



PROGRESS
PRODUCTIVITY
PROSPERITY

The Impact of Energy Efficiency Investments:
Benchmarking Job Creation in the Southeast

ENERGYPRO³
PRODUCTIVITY PROGRESS PROSPERITY
REPORT



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.

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights.

Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

Our Partners





The Impact of Energy Efficiency Investments: Benchmarking Job Creation in the Southeast

This report is titled “The Impact of Energy Efficiency Investments: Benchmarking Job Creation in the Southeast.” It builds upon findings in 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 modeled hypothetical situations in which \$1M is applied to various economic sectors, under the same conditions that SEEA’s energy efficiency investments were made from 2010 to 2013. This report provides a detailed description of the methodology used by the Cadmus Group, as well as the findings of this job creation benchmarking analysis.



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

1	INTRODUCTION
3	ECONOMIC IMPACT FINDINGS
3	BBNP Program Economic Impact Summary
4	Employment Impacts
4	Return on Investment
5	BENCHMARKING METHODOLOGY
5	Modeling Economic Impacts with IMPLAN v3.1
5	Hypothetical Spending Scenarios Modeled
5	Assumptions and Model Inputs
6	Trade and Services Industry
7	Construction Industry
8	Renewable Energy Industry
9	Manufacturing Industry
9	Energy Industry
10	BENCHMARKING FINDINGS
12	CONCLUSION
14	Appendix A.IMPLAN sector codes and descriptions



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). American Recovery and Reinvestment Act (ARRA) funds, delivered through DOE Energy Efficiency and Conservation Block Grants (EECBG) and DOE State Energy Programs (SEP), supported these programs.

Cadmus estimated net employment and other economic impacts resulting from the programs' operations. This required conducting state- and region-level analyses using 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' economic impact 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	Carrborro	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 (EECBG)	VA	Charlottesville	Residential, Commercial, Multifamily
NEXT STEP	VA	Hampton Roads	Residential
Richmond REA	VA	Richmond	Residential

In January 2014, Cadmus delivered a full report to SEEA that presented the methodology, data sources, and findings for the economic impact analysis.² This supplementary report provides information about Cadmus' follow-up benchmarking analysis, which frames the results from the original regional-level economic impact study. This report reviews previously calculated economic impacts attributable to the BBNP programs administered by SEEA and presents Cadmus' methodology and findings from the subsequent benchmarking analysis.

¹ <http://implan.com>

² The full report can be accessed at: <http://seealliance.org/wp-content/uploads/SEEA-EPS-EE-Report.pdf>



THE GIVEN ANALYTICAL REPORT ALLOWS TO ESTIMATE TO THE FULL CURRENT SITUATION BOTH IN
CURRENT AND IN THE DIVISIONS SEPARATELY. IT WILL ALLOW TO PREDICT MORE PRECISELY IMMEDIATE
PROSPECTS OF DEVELOPMENT OF THE COMPANY AT THE ACCOUNT OF PRESERVATION OF POSITIVE DYNAMICS
AS A RESULT OF INVESTIGATION OF PERIOD TO DO NEXT: RAISE A BREAK-EVEN SALES LEVEL, IN-
CREASE INCREASES OF DIRECT SALES, REDUCE COSTS TO TRANSPORTATION, STRENGTHEN SALE DIVISIONS,
CARRY OUT PERSONNEL TRAINING.

DEPENDENCE OF PROFIT FROM ADVERTISING IN LAST FIVE QUARTERS



ECONOMIC IMPACT FINDINGS

This section presents regional-level economic impacts attributable to the BBNP programs administered by SEEA. All findings are net and are presented per the following key indicators:

- **Jobs** include full- and part-time employment for one year. A job in IMPLAN equals the annual average of monthly jobs in a given industry.³ Thus, one job lasting 12 months equals two jobs lasting six months or three jobs lasting four months, and so on. IMPLAN offers sector-specific conversion factors to transform job data identified in the model outputs to full-time jobs.⁴ *All employment impacts presented in this report have been adjusted to represent full-time employee (FTE) jobs.*
- **Labor income** represents an employee's total payroll cost, as paid by an employer. This includes: wages and salary; all benefits (e.g., health and retirement); and payroll taxes (e.g., both sides of Social Security, unemployment taxes). 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 annual production estimates for the dataset year are presented as producer prices. For manufacturers, this equals sales, plus or minus the change in inventory. For service sectors, production equals sales. For retail and wholesale trade, output equals gross margin.

The IMPLAN I/O model takes user-specified inputs and generates economic impact outputs through matrices, based on actual historical economic data. The outputs include three types of economic effects:

1. **Direct effects**, perhaps the most intuitive type of economic impact, 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.
2. **Indirect effects** result from changes in the demand for “factor inputs” caused by program activities. Factor inputs are primary goods and services necessary for operations of a program, such as equipment used to install energy-efficient retrofits. Indirect effects account for additional materials administrators and implementation contractors purchase to run a program. IMPLAN's I/O matrices capture these changes in demand and model the effects on all related industries.
3. **Induced effects** result from the ways households and workers spend newfound money on general consumer goods and services. The term “induced” refers to these effects reflecting impacts on industries not directly involved with the program or in supplying a program's factor inputs. For example, a program participant may spend 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 a program effect.

BBNP Program Economic Impacts

Cadmus developed a regional model to identify the economic impacts attributable to all SEP and EECBG programs. Since this regional IMPLAN model includes built-in assumptions about eight state-level economies within SEEA's territory, including assumptions about industrial and household purchasing patterns and interactions, economic impacts presented do not equal the sum of individual state impacts presented in the full report.

Total Economic Impact Summary

The IMPLAN model identified the following key indicators of economic impacts: employment, labor income, total value added, and output impacts. Table 2 summarizes these impacts for the entire Southeast region.

3. The Quarterly Census of Employment and Wages, the U.S. Bureau of Labor Statistics, and the Bureau of Economic Analysis use this same definition.

4. Conversions to FTE jobs vary by economic sector, with conversion factors available from IMPLAN at http://implan.com/V4/index.php?option=com_multicategories&view=article&id=628:628&Itemid=14.

