

# CONSULTANT REPORT

## EMPLOYMENT AND ECONOMIC EFFECTS FROM THE CALIFORNIA ENERGY COMMISSION'S AMERICAN RECOVERY AND REINVESTMENT ACT OF 2009 PROGRAMS

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# ABSTRACT

In the wake of a severe recession, President Barack Obama signed the American Recovery and Reinvestment Act of 2009 (ARRA) into law in order to create and save jobs. As a subset of a larger ARRA funded economic stimulus package designated for California, the California Energy Commission administered a portfolio of programs. As part of an effort to measure, verify and evaluate the accomplishments of the Energy Commission's program spending of ARRA's State Energy Program and Energy Efficiency and Conservation Block Grant Program funds, the Energy Commission contracted with DNV KEMA Energy & Sustainability to investigate the economic and employment effects. This investigation used the Regional Economic Models, Inc., Policy Insight model to estimate the number of direct, indirect, and induced jobs; the annual and cumulative outcomes for income; gross state revenue; and gross state product. Results are then presented at the state, regional, and program level and are expressed as an incremental change from a base case of no Energy Commission distribution of ARRA funds. The base case incorporates key economic drivers such as the mix of businesses, population growth and other impacts, such as those arising from the recession.

The results indicate that the funding provided through the Energy Commission's evaluated ARRA programs generated an estimated 3,723 full-time or part-time jobs from 2010 through 2012 through direct program spending. Lower energy bills allowing residential ratepayers to have greater discretionary spending power and commercial customers greater competitiveness, are forecast by the Regional Economic Models, Inc., Policy Insight model to increase future employment and state revenue when compared to the base case forecast. The added household spending and gain in competitiveness by California businesses due to the Energy Commission's ARRA spending cumulatively creates 16,946 full-time or part-time jobs from 2010 through 2026.

Investments made through the Energy Commission's evaluated ARRA programs are expected to generate \$1.3 billion in increased personal income and \$2 billion in gross state product by 2026. The added employment and economic activity from these program investments are forecast to increase state revenue from taxes and fees by nearly \$243 million.

**Keywords:** Employment impacts, economic development effects, REMI model, Energy Commission, ARRA programs, gross state product, state revenue, direct jobs, indirect jobs, induced jobs

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# EXECUTIVE SUMMARY

## Overview

The California Energy Commission administered a portfolio of programs using funding provided by the American Recovery and Reinvestment Act of 2009 (ARRA) for State Energy Programs (SEP) and Energy Efficiency and Conservation Block Grants (EECBG). As part of this effort, the Energy Commission contracted with DNV KEMA Energy & Sustainability (DNV KEMA) to evaluate the programs administered by the Energy Commission.

The programs evaluated are:

- California Comprehensive Residential Retrofit.
- Clean Energy Business Finance Program.
- Clean Energy Workforce Training Program.
- Energy Conservation Assistance Act-ARRA Program.
- Energy Efficiency and Conservation Block Grant Small Cities and Counties Program.
- Energy Efficient State Property Revolving Loan Fund Program.
- Municipal and Commercial Targeted Measure Retrofit Program.

The Energy Commission's State Energy Efficient Appliance Rebate Program and the Energy Assurance Planning Program are not included in this analysis. Also not included are the economic impacts of other ARRA-funded awards, grants, loans, infrastructure, and programs that may have been offered directly or indirectly to California local government, businesses, universities, or its residents unless program participants identified these as leverage funds for the Energy Commission's programs.

For energy efficiency programs, this evaluation, measurement, and verification (EM&V) effort involved verifying energy measure installations, measuring energy savings from a sample of projects, and comparing those savings and impacts to estimates submitted by program applicants. This EM&V effort also included calculating carbon emission reductions, cost-effectiveness and economic impacts at the program and portfolio levels.

A subcontractor, Economic Development Research Group, investigated the economic and employment effects from the evaluated programs. The scope of this assessment includes only SEP and EECBG funding administered by the Energy Commission. This assessment report quantifies the estimated employment changes, as well as the annual and cumulative influence on personal income, gross state revenue, and gross state product. These effects were also assessed by region and by program.

## Approach

The model used for this analysis was the Regional Economic Models, Inc. (REMI) Policy Insights Plus (PI+) model.<sup>1</sup> It depicts a seven-region model of the California economy with detail, and economic assumptions at the regional level, to address impacts on the residential household sector and 23 industry sectors. The model integrates input-output, computable general equilibrium, econometric and economic geography methodologies<sup>2</sup> into an annual forecasting system (capable of doing analysis through 2060). It includes the ability to adjust a full range of variables to introduce direct elements of a policy change into the model, to assess economic impacts to a targeted region. The model uses inputs specified by the user to make an alternative forecast to the baseline (status quo) market, based on industry and labor market interactions, customized by REMI to reflect the regions defined by the analysis objectives. The model generates a default baseline level of economic activity based on these regional interactions. When model inputs are changed (for example, a change to participant estimated energy bill savings), the model recalculates economic flows and presents results in terms of change from the baseline.

For this research, the Energy Commission divided the 58 California counties into seven regions. These regions are modeled as economic units within the state in terms of job creation and trade flows. With these defined units, evaluators developed two macroeconomic cases to compare. The first case established a baseline of activity for the California economy, by region, with no program spending included. The second case performs the same analysis but includes regional expenditures and economic linkages, along with estimated energy bill changes associated with the Energy Commission's programs.

Data collection to perform this analysis came from three primary sources: Energy Commission staff, program implementers and the evaluation team. Energy Commission staff developed program expenditure data. These data contained expenditures on operations, incentives, and financing. In addition, program implementers provided data on individual project locations to assign regions, costs, and incentives by type (grants, rebates, or financing) for calculating participant net project expenditures and cash flows.

Specific building energy upgrade projects included energy efficiency and onsite solar photovoltaic electricity generation. For the specific projects, the evaluation team developed the energy savings and cost data. As a result, the benefits, costs, and cash flows could be directly assigned to specific market segments in the regional economies. This economic direct effect information was introduced into the REMI Policy Insight model. This dynamic general equilibrium input-output model produces annual estimates of regional macroeconomic changes due to program spending.

The emphasis for this report is on the annual forecast change in employment resulting from ARRA activities administered by the Energy Commission. The direct effects that were captured by the analysis include employment effects from program spending on equipment and labor, as

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1 Amherst, Massachusetts. [www.remi.com](http://www.remi.com).

2 REMI PI+ V1.6 model equations, 2014 Regional Economic Models, Inc., <http://www.remi.com/products/pi>.

well as effects to program participants resulting from reduced energy bills. These savings are compared to the incremental cost required to implement the energy retrofit and upgrade projects. Since energy bills are necessary household expenses, bill reductions will increase households' discretionary income and free up funds to save or spend on nonessential goods and services. For businesses and government, bill reductions result in lower operating costs. Any increases in household incomes and state and local government budget resources from lower energy bills are assumed to flow through each region and the state in the form of increased spending on goods and services. For California businesses, the estimated net energy saving reduces operating costs, enhances their competitiveness, and leads to gains in market share. It is this forecasted increase in spending and business market shares that drive the determination of greater economic activity and job creation of this analysis.

### Summary of Results

Findings from this study are presented at the state, region, and program level. All results are stated in 2012 dollars.

- Program expenditures directly generated a combination of 3,723 full-time and part-time jobs from 2010 through 2012. Much of this direct employment, with a possible exception in the manufacturing sector, ended along with the ARRA funding.
- From 2010 through 2026, the spending from the programs is estimated to generate 16,946 job-years. This is a combination of direct jobs created by program delivery; indirect jobs through purchases of equipment from suppliers, distributors, and manufacturers; and induced jobs that result from consumer spending made possible by energy bill reductions.
- Modeled job effects resulting from estimated lower energy bills are due to a combination of extra spending by households and governmental entities, along with the increased market shares for participating businesses.
- Incremental personal income of \$1.27 billion was created through additional wages and salaries over the 16-year period.
- The economic activity resulting from the Energy Commission's administered ARRA programs is expected to generate a cumulative value of \$2.04 billion in gross state product over 16 years.
- Additional revenue of about \$243 million is expected to flow to the state through taxes and fees over the same period. This incremental revenue is prior to subtracting any incremental expenses.

Program (ARRA) and base case (no-ARRA) results are summarized in Table 1. The base case represents the entire California economy. ARRA results represent incremental changes to the no-ARRA base case.

**Table 1: Summary of Estimated Employment and Economic Outcomes in California (2010-2026)**

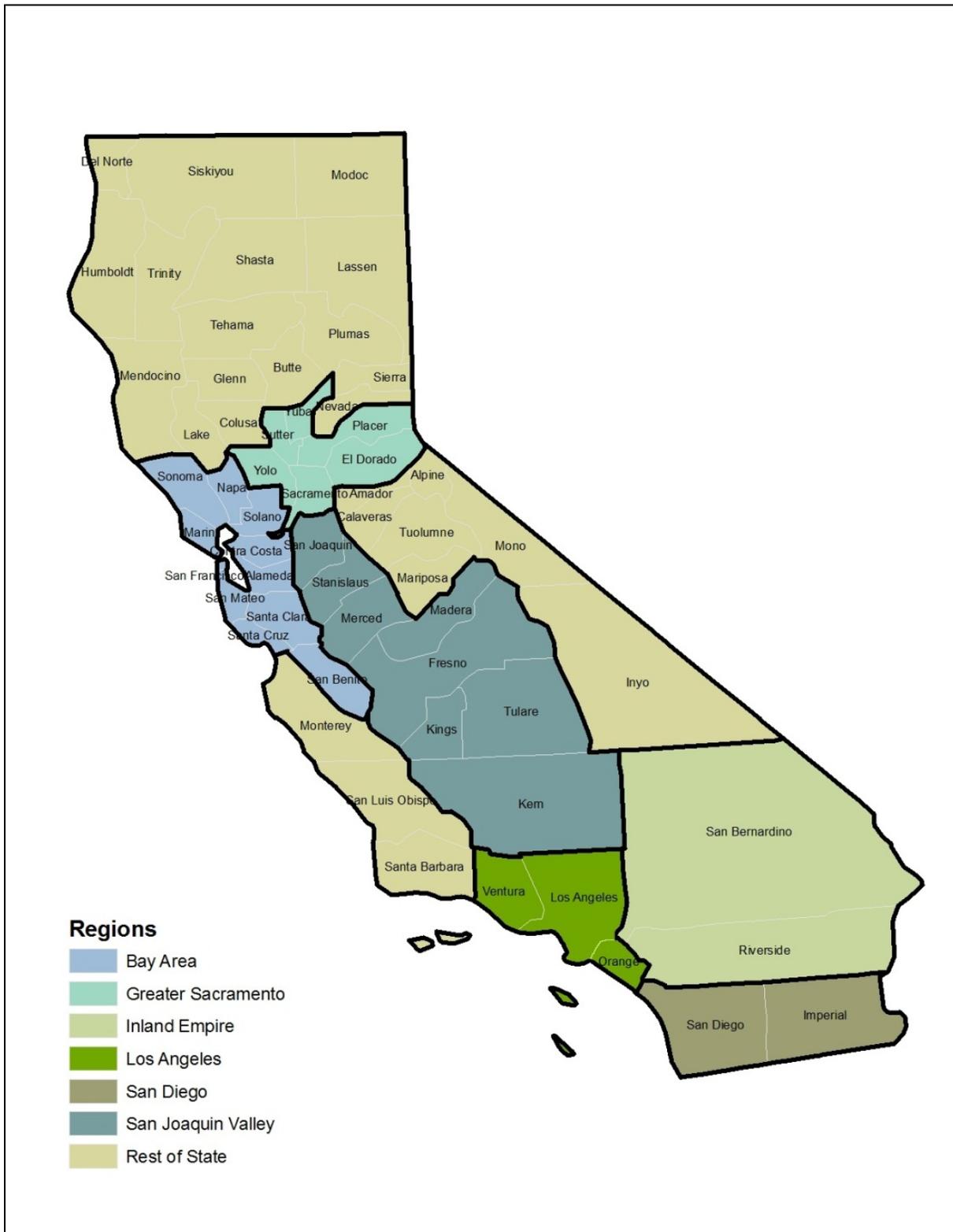
	Direct Outcomes (2010-2012)	Direct, Indirect, and Induced Outcomes (2010-2026)			
	Employment <sup>1</sup>	Employment <sup>1</sup>	Personal Income	Gross State Product	State Revenue
ARRA	3,723 full-time and part-time	16,946 full-time and part-time	\$1.27 billion	\$2.04 billion	\$243 million
Base Case	60 million	374 million	\$35 trillion	\$40 trillion	\$4 trillion

<sup>1</sup>The direct employment total during 2010-2012 is a subset of the direct, indirect and induced employment total during 2010-2026. Employment is presented in job years (one job for one year). One job year can be due to either full time or part time employment. Source: Economic Development Research Group

## Region Results

In addition to reporting state level effects, the analysis includes regional effects of this Energy Commission’s administered ARRA programs. This does not include the majority of other stimulus funds that were awarded directly to regions, counties, cities, companies, and individuals in California. For this analysis, the Energy Commission grouped the 58 counties in California into seven regions. Each region represents an economic unit in terms of job creation or trade flows. A map showing the location of the regions in the state is shown in Figure 1.

Figure 1: Analysis Regions



Source: DNV KEMA

Table 2 presents a summary of the estimated employment and economic outputs by region.

**Table 2: Summary of Estimated Employment and Economic Outcomes by Region (2010-2026)**

Region	ARRA Program Spending (2010-2012) <sup>1</sup>	Direct Outcomes (2010-2012)	Direct, Indirect, and Induced Outcomes (2010-2026)			
		Employment	Employment	Personal Income (millions)	Gross State Product (millions)	State Revenue (millions)
Bay Area	\$83,151,362	1,317	8,460	\$661	\$1,310	\$100
San Joaquin Valley	\$25,671,404	700	2,125	\$136	\$154	\$23
Greater Sacramento	\$68,267,431	510	1,816	\$112	\$151	\$51
Los Angeles	\$34,531,245	455	2,131	\$151	\$190	\$35
Rest of State	\$25,503,370	354	886	\$116	\$123	\$19
San Diego	\$16,137,979	304	863	\$52	\$65	\$7
Inland Empire	\$4,316,551	83	665	\$46	\$51	\$8
ARRA Portfolio	\$257,579,342	3,723	16,946	\$1,274	\$2,044	\$243

<sup>1</sup> ARRA program spending for the California Comprehensive Residential Retrofit program has been updated since the initial employment and economic analysis was performed. Only direct employment from this program spending update is reflected in this report.

Source: DNV KEMA and Economic Development Research Group

Half of the nearly 17,000 direct, indirect, and induced job-years expected through 2026 – resulting from estimated lower energy bills, extra spending by households and governmental entities, and increased market shares for participating California businesses – will be achieved in the Bay Area. Another 36 percent of these are expected to be achieved in the San Joaquin Valley, Los Angeles and Greater Sacramento regions (distributed somewhat equally among these three regions).

Typically the level of state revenue for a region corresponds positively with that region’s Gross State Product (GSP). Economic impacts through 2026, such as incremental increased personal income, gross state product, and state revenue, are expected to be highest in the Bay Area due to program spending levels and the region’s concentration of employment in “green” manufacturing. The Bay Area region produces 64 percent of total GSP and 41 percent of state revenue. Similarly, the San Diego region produces 3 percent of GSP and 3 percent of state revenue.

The Greater Sacramento region generates a disproportionately larger state revenue contribution (21 percent) compared to its contribution to GSP (7 percent). A large reason for this is because more intergovernmental transfer payments flow into the region. These payments are reflected in the model as higher gross state revenue.

## Program Contribution

Estimated program contributions to job creation, personal income, gross state product, and state revenue are sorted by program spending and shown in Table 3. As shown, 74 percent of the Energy Commission’s ARRA program spending was through four programs: California Comprehensive Residential Building Retrofits, Energy Efficiency and Conservation Block Grant, Municipal and Commercial Targeted Measure Retrofit, and Energy Efficient State Property Revolving Fund. These programs also contributed more than 68 percent of direct employment during 2010-2012.

**Table 3: Summary of Estimated Employment and Economic Outcomes by Program (2010-2026)**

Program	ARRA Program Spending (2010-2012) <sup>1</sup>	Direct Outcomes (2010-2012)	Direct, Indirect, and Induced Outcomes (2010-2026)			
		Employment	Employment	Personal Income (millions)	Gross State Product (millions)	State Revenue (millions)
California Comprehensive Residential Retrofit	\$98,239,488	1,281	486	\$8	\$2	\$74
Clean Energy Business Financing <sup>3</sup>	\$18,857,451	358	7,159	\$562	\$1,209	\$86
Clean Energy Workforce Training	\$18,876,507	276	447	\$29	\$26	\$3
Energy Conservation Assistance Act-ARRA	\$20,288,212	480	1,125	\$67	\$61	\$5
Energy Efficiency and Conservation Block Grant Small Cities and Counties	\$33,597,852	357	1,988	\$175	\$197	\$17
Energy Efficient State Property Revolving Loan	\$27,630,725	230	1,875	\$135	\$159	\$12

<sup>3</sup> This contribution to job creation assumes no closures of participating facilities or layoffs from 2013 and going forward.

Program	ARRA Program Spending (2010-2012) <sup>1</sup>	Direct Outcomes (2010-2012)	Direct, Indirect, and Induced Outcomes (2010-2026)			
		Employment	Employment	Personal Income (millions)	Gross State Product (millions)	State Revenue (millions)
Municipal & Commercial Targeted Measure Retrofit	\$29,943,616	650	3,681	\$283	\$373	\$46
CEC Support	\$10,145,491	91	185	\$15	\$17	0
Totals	\$257,579,342	3,723	16,946	\$1,274	\$2,044	\$ 243

<sup>1</sup> ARRA program spending for the California Comprehensive Residential Retrofit program has been updated since the initial employment and economic analysis was performed. Only direct employment from this program spending update is reflected in this report.

Source: DNV KEMA and Economic Development Research Group

In this modeling framework, direct jobs are created by program delivery; indirect jobs are generated through purchases of equipment from suppliers, distributors, and manufacturers; and induced jobs result from increases in consumer discretionary spending made possible by energy bill reductions. The contributions to job creation were modeled at a specific point in time (2012) and if market conditions dramatically change the actual results will be different. In the shorter term, programs that were labor intensive by design generated the most jobs; in the longer term, induced jobs became more important.

The manufacturing activities associated with the Clean Energy Business Finance Program support the most significant statewide job creation and drive the highest multipliers of spending. (This modeled result is based on information through 2012 and should be considered optimistic since in the interim the solar market conditions have become more challenging and one of the loan recipients ceased operations in California.) Other programs creating jobs in the longer-term are the Municipal and Commercial Targeted Measure Retrofit Program, followed by the Energy Efficiency and Conservation Block Grant Small Cities and Counties and the Energy Efficient State Property Revolving Loan Program. The California Comprehensive Residential Retrofit Program generated direct jobs for program administrators, contractors and job trainers. California Comprehensive Residential Retrofit Program participants did not generate the level of energy bill savings to show high levels of job creation after the termination of the ARRA program and, as discussed in Chapter 6, the analysis in this study was not able to evaluate the long-term benefits of the CCRP program that are expected to result from the market transformation emphasis of the program.

