where BBNP programs not included in the separate cost-effectiveness analysis were operating and applied those as estimates of avoided costs for SEP programs.[15] Table 7 presents the ratios that Cadmus developed for Alabama, North Carolina, and Virginia.

Table 7. Ratios Used for Avoided Cost Assumptions

State	$ / kWh Ex Ante Savings	$ / therm Ex Ante Savings
Alabama	$0.64/kWh	$4.71/therm
North Carolina	$0.92/kWh	$4.68/therm
Virginia	$0.54/kWh	$5.87/therm

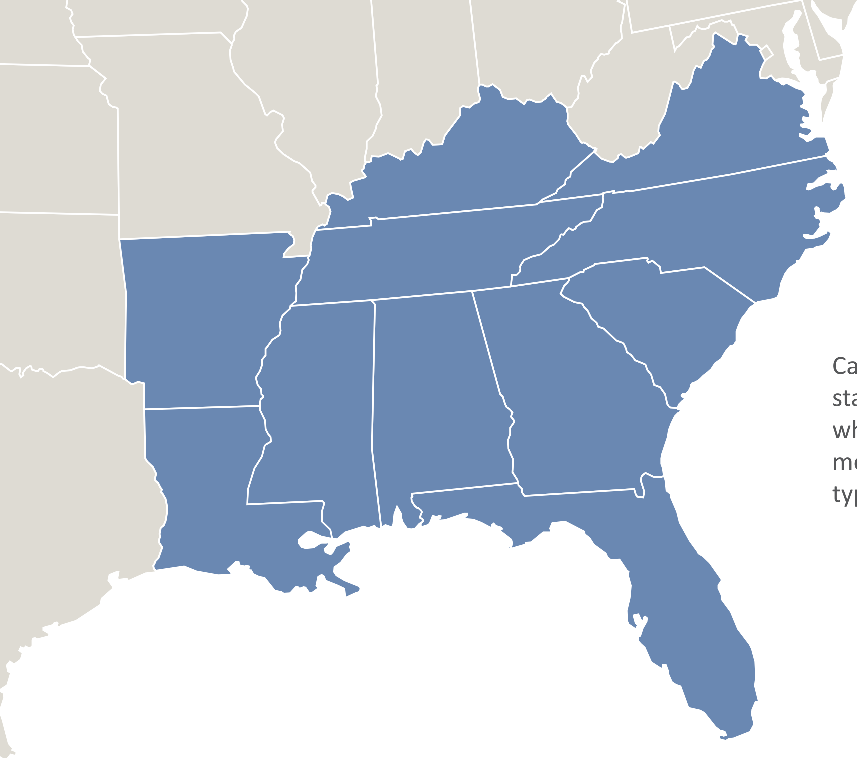
Affiliated Program Spending and Customer Contributions to Project Costs

Cadmus relied on two datasets, one for all EECGB programs and another for all SEP programs, when calculating state- and region-level figures for affiliated program spending and customer contribution inputs.[16] Each dataset was developed using a DOE reporting template; unfortunately, the DOE template does not require a level of data granularity that is appropriate for economic impact analysis. For example, while most projects included total audit and retrofit costs, there was rarely an indication as to how much of those costs were covered by customers, BBNP financial incentives, utility rebates, or tax credits.

In order to make reasonable assumptions about which of these sources contributed money to cover project costs, as well as how much each source contributed to each project, Cadmus researched the BBNP programs' design and incentive rules. In many cases, this research allowed Cadmus to make reasonable assumptions about project cost allocation. Whenever a program's design and incentive rules were unclear or lacked appropriate specificity, however, Cadmus assumed project costs were covered by customer contributions. *This assumption would tend to over-estimate customer contributions to project costs in multiple states where program incentive rules were not clear.*

15. Again, programs not included in Cadmus' separate cost-effectiveness analysis received ARRA funds through the DOE SEP. Cadmus also did not evaluate the Charlotte, North Carolina, CBRetro program for cost-effectiveness. In total, two SEP programs in Alabama, four SEP programs in Virginia, and one multifamily program in North Carolina required the assumption discussed above.