Table 2. 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

The IMPLAN model presents employment impacts 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 equals two jobs lasting six months each, which equals three jobs lasting four months, and so on. A job can be full-time or part-time. Conversions to FTE jobs vary by economic sector; IMPLAN presents conversion factors at:

<http://goo.gl/ZvXYxm>

Employment impacts presented in this report have been adjusted to represent FTE jobs.

Table 3 presents the 10 largest sector-level employment impacts for the Southeast region.

Table 3. 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

Investments in the region totaled \$20,212,667.56. 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 4 presents these four returns on investment for the entire Southeast Region.

Table 4. 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

BENCHMARKING METHODOLOGY

This section explains the methodology Cadmus used to benchmark regional-level returns on investment attributable to SEEA's BBNP programs. It briefly describes and presents an overview of the IMPLAN model, discusses the hypothetical spending scenarios used for benchmarking the previously presented returns on investment, and reviews the assumptions and calculations used for preparing each scenario's model inputs.

Modeling Economic Impacts with IMPLAN v3.1

Changes in final demand (e.g., purchases) drive the IMPLAN model. IMPLAN utilizes matrix math to capture impacts that a change in final demand in one economic sector can have on other sectors; this process uses built-in economic multipliers.⁵ The program describes how a \$1.00 change in final demand would affect given sectors' output.⁶ In other words, an increase or decrease in production and employment within a local area creates a "multiplier" effect as changes in local spending affect other economic sectors.

The model's underlying assumptions derive from actual 2011 economic data relating local and regional industries to one another.⁷ IMPLAN compares the effects of user-specified spending on the economy to a hypothetical baseline of that economy, in which user-specified spending would not exist. IMPLAN then calculates the spending's net impacts on the economy.

Hypothetical Spending Scenarios Modeled

Cadmus worked with SEEA staff members to identify five alternative spending scenarios for benchmarking the regional-level returns on investment presented above. For each scenario, Cadmus modeled a hypothetical, one-million dollar investment (i.e., a change in final demand) in a particular economic industry. Cadmus analyzed hypothetical spending in these five industries:

1. Trade and services
2. Construction
3. Renewable energy
4. Manufacturing
5. Energy

Assumptions and Model Inputs

For the five alternative spending scenarios, Cadmus assumed the hypothetical one-million dollar investment came from outside of the accounting domain (i.e., the Southeast region). Likewise, the original economic impact analysis assumed ARRA funds supporting BBNP programs entirely derived from outside the Southeast region. Therefore, results can reasonably be compared across all modeling scenarios.

Cadmus also assumed which economic sectors would prove relevant to each industry analyzed and how each one-million dollar investment would be divided across the relevant sectors. The following sections present these assumptions and the resulting model inputs used for each alternative spending scenario.

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

5. "Matrix math" applies common mathematical functions (e.g., addition, subtraction, and multiplication) to rectangular arrays of numbers.

6. Lindall, S., and Olson, D. The IMPLAN Input-Output System. MIG Inc. Available online at: ftp://199.141.121.35/Economics/NatImpact/implan_io_system_description.pdf

7. September 5, 2013, Cadmus purchased 2011 state-level baseline economic data from IMPLAN Group LLC.

Trade and Services Industry

This benchmarking analysis assumes the trade and services industry includes all IMPLAN sectors with the word “trade” or “services” in the sector description. Cadmus reviewed the complete list of sectors in IMPLAN and filtered the list per these criteria.

After developing a list of sectors relevant to the trade and services industry, Cadmus applied the hypothetical one-million dollar investment evenly across each sector.

Table 5 lists the sectors relevant to the trade and services industry as well as the model input value (i.e., change in final demand) for each.

Table 5. IMPLAN Sectors and Model Inputs, Trade and Services Industry

Sector	Description	Input (\$)
319	Wholesale trade	26,315.79
352	Data processing, hosting, and related services	26,315.79
353	Other information services	26,315.79
367	Legal services	26,315.79
368	Accounting, tax preparation, bookkeeping, and payroll services	26,315.79
369	Architectural, engineering, and related services	26,315.79
370	Specialized design services	26,315.79
371	Custom computer programming services	26,315.79
372	Computer systems design services	26,315.79
373	Other computer related services, including facilities management	26,315.79
374	Management, scientific, and technical consulting services	26,315.79
375	Environmental and other technical consulting services	26,315.79
376	Scientific research and development services	26,315.79
377	Advertising and related services	26,315.79
378	Photographic services	26,315.79
379	Veterinary services	26,315.79
380	All other miscellaneous professional, scientific, and technical services	26,315.79
382	Employment services	26,315.79
383	Travel arrangement and reservation services	26,315.79

Sector	Description	Input (\$)
384	Office administrative services	26,315.79
385	Facilities support services	26,315.79
386	Business support services	26,315.79
387	Investigation and security services	26,315.79
388	Services to buildings and dwellings	26,315.79
389	Other support services	26,315.79
390	Waste management and remediation services	26,315.79
393	Other educational services	26,315.79
395	Home health care services	26,315.79
396	Medical and diagnostic labs and outpatient and other ambulatory care services	26,315.79
399	Child day care services	26,315.79
400	Individual and family services	26,315.79
401	Community food, housing, and other relief services, including rehabilitation services	26,315.79
413	Food services and drinking places	26,315.79
419	Personal care services	26,315.79
420	Death care services	26,315.79
421	Dry-cleaning and laundry services	26,315.79
422	Other personal services	26,315.79
427	Postal service	26,315.79
Total		1,000,000.00

Construction Industry

This benchmarking analysis assumes the construction industry includes all IMPLAN sectors with the word “construction” in the sector description. Cadmus reviewed the complete list of sectors in IMPLAN and filtered the list per this criterion.

After developing a list of sectors relevant to the construction industry, Cadmus applied the hypothetical one-million dollar investment evenly across each sector.

Table 6 lists the sectors relevant to the construction industry as well as the model input value (i.e., change in final demand) for each.