# CHAPTER 1:

## Introduction

The California Energy Commission supported a portfolio of programs using funding provided by the American Recovery and Reinvestment Act of 2009 (ARRA) for State Energy Programs (SEP) and Energy Efficiency and Conservation Block Grants (EECBG). As part of this effort, the Energy Commission contracted with DNV KEMA Energy & Sustainability (DNV KEMA) to evaluate the programs. For energy efficiency programs, this entailed verifying energy measure installations, measuring energy savings from a sample of projects, and comparing those savings to estimates submitted by program applicants. This evaluation, measurement, and verification (EM&V) effort also included calculating cost-effectiveness and carbon emission reductions at the program and portfolio levels.

In addition to estimated energy savings associated with the programs, the Energy Commission sought to understand the economic and employment effects of the portfolio of ARRA programs. This report is intended to answer those economic and employment questions.

The specific questions addressed in this report are:

- How much gross project spending (both Energy Commission administered ARRA funds and leveraged funds) is directed toward in-state industry sectors?
- What industries and occupations are expected to experience job growth/losses as a result?
- How many total jobs (direct, indirect, and induced<sup>4</sup>) are expected to be created by industry and occupation?
- What are the estimated annual and cumulative:
  - Income effects?
  - Effect on state revenue?
  - Influence on gross state product (GSP)?

For this analysis, the Energy Commission grouped the 58 counties in California into seven regions, as shown in Table 4. Each region represents an economic unit in terms of job creation or trade flows.

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<sup>4</sup> Direct jobs are jobs created by program implementers, subcontractors and suppliers directly from spending by ARRA funded programs. Indirect jobs refers to subcontracts with material suppliers who make materials used in ARRA supported projects and central service providers whose employees are not directly charged to ARRA supported projects and activities. Induced jobs are created or retained elsewhere in the economy as a result of ARRA supported projects and activities, such as by the re-spending of worker income within the local community or new spending by participants due to energy bill savings.

**Table 4: Region Definitions**

Region	Region Definition (Counties Included)
Bay Area	Alameda, Contra Costa, Marin, Napa, San Benito, San Francisco, San Mateo, Santa Clara, Santa Cruz, Solano, Sonoma
Greater Sacramento	El Dorado, Placer, Sacramento, Sutter, Yolo, Yuba
San Joaquin Valley	Fresno, Kern, Kings, Madera, Merced, San Joaquin, Stanislaus, Tulare
Los Angeles	Los Angeles, Orange, Ventura
Inland Empire	Riverside, San Bernardino
San Diego	Imperial, San Diego
Rest of State	Northern California (Del Norte, Humboldt, Lake, Lassen, Mendocino, Modoc, Nevada, Plumas, Sierra, Siskiyou, Trinity) Central Coast (Monterey, San Luis Obispo, Santa Barbara) Northern Sacramento Valley (Butte, Colusa, Glenn, Shasta, Tehama) Central Sierra (Alpine, Amador, Calaveras, Inyo, Mariposa, Mono, Tuolumne)

Source: DNV KEMA

The findings in this report do not represent annual totals by occupations or industries, or for regional, or state-level employment, GSP, or income. The findings represent estimated incremental changes over what would have happened without the Energy Commission’s ARRA funding. To develop the estimated incremental change, first, a baseline level of activity is modeled with the Regional Economic Models, Inc. (REMI) Policy Insight model at the regional level. This model includes assumptions about the regional economies, sector linkages and economic conditions (such as the impact of the recession). To create an alternate case, the model is rerun with the additional spending created by ARRA, using these same assumptions and sector linkages. The difference between the baseline and alternate case is the estimated incremental change for GSP, state income, and employment. The process for creating the baseline and alternate case is explained in detail in Chapter 4.

The scope of this assessment includes only SEP and EECBG funding administered by the Energy Commission. It does not include the economic impacts of other ARRA-funded awards, grants, loans, infrastructure, and programs that may have been offered directly or indirectly to California local government, businesses, universities, or its residents. It includes the estimated effects for each year where ARRA program spending occurred (2010, 2011, and 2012). In addition to the economic and employment effects from direct spending, the analysis includes the indirect and induced effects resulting from reduced estimated energy consumption beyond the initial program years through 2026 (the estimated useful life of the installed energy upgrades).

The remaining chapters are organized as follows:

- **Chapter 2 Programs:** Provides a high-level summary of program purposes and targeted segments. Details are included in the evaluation reports.
- **Chapter 3 Results:** Explains the findings on state level economic outcomes and job creation by program and region.
- **Chapter 4 Detailed Methods:** Explains the general approach to evaluating the ARRA program expenditures at a regional- and state-level context.
- **Chapter 5 Conclusion:** Summarizes the findings in the full report.
- **Chapter 6 Conservative Aspects of the Analysis and Future Study:** Presents a discussion of market transformation aspects of the program and areas where future analysis could be expanded.
- **Glossary:** Provides a listing and definitions for acronyms used in this report.

Appendices to this report include:

- **Appendix A:** ARRA Incentive Spending by County.
- **Appendix B:** ARRA Loans by County.
- **Appendix C:** Annual Economic Impacts by Region (2010-2026).
- **Appendix D:** Private-Sector Employment by Industry by Region.
- **Appendix E:** Employment by Occupation by Region.

## CHAPTER 2: Programs

The Energy Commission was authorized by the United States Department of Energy (DOE) to administer the ARRA funds for the SEP and EECBG. In the wake of the worst recession since the Great Depression, the ARRA economic stimulus program was enacted to preserve and create jobs and promote economic recovery; to assist households and businesses most affected by the recession; to provide investments needed to increase economic efficiency by spurring technological advances in science and health; to invest in transportation, environmental protection, and other infrastructure that will provide long-term economic benefits; and to stabilize state and local government budgets.<sup>5</sup>

DOE established the following objectives for the ARRA SEP funds:

- Transform energy markets in partnership with states to accelerate near-term deployment of energy efficiency and renewable technologies.
- Promote an integrated portfolio of energy efficiency and renewable energy solutions to meet United States energy security, economic vitality, and environmental quality objectives.
- Strengthen core SEPs to develop and adopt leading market transformation initiatives.<sup>6</sup>

The purpose of the EECBG SCC Program is to:

- Assist eligible entities in creating and implementing strategies to reduce fossil fuel emissions in a manner that is environmentally sustainable and, to the maximum extent practicable, to maximize benefits for local and regional communities.
- Reduce the total energy use of the eligible entities.
- Improve energy efficiency in the building sector, the transportation sector, and other appropriate sectors.<sup>7</sup>

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5 U.S. Department of Energy, *State Energy Program Formula Grants, American Recovery and Reinvestment Act, Funding Opportunity Number: DE-FOA-0000052*, February 3, 2009, p. 5

[http://www.energy.ca.gov/recovery/documents/SEP\\_Recovery\\_Act\\_Guidance\\_DE-FOA-00000521.pdf](http://www.energy.ca.gov/recovery/documents/SEP_Recovery_Act_Guidance_DE-FOA-00000521.pdf).

6 Market transformation is defined as “strategic interventions that cause lasting changes in the structure or function of a market or the behavior of market participants, resulting in an increase in adoption of energy efficiency and renewable energy products, services, and practices.” (pp. 24-25 of DE-FOA-0000052).

7 U.S. Department of Energy, *Recovery Act – Energy Efficiency and Conservation Block Grants – Formula Grants, Funding Opportunity Number: DE-FOA-0000013*, May 11, 2009, p. 5

[http://www1.eere.energy.gov/wip/pdfs/de\\_foa\\_0000013\\_amendment\\_000003.pdf](http://www1.eere.energy.gov/wip/pdfs/de_foa_0000013_amendment_000003.pdf).

In response to this direction, the Energy Commission established an extensive portfolio of programs to pursue the multiplicity of ARRA goals and objectives. The Energy Commission's ARRA portfolio represented a continuum of initiatives ranging from immediate investment in known opportunities for building retrofits, to investment in the development of market functions intended to result in ongoing market transformation and achievement of California energy efficiency and climate change goals. In combination, the Energy Commission's program portfolio was intended to achieve a balance of emphasis both on immediate upgrade projects and on sustained market transformation.

The portfolio was composed of seven main programs: five funded by SEP, one funded by EECBG, and one funded by both SEP and EECBG. These programs focused on different markets and employed different strategies to meet the needs of the different market segments. This diversification of programs allowed the Energy Commission to pilot and field test several delivery approaches simultaneously.

Foremost, this entire portfolio was targeted at achieving economic recovery during the ARRA period. A primary purpose of this report is to estimate the jobs created during 2010-2012 to measure the Energy Commission's success at achieving this top priority.

The Energy Commission's portfolio also aimed to achieve immediate energy efficiency and onsite renewable electricity generation retrofit and upgrade projects in residential, commercial, and municipal buildings that would result in energy savings and, thus, participant energy bill reductions, through projects completed during the ARRA period. In addition, the portfolio included immediate investments in renewable electricity generation equipment manufacturing facilities. This report estimates considerable direct, indirect, and induced jobs and other positive economic effects resulting from the energy bill reductions (net of project costs) from the immediate energy upgrade projects and the ongoing clean energy manufacturing capacity increase over the period of 2010-2026.

In addition, the Energy Commission's portfolio placed high priority on achieving DOE's and California's market transformation objectives with specific emphasis on piloting program components for the state's core *Comprehensive Energy Efficiency Program for Existing Buildings*, specified in Assembly Bill 758 (Skinner, Chapter 470, Statutes of 2009).<sup>8</sup> The Energy Commission's portfolio included the largest state sponsored workforce development efforts in the nation and placed special emphasis on establishing financing programs that leverage other opportunities and could be sustained long after the short ARRA period. This includes piloting an innovative approach called Property Assessed Clean Energy (PACE) and offering other financing options, such as revolving loan, loan loss reserve, and debt service reserve funding.

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<sup>8</sup> AB 758 directed that the comprehensive program comprise a complementary portfolio of techniques, applications, and practices that will achieve greater energy efficiency, and that it contain an explicit set of program components that may include, but need not be limited to, a broad range of energy assessments, building benchmarking, energy rating, cost-effective energy efficiency improvements, public and private sector energy efficiency financing options, public outreach and education efforts, and green workforce training.

The Energy Commission's programs are expected to be a foundation for important changes to the California's energy upgrade markets in the future. As loans are repaid, the Energy Commission's ARRA funded financing programs continue to recycle funds into projects. Also, the state's utilities and local and regional governments are administering and implementing programs based on the ARRA funded pilots. In addition, the capacity built by workers trained in clean energy techniques and practices should lead to future energy savings. Unfortunately, data, time, and resources did not allow for modeling and analysis of additional employment and economic impacts generated by these market transforming effects of the Energy Commission's programs. Quantification of the effects of these market transformation efforts should be included in future studies.

Brief program descriptions are provided in this chapter. Details about each program are reported in the subrecipient final reports and the respective DNV KEMA program evaluation reports.

## Program Descriptions

### California Comprehensive Residential Building Retrofit (CCRR)

CCRR was designed to enable market transformation by establishing a program model for expanded whole-building energy efficiency retrofits and upgrades in single-family and multifamily buildings in California. Program goals included job creation and energy savings across California's existing residential building sector. These energy assessments and upgrades were designed to deliver both energy and non-energy benefits – upgrading homes to provide greater comfort, healthier living environments and greater property value to homeowners.

CCRR worked in collaboration with regional and local governments, the California Public Utilities Commission (CPUC), and utility programs to deliver comprehensive energy efficiency assessments and upgrades to existing single-family and multifamily homes. CCRR piloted improvement in the efficiency of existing single-family and multifamily homes by assessing energy savings opportunities and funding whole-building upgrades, including attic, wall, and floor insulation; building envelope sealing; duct sealing and repair; ENERGY STAR® appliance replacement; air conditioner and/or furnace replacement; cool roofs<sup>9</sup>; radiant barriers; and ENERGY STAR® window replacement.

CCRR was a statewide program funded by SEP and EECBG and implemented through eight subrecipients:

- **Retrofit Bay Area** – administered by the Association of Bay Area Governments (ABAG), a regional joint powers authority and funded by SEP.
- **Affordable MultiFamily Initiative** – administered by the San Francisco Mayor's Office of Housing (SFMOH) and funded by SEP.

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<sup>9</sup> Cool-roofs are flat (typically commercial) rooftops coated to reflect light and reduce heat gain.

- **Moderate Income Sustainable Technology Program** – administered by CRHMFA (formerly, the California Rural Home Mortgage Finance Authority) Homebuyers Fund (CHF), a regional joint powers authority and funded by SEP.
- **Home Performance Program** – administered by the Sacramento Municipal Utility District (SMUD) and funded by SEP.
- **Energy Upgrade California in San Diego** – administered by the County of San Diego and funded by EECBG.
- **Regional Comprehensive Residential Retrofit Program** – administered by the City of Fresno in Fresno, Madera, Tulare, Kings, and Kern Counties. Fresno received SEP and EECBG funding.
- **Retrofit Los Angeles** – administered by the County of Los Angeles and funded by EECBG.
- **Energy Upgrade California (EUC)** – the Local Government Commission (LGC), a statewide joint powers authority, administered support initiatives for the statewide EUC collaboration and funded by SEP.

Explanations of the unique approaches pursued by each subrecipient can be found in Impact Evaluation of the California Comprehensive Residential Retrofit Programs, pp. 2-4.

#### Clean Energy Business Finance Program (CEBFP)

CEBFP offered below-market interest rate loans to clean energy manufacturing companies located, or planning to locate, in California. The subrecipients were solar panel manufacturers. To implement this program, the Energy Commission used an interagency agreement with the California Business, Transportation, and Housing Agency (BTH). BTH used ongoing contracts with regional financial development corporations (FDCs) for financial underwriting and loan servicing expertise. This program was funded using SEP funds.

#### Clean Energy Workforce Training Program (CEWTP)

CEWTP supported public/private training partnerships and addressed the anticipated demand for trained workers in the clean energy industry. Using interagency agreements with the California Employment Development Department (EDD) and the Employment Training Panel (ETP), and partnerships with workforce investment boards, community colleges, unions, and private organizations, CEWTP trained approximately 7,400 individuals in the design, installation, and analysis of renewable energy, and building energy efficiency technologies during its two years of operation. This program was funded using SEP funds.

#### ECAA-ARRA

ECAA-ARRA augmented the existing State of California ECAA loan program with ARRA SEP funding. The Energy Commission awarded loans to municipal facilities across all regions of the state from Del Norte to San Diego Counties. Projects included public safety facilities, libraries, colleges, and other local government buildings. Examples of qualifying energy efficiency measures implemented through these projects include interior and exterior lighting; traffic and

street lights; lighting controls, heating, ventilation, and cooling (HVAC) retrofits and controls; and other measures such as computer management upgrades, water and wastewater equipment upgrades, variable-frequency drives (VFDs), high-efficiency motors, and renewable energy generation.

### Energy Efficiency Conservation Block Grant – Small Cities and Counties

EECBG Small Cities and Counties (EECBG-SCC), was a statewide grant program targeting small municipal and county governments not eligible for grants directly from the U.S. DOE. Small governments are located in both urban and rural areas and are defined as having populations of fewer than 35,000 residents for cities and fewer than 200,000 for counties. The Energy Commission awarded 206 one-time grants to these jurisdictions for energy efficiency retrofits and upgrades at local government buildings and facilities, including community centers, libraries, city halls, parking lots, and jails. There were two funding phases for this program, and both are captured in this analysis.

### Energy Efficient State Property Revolving Loan Program (Department of General Services [DGS])

This program (referred to as DGS in this report) provided low-interest loans for retrofits to state-owned or leased facilities. Four major elements of this self-sustaining loan program consisted of the small building element, the large building element, California Department of Corrections and Rehabilitation (CDCR) projects, and the Office of the Chief Information Officer (OCIO) project. The mix of projects implemented during 2009-2011 was diverse, ranging from simple lighting upgrades at small buildings to complicated correction and repairs of building equipment and operations and maintenance practices (often referred to as *retrocommissioning*). The program used SEP funding.

### Municipal and Commercial Targeted Measure Retrofit Program (MCR)

MCR included three subprograms/implementers for commercial retrofit projects showcasing newer lighting and control technologies: Energy Smart Jobs, Energy Technology Assistance Program, and Oakland Shines. All are funded through SEP.

- **Energy Smart Jobs (ESJ):** ESJ was the largest MCR subprogram in terms of budget. It was designed and implemented by Portland Energy Conservation, Inc. (PECI) to deliver relatively new technologies to grocery stores, convenience stores, and restaurants located throughout the state. The equipment installed included light-emitting diode (LED) bilevel refrigerated case lighting, refrigeration energy management system (EMS) controls, and beverage merchandiser controllers. One program goal was to ease the creation of relationships across California Conservation Corps (CCC) members, trade allies, utilities, and customers to ensure that both job creation and energy efficiency opportunities continue beyond the time frame of the program.
- **Energy Technology Assistance Program (ETAP):** Energy Solutions designed and implemented ETAP which focused on providing technical support, implementation assistance, financial incentives, and financing to local government customers throughout

the state including counties, cities, and special districts. The program promoted occupancy controlled bilevel lighting for parking lots/garages, and wireless controllers for lighting and HVAC. Energy Solutions developed information sheets and case studies to educate the targeted markets about the program’s advanced technologies.

- **Oakland Shines (OS):** Designed and implemented by Quantum Energy Services & Technologies, Inc. (QuEST), OS was the smallest of the MCR subprograms in terms of budget and geography. The program installed and paid incentives for advanced lighting and HVAC measures, including wireless control technologies, in commercial buildings and parking structures within Oakland.

## Program Expenditures

The Energy Commission ARRA-funded programs covered a wide portfolio of market transformation and building energy upgrade activities in the residential, commercial, and state and local government sectors. In addition to providing rebates and loans for home and facility energy assessments and energy upgrade installations, ARRA disbursements to subrecipients paid for program operations, including administration and implementation, marketing and customer information and outreach, workforce development and training, and quality assurance (QA). In addition, ARRA funding covered costs for Energy Commission staff in program administration.

### ARRA Program Expenditures by Region

Table 5 summarizes the regional distribution of the total ARRA program expenditures. For this analysis, the Energy Commission grouped the 58 counties in California into seven regions. Each region represents an economic unit in terms of job creation or trade flows.