16. These datasets were obtained directly from SEEA staff, via email correspondence during August and September 2013.



REGIONAL AND STATE-LEVEL MODEL FINDINGS

Cadmus modeled BBNP program economic impacts for each state in SEEA territory as well as the Southeast Region as a whole. In this section, we present findings from each model. The methodology section above provides a detailed summary of the types of economic effects and key indicators presented here.

Southeast Region

Cadmus developed one regional model to identify the economic impacts attributable to all SEP and EECGB programs combined. Note that since this regional IMPLAN model includes built-in assumptions about *all eight* state-level economies within SEEA territory, including assumptions about industrial and household purchasing patterns and interactions, economic impacts presented here are not equal to the sum of individual state impacts presented below.

Total Economic Impact Summary

Key indicators of economic impact identified by the IMPLAN model include employment, labor income, total value added, and output impacts. Table 8 summarizes these impacts for the entire Southeast region.

Table 8. Economic Impact Summary, Southeast Region*

Type of Effect	Key Indicator			
	Jobs (#)	Labor Income ($)	Total Value Added ($)	Output ($)
Direct Effect	239.93	16,256,217.04	27,584,611.49	55,689,600.92
Indirect Effect	106.15	6,191,403.20	10,120,714.85	22,223,316.12
Induced Effect	3.24	131,923.28	265,597.87	366,471.30
Total Effect	**349.33**	**22,579,543.52**	**37,970,924.21**	**78,279,388.35**

*Columns may not add up to totals due to rounding.

Employment Impacts

Employment impacts identified by the IMPLAN model are presented by economic sector. Each job identified in the IMPLAN model's output represents the annual average of monthly jobs in a particular industry. Thus, one job lasting 12 months is equal to two jobs lasting six months each, which is equal to three jobs lasting four months each, and so on. A job can be either full-time or part-time. Conversions to full-time employee (FTE) jobs vary by economic sector; conversion factors are available from IMPLAN at http://implan.com/V4/index.php?option=com_multicategories&view=article&id=628:628&Itemid=14.

All employment impacts presented in this report have been adjusted to represent full-time employee (FTE) jobs.

Table 9 presents the ten largest sector-level employment impacts for the entire Southeast region.

Table 9. Ten Largest Employment Impacts by Sector, Southeast Region

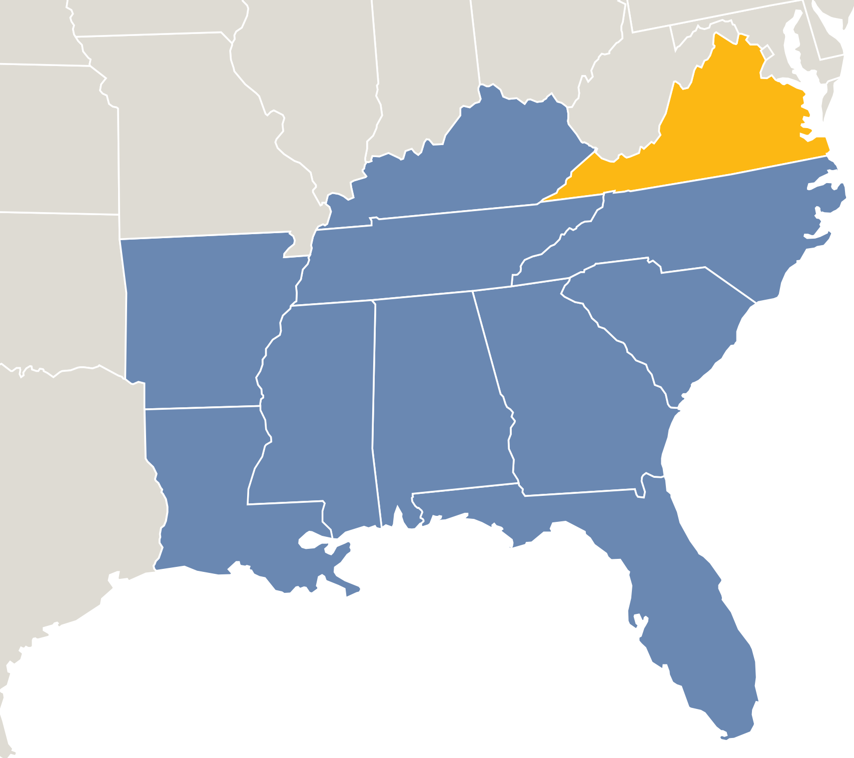
Rank	Sector	Description	Jobs (#)
1	40	Maintenance and repair construction of residential structures	88.0
2	98	Reconstituted wood product manufacturing	21.8
3	375	Environmental and other technical consulting services	19.6
4	374	Management, scientific, and technical consulting services	19.3
5	431	State and local government electric utilities	18.7
6	413	Food services and drinking places	10.0
7	216	Air conditioning, refrigeration, and warm air heating equipment manufacturing	9.6
8	368	Accounting, tax preparation, bookkeeping, and payroll services	8.8
9	215	Heating equipment (except warm air furnaces) manufacturing	6.9
10	39	Maintenance and repair construction of nonresidential structures	6.1