Table 6. IMPLAN Sectors and Model Inputs, Construction Industry

Sector	Description	Input (\$)
34	Construction of new nonresidential commercial and health care structures	125,000.00
35	Construction of new nonresidential manufacturing structures	125,000.00
36	Construction of other new nonresidential structures	125,000.00
37	Construction of new residential permanent site single- and multi-family structures	125,000.00
38	Construction of other new residential structures	125,000.00
39	Maintenance and repair construction of nonresidential structures	125,000.00
40	Maintenance and repair construction of residential structures	125,000.00
205	Construction machinery manufacturing	125,000.00
Total		1,000,000.00

Renewable Energy Industry

This benchmarking analysis assumes the renewable energy industry includes all IMPLAN sectors relevant to solar array and wind turbine construction, installation, and maintenance. Cadmus reviewed the complete list of sectors in IMPLAN and identified two maintenance and repair construction sectors relevant to the installation and maintenance of solar arrays and wind turbines: (1) maintenance and repair construction of nonresidential structures; and (2) maintenance and repair construction of residential structures. Cadmus utilized a simplifying assumption that 15% of the total hypothetical investment would go to each of these sectors.

Cadmus reviewed technical reports from the Renewable Energy Policy Project (REPP) to determine the manufacturing sectors relevant to solar array and wind turbine development.⁸ These reports included information about the material components and subcomponents necessary for solar array and wind turbine construction. Cadmus used this information to develop appropriate percentage breakouts for each manufacturing sector identified.

Table 7 lists the sectors relevant to the renewable energy industry as well as the model input value (i.e., change in final demand) for each.

Table 7. IMPLAN Sectors and Model Inputs, Renewable Energy Industry

Sector	Description	Input (\$)
39	Maintenance and repair construction of nonresidential structures	150,000.00
40	Maintenance and repair construction of residential structures	150,000.00
127	Plastics material and resin manufacturing	16,100.00
142	Plastics packaging materials and unlaminated film and sheet manufacturing	16,100.00
149	Other plastics product manufacturing	28,787.50
156	Flat glass manufacturing	16,100.00
177	Copper rolling, drawing, extruding and alloying	5,500.00
179	Ferrous metal foundries	98,437.50
186	Plate work and fabricated structural product manufacturing	45,500.00
187	Ornamental and architectural metal products manufacturing	16,100.00
200	Ball and roller bearing manufacturing	15,487.50
222	Turbine and turbine generator set units manufacturing	31,675.00
223	Speed changer, industrial high-speed drive, and gear manufacturing	15,487.50
224	Mechanical power transmission equipment manufacturing	35,612.50
242	Bare printed circuit board manufacturing	4,637.50
243	Semiconductor and related device manufacturing	189,950.00
246	Printed circuit assembly (electronic assembly) manufacturing	4,637.50
253	Electricity and signal testing instruments manufacturing	5,500.00
256	Watch, clock, and other measuring and controlling device manufacturing	9,275.00
267	Motor and generator manufacturing	28,787.50
268	Switchgear and switchboard apparatus manufacturing	11,000.00
270	Storage battery manufacturing	5,500.00
273	Wiring device manufacturing	24,150.00
275	All other miscellaneous electrical equipment and component manufacturing	75,675.00
Total		1,000,000.00

⁸ Sterzinger, George and Matt Svrcek. "Solar PV Development: Location of Economic Activity." REPP technical report. January 2005

Manufacturing Industry

This benchmarking analysis assumes the manufacturing industry includes the top 10 IMPLAN sectors with the word “manufacturing” in the sector description.⁹ Cadmus reviewed the complete list of sectors in IMPLAN and filtered the list per this criterion.

After developing a list of the top 10 sectors relevant to the manufacturing industry, Cadmus applied the hypothetical one-million dollar investment evenly across each sector.

Table 8 lists the sectors relevant to the manufacturing industry as well as the model input value (i.e., change in final demand) for each.

Table 8. IMPLAN Sectors and Model Inputs, Manufacturing Industry

Sector	Description	Input (\$)
35	Construction of new nonresidential manufacturing structures	100,000.00
62	Bread and bakery product manufacturing	100,000.00
107	Paperboard container manufacturing	100,000.00
133	Pharmaceutical preparation manufacturing	100,000.00
149	Other plastics product manufacturing	100,000.00
186	Plate work and fabricated structural product manufacturing	100,000.00
187	Ornamental and architectural metal products manufacturing	100,000.00
283	Motor vehicle parts manufacturing	100,000.00
284	Aircraft manufacturing	100,000.00
306	Surgical appliance and supplies manufacturing	100,000.00
Total		1,000,000.00

Energy Industry

This benchmarking analysis assumes the energy industry includes the following IMPLAN sectors:

- Electric power generation, transmission, and distribution;
- Natural gas distribution;
- Federal electric utilities; and
- State and local government electric utilities.

Cadmus reviewed the complete list of sectors in IMPLAN and filtered the list per these criteria.

After developing a list of the sectors relevant to the energy industry, Cadmus applied the hypothetical one-million dollar investment evenly across each sector.

Table 9 lists the sectors relevant to the manufacturing industry as well as the input value (i.e., change in final demand) for each.

Table 9. IMPLAN Sectors and Model Inputs, Energy Industry

Sector	Description	Input (\$)
31	Electric power generation, transmission, and distribution	250,000.00
32	Natural gas distribution	250,000.00
428	Federal electric utilities	250,000.00
431	State and local government electric utilities	250,000.00
Total		1,000,000.00

9. Sterzinger, George and Matt Svrcek. “Wind Turbine Development: Location of Manufacturing Activity.” REPP technical report. September 2004.

10. Cadmus ranked all manufacturing sectors using 2011 employment data specific to the Southeast region. For analysis purposes, the top 10 manufacturing sectors are those with the highest number of employees in the Southeast region in 2011 (the model base year).

BENCHMARKING FINDINGS

This section presents economic impacts attributable to BBNP programs administered by SEEA throughout the Southeast region as well as the five alternative spending scenarios previously described. For each model, Cadmus calculated four different returns on 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.

A one-million dollar investment in the BBNP programs administered by SEEA provided the highest return across all key economic indicators. Every one-million dollars of ARRA funding spent on energy efficiency in the Southeast region resulted in: 17.28 net FTE jobs; \$1,117,098.64 of net labor income; \$1,878,570.66 of net total value added; and \$3,872,788.59 of net output. Table 10 summarizes these returns on investment for each modeling scenario.