**Table 5: Total ARRA Program Spending by Region (2010-2012)**

Region	Region Definition (Counties Included)	ARRA Program Spending (2010-2012) <sup>1</sup>
Bay Area	Alameda, Contra Costa, Marin, Napa, San Benito, San Francisco, San Mateo, Santa Clara, Santa Cruz, Solano, Sonoma	\$83,151,362
Greater Sacramento	El Dorado, Placer, Sacramento, Sutter, Yolo, Yuba	\$68,267,431
San Joaquin Valley	Fresno, Kern, Kings, Madera, Merced, San Joaquin, Stanislaus, Tulare	\$25,671,404
Los Angeles	Los Angeles, Orange, Ventura	\$34,531,245
Inland Empire	Riverside, San Bernardino	\$4,316,551
San Diego	Imperial, San Diego	\$16,137,979
Rest of State	Northern California (Del Norte, Humboldt, Lake, Lassen, Mendocino, Modoc, Nevada, Plumas, Sierra, Siskiyou, Trinity) Central Coast (Monterey, San Luis Obispo, Santa Barbara) Northern Sacramento Valley (Butte, Colusa, Glenn, Shasta, Tehama) Central Sierra (Alpine, Amador, Calaveras, Inyo, Mariposa, Mono, Tuolumne)	\$25,671,404
ARRA Portfolio		\$257,579,342

<sup>1</sup> ARRA program spending for the California Comprehensive Residential Retrofit program has been updated since the initial employment and economic analysis was performed. Only direct employment from this program spending update is reflected in this report.

Source: DNV KEMA

### ARRA Program Expenditures by Program and Type of Activity

Table 6 shows ARRA expenditures by program and by type of activity. As shown, about 54 percent of ARRA funding was provided for financing and incentives, with the remainder used to fund program operations.

**Table 6: ARRA Program Expenditures by Category and Leveraged Funding (2010-2012)**

Program	ARRA Program Spending (2010-2012) <sup>1</sup>			
	Total	Operations	Financing	Incentives
CCRR	\$98,239,488	\$71,960,600	\$22,077,765	\$4,201,123
CEBFP	\$18,857,451	\$750,967	\$18,106,484	
CEWTP	\$18,876,507	\$18,876,507		
DGS	\$27,630,725	\$335,963	\$27,294,762	
ECAA-ARRA	\$20,288,212	\$798,000	\$19,490,212	
EECBG-SCC	\$33,597,852	\$1,177,156		\$32,420,696
MCR	\$29,943,616	\$13,571,542		\$16,372,074
CEC Support	\$10,145,491	\$10,145,491		
ARRA Portfolio	\$257,579,342	\$117,616,226	\$86,969,223	\$52,993,893

<sup>1</sup>ARRA program spending for the California Comprehensive Residential Retrofit program has been updated since the initial employment and economic analysis was performed. Only direct employment from this program spending update is reflected in this report.

Source: Energy Commission and DNV KEMA

Financing enabled lending to the participant for the purchase and installation of energy upgrade projects. The principal and interest payments for this financing are amortized costs to participants over the life of the financing. The financing is paid back over time and offers the benefit of below-market interest rates. Through four programs, ARRA provided nearly \$87 million in financing throughout the state. CEBF provided loans for clean energy manufacturing companies located or planning to locate in California. Two programs, DGS and ECAA-ARRA, used financing as their primary tool to fund energy efficiency retrofits of state and public buildings. Several subrecipients within the CCRR Program also offered financing for residential energy upgrade projects. In many cases, these programs financed 100 percent of the project cost. The amount of the energy bill savings from the upgrade project contributed at least partial payment of the amount of the principal and interest payments over the duration of the loan. The closer the financing duration was to matching the useful life of the energy upgrade measures, increased the likelihood that the energy bill savings would match the payment amount. After the financing duration was complete and the financing was fully paid, the energy bill savings would accrue to the program participant in its entirety.

About \$53 million in ARRA funding was used for incentives. Incentives typically included one-time payments in the form of upfront rebates or grants for energy upgrade equipment or services. Incentives were used to reduce project costs (up to 100 percent in a few programs). For these programs, energy bill savings fully accrue to the program participant immediately.

Incentives were primarily distributed through the CCRR, MCR, and EECBG SCC Programs. Total incentives dollars paid out by program for each county is provided in Appendix A.

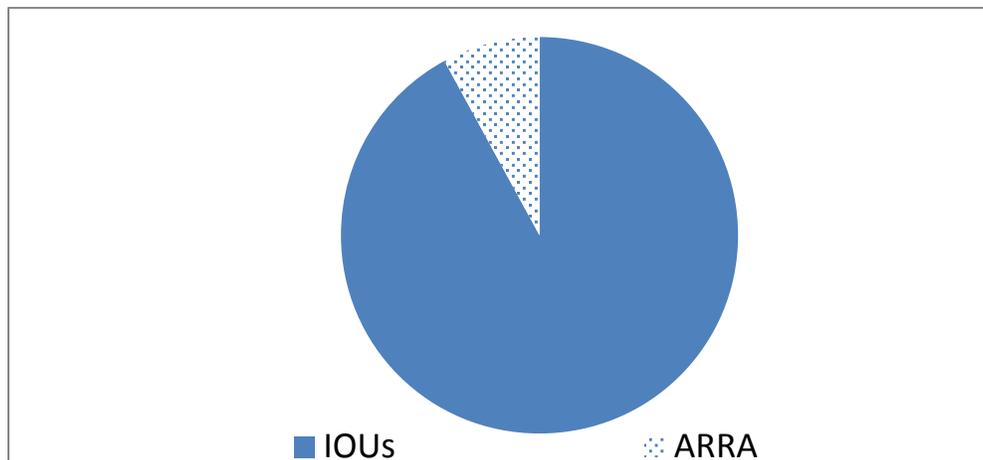
In addition, leveraged funding was included in the analysis to the extent it was reported by the subrecipients from investor-owned utilities (IOUs), as well as from any federal, state, or local

government programs. Funding was reported inconsistently by subrecipients, so reported leveraged funding may not actually include all leveraged funding used. Finally, the ARRA programs leveraged “in-kind” resources for joint marketing, curriculum development, and other donated activities. These “in-kind” resources are difficult to quantify in general, but they are also difficult to assess on an incremental basis because absent the program, some of these in-kind resources may have been expended into the economy in other ways.

## ARRA Program Funding in Context

The ARRA program funding for California was small compared to the overall California economy or the other energy efficiency spending in the state. During 2012, California was the ninth largest economy in the world.<sup>10</sup> In 2012, California had a GSP of nearly \$2 trillion.<sup>11</sup> Within this economic backdrop, the employment and economic impact analysis estimates the effects of nearly \$260 million in combined ARRA SEP and EECBG spending administered by the Energy Commission. Over the same three-year period, however, the California IOUs spent more than \$3 billion on energy efficiency programs.<sup>12</sup> Public utilities and municipalities also participated in funding energy efficiency programs. Figure 2 shows that the Energy Commission’s ARRA spending represents less than 10 percent of IOU spending on energy efficiency in California from 2010 through 2012.

**Figure 2: Relative Spending on Energy Efficiency in California**



Source: DNV KEMA

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10 Center for Continuing Study of the California Economy, [www.cccse.com/Numbersnews.php](http://www.cccse.com/Numbersnews.php).

11 Bureau of Economic Analysis ([www.bea.gov/iTable](http://www.bea.gov/iTable)).

12 Decision Approving 2010 to 2012 Energy Efficiency Portfolios and Budgets, CPUC, Aug. 25, 2009.

## CHAPTER 3: Results

This section presents findings on estimated employment and economic impacts by program and by region. Employment refers to incremental jobs created in the year they are reported. Employment in this analysis does not distinguish between full-time and part-time or permanent versus temporary jobs. Some but not all jobs reported continue into future years.

Estimated cumulative employment numbers reported here are in terms of *job-years*. Job-years are defined as one job for one year. For example, one job reported in Year One is one job, and cumulatively is referred to as one job-year. One job reported in Year Two is one job, and the combination of this job reported in Year Two and the job reported in Year One is cumulatively referred to as two job-years. This is illustrated in Table 7. As shown, a total of 827 direct jobs were created in 2010 (Year One of the ARRA analysis period). A total of 1,801 direct jobs were created in 2011 (Year Two), and 1,095 direct jobs were created in 2012 (Year Three). As a result, cumulative job-year impacts total 3,723 during 2010 through 2012. Clearly, the same 3,723 jobs were not held by the same 3,723 individuals over the full three-year period, nor were there a total of 3,723 jobs held at the end of 2012.

**Table 7: Annual Jobs to Job-Years**

Year	2010	2011	2012	Job-Years
Direct Jobs	827	1,801	1,095	3,723

Source: DNV KEMA

Another way to look at the results is by overall funding source. In Table 8 macroeconomic results are shown by the two sources used to fund the programs during the ARRA period. These sources are SEPs and EECBGs.

**Table 8: Results via Funding Source**

Evaluation Result		ARRA Funding Source		Total Energy Commission ARRA Portfolio
		State Energy Program	Energy Efficiency and Conservation Block Grant Program	
Direct Employment Outcomes (2010-2012)	Full-time and part-time jobs	3,160	563	3,723
Direct, Indirect, and Induced Employment Outcomes (2010-2026)	Full-time and part-time jobs	14,857	2,089	16,946
Direct, Indirect, and Induced Economic Outcomes (2010-2026)	Personal Income (millions)	\$1,096	\$178	\$1,274
	GSP (millions)	\$1,844	\$200	\$2,044
	State Revenue (millions)	\$215	\$28	\$243

Source: Economic Development Research Group, Inc. using the REMI PI+ impact model

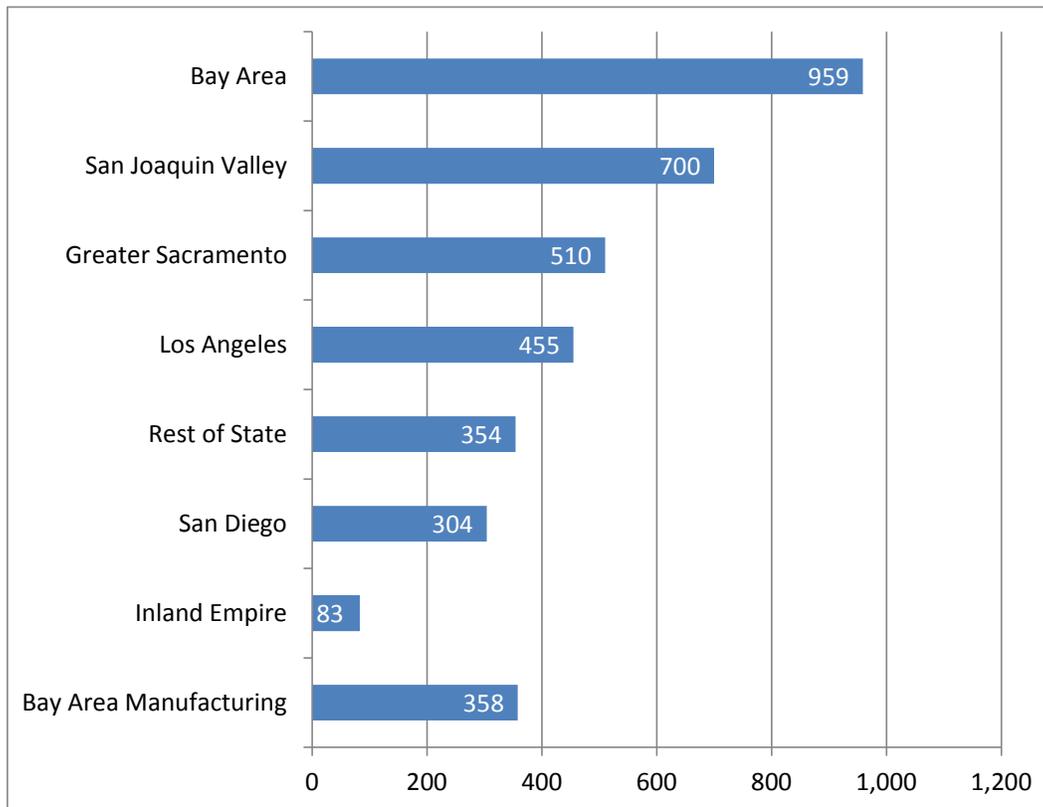
Results presented in this chapter are organized as follows:

- Estimated direct employment impacts by region (2010-2012)
- Estimated direct employment impacts by program (2010-2012)
- Estimated direct, indirect, and induced employment impacts by region (2010-2026)
- Estimated direct, indirect, and induced employment impacts by program (2010-2026)
- Estimated employment impacts by industry and occupation types
- Estimated economic impacts by region
- Estimated employment impact scenarios

### **Estimated Direct Employment Impacts by Region (2010-2012)**

Most of the projects and, as a result, the direct employment resulting from these projects are concentrated around major population centers, such as the San Francisco Bay Area, Greater Sacramento, and Los Angeles regions, as shown in Figure 3. In addition, a total of 700 direct jobs were created in the San Joaquin Valley, primarily around population centers.

**Figure 3: Estimated Direct Employment Impacts by Region (2010-2012)**



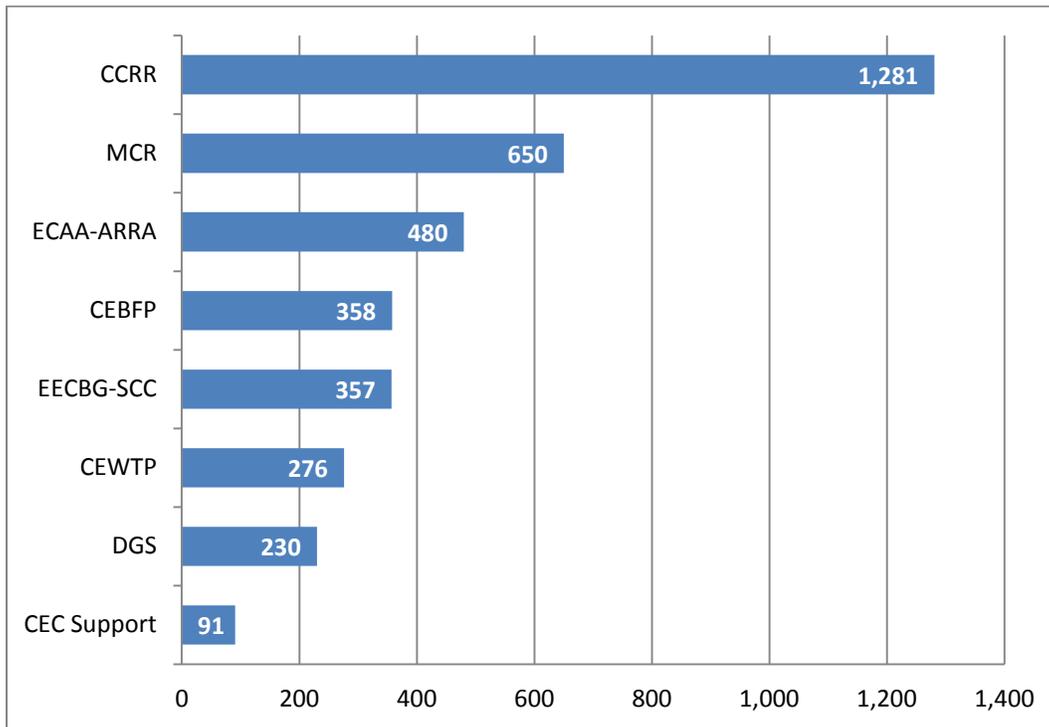
Source: Economic Development Research Group

The one region that stands out for estimated direct job creation is the Bay Area. The 11 counties in this region provided large suburban concentrations for CCRR energy assessments and upgrades, a multitude of businesses and municipalities targeted by MCR, and municipal government facilities targeted by ECAA. In addition, the loans provided through the CEBPF program were located in the Bay Area. The direct jobs estimated for the CEBPF are isolated in the bottom bar in Figure 3 to make comparisons among the other programs across regions more clear.

### **Estimated Direct Employment Impacts by Program (2010-2012)**

Figure 4 presents similar estimated direct jobs results by program. Nearly 1,300 estimated direct jobs (about one-third of the 3,723 total) were created as a result of the CCRR program, followed by MCR (17 percent) and ECAA-ARRA (13 percent). The CEBFP and EECBG-SCC programs contributed about 350 direct jobs (10 percent) each.

**Figure 4: Estimated Direct Employment Impacts by Program (2010-2012)**

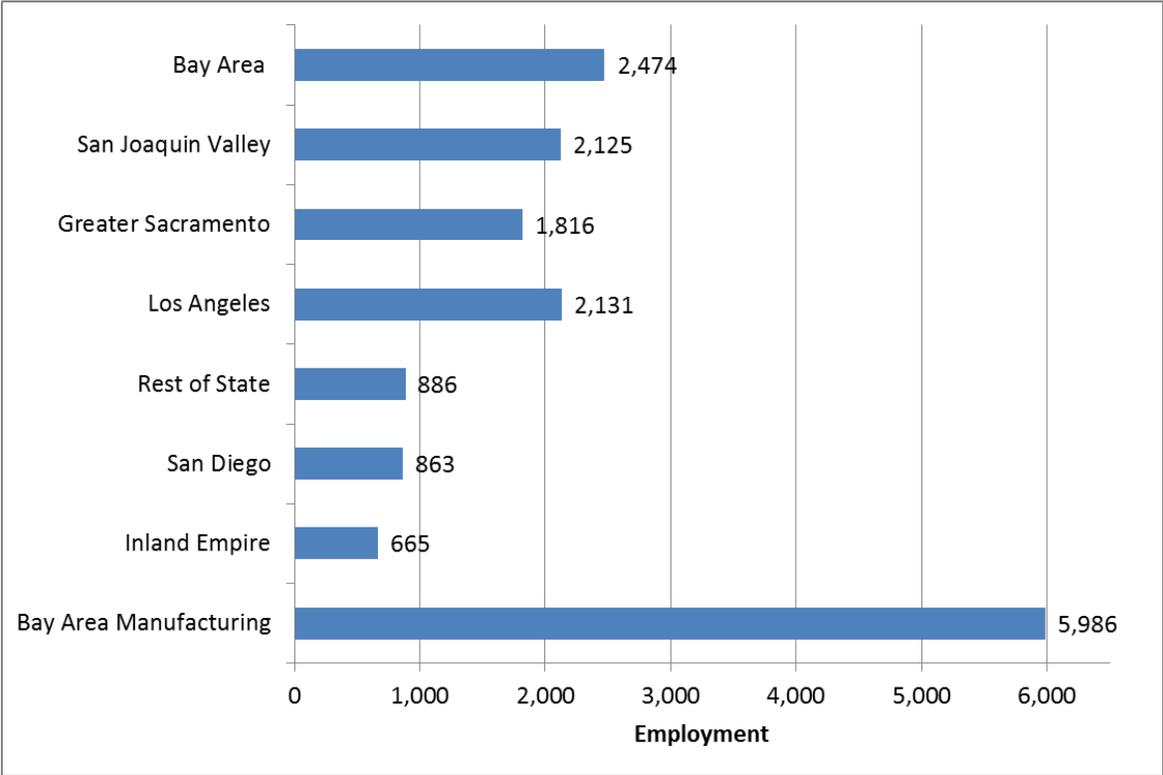


Source: Economic Development Research Group

### **Estimated Direct, Indirect, and Induced Employment Impacts by Region (2010-2026)**

Over time, the mix of programs creating jobs will change. The direct spending from the programs during 2010-2012 created an estimated total of 16,946 direct, indirect, and induced jobs (or, more precisely, job-years) through 2026. These jobs are projected based on a combination of extra spending by households and governmental entities, along with the increased market shares for participating California businesses, resulting from expected lower energy bills. The estimated energy bill savings increase residential participants' discretionary incomes or lower business and government operating costs, leading to increased spending over time on goods, services, and potentially new employees. Figure 5 presents the estimated direct, indirect, and induced employment impacts during 2010-2026 by region. As shown, regions with the highest program expenditures may not have resulted in the highest long-term employment effects. Instead, the analysis projects the greatest impacts in regions where programs provided the estimated greatest net energy bill savings to program participants.