Return on Investment

A total of $20,212,667.56 was invested in the region. Cadmus calculated four different returns on this investment: (1) jobs per million dollars invested; (2) labor income per million dollars invested; (3) value added per million dollars invested; and (4) economic output per million dollars invested. Table 10 presents these four returns on investment for the entire Southeast Region.

Table 10. Returns on Investment, Southeast Region

	Return Per Million Dollars Invested
Jobs (#)	17.28
Labor Income ($)	1,117,098.64
Value Added ($)	1,878,570.66
Output ($)	3,872,788.59



VIRGINIA

The following BBNP programs were delivered in Virginia: (1) Arlington LEAP; (2) CAFE2; (3) Charlottesville LEAP (SEP); (4) Charlottesville LEAP (EECGB); (5) NEXT STEP – Hampton Roads; and (6) Richmond Regional Energy Alliance (REA). Cadmus developed a state-level model to analyze the economic impacts resulting from these six programs in isolation from all others.

Total Economic Impact Summary

Key indicators of economic impact identified by the IMPLAN model include employment, labor income, total value added, and output impacts. Table 32 summarizes these impacts for Virginia.

Table 32. Economic Impact Summary, Virginia*

Type of Effect	Key Indicator			
	Jobs (#)	Labor Income ($)	Total Value Added ($)	Output ($)
Direct Effect	68.36	4,392,186.84	7,939,810.73	18,065,898.87
Indirect Effect	26.27	1,617,732.44	2,529,841.00	4,762,773.70
Induced Effect	-27.41	-1,347,211.83	-2,494,316.58	-4,067,186.57
Total Effect	**67.22**	**4,662,707.45**	**7,975,335.15**	**18,761,486.00**

*Columns may not add up to totals due to rounding.

Employment Impacts

Employment impacts identified by the IMPLAN model are presented by economic sector. Each job identified in the IMPLAN model's output represents the annual average of monthly jobs in a particular industry. Thus, one job lasting 12 months is equal to two jobs lasting six months each, which is equal to three jobs lasting four months each, and so on. A job can be either full-time or part-time. Jobs presented here are adjusted to represent full-time employee (FTE) jobs. Table 33 presents the ten largest sector-level employment impacts for Virginia.

Table 33. Ten Largest Employment Impacts by Sector, Virginia

Rank	Sector	Description	Jobs (#)
1	40	Maintenance and repair construction of residential structures	30.3
2	98	Reconstituted wood product manufacturing	8.8
3	216	Air conditioning, refrigeration, and warm air heating equipment manufacturing	4.1
4	375	Environmental and other technical consulting services	3.6
5	215	Heating equipment (except warm air furnaces) manufacturing	2.8
6	159	Glass product manufacturing made of purchased glass	2.4
7	388	Services to buildings and dwellings	2.3
8	31	Electric power generation, transmission, and distribution	2.2
9	39	Maintenance and repair construction of nonresidential structures	1.7
10	137	Adhesive manufacturing	1.6