Table 10. Summary of Returns on Investment, by Model

Model	Return Per Million Dollars Invested			
	Jobs (#)	Labor Income (\$)	Total Value Added (\$)	Output (\$)
BBNP Programs	17.28	1,117,098.64	1,878,570.66	3,872,788.59
Trade and Services	17.02	827,687.19	1,199,223.38	1,934,823.42
Construction	13.98	728,868.86	1,044,394.57	2,009,924.96
Renewable Energy	9.70	550,797.77	902,409.12	1,923,806.35
Manufacturing	8.96	510,494.78	790,709.67	1,921,881.29
Energy	8.31	549,817.11	768,785.44	2,077,488.51

The following figures illustrate relative returns on investment across the six modeling scenarios, with each figure presenting relative returns on investment for a single key indicator: jobs, labor income, total value added, and output.

Figure 1. Jobs Created Per Million Dollars Invested, by Model

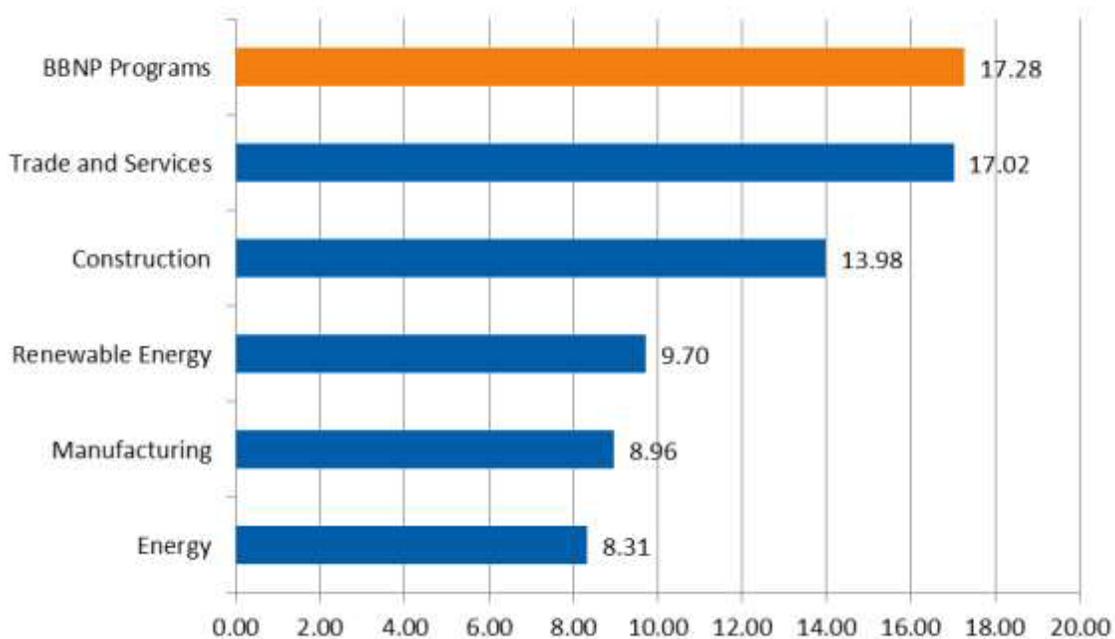


Figure 2. Labor Income Generated Per Million Dollars Invested, by Model

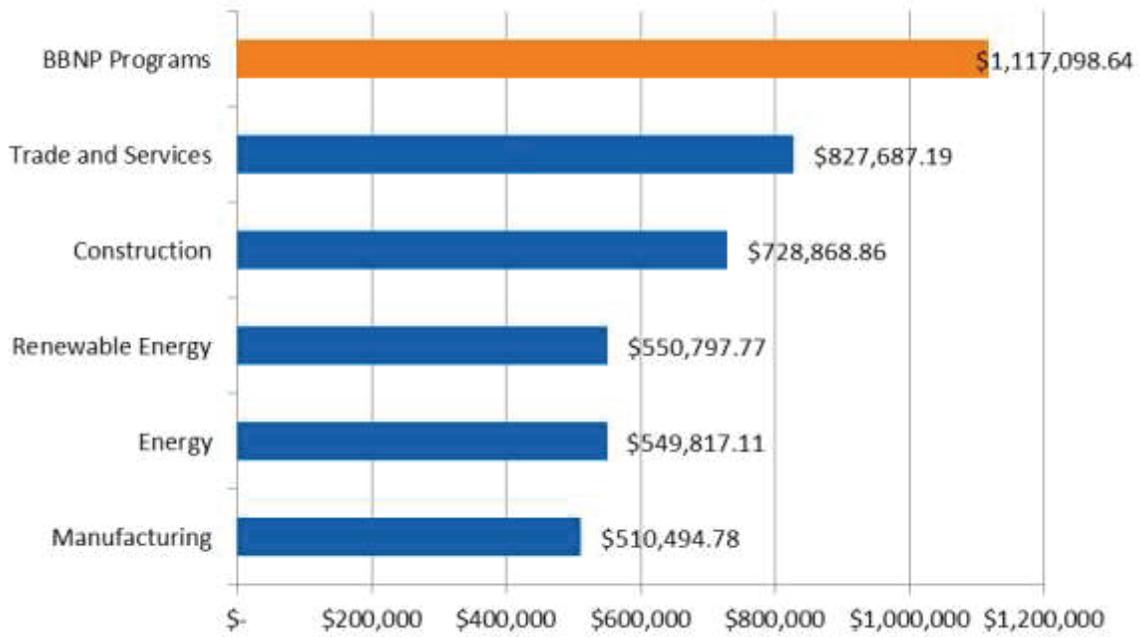
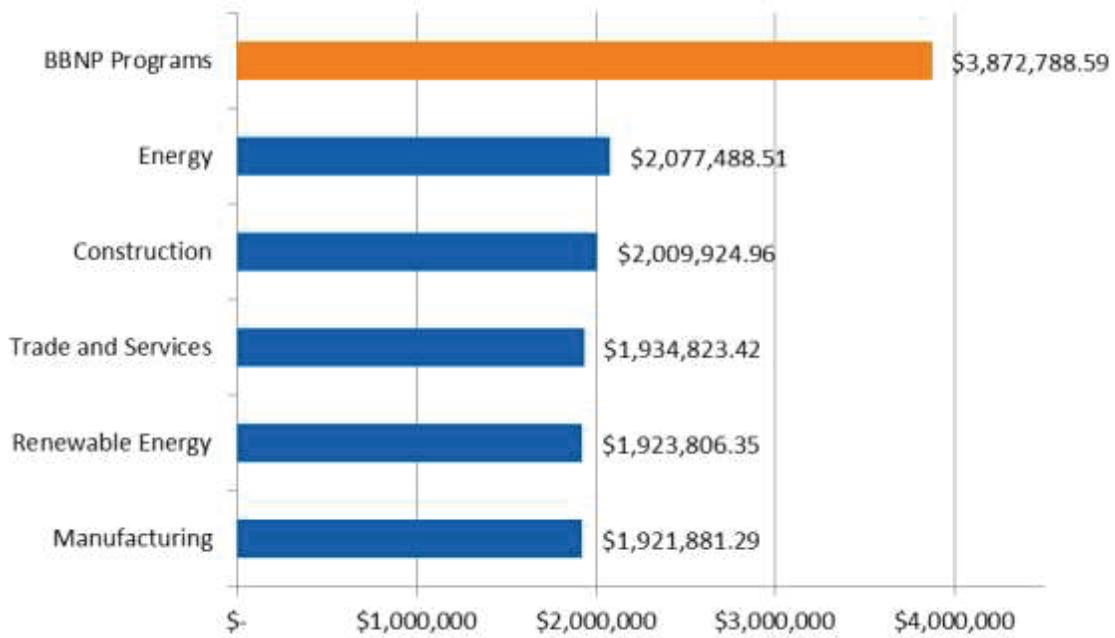