**Figure 5: Estimated Direct, Indirect, and Induced Employment Impacts by Region (2010-2026) (ARRA Program Expenditures)**



Source: Economic Development Research Group

Direct spending from the CEBFP program resulted in direct, indirect, and induced jobs throughout the state, but the majority of these jobs were located within the Bay Area, where the three CEBFP manufacturing facilities that received financing are located.<sup>13</sup> For ease of comparison, manufacturing jobs have been isolated from the other Bay Area results, so comparisons among other programs across regions are clearer.

**Estimated Direct, Indirect, and Induced Employment Impacts by Program (2010-2026)**

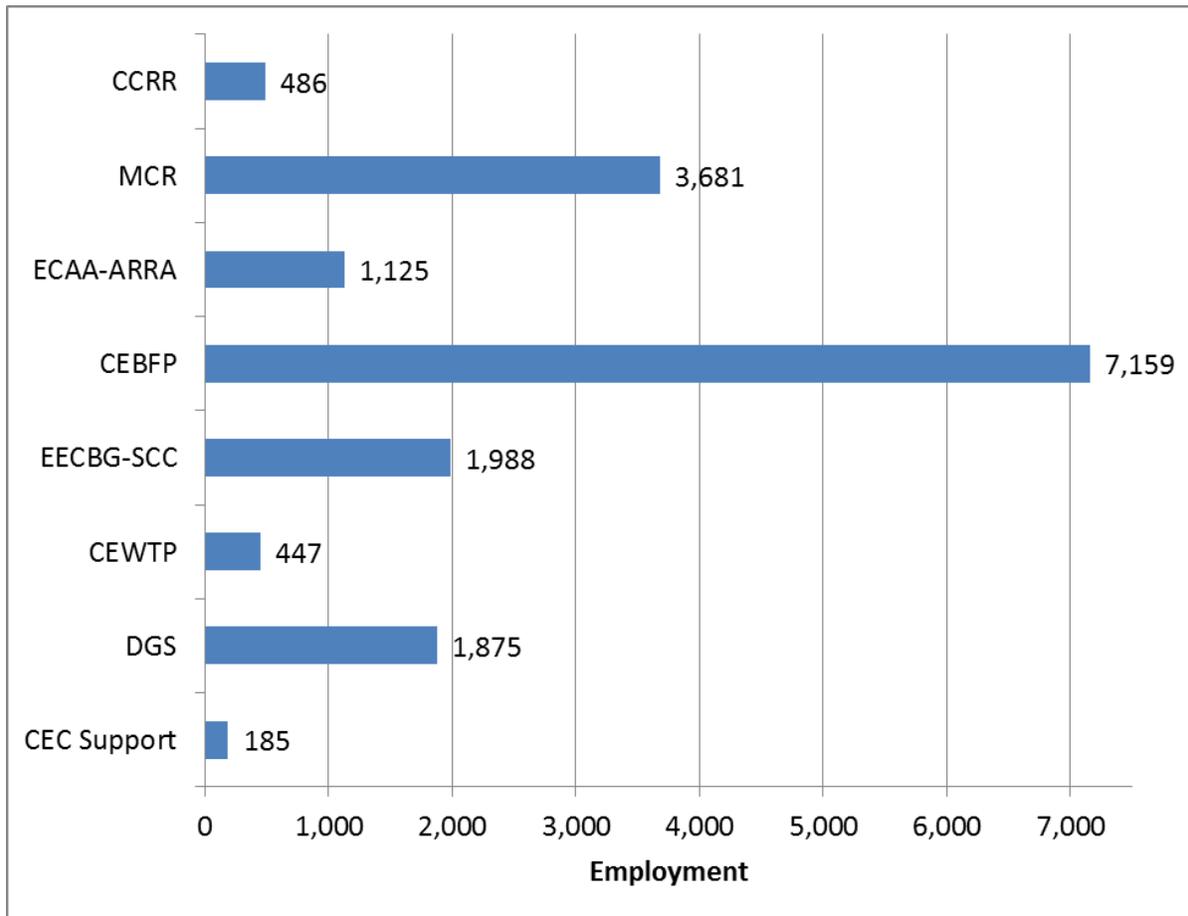
As mentioned above, the spending from the ARRA programs during 2010-2012 created an estimated total of 16,946 direct, indirect, and induced jobs (or, more precisely, job-years) through 2026. Figure 6 presents these estimated direct, indirect, and induced employment impacts during the 2010-2026 period by program. As shown, programs with the highest expenditures did not necessarily result in the highest, estimated direct, indirect, and induced

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<sup>13</sup> A fourth CEBFP recipient initially planned to locate a manufacturing facility in San Diego County. For business reasons this recipient did not open the facility and repaid the full amount of the loan early.

employment effects. Instead, the research team sees the greatest long-term impacts from manufacturing programs followed by programs that provided the most net energy bill savings to participants.

**Figure 6: Estimated Direct, Indirect, and Induced Employment Impacts by Program (2010-2026) (ARRA Program Expenditures)**



Source: Economic Development Research Group

For example, the MCR program not only created considerable direct jobs for sales people, auditors, and installers, but it reached the highest number of program participants with high net energy bill savings. This resulted in considerable additional estimated indirect and induced jobs as the business participants are expected to benefit from increased net profit and market share.

Furthermore, direct spending from the CEBFP program resulted in direct, indirect, and induced jobs throughout the state, but the majority of these jobs were located within the Bay Area where the operational CEBFP manufacturing facilities are located.

## **Estimated Program-Level Employment by Industry and Occupation**

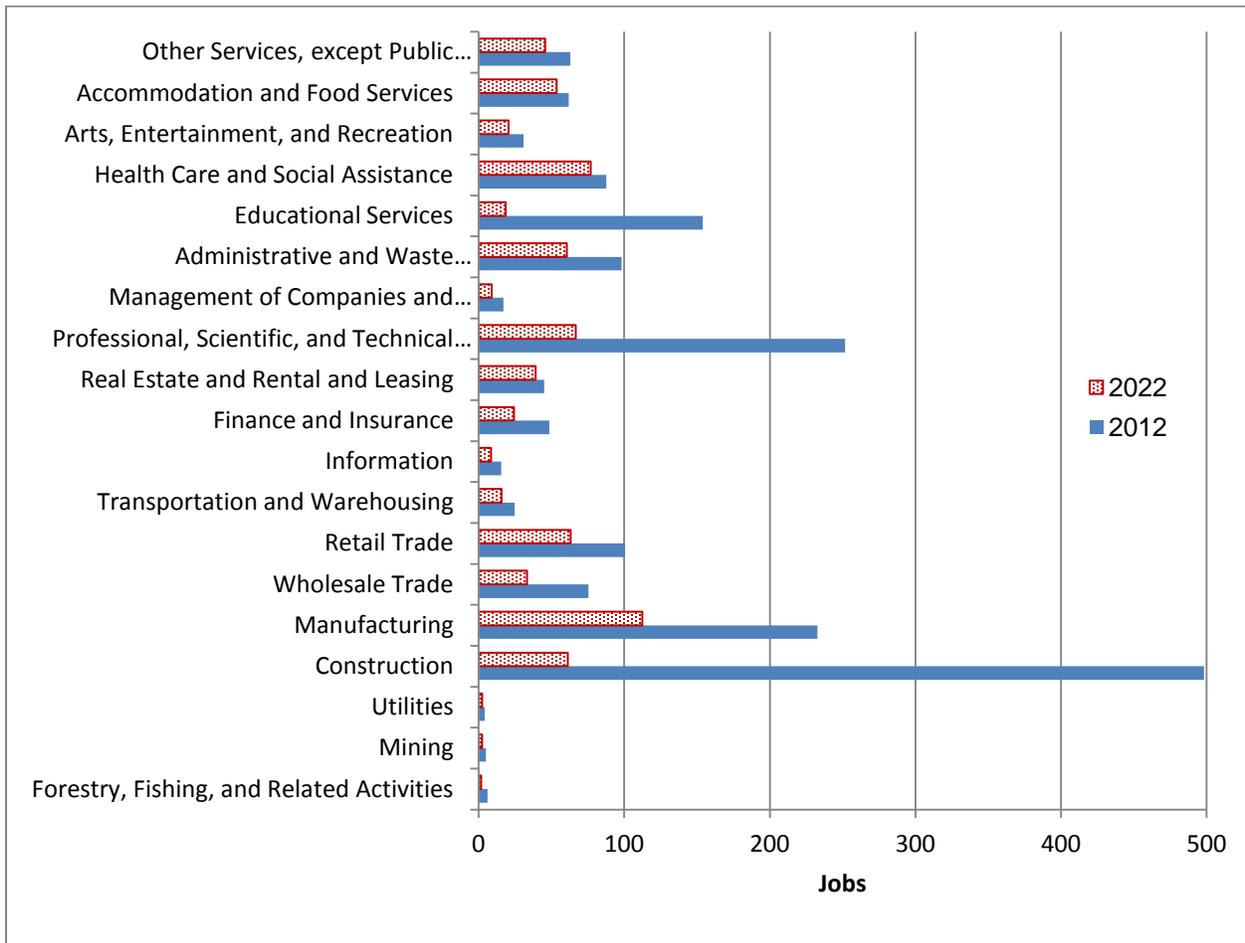
Industry-level job impacts describe the expected job changes in private-sector activities. Occupational impacts, on the other hand, account for the type of jobs in either the private-sector or the public sector. Employment depends not only on initial spending (for direct jobs), but how effectively the program created lasting financial benefits for participants. Each sector of the economy has its own growth response to cost savings.

Employment changes occur across industries over time. During the three years of ARRA program spending, employment gains come from subrecipient activity. After year three, the effects on the California economy are due to the estimated reduced energy bills realized by participants and the economic multipliers associated with specific industries and regions.

For all regions and all programs in the state, Figure 7 shows that during 2012, the last year of program implementation, employment gain is dominated by the construction industry followed by the professional, scientific and technical industry. This domination reflects the initial capital and labor spending on selling and installing efficiency upgrades such as lighting and HVAC equipment and on the jobs needed to implement the program related activities. By 2022, construction and professional scientific and technical industries employment has moved closer to the base forecast level, and spending throughout the economy generated by ARRA has shifted the type of employment gains to manufacturing followed by service industries such as health care, retail, and professional services. Tables showing this industry transition for each region are provided in Appendix E.

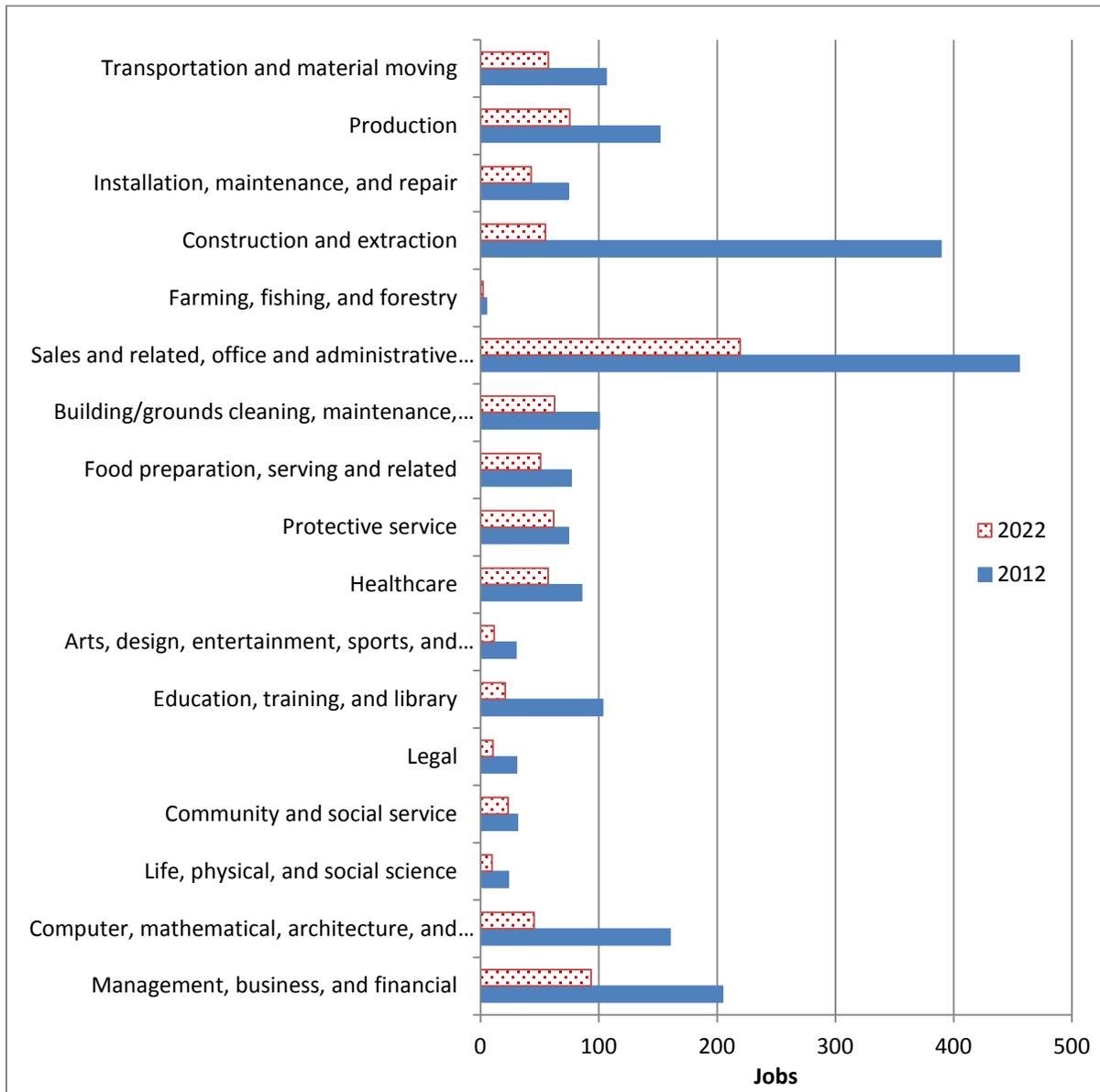
Occupations within these industries are shown in Figure 8. Sales remain a dominant occupation, but these jobs have shifted in type from construction to retail and other industries. Tables for these occupational changes by region are presented in Appendix D.

**Figure 7: Estimated Annual Employment Changes Statewide by Industry Sector**



Source: Economic Development Research Group

**Figure 8: Estimated Annual Employment Changes Statewide by Occupation**



Source: Economic Development Research Group

## Estimated Gross State Product

This section presents the estimated annual and cumulative outcomes on GSP, state revenue, and personal income from ARRA spending.

GSP is a measure of the state's output. It is the market value of all goods and services produced by the state in one year. Typically when GSP is growing, economic activity is increasing, and households and businesses are made better off.<sup>14</sup> As discussed in Chapter 1, this analysis presents GSP as an annual incremental amount caused by ARRA spending. The results are not totals for the state but represent changes that are relative to a base case level of economic activity, excluding ARRA spending. The incremental change acknowledges ongoing pre-ARRA SEP spending.

Under the ARRA case, the federal stimulus spending generated an additional \$110 million GSP in the first year of ARRA expenditures. The incremental annual increase in GSP over the base case after the ARRA spending ends and reaches an estimated annual peak of \$133 million in 2022 as the benefits of estimated lower energy bills flow through the state economy. Stated another way, an additional \$100 million per year on average over a 20-year period creates a cumulative \$2.04 billion in economic activity generated as a result of ARRA spending.

Top regions contributing to GSP are the Bay Area (\$1, 310 million), Los Angeles, (\$190 million), and San Joaquin Valley (\$154 million).

Bay Area GSP was driven by CEBFP and MCR. CEBFP provided loans that expanded solar manufacturing facilities, and the analysis projects it to have the greatest contribution to GSP over time. This result is expected since in employment models, manufacturing typically has a higher value-add per job and is attributed with higher economic multipliers than service-based businesses. This will increase GSP through the sale of panels in California, the United States, and abroad. As discussed earlier in this report, given changing market conditions evaluators expect that the actual impacts will be lower than projected here. MCR allowed businesses to lower operating costs and gain market share.

In Los Angeles, MCR and EECBG-SCC accounted for nearly two thirds (64 percent) of regional GSP.

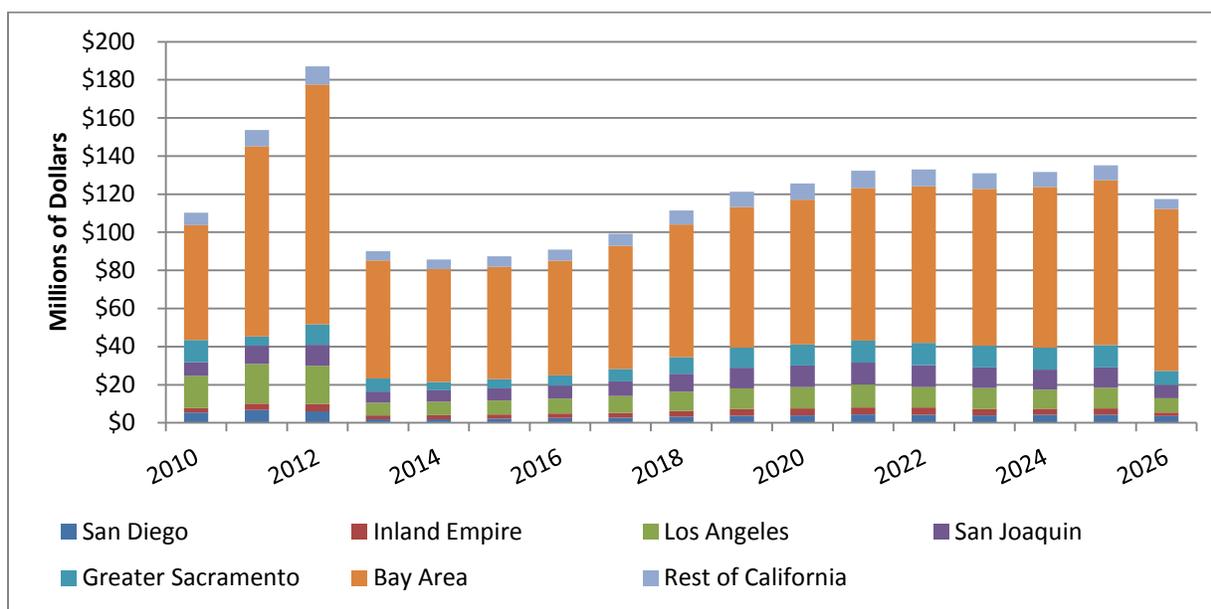
For the San Joaquin region MCR and DGS accounted for nearly a fourth of GSP (23 and 24 percent respectively) with EECBG-SCC contributing another 20 percent.