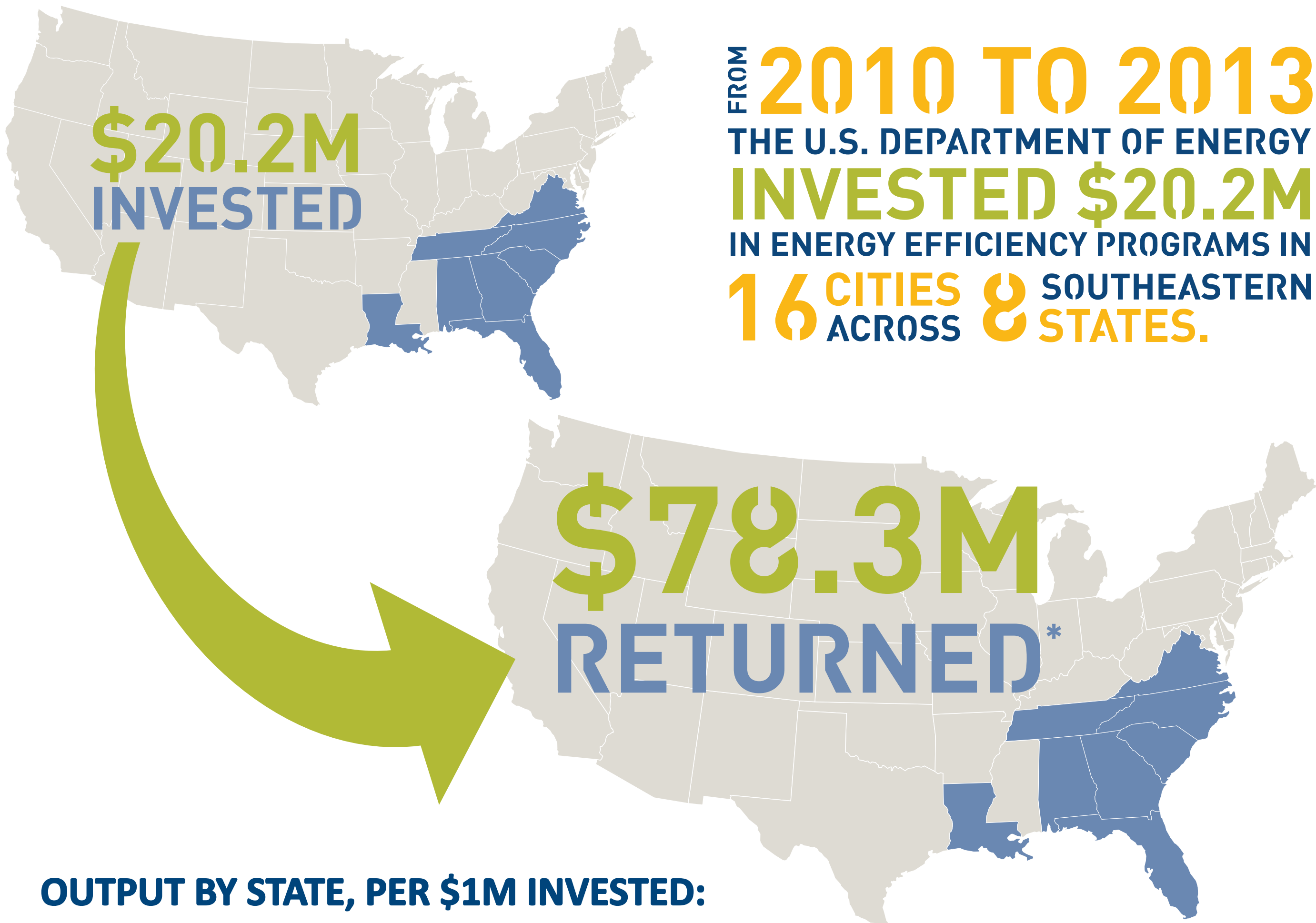
Return on Investment

A total of $5,383,005.00 was invested in Virginia. Cadmus calculated four different returns on this investment: (1) jobs per million dollars invested; (2) labor income per million dollars invested; (3) value added per million dollars invested; and (4) economic output per million dollars invested. Table 34 presents these four returns on investment for Virginia.