Figure 3. Value Added Per Million Dollars Invested, by Model



Figure 4. Output Generated Per Million Dollars Invested, by Model



CONCLUSION

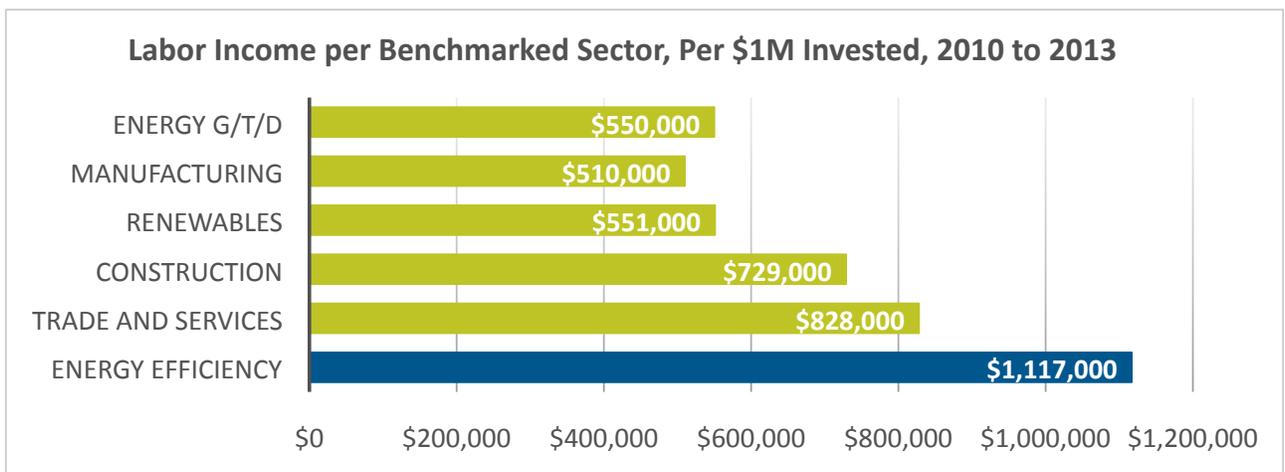
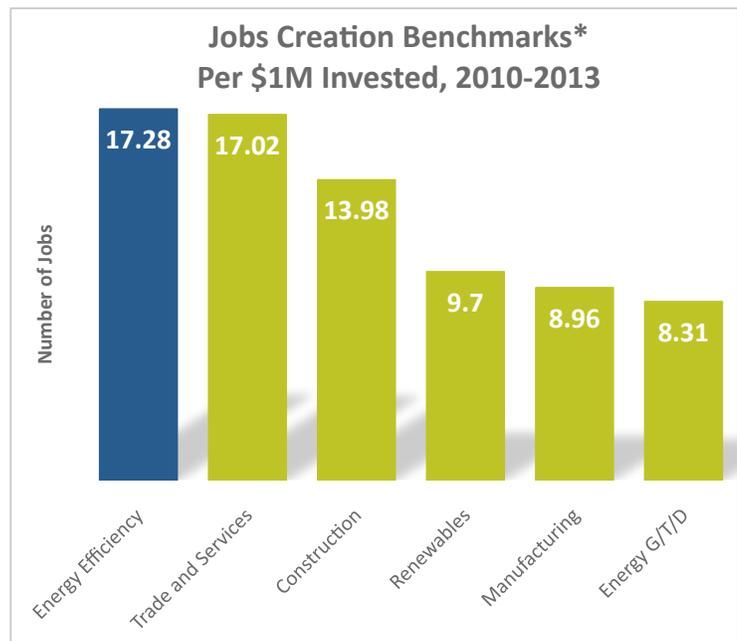
Investment (i.e., increased final demand) in any industry results in positive economic impacts. However, different investments lead to different outcomes. This report's findings indicate investments in energy-efficiency programs, represented by ARRA-funded BBNP programs administered by SEEA, are, in relative terms, more impactful on job creation, labor income generation, economic value generation, and overall economic output than investments in specific industries, such as trade and services, construction, renewable energy, manufacturing, and energy.

Job Creation Engine

Benchmarking the Employment Impact of Energy Efficiency Investments in the Southeast



FROM 2010 TO 2013
THE U.S. DEPARTMENT OF
ENERGY INVESTED
\$20.2M IN ENERGY
EFFICIENCY PROGRAMS
IN 13 CITIES ACROSS **8**
SOUTHEASTERN STATES.



*Benchmarks were calculated using IMPLAN v3.0 economic modeling software, and are based on a hypothetical situation in which \$1M is applied to various economic sectors under the same conditions that SEEA's energy efficiency investments were made from 2010 to 2013.