The annual changes in GSP from the initial program spending in 2010 through the duration of the useful life of the energy upgrade measures in 2026 are shown in Figure 9. A table presents these data in Appendix C.

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<sup>14</sup> This statement assumes a low and stable inflation rate.

**Figure 9: Annual GSP (Millions of 2012 Dollars)**



Source: Economic Development Research Group

## Estimated State Revenue From Regions

Revenue will flow to the state through a range of taxes and fees. The majority of these taxes are income taxes and state sales tax generated through more or higher wage-earning employment and higher consumption of goods. Since the MCR program targeted commercial and municipal projects throughout the state, it provides a useful example of the role these taxes and fees play for state revenue.

Revenue sources are grouped by general category, as shown in Figure 10. Income, sales, and other taxes are projected to contribute roughly half (56 percent) of the revenue flowing to the state. More jobs mean more people earning wages and paying taxes on those wages. This also may result in higher sales taxes as workers spend their wages on taxable goods and services. Business also will pay taxes from their sales.

MCR also included municipal government facilities. Intergovernmental revenue for MCR however contributes an additional 24 percent. Intergovernmental revenue represents the flow of funds between levels of government and between agencies at the same level. Funds may originate at the local, state or federal levels. This revenue can include money from shared taxes, grants and loans, or reimbursement for services rendered. It is shown in this report as part of an example of state revenue composition.

**Figure 10: Example of Sources on State Revenue From MCR**

Individual Income Tax	Intergovernmental Revenue	Other Taxes	General Sales Tax	All Other Revenue
27%	24%	17%	17%	15%

Source: Economic Development Research Group

Incremental revenue accruing to the State from MCR investment is detailed in Table 9.

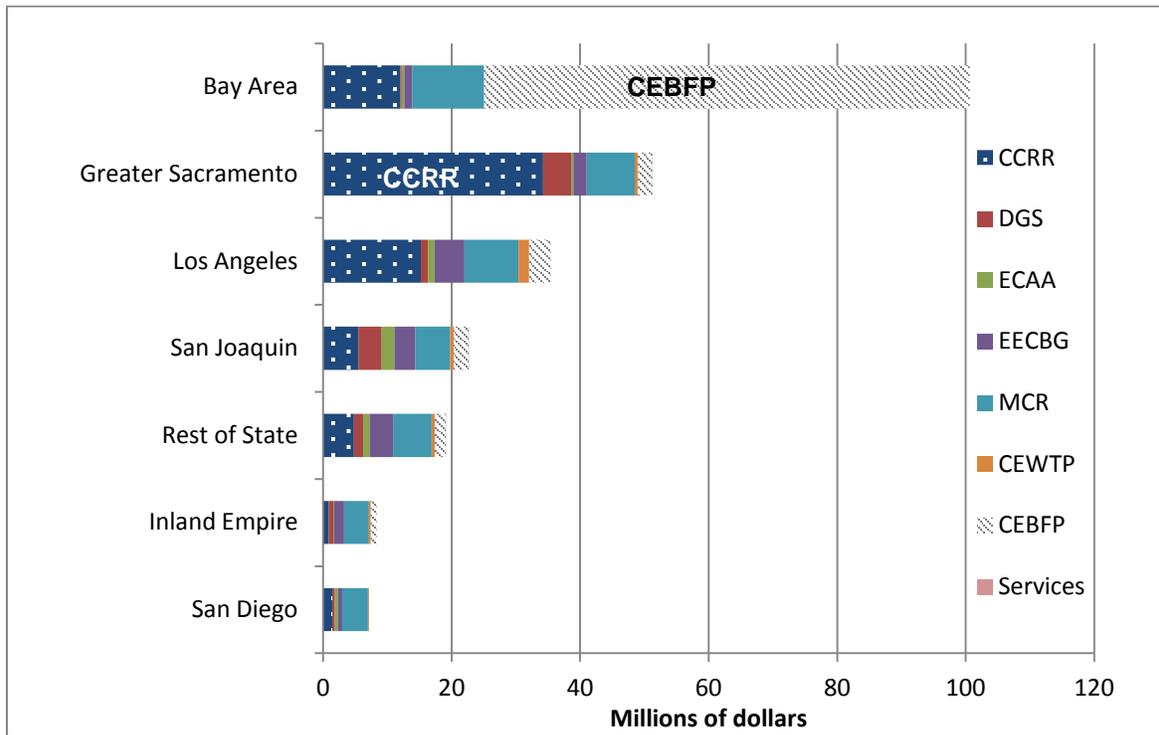
**Table 9: State Revenue Sources – MCR Example**

Revenue Category	Source of Revenue	MCR Contribution (%)
Individual Income Tax	Individual Income Tax	0.27
Intergovernmental Revenue	Intergovernmental Revenue	0.24
General Sales Tax	General Sales Tax	0.17
All Other Revenue	Current Charges	0.08
Other Taxes	Corporate Income Taxes	0.06
All Other Revenue	Miscellaneous General Revenue	0.05
Other Taxes	License Taxes	0.05
Other Taxes	Selective Sales Tax	0.04
All Other Revenue	Utility Revenue	0.02
Other Taxes	Other Taxes	0.02

Source: Economic Development Research Group

Each region has its own mix of residential, commercial, industrial, and government entities. The ARRA portfolio of programs targeted each of these segments differently and implemented projects in different regions of the state. Figure 11 shows the regional contribution of funds flowing from each region to the state in the form of estimated taxes and fees based on the incremental economic activity generated by the programs. Not surprisingly, the Bay Area shows the greatest estimated contribution to state revenue at 43.4 percent. This region included manufacturing loans through the CEBFP, along with residential and commercial retrofits throughout this 11-county region. Another one-third of projected state revenue will come from the Greater Sacramento region (20.8 percent) and the Los Angeles region (15.0 percent).

**Figure 11: Estimated Cumulative State Revenue by Program and Region (Millions of 2012 Dollars)**



Source: Economic Development Research Group,

## Bill Savings Scenarios

The indirect and induced ARRA influences estimated and discussed in this report are based on estimated participant bill savings within the context of a set of REMI macroeconomic conditions. There is a degree of uncertainty around this estimate, however. The sensitivity of spending and employment to different levels of bill savings can be developed by running the model.

The Energy Commission staff produces three retail rate scenarios (LOW, MID, and HIGH). Each retail rate scenario represents underlying assumptions of the Energy Commission about the forecasted future level of state economic activity. These scenarios are not absolutes but represent a range of economic activity. These rates also can be used to investigate employment and GSP outcomes with a range of bill savings.

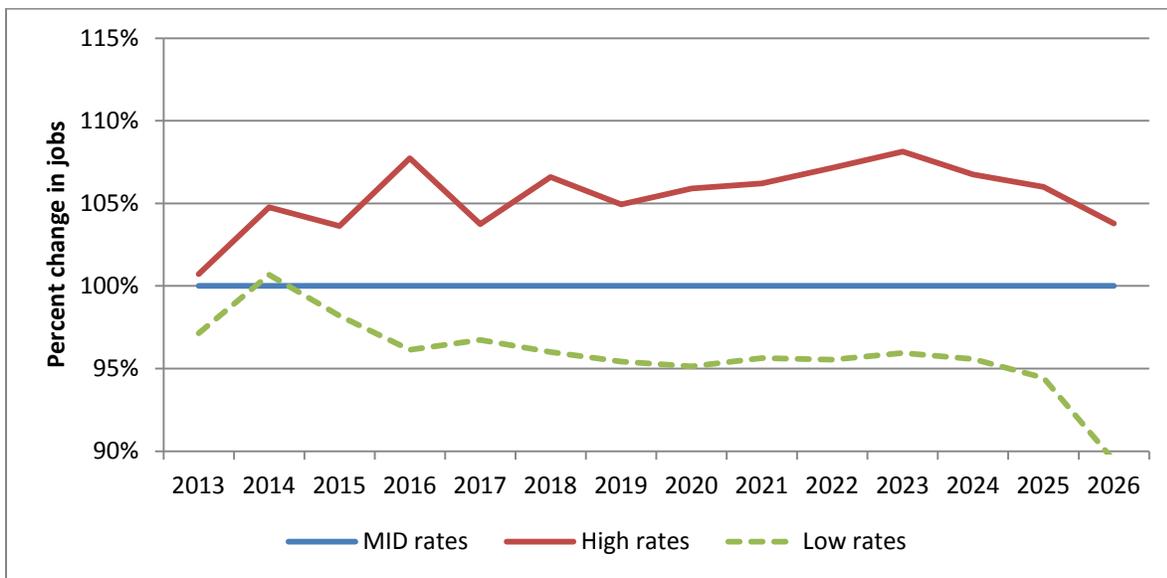
The analysis in Chapter 3 is predicated on the MID demand rate bill saving scenario. The forecasts in this section represent a continuous range of possible outcomes where the MID scenario is considered the most likely to be realized (100 percent line in the graph).

Holding the program expenditures, project expenditures, and REMI macroeconomic conditions constant, more energy bill savings for program participants translates to more discretionary income available to spend on other goods and services and more consumption for households. Businesses become more competitive through lower operating costs and may choose to reinvest,

pay higher wages, or hire more employees. Government entities also experience lower operating costs, and these may translate into capital reinvestment or reallocation of budgets. These changes support the expansion of economic activity leading to higher employment. Conversely, lowering energy bill savings has the opposite effect.

High and low bill savings scenarios are presented as annual percentage changes relative to the MID bill savings case. Figure 13 provides aggregate changes in statewide employment under each scenario and illustrates estimated aggregate changes in gross state product under these same scenarios.<sup>15</sup>

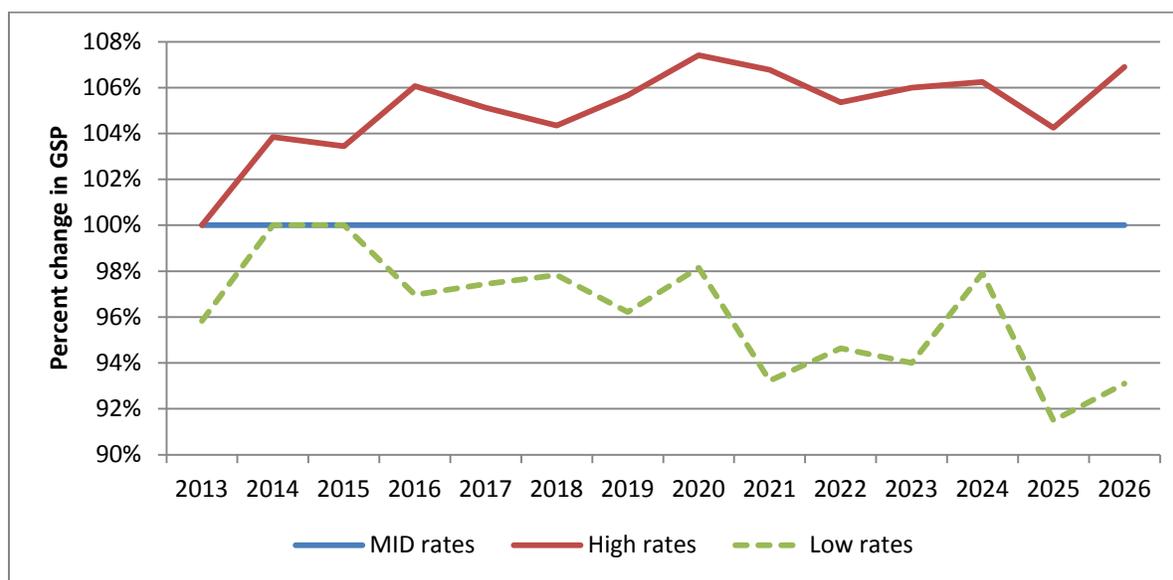
**Figure 12: Estimated Net ARRA-Induced Employment Changes With Three Energy Bill Savings Scenarios**



Source: Economic Development Research Group, Inc., using the REMI PI+ impact model

<sup>15</sup> Employment and GSP reflect differently over time because the composition of jobs changes over time, affecting each industry differently. It is the industry composition that drives changes in macroeconomic factors, such as GSP.

**Figure 13: Estimated Net ARRA-Induced GSP Changes With Three Energy Bill Savings Scenarios**



Source: Economic Development Research Group, Inc., using the REMI PI+ impact model

## Self-Sustaining Financing

Four of the ARRA programs incorporate a self-sustaining revolving loan fund into their program design. These programs are DGS for state entities, ECAA-ARRA for the municipal sector, CEBFP for the manufacturing sector, and CCRR for single-family and multifamily properties.

Each program used the ARRA funds to start a new revolving loan pool (CCRR, CEBFP, and DGS) or augment an existing one (ECAA-ARRA). Loan awards were made from these pools following a solicitation and application process. Once the funds are disbursed, the loan pool is replenished through ongoing repayment of the loans. When the size of the pool reaches – or is anticipated to reach – a threshold dollar level from loan repayments, the program can initiate a new solicitation and application process. By replenishing the loan pool, the program is an engine that can continue to fund energy efficiency or onsite renewable generation projects well after the initial ARRA funding has ended. Where the ARRA funds augment an existing loan pool, these funds were accounted for separately to estimate employment from ARRA.

While the employment and economic development of these future projects are not included in the scope of this analysis, the authors illustrate the potential effects for all such self-sustaining financing programs, using simplified examples for ECAA-ARRA and DGS.

The ECAA program made loans to local governments with a 15-year loan duration at 1 percent interest for municipal energy upgrade projects. If there are no defaults on these loans, and they are repaid according to their terms, in three years the ECAA-ARRA loan pool will have accumulated more than \$4.2 million in principal and interest repayments. This represents 21.6

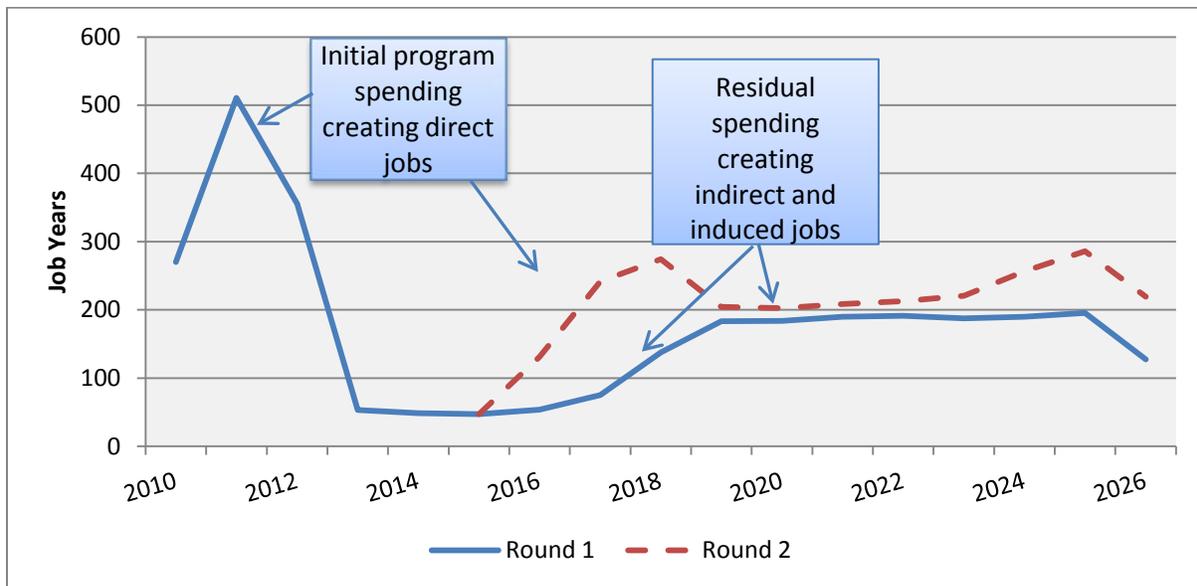
percent of the original ECAA-ARRA loan pool in just three years. If these repaid funds are loaned out in 2015, the program could generate up to an additional 226 incremental jobs by 2030. This assumes that the loans are used to fund projects that are similar in size, type, risk, segment, and geography to the initial loans.

DGS offered loans with a duration of 6 years at 2.5 percent interest. These loans went to facilities owned by the State of California. By 2016, this program will recover 54 percent (\$14,866,090) of the original loan pool. Holding all factors constant, new DGS loans with repaid funds could provide an additional 887 jobs by 2030.

Total estimated employment effects resulting from the initial ARRA loan pool (Round 1) and the next pool of loans funded through repayments of the first round of loans (Round 2) are illustrated in Figure 14.

The estimated incremental jobs are shown in Table 10. Initially, job creation occurs (mainly in the construction sector) from program spending as projects are implemented. Once these projects are complete, the construction jobs drop off, but the resulting lower operating expenses from reduced energy bills allow for increased spending in the government sector. As a result, job creation shifts toward service industries such as retail trade, professional services, and health care.

**Figure 14: Revolving Loan Pool Example**



Source: DNV KEMA

**Table 10: Incremental Jobs From Round 2 Loans for ECAA and DGS**

<b>Year</b>	<b>Incremental Jobs</b>
2015	0
2016	77
2017	166
2018	137
2019	21
2020	19
2021	18
2022	22
2023	33
2024	66
2025	91
2026	91
2027	94
2028	93
2029	92
2030	93
<b>Total jobs</b>	<b>1,113</b>

Source: DNV KEMA

## CHAPTER 4: Detailed Methods

The analysis presented in this report is based on the Renewable Energy Efficiency Mapping (REEM) framework developed by Economic Development Research Group (EDRG) to translate the ways in which program dollars (in this case SEP and EECBG dollars) are injected into the economy, and how they influence economic outcomes in different market segments. REEM is used as a preprocessor to ensure that data reflecting energy policy and program implementation activities are thoroughly and properly characterized. While REEM can perform key allocation mapping, many of the REEM inputs and industrial sector mappings were developed by DNV KEMA as part of the ARRA program evaluation and cost-effectiveness analysis. Expenditure and project cost data for this analysis came from the Energy Commission directly or from program implementers through the Energy Commission. Energy savings for electric and gas projects were extracted from the program impact evaluation reports. Sectors receiving funding were known, and project cost allocations between labor and equipment were assigned based on factors from the DEER database.