Table 34. Returns on Investment, Virginia

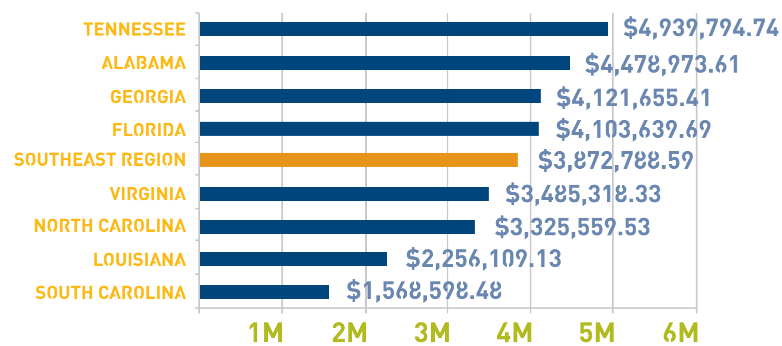
Type of Return	Return Per Million Dollars Invested
Jobs (#)	12.49
Labor Income ($)	866,190.44
Value Added ($)	1,481,576.77
Output ($)	3,485,318.33

ECONOMIC POWERHOUSE:
The ROI of Energy Efficiency Investing



FROM 2010 TO 2013
THE U.S. DEPARTMENT OF ENERGY
INVESTED $20.2M
IN ENERGY EFFICIENCY PROGRAMS IN
16 CITIES ACROSS 8 SOUTHEASTERN STATES.

OUTPUT BY STATE, PER $1M INVESTED:



RETURN ON INVESTMENT

387%

EMPLOYMENT IMPACT

349
NEW JOBS

SEEA
SOUTHEAST ENERGY EFFICIENCY ALLIANCE

ENERGYPRO³
PRODUCTIVITY PROGRESS PROSPERITY

* Achieved through direct, indirect and induced effects.

Summary of Returns on Investment

The following figures present key return on investment findings. Findings from each of the nine models presented above are included in each figure. The return on investment figures for both Alabama and Virginia are based on spending totals that include program administration costs, which are not accounted for in any of the other six states' spending totals. As a result, return on investment figures for both Alabama and Virginia are diminished relative to the same figures presented for other states.

For a detailed discussion of the key indicators presented here, please refer to the Methodology section above. The key indicators are: jobs, labor income, value added, and output.

Figure 2 presents a summary of jobs created per million dollars of program investment.

Figure 2. Jobs Created Per Million Dollars of Program Investment, by Model Region

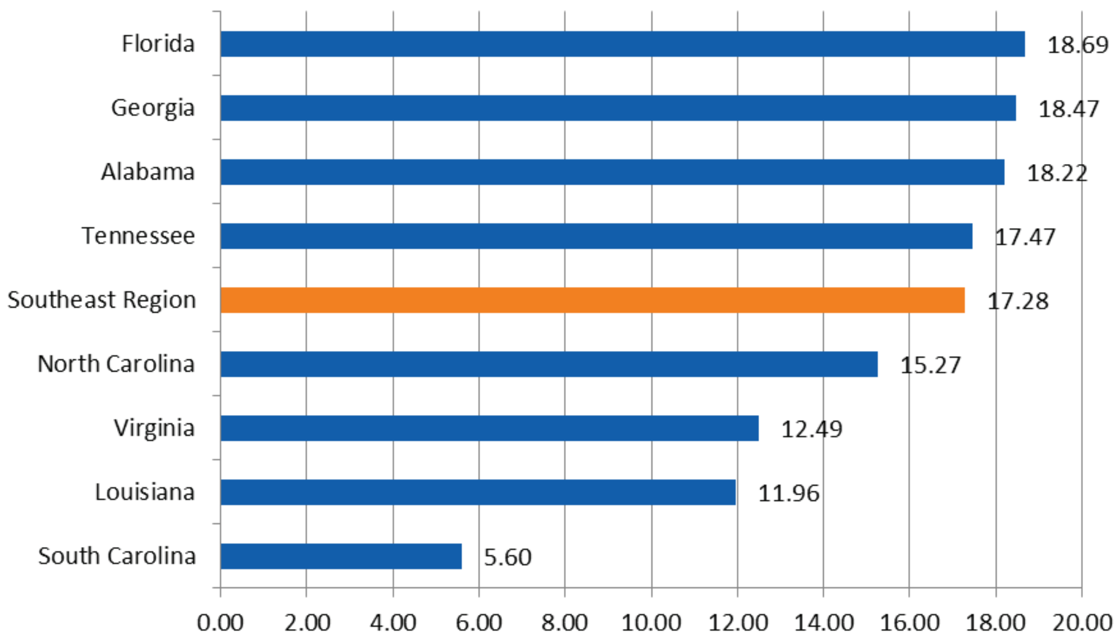


Figure 3 presents a summary of labor income generated per million dollars of program investment.