Appendix A. IMPLAN Sector Codes and Descriptions

Table A-1 summarizes all economic sector codes recognized by the IMPLAN modeling software, as well as a brief description of each.

Table A-1. IMPLAN Sector Codes and Descriptions

IMPLAN Sector Code	IMPLAN Description
1	Oilseed farming
2	Grain farming
3	Vegetable and melon farming
4	Fruit farming
5	Tree nut farming
6	Greenhouse, nursery, and floriculture production
7	Tobacco farming
8	Cotton farming
9	Sugarcane and sugar beet farming
10	All other crop farming
11	Cattle ranching and farming
12	Dairy cattle and milk production
13	Poultry and egg production
14	Animal production, except cattle and poultry and eggs
15	Forest nurseries, forest products, and timber tracts
16	Logging
17	Fishing
18	Hunting and trapping
19	Support activities for agriculture and forestry
20	Oil and gas extraction
21	Coal mining
22	Iron ore mining
23	Copper, nickel, lead, and zinc mining
24	Gold, silver, and other metal ore mining
25	Stone mining and quarrying
26	Sand, gravel, clay, and ceramic and refractory minerals mining and quarrying
27	Other nonmetallic mineral mining and quarrying
28	Drilling oil and gas wells
29	Support activities for oil and gas operations
30	Support activities for other mining
31	Electric power generation, transmission, and distribution
32	Natural gas distribution
33	Water, sewage and other systems
34	Construction of new nonresidential commercial and health care structures
35	Construction of new nonresidential manufacturing structures
36	Construction of other new nonresidential structures

IMPLAN Sector Code	IMPLAN Description
37	Construction of new residential permanent site single- and multi-family structures
38	Construction of other new residential structures
39	Maintenance and repair construction of nonresidential maintenance and repair
40	Maintenance and repair construction of residential structures
41	Dog and cat food manufacturing
42	Other animal food manufacturing
43	Flour milling and malt manufacturing
44	Wet corn milling
45	Soybean and other oilseed processing
46	Fats and oils refining and blending
47	Breakfast cereal manufacturing
48	Sugar cane mills and refining
49	Beet sugar manufacturing
50	Chocolate and confectionery manufacturing from cacao beans
51	Confectionery manufacturing from purchased chocolate
52	Non-chocolate confectionery manufacturing
53	Frozen food manufacturing
54	Fruit and vegetable canning, pickling, and drying
55	Fluid milk and butter manufacturing
56	Cheese manufacturing
57	Dry, condensed, and evaporated dairy product manufacturing
58	Ice cream and frozen dessert manufacturing
59	Animal (except poultry) slaughtering, rendering, and processing
60	Poultry processing
61	Seafood product preparation and packaging
62	Bread and bakery product manufacturing
63	Cookie, cracker, and pasta manufacturing
64	Tortilla manufacturing
65	Snack food manufacturing
66	Coffee and tea manufacturing
67	Flavoring syrup and concentrate manufacturing
68	Seasoning and dressing manufacturing
69	All other food manufacturing
70	Soft drink and ice manufacturing
71	Breweries
72	Wineries
73	Distilleries
74	Tobacco product manufacturing
75	Fiber, yarn, and thread mills
76	Broadwoven fabric mills
77	Narrow fabric mills and schiffli machine embroidery
78	Nonwoven fabric mills

IMPLAN Sector Code	IMPLAN Description
79	Knit fabric mills
80	Textile and fabric finishing mills
81	Fabric coating mills
82	Carpet and rug mills
83	Curtain and linen mills
84	Textile bag and canvas mills
85	All other textile product mills
86	Apparel knitting mills
87	Cut and sew apparel contractors
88	Men's and boys' cut and sew apparel manufacturing
89	Women's and girls' cut and sew apparel manufacturing
90	Other cut and sew apparel manufacturing
91	Apparel accessories and other apparel manufacturing
92	Leather and hide tanning and finishing
93	Footwear manufacturing
94	Other leather and allied product manufacturing
95	Sawmills and wood preservation
96	Veneer and plywood manufacturing
97	Engineered wood member and truss manufacturing
98	Reconstituted wood product manufacturing
99	Wood windows and doors and millwork
100	Wood container and pallet manufacturing
101	Manufactured home (mobile home) manufacturing
102	Prefabricated wood building manufacturing
103	All other miscellaneous wood product manufacturing
104	Pulp mills
105	Paper mills
106	Paperboard Mills
107	Paperboard container manufacturing
108	Coated and laminated paper, packaging paper and plastics film manufacturing
109	All other paper bag and coated and treated paper manufacturing
110	Stationery product manufacturing
111	Sanitary paper product manufacturing
112	All other converted paper product manufacturing
113	Printing
114	Support activities for printing
115	Petroleum refineries
116	Asphalt paving mixture and block manufacturing
117	Asphalt shingle and coating materials manufacturing
118	Petroleum lubricating oil and grease manufacturing
119	All other petroleum and coal products manufacturing
120	Petrochemical manufacturing

IMPLAN Sector Code	IMPLAN Description
121	Industrial gas manufacturing
122	Synthetic dye and pigment manufacturing
123	Alkalies and chlorine manufacturing
124	Carbon black manufacturing
125	All other basic inorganic chemical manufacturing
126	Other basic organic chemical manufacturing
127	Plastics material and resin manufacturing
128	Synthetic rubber manufacturing
129	Artificial and synthetic fibers and filaments manufacturing
130	Fertilizer manufacturing
131	Pesticide and other agricultural chemical manufacturing
132	Medicinal and botanical manufacturing
133	Pharmaceutical preparation manufacturing
134	In-vitro diagnostic substance manufacturing
135	Biological product (except diagnostic) manufacturing
136	Paint and coating manufacturing
137	Adhesive manufacturing
138	Soap and cleaning compound manufacturing
139	Toilet preparation manufacturing
140	Printing ink manufacturing
141	All other chemical product and preparation manufacturing
142	Plastics packaging materials and unlaminated film and sheet manufacturing
143	Unlaminated plastics profile shape manufacturing
144	Plastics pipe and pipe fitting manufacturing
145	Laminated plastics plate, sheet (except packaging), and shape manufacturing
146	Polystyrene foam product manufacturing
147	Urethane and other foam product (except polystyrene) manufacturing
148	Plastics bottle manufacturing
149	Other plastics product manufacturing
150	Tire manufacturing
151	Rubber and plastics hoses and belting manufacturing
152	Other rubber product manufacturing
153	Pottery, ceramics, and plumbing fixture manufacturing
154	Brick, tile, and other structural clay product manufacturing
155	Clay and nonclay refractory manufacturing
156	Flat glass manufacturing
157	Other pressed and blown glass and glassware manufacturing
158	Glass container manufacturing
159	Glass product manufacturing made of purchased glass
160	Cement manufacturing
161	Ready-mix concrete manufacturing
162	Concrete pipe, brick, and block manufacturing