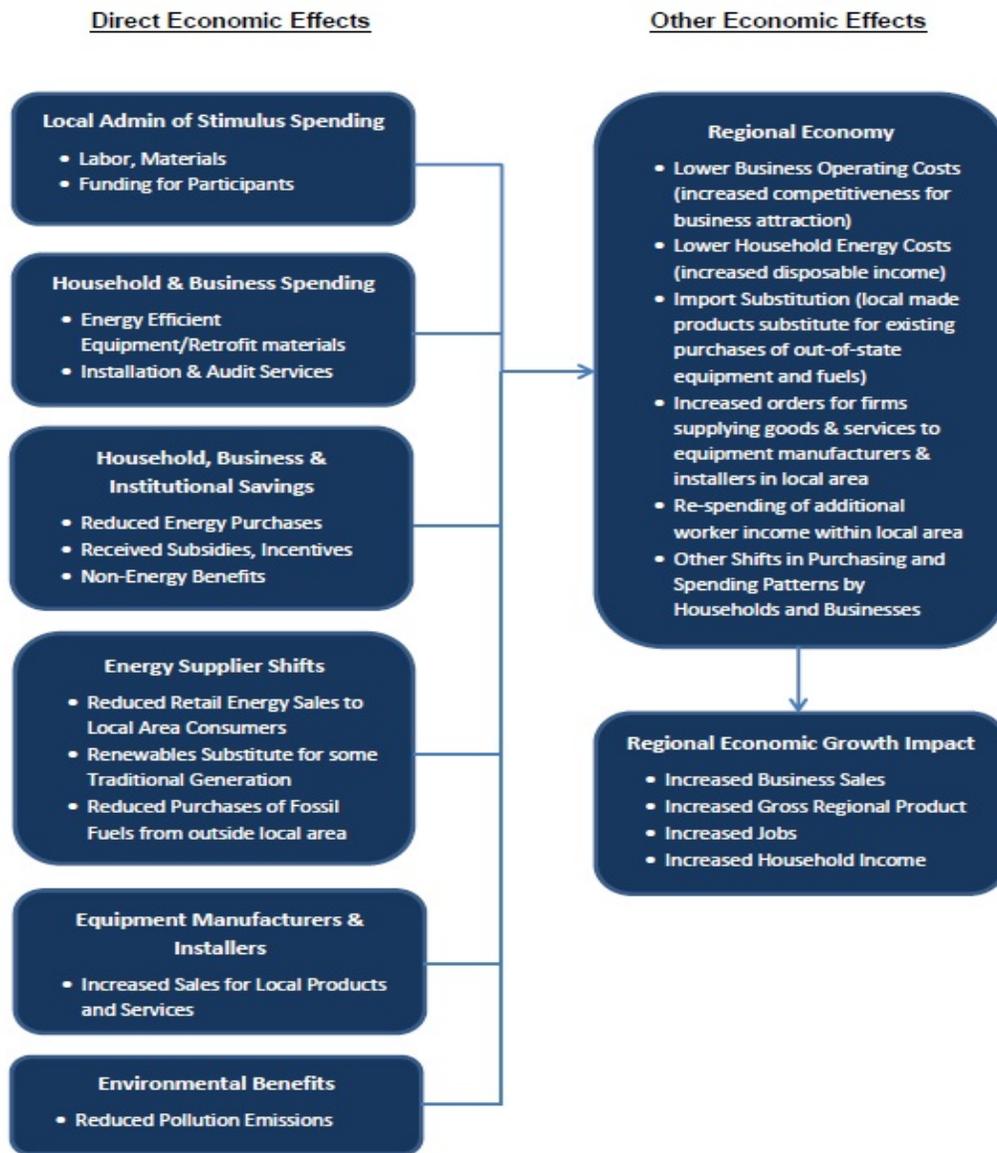
The resulting expenditure allocations were inputs for the REMI model to explore their direct influence on the regional economies.

The broader macroeconomic outcomes can be gauged for a given region of interest using an economic model that can react to each of the specific direct economic effects (anticipated or observed).

For example, a commercial or industrial customer with a lower energy bill has lower costs of doing business in their region and, as a result, is more competitive within those markets where the customer competes for business. This grows sales, along with jobs, labor income, and value-added product. By eventually spending less on energy consumption, households have disposable income to spend on other goods and services.

In addition, this activity may reduce energy generation that would have implicitly sent more dollars out of the region for fuel imports. This leakage from the local economy is replaced with locally provided services to install and maintain lower energy using dwellings or facilities, and provide some locally sourced equipment, components, and installation services. As businesses experience more sales, this has a multiplier effect on their suppliers. As households have more income (from energy bill savings) and spend it supporting local jobs, more local wages are created, and those new wages will have multiplier effects on the regional market. In Figure 15, the left portion of the diagram portrays the set of direct effects that are possible with a broad range of energy-related investments and objectives. This analysis, however, focused on regional administration in addition to household, business, and institutional spending and energy savings.

Figure 15: REEM Framework for Energy Impact Analysis



Source: ©2005-2011 Economic Development Research Group, Inc.

## Data Requirements

The four major categories of direct effects associated with energy policies or investments and their potential to initiate macroeconomic responses are described in this chapter. In addition, the analysis requires tracking these cost data based on the geographic region where expenditures occurred and by the type of activity (for example, energy audits/assessments and energy efficiency upgrade or on-site renewable electricity generation). The four categories are described below.

## Local Administration of Stimulus Spending

These dollars are spent to operate the state's SEP and EECBG programs. This spending includes incentives and loans disbursed to business and household participants, as well as expenditures for program management, marketing and participant information, workforce development and training, and QA/quality control (QC).

## Household, Business, and Institutional Energy Bill Savings

These savings include estimated energy bill savings to businesses, agencies, and households from reductions in energy consumption realized as a result of the SEP- and EECBG-funded projects.

## Household and Business Spending

This spending includes additional household and business expenditures associated with the incremental cost of purchasing and installing energy retrofits and upgrades, including efficient equipment or on-site renewable electricity generation. These are the full costs for the new energy upgrades, minus incentives paid by the ARRA program, and any other rebates available to the program participant.

For example, if a project has a total cost of \$100,000, this is the project cost and the level of expenditure introduced into the regional economy. However, the participant's cost is \$100,000 minus ARRA payments (\$50,000), minus IOU rebates (\$30,000), and minus municipal and local rebates (\$10,000). The resulting participant's out-of-pocket expense would be \$10,000. The estimated net savings for a participating household are the recurring energy bill savings minus the out-of-pocket expenditure for the energy upgrade project. Changes in the energy bill create changes in discretionary funds available for households to save or spend on additional goods and services in current and future periods. For participating commercial facilities, the estimated net energy bill savings lower operating costs. For participating government facilities, the net energy bill savings augment public spending.

Annual values are used for modeling purposes to generate annual economic flows within the state. DNV KEMA provided EDRG with annual spending, bill savings, and related cost data by region and year for the analysis period. Table 11 provides a breakdown on the level of detail for household and business costs, and savings used as model inputs.

## Equipment Manufacturers and Installers

Wholesale: *Locally procured* in the model triggers a particular set of economic linkages associated with energy upgrade products purchased from a wholesale distributor located within one of the seven regions defined in the model, and installed within the same region. For most energy upgrades, the purchase region is the same as the region where the upgrades were installed. One notable exception is for the specialized manufacturing equipment in the CEBFP purchased directly from manufacturers outside California.

Manufacturing: *Locally manufactured* in the model triggers a different set of economic linkages associated with equipment manufactured in the region or in the state. California has a diverse manufacturing base that includes some lighting manufacturing. However, there is no

documentation that energy upgrade measures implemented through the ARRA programs are part of this manufacturing base. For example, equipment for end use such as heating and cooling are manufactured outside California (Goodman in Texas, Trane in Wisconsin, and Carrier in New York). Another company, Corning, manufactures several building materials in California. These are roofing products in the Los Angeles region and stone veneer in the Bay Area region. Other product manufacturing by this company, such as thermal insulation manufacturing is done predominantly outside the state.

**Table 11: Expenditure Data Inputs for the REMI Model**

REMI Model Data Inputs for Equipment Investments	
1.	Labor cost by type (for example, auditor, construction laborer)
2.	"Locally manufactured or procured" building equipment (for example, windows, insulation, HVAC, motors) or production system components (for example, solar panel assembly tables, injection molding or cutting machines, chemical baths, furnaces)
3.	Annual energy saved by building type (net of owner's investment cost)

Source: Economic Development Research Group

## Data Availability and Collection

The data used for this analysis existed in many different forms and places. Program expenditure data were provided by the Energy Commission staff, including contract agreement managers (CAMs), based on subrecipient reporting that was entered into the Energy Commission's Program Information Management System, which contains administrative, incentive, and financing expenditures for each program. For most programs, tracking data included project costs and incentives, including ARRA funds and leveraged funds. Detail-level data as described earlier in this chapter were not available for some programs. In most cases where these data were not available, the evaluation team developed estimates.

Energy savings data were developed by the evaluation team for evaluation reports for each program. Data collected by the evaluation team included:

- Energy savings (kilowatt hours [kWhs,] therms) for both the first year and life cycle of the energy upgrade measures.
- Onsite renewable electricity generation capacity (kW) and kWhs.

Program Operations Spending: Subrecipients reported expenditures, by category, to the Energy Commission. The Energy Commission staff provided this program-level data to the evaluation team. The evaluation team reviewed this data and followed up with program contract managers and/or subrecipients where clarification or more detail was necessary.

Household, Business, and Institutional Energy Bill Savings: Participants who received services, incentives, and financing from the program were the focus of the energy bill savings impact evaluations. The energy savings reported from those evaluations were used to estimate energy bill savings by applying forecasted, average retail electric and natural gas rates by sector for each region where projects are located. The Energy Commission provided average retail rate forecasts by IOU service territory and rate class for a 20-year period.

Household and business savings are the stream of estimated energy bill savings that result from energy savings for energy retrofits and upgrade projects completed through the programs over the effective useful life of the installed energy measures. Savings were estimated based on a sample of participants, as reported in the program impact evaluation reports.

Household and Business Spending: This spending represents the participant’s “out-of-pocket” first costs. Project costs were not recorded in a standardized way, and each program and subrecipient tracked these expenditures with varying levels of detail and accuracy.

Where subrecipients tracked and reported project-level equipment and labor expenditures, the evaluation team used these data to develop project averages. When project expenditures did not exist explicitly but could be attributed through incentive payments, loan amounts, or other program information, the evaluation team developed these estimates.

When project expenditures were unknown, in some cases the evaluation team generated estimates using a sample of documented project expenditures from similar type projects. Implementers did not determine that there were incremental operations and maintenance costs for the retrofits and upgrade projects.

To place projects in one of the seven analysis regions, project locations were assigned to counties. The county determined the region assignment.

The split of project costs into equipment and labor costs were based on average factors from the Database for Energy Efficient Resources, published in 2008 (DEER 2008) for commercial, industrial, and governmental projects. For residential projects, the average factors for the split of labor and equipment came from a set of sample projects. Table 12 lists these equipment and labor factors.

**Table 12: Project Factors**

Project Type	Equipment	Labor	Source
Nonresidential Lighting	70%	30%	DEER 2008
Nonresidential HVAC	60%	40%	DEER 2008
Residential Whole House Retrofit	65%	35%	CCRR SAMPLE

Source: DNV KEMA

After these factors were applied to project costs, the data were grouped by region. The labor costs were further broken down into industry type at the two-digit level of the North American Industry Classification System (NAICS). NAICS codes were assigned based on the predominate end use for the project. For example, for solar photovoltaic (PV) installation projects, NAICS Code 23 applied. Table 13 shows these NAICS codes.

**Table 13: Two-Digit NAICS Codes**

Labor Category	NAICS Descriptions
Training	61 Educational Services
Home Inspection Services	54 Professional-Technical Services
Solar Cells Manufacturing	33 Manufacturing
Marketing	54 Professional-Technical Services
Electrical	23 Construction
HVAC	23 Construction
PV installation	23 Construction
Insulation	23 Construction

Source: DNV KEMA

The cost and energy savings data are annual flows estimated over the weighted average measure life (WAML) for projects in a program. These data include program expenditures, participant expenditures,<sup>16</sup> and estimated energy bill savings. These data comprise the inputs for the REMI model.

ARRA-Funded Jobs: The U.S. DOE requires each ARRA contract subrecipient to report labor hours for employment created or retained directly as a result of the program. The Energy Commission collects job creation and retention data through the California Energy Commission’s ARRA Reporting System (CARS). ARRA jobs reported in this system are defined as “jobs in which wages or salaries are either paid for, or will be reimbursed with ARRA funds.”<sup>17</sup> This information is not a direct input into the model. It does, however, serve as an “order-of-magnitude” comparison with the direct job estimates driven by program and project spending streams from the REMI modeling.

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<sup>16</sup> Participant expenditures are the participants’ out-of-pocket cost after all incentives, tax credits, and PV loan benefits have been applied.

<sup>17</sup> *Jobs Creation and Retention Reporting Toolbox*. Perry-Smith, February 2011, page 2.

## Modeling Approach

The model used for this analysis was the REMI Policy Insights Plus (PI+).<sup>18</sup> It depicts a seven-region model of the California economy with detail, and economic assumptions at the regional level, to address impacts on the residential household sector and 23 industry sectors. The model is a computable general equilibrium (CGE)<sup>19</sup> annual forecasting system (capable of doing analysis through 2060). It includes the ability to adjust a full range of variables to introduce direct elements of a policy change into the model, to assess economic impacts to a targeted region. The model uses inputs specified by the user to make an alternative forecast to the baseline (status quo) market, based on industry and labor market interactions, customized by REMI to reflect the regions defined by the analysis objectives. The model generates a default baseline level of economic activity based on these regional interactions. When model inputs are changed (for example, a change to participant estimated energy bill savings), the model recalculates economic flows and presents results in terms of change from the baseline. The steps are listed below:

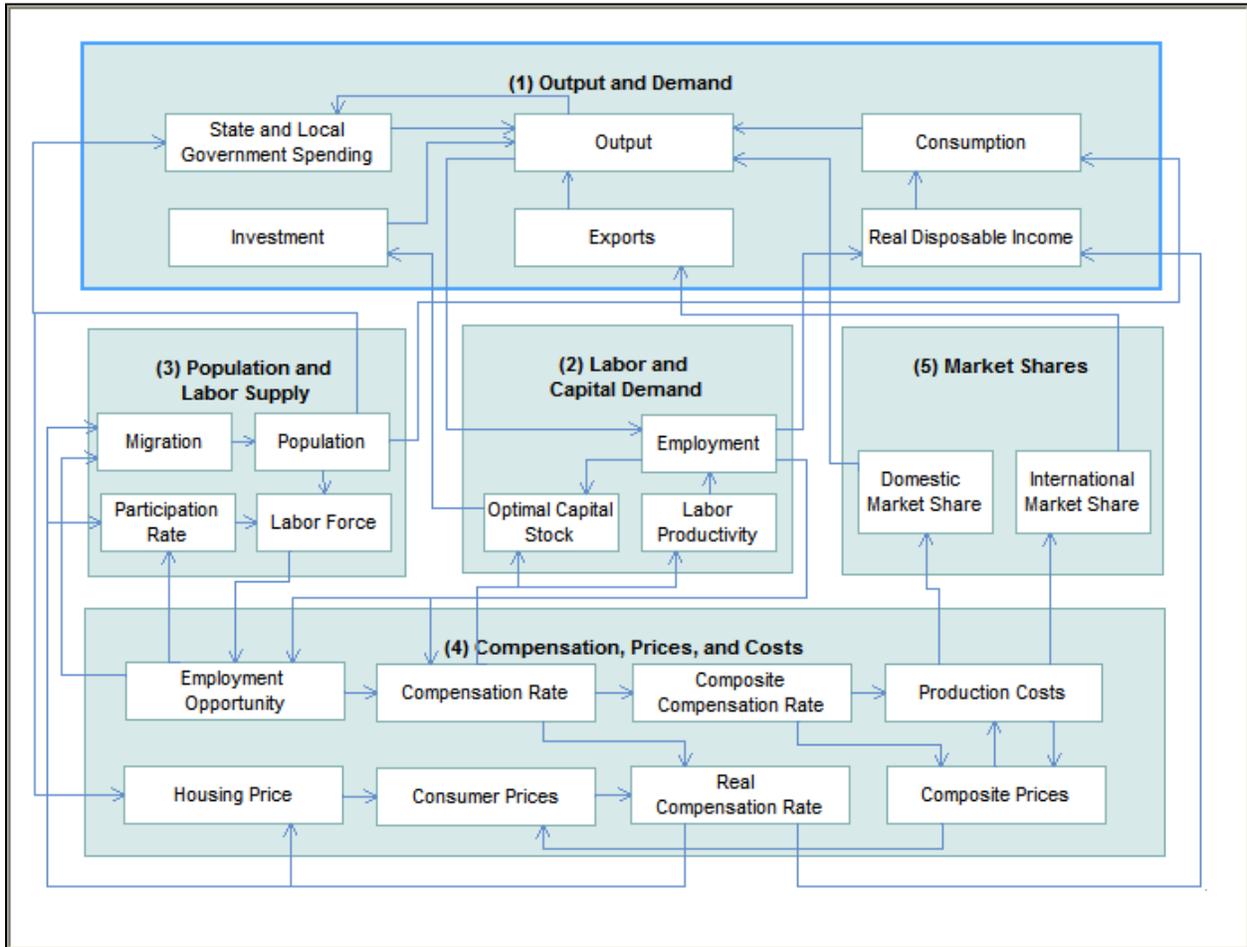
- Define the desired set of direct project effects for analysis.
- Develop macroeconomic model with required responses. Figure 16 presents the set of REMI model linkages. REMI populates these, and the output becomes the baseline scenario.
- Map and model region-level, project direct effects into economic changes.
- Adjust the model to reflect ARRA-induced spending, and rerun the model.
- Introduce changes to the model, and solve for regional annual total job impacts (total equals direct plus indirect plus induced impact cycles) among other annual metrics.

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<sup>18</sup> Amherst, Massachusetts. [www.remi.com](http://www.remi.com).

<sup>19</sup> [http://en.wikipedia.org/wiki/Computable\\_general\\_equilibrium](http://en.wikipedia.org/wiki/Computable_general_equilibrium).