Figure 3. Labor Income Generated Per Million Dollars of Program Investment, by Model Region

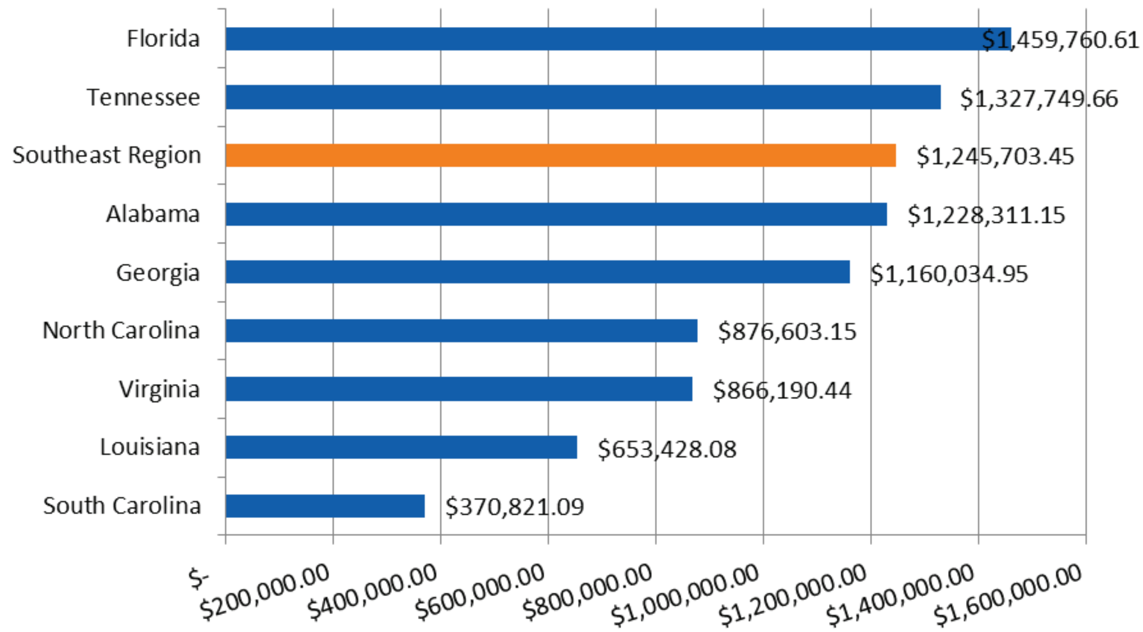


Figure 4 presents a summary of value added per million dollars of program investment.