IMPLAN Sector Code	IMPLAN Description
163	Other concrete product manufacturing
164	Lime and gypsum product manufacturing
165	Abrasive product manufacturing
166	Cut stone and stone product manufacturing
167	Ground or treated mineral and earth manufacturing
168	Mineral wool manufacturing
169	Miscellaneous nonmetallic mineral products
170	Iron and steel mills and ferroalloy manufacturing
171	Steel product manufacturing from purchased steel
172	Alumina refining and primary aluminum production
173	Secondary smelting and alloying of aluminum
174	Aluminum product manufacturing from purchased aluminum
175	Primary smelting and refining of copper
176	Primary smelting and refining of nonferrous metal (except copper and aluminum)
177	Copper rolling, drawing, extruding and alloying
178	Nonferrous metal (except copper and aluminum) rolling, drawing, extruding and alloying
179	Ferrous metal foundries
180	Nonferrous metal foundries
181	All other forging, stamping, and sintering
182	Custom roll forming
183	Crown and closure manufacturing and metal stamping
184	Cutlery, utensil, pot, and pan manufacturing
185	Hand tool manufacturing
186	Plate work and fabricated structural product manufacturing
187	Ornamental and architectural metal products manufacturing
188	Power boiler and heat exchanger manufacturing
189	Metal tank (heavy gauge) manufacturing
190	Metal can, box, and other metal container (light gauge) manufacturing
191	Ammunition manufacturing
192	Arms, ordnance, and accessories manufacturing
193	Hardware manufacturing
194	Spring and wire product manufacturing
195	Machine shops
196	Turned product and screw, nut, and bolt manufacturing
197	Coating, engraving, heat treating and allied activities
198	Valve and fittings other than plumbing
199	Plumbing fixture fitting and trim manufacturing
200	Ball and roller bearing manufacturing
201	Fabricated pipe and pipe fitting manufacturing
202	Other fabricated metal manufacturing
203	Farm machinery and equipment manufacturing
204	Lawn and garden equipment manufacturing

IMPLAN Sector Code	IMPLAN Description
205	Construction machinery manufacturing
206	Mining and oil and gas field machinery manufacturing
207	Other industrial machinery manufacturing
208	Plastics and rubber industry machinery manufacturing
209	Semiconductor machinery manufacturing
210	Vending, commercial, industrial, and office machinery manufacturing
211	Optical instrument and lens manufacturing
212	Photographic and photocopying equipment manufacturing
213	Other commercial and service industry machinery manufacturing
214	Air purification and ventilation equipment manufacturing
215	Heating equipment (except warm air furnaces) manufacturing
216	Air conditioning, refrigeration, and warm air heating equipment manufacturing
217	Industrial mold manufacturing
218	Metal cutting and forming machine tool manufacturing
219	Special tool, die, jig, and fixture manufacturing
220	Cutting tool and machine tool accessory manufacturing
221	Rolling mill and other metalworking machinery manufacturing
222	Turbine and turbine generator set units manufacturing
223	Speed changer, industrial high-speed drive, and gear manufacturing
224	Mechanical power transmission equipment manufacturing
225	Other engine equipment manufacturing
226	Pump and pumping equipment manufacturing
227	Air and gas compressor manufacturing
228	Material handling equipment manufacturing
229	Power-driven hand tool manufacturing
230	Other general purpose machinery manufacturing
231	Packaging machinery manufacturing
232	Industrial process furnace and oven manufacturing
233	Fluid power process machinery
234	Electronic computer manufacturing
235	Computer storage device manufacturing
236	Computer terminals and other computer peripheral equipment manufacturing
237	Telephone apparatus manufacturing
238	Broadcast and wireless communications equipment
239	Other communications equipment manufacturing
240	Audio and video equipment manufacturing
241	Electron tube manufacturing
242	Bare printed circuit board manufacturing
243	Semiconductor and related device manufacturing
244	Electronic capacitor, resistor, coil, transformer, and other inductor manufacturing
245	Electronic connector manufacturing
246	Printed circuit assembly (electronic assembly) manufacturing

IMPLAN Sector Code	IMPLAN Description
247	Other electronic component manufacturing
248	Electro-medical and electrotherapeutic apparatus manufacturing
249	Search, detection, and navigation instruments manufacturing
250	Automatic environmental control manufacturing
251	Industrial process variable instruments manufacturing
252	Totalizing fluid meters and counting devices manufacturing
253	Electricity and signal testing instruments manufacturing
254	Analytical laboratory instrument manufacturing
255	Irradiation apparatus manufacturing
256	Watch, clock, and other measuring and controlling device manufacturing
257	Software, audio, and video media reproducing
258	Magnetic and optical recording media manufacturing
259	Electric lamp bulb and part manufacturing
260	Lighting fixture manufacturing
261	Small electrical appliance manufacturing
262	Household cooking appliance manufacturing
263	Household refrigerator and home freezer manufacturing
264	Household laundry equipment manufacturing
265	Other major household appliance manufacturing
266	Power, distribution, and specialty transformer manufacturing
267	Motor and generator manufacturing
268	Switchgear and switchboard apparatus manufacturing
269	Relay and industrial control manufacturing
270	Storage battery manufacturing
271	Primary battery manufacturing
272	Communication and energy wire and cable manufacturing
273	Wiring device manufacturing
274	Carbon and graphite product manufacturing
275	All other miscellaneous electrical equipment and component manufacturing
276	Automobile manufacturing
277	Light truck and utility vehicle manufacturing
278	Heavy duty truck manufacturing
279	Motor vehicle body manufacturing
280	Truck trailer manufacturing
281	Motor home manufacturing
282	Travel trailer and camper manufacturing
283	Motor vehicle parts manufacturing
284	Aircraft manufacturing
285	Aircraft engine and engine parts manufacturing
286	Other aircraft parts and auxiliary equipment manufacturing
287	Guided missile and space vehicle manufacturing
288	Propulsion units and parts for space vehicles and guided missiles