**Figure 16: REMI Model Linkages**

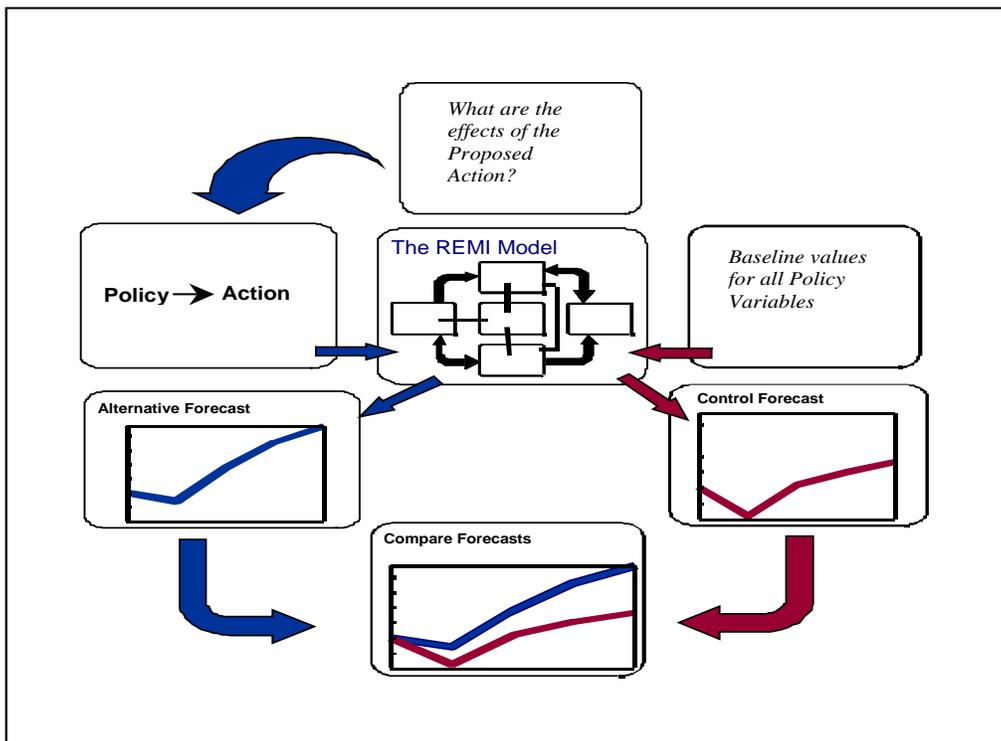


Source: Regional Economic Modeling, Inc., REMI documentation

To estimate job effects along with other macroeconomic changes from ARRA spending, key information was assembled from the program impact evaluations, the cost-effectiveness analyses, and other relevant sources. For example, estimated energy bill savings, project costs, and direct program expenditures for operations and support services were used as key input data to the macroeconomic analysis.

Changes in the model output from the baseline represent the change caused by a “proposed action.” In this analysis it is the introduction of the additional ARRA spending. The impact is the resulting estimated annual change in employment, or dollars of GSP (regional), or labor income, as a change from what the macro indicator would have been without the “proposed action.” A change can be shown as a difference from the baseline or as a percentage change. Figure 17 depicts this sequence of analysis.

**Figure 17: Identifying Annual Economic Impacts With a REMI Model**



Source: Regional Economic Modeling, Inc.

In a multiregional REMI model, an economic event in one region will have varying spillover effects on surrounding regions. Triggered by the policy or investment, these effects result from preexisting labor flows, interregional business transactions, and changes in relative competitiveness.

### Analytical Process

DNV KEMA provided EDRG with a consolidated dataset of expenditures and bill savings representing a time series (for the interval 2010 through 2026/2027)<sup>20</sup> for each of seven programs: CCRR, CEBFP, CEWTP, DGS, ECAA, EECBG-SCC, and MCR. To support the macroeconomic analysis, program activities first were segmented by target market (residential, commercial, industrial, state government, or municipalities) and then by region. The dataset for each program had administrative costs, projects costs, and estimated energy savings from reduced electricity and/or natural gas consumption.

<sup>20</sup> Expressed in 2012 constant dollars.

Gross (total) project costs were broken out:

- As project cost for labor and equipment.
- For CCRR only, labor was additionally allocated either to Sector 23 “Construction Labor” or to Sector 54 “Misc. Professional and Technical Services.” This was done because CCRR included stand-alone energy assessment activity.
- For CEWTP, all of the labor was assigned to Sector 61 “Educational Services.”

Along with a set of assumptions described below, the steps above make it possible to map or translate these concepts into a set of interactions initiated by the programs that alters the baseline macroeconomic trajectory across each region.

### Assumptions

- Gross project cost is the basis for creating the “demands” allocated between energy-efficient equipment and labor for installation/inspection/audit activities. The factors are listed in Table 12.
- Equipment purchases for the CEBFP (industrial) subrecipients are considered as manufactured out-of-state and sourced factory-direct.
- Equipment purchases for all other programs conservatively assume zero in-state manufacturing. Each region contains a wholesale distribution sector for sourcing and credits the distributor’s markup to the region.<sup>21</sup>
- Direct expenditures on project labor occur in the region where the project was implemented.
- Program-related costs (net of the incentive and financing budgets) form the basis for more local spending to run the program; hire-third party consultants to implement a program; perform QA/QC, EM&V activities; market the program to customers; and conduct training workshops. Some of these dollars pay state and local government employees to run day-to-day aspects of the program.
- Participant costs (out-of-pocket costs for energy retrofit and upgrade projects) are the gross project costs minus any rebate or other form of incentive.
- The participant’s estimated net energy bill savings are specified after considering any future stream of loan repayment cost.
- Net energy bill savings streams for programs are estimated over the period of analysis, which for most programs is consistent with the program’s savings-weighted average measure life. For most programs the estimated net energy bill savings stream was determined through 2026. The exceptions are DGS (affecting state facilities) and EECBG (affecting local government facilities), for which the estimated net energy bill savings stream was determined through 2027.

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21 Neither DNV KEMA nor Energy Commission could verify information on in-state manufacturing of energy efficiency materials and equipment purchased by ARRA-funded programs.

## Modeling ARRA Activities in REMI

The first distinction to be made with program-specific information is to assign the customer segment(s) participating in the programs, as indicated by:

- Participant contributions, either through cash or making loan payments (after rebates, incentive monies, or other leveraged funds are received) to cover the cost of making energy upgrade projects.
- Estimated participant energy bill savings expected through reduced energy consumption due to energy efficiency or solar PV installations.<sup>22</sup>

The ARRA programs targeted specific customer segments, so assignments were relatively straightforward. Table 14 provides this segment information.

**Table 14: Market Segments by Program**

	CCRR & LGC	DGS	ECAA-ARRA	EECBG-SCC	MCR	CEBFP	CEWTP
Participant Segment	Residential, Commercial Pilots	State	Municipal	Municipal	Municipal, Commercial	Select Manufacturing	Working Age Cohorts

Source: DNV KEMA

To create an alternative macroeconomic forecast across the California regions, costs and benefits are entered into the REMI analysis model for each programs described below:

- Labor dollars are local labor compensation payments by sector at the two-digit NAICS code level. For the ARRA programs, the NAICS names and codes were construction trades (23), professional and technical services (54), and educational services (61). Labor dollars are estimated based on total project costs and the project factors presented in Table 12.
- “Equipment” dollars represent the energy upgrade measures installed through the ARRA programs, which are procured through wholesale distributors and not directly from manufacturers. The exception is CEBFP, where all equipment is considered to be procured factory-direct from outside California. “Equipment” dollars are estimated from project costs based on the project factors in Table 11.
- Incentives and rebate dollars are applied to project costs to reduce the cost of projects to participants. Energy Commission ARRA dollars were reported by the Energy

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<sup>22</sup> Benefits for demand reductions are not included in this analysis.

Commission. Rebate dollars from other sources such as IOUs, publicly owned utilities (POUs), and municipal governments are included where reported by implementers.

- Financing cost payment flows are determined using program-specific interest rates and loan durations.
- Financing cost flows are deducted from estimated energy bill reductions to determine net energy bill dollar flows, which affect changes in the cost of living in the residential segment and the cost of doing business in the commercial segment.
- Participant costs also represent changes in the cost of living in the residential segment and the cost of doing business in the commercial segment. Gross projects costs are restated as net project costs by deducting incentives and rebates. Net project costs are referred to as participant costs.
- Program operations spending (apart from incentives and financing) includes state government employee compensation for day-to-day program activities, along with subrecipient professional and technical services paid through ARRA funding for all other aspects of administering the program.

## **CHAPTER 5: Conclusion**

This analysis addressed several questions about the estimated impact from certain Energy Commission ARRA-funded programs from 2010 through 2012.

- How much gross project spending was directed toward in-state industries?
- Which industries and occupations are expected to experience job growth as a result of this spending?
- How many jobs are expected to be created by industry and occupation?
- What is the estimated influence on income, state revenue, and GSP?

The ARRA dollars entered the regional- and state-level economy in two forms. One form was as wages to new and existing employees. The other was through energy upgrade measure purchases and installations resulting in estimated energy bill savings to program participants. Lower estimated energy bills translate to more funds to spend on other goods and services for participating households and lower operating costs for businesses and governments.

### **Spending on Project Equipment**

This analysis assumes all energy-efficient equipment purchase dollars went through wholesale distributors located in the same regions where projects occurred, but no energy-efficient equipment dollars were assumed to go directly to manufacturers in California. While California has a diverse manufacturing sector, the type of equipment used for most ARRA energy upgrades, such as central air-conditioning units, thermal insulation, and lighting equipment, are typically manufactured outside California.

### **ARRA Spending Effects**

The type of employment that resulted directly from ARRA expenditures were temporary full-time and part-time jobs. This is expected since ARRA funding had specific start and stop time limits. In addition to installing energy upgrade measures, these jobs involved designing, administering, and implementing the programs. Employment activities included everything from marketing and operations, to training and building energy auditing, and rating. The initial activities to provide training, install energy upgrade measures for retrofits, and expand manufacturing generated an estimated equivalent of 3,723 total jobs over three years, mainly in construction.

Once the ARRA expenditures terminated, much of this employment (with the exception of the CEBFP) was assumed to terminate also. However, the effects of the ARRA expenditures

persisted as reduced energy bills improved cash flow for program participants. DNV KEMA estimates the monetary savings from energy bills will support the additional equivalent of 16,946 job years over a 16-year period.

Where expenditures included additional capital for manufacturing, such as the CEBFP, these funds expanded production facilities, setting the stage for more employment driven by market conditions. At the point in time when evaluators modeled ARRA activities in REMI, the remaining three participating manufacturing facilities were expected to support about 477 jobs annually from direct increases in manufacturing employment and from the multiplier response to this activity. The model assumed there are no facility closures or layoffs from 2013 through 2026 for the manufacturers who received financing through the CEBFP. However, one of the three manufacturing facilities ceased California operations and employment after the ARRA activities were modeled. In addition, due to challenging market conditions, the solar panel manufacturing industry continues to consolidate. For these reasons, the total future jobs projected in this report for the CEBFP should be considered high.

While one region accounted for all of the job creation as a result of direct program spending from the CEBFP, when the CEBFP jobs are excluded, job creation in the Bay Area is similar to the other regions. Over time, job creation occurs in the regions where programs delivered the greatest estimated net energy bill savings for participants.

The ARRA investments made by the Energy Commission are expected to generate \$2.04 billion in GSP through 2026. Over this same period, the activity generated by ARRA will increase personal income by \$1.27 billion and increase revenue to the state through additional taxes and fees by nearly \$243 million.<sup>23</sup>

Table 15 summarizes ARRA's employment and economic outcomes.

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<sup>23</sup> All values are in 2012 dollars.

**Table 15: Summary of Estimated Employment and Economic Outcomes by Region (2010-2026)**

Region	ARRA Program Spending (2010-2012) <sup>1</sup>	Direct Outcomes (2010-2012)	Direct, Indirect, and Induced Outcomes (2010-2026)			
		Employment	Employment	Personal Income (millions)	Gross State Product (millions)	State Revenue (millions)
Bay Area	\$83,151,362	1,317	8,460	\$661	\$1,310	\$100
San Joaquin Valley	\$25,671,404	700	2,125	\$136	\$154	\$23
Greater Sacramento	\$68,267,431	510	1,816	\$112	\$151	\$51
Los Angeles	\$34,531,245	455	2,131	\$151	\$190	\$35
Rest of State	\$25,503,370	354	886	\$116	\$123	\$19
San Diego	\$16,137,979	304	863	\$52	\$65	\$7
Inland Empire	\$4,316,551	83	665	\$46	\$51	\$8
<b>Total</b>	<b>\$257,579,342</b>	<b>3,723</b>	<b>16,946</b>	<b>\$1,274</b>	<b>\$2,044</b>	<b>\$243</b>

<sup>1</sup> ARRA program spending for the California Comprehensive Residential Retrofit program has been updated since the initial employment and economic analysis was performed. Only direct employment from this program spending update is reflected in this report.

Source: DNV KEMA and Economic Development Research Group

## **CHAPTER 6: Conservative Aspects of the Analysis and Future Study**

The Energy Commission placed a high priority on the achievement of DOE's and California's market transformation objectives. The analysis presented in this report, however, does not include the potential employment and economic implications of future market transformation within the state. The data, time, and resources were not available to the evaluation team for the Commission's market transformation efforts under ARRA to be included in the scope of this analysis. Also, there were other aspects of the analysis that could have been addressed if better data and greater time and resources had been available. The results of this analysis are well supported by the data and analysis that was completed but must be considered conservative estimates of the employment and economic implications that the ARRA funding will have on California into the future. This chapter discusses conservative aspects of the analysis and recommends that these matters be addressed in future study.

### **Estimated Direct Employment During the ARRA Period (2010-2026)**

The Energy Commission's entire portfolio or programs placed foremost priority on economic recovery during the ARRA period. The direct employment reported in the 2010-2012 period demonstrates that priority.

### **Estimated Direct, Indirect and Induced Employment and Economic Impacts (2010-2026) Due to Estimated Energy Bill Reductions From Energy Upgrade Projects Completed During the ARRA Period**

The direct, indirect, and induced employment and economic impacts reported in the analysis are driven by the estimated energy bill reductions that resulted from the energy upgrade projects completed in residential, commercial, and municipal buildings during the ARRA period. This analysis was conservative because it did not address several aspects that were beyond the scope of the analysis, due to a lack of data, time, and resources.

#### **Time-Dependent Valuation**

The analysis in this report assumed that the dollar value of the energy savings that resulted from ARRA programs was captured by the Energy Commission's average retail electricity and natural gas price forecast. This average forecast assumes that each kWh and therm of energy that is saved is of equal value, without capturing whether the electricity savings occur at the time of day and season when the utility system is at peak demand and the cost of providing energy to the state's residential, commercial, and municipal buildings is at very high levels, and

without capturing whether the natural gas savings occur during the winter, when the cost of procuring and distributing natural gas is highest.

During peak periods, the value to California's economy of saving electricity from air conditioning or commercial/municipal lighting is dramatically higher than indicated by average retail rates, and during the winter, the value of saving natural gas from heating is substantially higher than indicated by average rates. Many of the ARRA residential, commercial, and municipal programs achieved most of their energy savings in these high-value periods, which was not captured in the cost-effectiveness analysis that was based solely on average retail rates.

The Energy Commission's *Building Energy Efficiency Standards* use a well-developed and vetted approach for evaluating the time-dependent valuation of energy savings.<sup>24</sup> The approach was developed and used in 2003 for the second update of the standards in response to the California electricity crisis; the approach was updated again in 2008 for the following update of the standards and again in 2011 for the most recent update of the standards. Using time-dependent valuation requires that energy savings be estimated for each hour of the year; these data were available for the CCR program, but use of the data for estimating time-dependent valued energy savings was outside the scope of the analysis in this report.

Since 2005, the CPUC also has employed the time-dependent valuation concept in its evaluation of the cost-effectiveness of utility programs, through its Avoided Cost Model and E3 Calculators.<sup>25</sup> These approaches use load duration curves for building sectors and energy efficiency measures to approximate the hourly data needed for the models when hourly data are not available through programs. This approach could have been used for estimating time-dependent valued energy savings for the commercial and municipal ARRA programs, but that was outside the scope of the analysis in this report.

### High Tier Rates

Figure 18 shows that residential retail rates for electricity in 2011 for each of the IOUs have three or four tiers that increase substantially for customers with higher monthly consumption.<sup>26</sup> Residential customers with energy bills that are subject to these higher tiers find investment in energy efficiency and onsite solar generation much more cost-effective. Many homeowner participants in the ARRA CCR programs were in these upper tiers, where the value of saving energy was substantially higher than indicated by average rates. Collection of data regarding estimated participant energy savings by tier was outside the scope of the analysis.

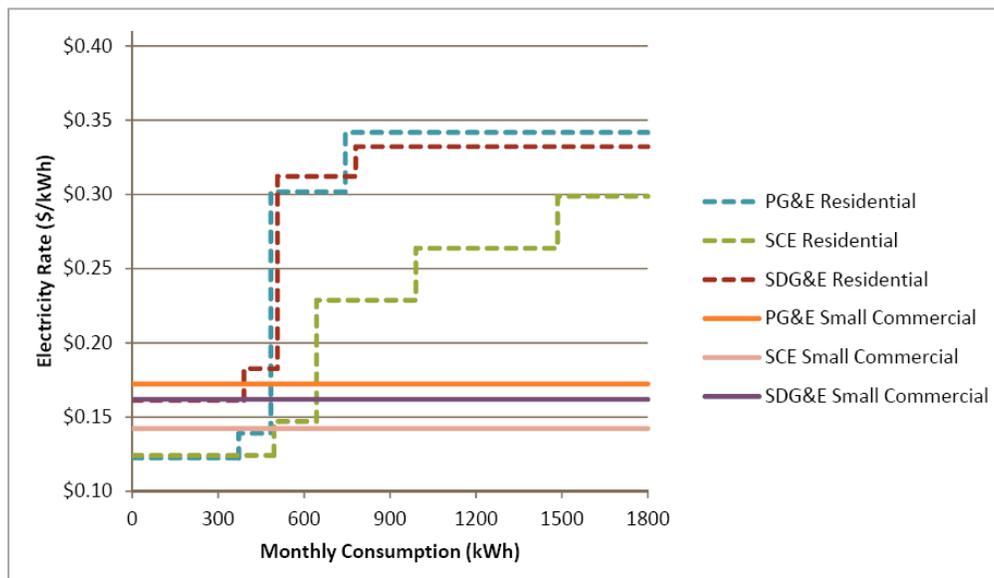
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24 California Energy Commission, *Time Dependent Valuation for Developing Building Efficiency Standards (TDV) Data Sources and Input*, February 2011, [http://www.energy.ca.gov/title24/2013standards/prerulemaking/documents/general\\_cec\\_documents/Title\\_24\\_2013\\_TDV\\_Methodology\\_Report\\_23Feb2011.pdf](http://www.energy.ca.gov/title24/2013standards/prerulemaking/documents/general_cec_documents/Title_24_2013_TDV_Methodology_Report_23Feb2011.pdf).