Figure 4. Value Added Per Million Dollars of Program Investment, by Model Region

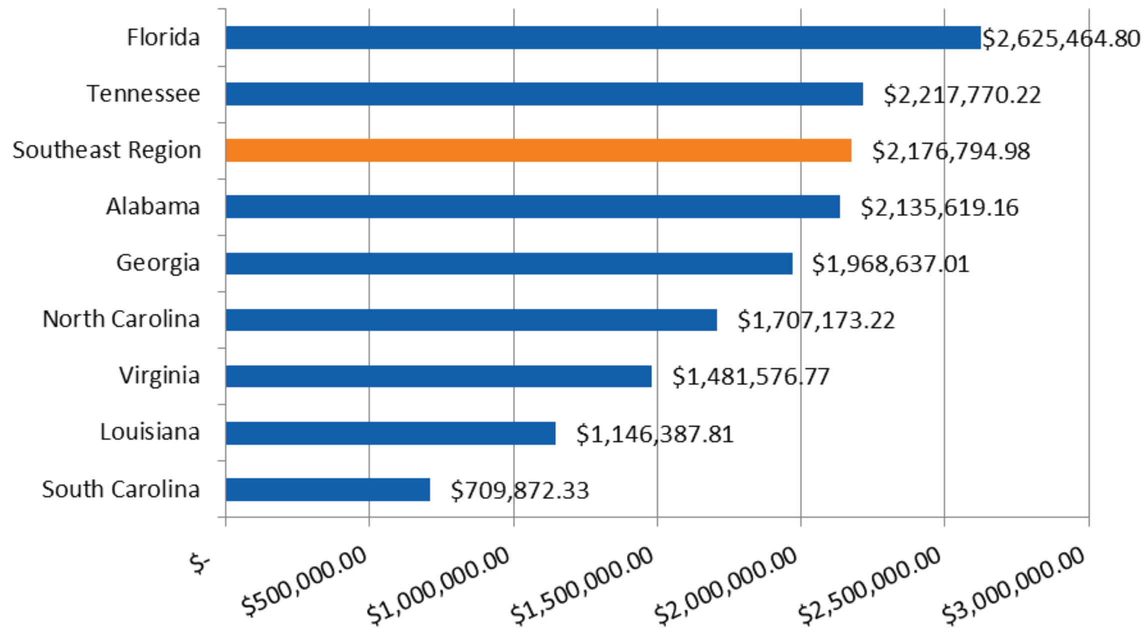
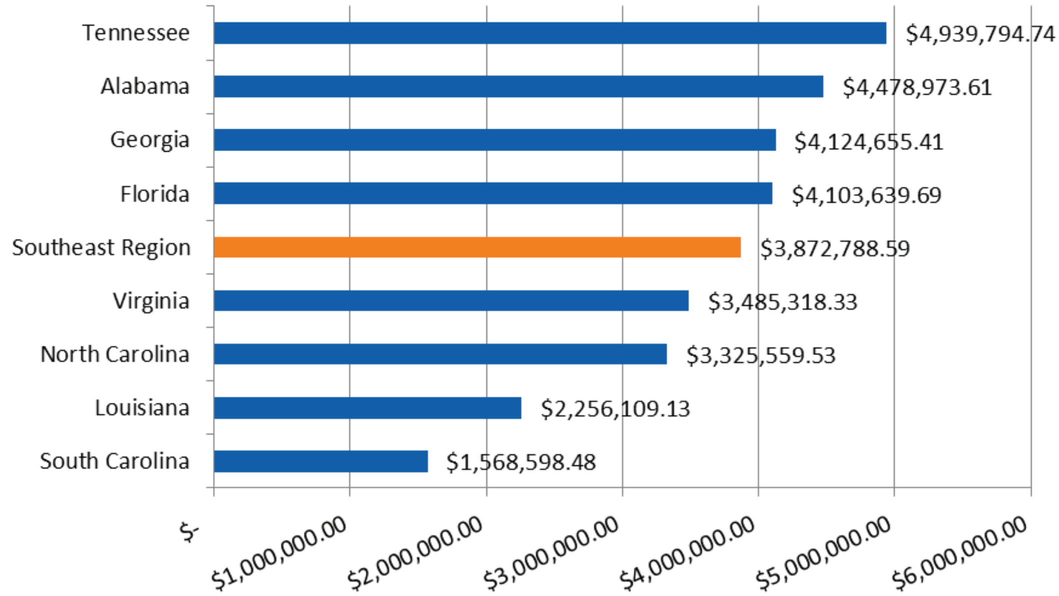


Figure 5 presents a summary of output generated per million dollars of program investment.

Figure 5. Output Generated Per Million Dollars of Program Investment, by Model Region



Economic impact analysis for this work was commissioned by SEEA from the Cadmus Group which used Impact Analysis for Planning (IMPLAN) v3.1 modeling software. The $78.3M of economic impact achieved results from direct, indirect, and induced effects on total industry production throughout the southeast region. The full report can be found at (add link here).

Conclusion

As this analysis indicates, investments in energy efficiency and related goods and services led to positive economic outcomes throughout the Southeast Region. Some model regions experienced greater returns on investment than others due to differences in state-level economies and individual program designs. Still, every model region experienced positive economic impacts resulting from the BBNP programs administered by SEEA and its affiliates.

Investments made by program administrators, participants, and sub-contractors positively affected other regional industries by creating jobs, generating new revenue, increasing profits, and enhancing the overall value of local industry production. However, the outcomes presented here are static and there is no suggestion that they can persist without sustained investment in energy efficiency and related goods and services.

SEEA
SOUTHEAST ENERGY EFFICIENCY ALLIANCE

www.SEEALLIANCE.org