IMPLAN Sector Code	IMPLAN Description
289	Railroad rolling stock manufacturing
290	Ship building and repairing
291	Boat building
292	Motorcycle, bicycle, and parts manufacturing
293	Military armored vehicle, tank, and tank component manufacturing
294	All other transportation equipment manufacturing
295	Wood kitchen cabinet and countertop manufacturing
296	Upholstered household furniture manufacturing
297	Non-upholstered wood household furniture manufacturing
298	Metal and other household furniture (except wood) manufacturing1
299	Institutional furniture manufacturing
300	Wood television, radio, and sewing machine cabinet manufacturing1
301	Office furniture and custom architectural woodwork and millwork manufacturing1
302	Showcase, partition, shelving, and locker manufacturing
303	Mattress manufacturing
304	Blind and shade manufacturing
305	Surgical and medical instrument manufacturing
306	Surgical appliance and supplies manufacturing
307	Dental equipment and supplies manufacturing
308	Ophthalmic goods manufacturing
309	Dental laboratories
310	Jewelry and silverware manufacturing
311	Sporting and athletic goods manufacturing
312	Doll, toy, and game manufacturing
313	Office supplies (except paper) manufacturing
314	Sign manufacturing
315	Gasket, packing, and sealing device manufacturing
316	Musical instrument manufacturing
317	All other miscellaneous manufacturing
318	Broom, brush, and mop manufacturing
319	Wholesale trade
320	Retail - Motor vehicle and parts
321	Retail - Furniture and home furnishings
322	Retail - Electronics and appliances
323	Retail - Building material and garden supply
324	Retail - Food and beverage
325	Retail - Health and personal care
326	Retail - Gasoline stations
327	Retail - Clothing and clothing accessories
328	Retail - Sporting goods, hobby, book and music
329	Retail - General merchandise
330	Retail - Miscellaneous

IMPLAN Sector Code	IMPLAN Description
331	Retail - Nonstore
332	Air transportation
333	Rail transportation
334	Water transportation
335	Truck transportation
336	Transit and ground passenger transportation
337	Pipeline transportation
338	Scenic and sightseeing transportation and support activities for transportation
339	Couriers and messengers
340	Warehousing and storage
341	Newspaper publishers
342	Periodical publishers
343	Book publishers
344	Directory, mailing list, and other publishers
345	Software publishers
346	Motion picture and video industries
347	Sound recording industries
348	Radio and television broadcasting
349	Cable and other subscription programming
350	Internet publishing and broadcasting
351	Telecommunications
352	Data processing, hosting, and related services
353	Other information services
354	Monetary authorities and depository credit intermediation
355	Non-depository credit intermediation and related activities
356	Securities, commodity contracts, investments, and related activities
357	Insurance carriers
358	Insurance agencies, brokerages, and related activities
359	Funds, trusts, and other financial vehicles
360	Real estate
361	Imputed rental value for owner-occupied dwellings
362	Automotive equipment rental and leasing
363	General and consumer goods rental except video tapes and discs
364	Video tape and disc rental
365	Commercial and industrial machinery and equipment rental and leasing
366	Lessors of nonfinancial intangible assets
367	Legal services
368	Accounting, tax preparation, bookkeeping, and payroll services
369	Architectural, engineering, and related services
370	Specialized design services
371	Custom computer programming services
372	Computer systems design services

IMPLAN Sector Code	IMPLAN Description
373	Other computer related services, including facilities management
374	Management, scientific, and technical consulting services
375	Environmental and other technical consulting services
376	Scientific research and development services
377	Advertising and related services
378	Photographic services
379	Veterinary services
380	All other miscellaneous professional, scientific, and technical services
381	Management of companies and enterprises
382	Employment services
383	Travel arrangement and reservation services
384	Office administrative services
385	Facilities support services
386	Business support services
387	Investigation and security services
388	Services to buildings and dwellings
389	Other support services
390	Waste management and remediation services
391	Elementary and secondary schools
392	Junior colleges, colleges, universities, and professional schools
393	Other educational services
394	Offices of physicians, dentists, and other health practitioners
395	Home health care services
396	Medical and diagnostic labs and outpatient and other ambulatory care services
397	Hospitals
398	Nursing and residential care facilities
399	Child day care services
400	Individual and family services
401	Community food, housing, and other relief services, including rehabilitation services
402	Performing arts companies
403	Spectator sports
404	Promoters of performing arts and sports and agents for public figures
405	Independent artists, writers, and performers
406	Museums, historical sites, zoos, and parks
407	Fitness and recreational sports centers
408	Bowling centers
409	Amusement parks, arcades, and gambling industries
410	Other amusement and recreation industries
411	Hotels and motels, including casino hotels
412	Other accommodations
413	Food services and drinking places
414	Automotive repair and maintenance, except car washes

IMPLAN Sector Code	IMPLAN Description
415	Car washes
416	Electronic and precision equipment repair and maintenance
417	Commercial and industrial machinery and equipment repair and maintenance
418	Personal and household goods repair and maintenance
419	Personal care services
420	Death care services
421	Dry-cleaning and laundry services
422	Other personal services
423	Religious organizations
424	Grantmaking, giving, and social advocacy organizations
425	Civic, social, professional, and similar organizations
426	Private households
427	Postal service
428	Federal electric utilities
429	Other Federal Government enterprises
430	State and local government passenger transit
431	State and local government electric utilities
432	Other state and local government enterprises
433	*Not an industry (Used and secondhand goods)
434	*Not an industry (Scrap)
435	*Not an industry (Rest of the world adjustment)
436	*Not an industry (Noncomparable imports)
437	Employment and payroll for SL Government Non-Education
438	Employment and payroll for SL Government Education
439	Employment and payroll for Federal Non-Military
440	Employment and payroll for Federal Military



www.SEEALLIANCE.org