25 California Public Utilities Commission, *Avoided Cost Model and E3 Calculators*, <http://www.cpuc.ca.gov/PUC/energy/Energy+Efficiency/Cost-effectiveness.htm>.

26 Energy and Environmental Economics, Inc. (for California Energy Commission), *Cost-Effectiveness of Rooftop Photovoltaic Systems for Consideration in California's Building Energy Efficiency Standards*, May 2013, p. 25, <http://www.energy.ca.gov/2013publications/CEC-400-2013-005/CEC-400-2013-005-D.pdf>.

**Figure 18: Residential and Commercial Retail Rates (\$/kWh, 2011)**



Source: Energy and Environmental Economics, Inc.

### Environmental Benefits

Energy efficiency and onsite renewable generation upgrades provide substantial environmental benefits to society and California residents, as a result of avoided power plant electricity generation and avoided natural gas use. Both the Energy Commission’s *Building Energy Efficiency Standards* and the CPUC’s *Avoided Cost Model* approaches to cost-effectiveness include explicit methods to include environmental impacts. These approaches endeavor to capture the utility costs for criteria pollutant and carbon mitigation that can be avoided through energy efficiency improvements in buildings. Although the inclusion of environmental benefits in cost-effectiveness analysis completed by the Energy Commission is required by Public Resources Code Section 25000.1(c), it was outside the scope of this analysis.

### Energy Savings After the Analysis Period

The long-term employment and economic impacts presented in this report were estimated for most programs over a 16-year period from 2010-2026. For many programs this captures all energy savings estimated to occur within the weighted-average life of the energy upgrade measures associated with that program. However, based on additional review after the forecast was generated, the weighted-average measure life for the CCRR programs’ measures was extended to 20 years. Thus, there were on average four additional years of energy savings expected to occur for CCRR programs that were not included in the analysis. Potentially, many of the building envelope measures that were emphasized in the CCRR program would actually produce energy savings for even longer than 20 years.

## Non-Energy Benefits

The residential, commercial, and municipal building owners who decided to make energy upgrades as a result of their ARRA program participation often did so for the economic value they would receive due to reasons beyond reducing their energy bills. Non-energy benefits include reduced exposure to volatility in future energy prices, enhanced comfort, improved health and safety, and, in nonresidential buildings, improved worker productivity. Many home performance contractors report that the non-energy benefits of energy upgrades may have greater value to many homeowners than their coincident reduction in energy bills.<sup>27</sup>

Under CPUC direction the IOUs have conducted process evaluations of the EUC program, which show that homeowners were very satisfied with what they received from the program. On a scale of 1 to 5, with 1 being “very dissatisfied” and 5 being “very satisfied,” homeowners on average rated the program a score of 4.7; 90 percent of the homeowners reported either being “very satisfied” or “satisfied.”<sup>28</sup> The respondents in the study reported that “the financial incentives/rebates were good/made it affordable,” “house is more comfortable,” “met expectations/no problems,” more often than mentioning energy bill savings. Customers who talked about the program with their family and friends mentioned “the program is a good deal,” “program benefits,” “increase in home comfort,” more frequently than “savings on their utility bill.”

In addition, Californians typically value conserving energy resources for the environmental benefits, including reductions in criteria and greenhouse gas emissions.<sup>29</sup>

The quantification of non-energy benefits is beginning to be addressed for energy efficiency programs in other states, but doing so was outside the scope of this analysis.

## Increased Property Value

One of the most important non-energy benefits resulting from energy upgrades in residential, commercial, and municipal buildings is the increase in the building’s property value at resale. Similar to other building improvements, building owners who invest in energy upgrades anticipate that a portion of the upgrade cost will be returned in the form of a sales premium when the building is sold. This creates a substantial repayment, on top of the energy bill savings, of the original price of the upgrades.

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27 Granada, Hannah Choi, et. al, *McKinsey & Company, Unlocking Energy Efficiency in the U.S. Economy*, June 2009, p. 13,

[http://www.mckinsey.com/client\\_service/electric\\_power\\_and\\_natural\\_gas/latest\\_thinking/unlocking\\_energy\\_efficiency\\_in\\_the\\_us\\_economy](http://www.mckinsey.com/client_service/electric_power_and_natural_gas/latest_thinking/unlocking_energy_efficiency_in_the_us_economy).

28 SBW, Consulting, Inc., *2010-1012 PG&E and SCE Whole House Retrofit Program Process Evaluation*, November 2012, [http://www.calmac.org/publications/2010-12\\_PG%26E\\_and\\_SCE\\_Whole\\_House\\_Retrofit\\_Program\\_Process\\_Evaluation\\_Study.pdf](http://www.calmac.org/publications/2010-12_PG%26E_and_SCE_Whole_House_Retrofit_Program_Process_Evaluation_Study.pdf), pp. 106-108.

29 Mark Baldassare, et. al., *Californians & the Environment*, Public Policy Institute of California Statewide Survey, July 2013, [http://www.ppic.org/content/pubs/survey/S\\_713MBS.pdf](http://www.ppic.org/content/pubs/survey/S_713MBS.pdf).

Several housing market studies have shown that energy efficiency and renewable onsite electricity generation upgrades to buildings do result in a premium when buildings are sold. Table 16 shows the results of several studies for single-family homes.

**Table 16: Study Findings of Increase in Property Values Resulting From Energy Upgrades**

	California Green Labeled Energy Efficiency (2012) <sup>30</sup>	California Solar Generation (2011) <sup>31</sup>	European Labeled Energy Efficiency (2010) <sup>32</sup>	Northwest Labeled Energy Efficiency (2009) <sup>33</sup>	U.S. Energy Efficiency (1998) <sup>34</sup>
Property Value Premium	9% \$34,800*	3.6% \$22,554**	3.7% €8,449 (\$11,575)***	4.2% to 9.6% \$16,800 to \$38,400****	\$20 for every \$1 reduction in annual utility bills \$8,622

\* Assumes \$400,000 average California home sales price

\*\* Modeled average sales price of \$626,500 in San Diego and Sacramento areas

\*\*\* Assumes €231,000 (\$316,470) average sales price for homes in the European areas of the study

\*\*\*\* Assumes \$400,000 average home sales price in Seattle and Portland areas

\*\*\*\*\* Based on average CCRR single-family home estimated savings

Source: Energy Commission

Compared to the average cost of upgrades in the CCRR whole-house, single-family programs of \$11,890, these studies showed average property premiums ranging upwards from 70 percent of the cost of those upgrades. While these studies did not investigate the property value increases

30 Nils Kok and Matthew E. Kahn, *The Value of Green Labels in the California Housing Market: An Economic Analysis of the Impact of Green Labeling on the Sales Price of a Home*. UCLA Institute of the Environment and Sustainability, July 2012, <http://www.environment.ucla.edu/news/article.asp?parentid=15325>.

31 Samuel Dastrup, Joshua S. Graff Zivin, Dora L. Costa, and Matthew E. Kahn, *Understanding The Solar Home Price Premium: Electricity Generation And "Green" Social Status*. National Bureau of Economic Research, July 2011, <http://papers.nber.org/tmp/81818-w17200.pdf>.

32 Dirk Brounen and Nils Kok, *On the Economics of Energy Labels in the Housing Market*. University of California, Berkeley: Institute of Business and Economic Research and Fisher Center for Real Estate and Urban Economics, August 2010, [http://urbanpolicy.berkeley.edu/pdf/BK\\_Energy\\_Labels\\_NK082410\\_wcover.pdf](http://urbanpolicy.berkeley.edu/pdf/BK_Energy_Labels_NK082410_wcover.pdf).

33 Ann Griffin, Ben Kaufman, Sterling Hamilton, *Certified Home Performance: Assessing the Market Impacts of Third Party Certification on Residential Properties*. Earth Advantage Institute, May 2009, <http://www.earthadvantage.org/assets/documents/AssessingMarketImpactsofThirdPartyCertification-090529.pdf>.

34 Rick Nevin and Gregory Watson, *Evidence of Rational Market Valuations for Home Energy Efficiency*. Appraisal Institute: The Appraisal Journal, October 1998, <http://www.ongrid.net/AppraisalJournalPVValue10.98.pdf>.

specifically resulting from the ARRA upgrades, they indicate that increases in property values, returning a significant portion of the cost of the upgrades, are likely to occur and increase California employment and grow the state's economy.

For commercial buildings the impact of energy upgrades is even more readily apparent. The appraisal of larger commercial buildings usually is based on the "income approach," which recognizes reductions in operating costs of the business and applies a capitalization rate to resulting net income that potentially increases property value by an order of magnitude higher than the annual energy bill savings. Substantial increases in rents and the resulting capitalization into market value for buildings with energy upgrades have also been reported in studies.<sup>35</sup> Development of policies and strategies to encourage and enable the appraisal and lending industries to identify and reflect the appropriate valuation of energy efficiency will be essential elements of achieving increased demand for efficiency improvements in existing buildings.

Estimation of the employment and economic outcomes due to non-energy benefits was outside the scope of the analysis in this report and was not possible within available data, time, and resources. Capturing non-energy benefits in employment and economic impact analyses would require development of ways to translate the non-energy benefits into monetary metrics that could suitably be input into the models used for these analyses.

## **Direct, Indirect, and Induced Employment and Economic Impacts Expected to Occur in the Future Due to the Energy Commission's Emphasis on Market Transformation**

The Energy Commission placed a high priority on the achievement of DOE's and California's market transformation objectives. (See pages 10 and 11.) The intent was to use ARRA as a launching pad for lasting changes in the structure and function of California's market for energy upgrades, and in the behavior of homeowners and the professionals who deliver energy upgrade services to accomplish California energy and climate change goals, which demand substantial gains in California's clean energy economy.

One aspect of this market transformation that was not captured in the analysis is the "learning curve" improvement in the delivery of energy efficiency and onsite renewable electric generation upgrades. This "learning curve" results from an increase in demand due to a better educated public regarding the need for and value of these upgrades, and an increase in the effectiveness and innovation in which these new services are provided by manufacturers and contractors to respond to that demand. These combined changes in demand and supply result in a lowered cost of providing these products and services. Addressing "learning curve"

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35 Eichholtz, Piet, et. al. Doing Well by Doing Good. Green Office Buildings. European Centre for Corporate Management, Maastricht University, University of California Energy Institute, Institute of Chartered Surveyors, January 2009, <http://www.ucei.berkeley.edu/PDF/seminar20090130.pdf>.

improvement is emerging as a prominent and recognized aspect of cost-effectiveness analyses of market transformational initiatives.<sup>36</sup>

Also, as noted in the Self-Sustaining Financing section (see pages 35 and 36), the Energy Commission's ARRA-funded financing programs were designed to continue to generate employment and economic impacts long after the end of the analysis period in this report. In addition to the programs mentioned in that section, the Energy Commission allocated SEP funds to other ongoing financing programs that use highly leveraged risk mitigation approaches, such as loan loss reserves or debt service reserves, to support continuing PACE and other innovative financing pilots with good lending terms into the future for residential, commercial, and municipal building energy upgrade projects, with little actual expenditure of the ARRA funds.

The Energy Commission's programs are expected to be a foundation for important changes to the California's energy upgrade markets in the future. The state's utilities and local and regional governments are administering and implementing programs based on the ARRA funded pilots. In addition, the capacity built by workers trained in clean energy techniques and practices should lead to future energy savings. Unfortunately, data, time, and resources did not allow for modeling and analysis of additional employment and economic impacts generated by these market transforming effects of the Energy Commission's programs. The employment and economic analysis presented in this report assumes a static market without the market structural changes that were the goal of the Energy Commission's ARRA efforts. Investigation of the potential for positive employment and economic outcomes would have required extensive project redesign and scope change that was not possible within available time and resources. Quantification of the effects of these market transformation efforts should be included in future studies.

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36 Energy and Environmental Economics, Inc. (for California Energy Commission), *Cost-Effectiveness of Rooftop Photovoltaic Systems for Consideration in California's Building Energy Efficiency Standards*, May 2013, pp. 30, 40 <http://www.energy.ca.gov/2013publications/CEC-400-2013-005/CEC-400-2013-005-D.pdf> and U.S. Department of Energy, *Cost Estimating Guide*, January 2011, pp. 22-23 <http://www.energysavings.com/energy/doc/DOE%20Cost%20Guide%20Draft%20%2001-24-11%20draft.pdf>.

# GLOSSARY

ABAG	Association of Bay Area Governments
ARRA	American Recovery and Reinvestment Act of 2009
BTH	Business, Transportation, and Housing Agency
Btu	British thermal unit – the energy needed to raise one pound of water by one degree Fahrenheit
CAMS	contract agreement managers
CARS	California Energy Commission’s ARRA Reporting System
CCC	California Conservation Corps
CCRR	California Comprehensive Residential Building Retrofits
CDCR	California Department of Corrections and Rehabilitation
CEBFP	Clean Energy Business Financing Program
CEWTP	Clean Energy Workforce Training Program
CGE	computable general equilibrium
CHF	CRHMFA Homebuyers Fund
CPUC	California Public Utilities Commission
CRHMFA	Formerly California Rural Home Mortgage Finance Authority
DEER 2008	Database for Energy Efficient Resources, published in 2008
DGS	Department of General Services
DNV KEMA	DNV KEMA Energy & Sustainability
ECAA	Energy Conservation Assistance Act
EDD	Employment Development Department
EDRG	Economic Development Research Group
EECBG	Energy Efficiency and Conservation Block Grant Program
EECBG-SCC	EECBG Small Cities and Counties
EM&V	evaluation, measurement, and verification

EMS	Energy Management System
Energy Commission	California Energy Commission
ESJ	Energy Smart Jobs
ETAP	Energy Technology Assistance Program
ETP	Employment Training Panel
EUC	Energy Upgrade California
FDC	Financial Development Corporation
Fresno	City of Fresno
GHG	greenhouse gas, also carbon emissions
GSP	gross state product
HERS	Home Energy Rating System
HVAC	heating, ventilation, and air conditioning
Indirect jobs	Jobs from subcontracts with material suppliers who make materials used in ARRA supported projects and central service providers whose employees are not directly charged to ARRA supported projects and activities
Induced jobs	Jobs created or retained elsewhere in the economy as a result of ARRA supported projects and activities, such as by the re-spending of worker income within the local community
IOU	investor-owned utility
kW	kilowatt
kWh	kilowatt-hour
LED	light-emitting diode
LGC	Local Government Commission contract
MCR	Municipal & Commercial Building Targeted Measure Retrofit Program
MIST	Moderate Income Sustainable Technology
NAICS	North American Industry Classification System
OCIO	Office of the Chief Information Officer
OS	Oakland Shines

PACE	Property Assessed Clean Energy
PECI	Portland Energy Conservation, Inc.
POU	publicly owned utility
PI+	Policy Insights Plus
PV	photovoltaic
QA	quality assurance
QC	quality control
QuEST	Quantum Energy Services & Technologies, Inc.
REEM	Renewable Energy Efficiency Mapping
REMI	Regional Economic Models, Inc.
Retrofit LA	Retrofit Los Angeles
SCC	Small Cities and Counties
SCE	Southern California Edison
SEP	State Energy Program
SFMOH	San Francisco Mayor's Office of Housing
SMUD	Sacramento Municipal Utility District
therm	100,000 British thermal units (Btu)
U.S. DOE	United States Department of Energy
VFD	variable frequency drive
WAML	weighted average measure life

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**APPENDIX A:  
ARRA Incentives by County**

**Table 17: ARRA Incentives by County**

Region	County	CCRR	EECBG_SCC	MCR	Total
1	Alameda	172,489	1,067,158	3,846,993	5,086,640
7	Amador	13,209	166,273	25,065	204,547
7	Butte	6,216	331,020	158,389	495,625
7	Calaveras	9,324	195,791	79,649	284,763
7	Colusa	777	27,318	43,904	71,999
1	Contra Costa	156,173	1,242,204	514,118	1,912,495
7	Del Norte	0	132,520	2,472	134,992
2	El Dorado	65,266	992,916	86,514	1,144,696
3	Fresno	62,158	0	608,905	671,063
7	Glenn	0	157,977	53,284	211,260
7	Humboldt	0	1,055,352	67,350	1,122,702
6	Imperial	0	510,215	4,342	514,557
7	Inyo	0	86,723	1,240	87,962
3	Kern	777	137,346	365,290	503,413
3	Kings	2,331	148,046	87,313	237,690
7	Lake	6,216	267,114	109,445	382,775
7	Lassen	0	108,142	0	108,142
4	Los Angeles	1,590,475	2,684,131	1,788,256	6,062,863
3	Madera	3,885	0	150,057	153,942
1	Marin	33,410	666,559	187,328	887,298
7	Mariposa	0	110,720	9,437	120,158
7	Mendocino	13,986	397,266	29,964	441,215
3	Merced	6,993	638,999	79,667	725,659
7	Mono	0	98,715	47	98,762
7	Monterey	0	955,651	189,560	1,145,211
1	Napa	1,554	186,928	59,980	248,461
7	Nevada	19,424	0	0	19,425
4	Orange	2,331	933,323	730,342	1,665,996
2	Placer	155,396	950,713	104,164	1,210,272
7	Plumas	0	125,479	0	125,479
5	Riverside	3,108	1,300,342	177,578	1,481,028
2	Sacramento	933,151	144,876	1,014,825	2,092,853
5	San Bernardino	4,662	703,750	292,851	1,001,264
1	San Benito	0	360,758	30,563	391,321
6	San Diego	184,144	541,216	1,304,527	2,029,888
1	San Francisco	95,568	0	442,173	537,741

Region	County	CCRR	EECBG_SCC	MCR	Total
3	San Joaquin	101,007	5,428,656	387,929	5,917,592
7	San Luis Obispo	3,885	566,101	162,539	732,525
1	San Mateo	146,072	1,326,999	548,646	2,021,716
7	Santa Barbara	2,331	1,114,455	89,307	1,206,090
1	Santa Clara	146,849	860,262	888,599	1,895,710
1	Santa Cruz	0	876,633	185,398	1,062,031
7	Shasta	6,216	876,998	77,548	960,763
7	Sierra	0	26,077	0	26,077
7	Siskiyou	0	337,665	0	337,665
1	Solano	32,633	463,831	204,030	700,494
1	Sonoma	107,998	265,094	447,911	821,005
3	Stanislaus	35,741	260,734	108,844	405,319
2	Sutter	15,540	165,311	97,387	278,238
7	Tehama	0	268,879	19,314	288,193
3	Tulare	10,101	186,783	94,097	290,981
7	Tuolumne	1,554	317,082	19,167	337,803
4	Ventura	777	1,011,939	61,323	1,074,039
2	Yolo	41,180	182,326	239,207	462,713
2	Yuba	6,216	459,330	95,237	560,783
Total		4,201,123	32,420,696	16,372,074	52,993,893

Source: DNV KEMA

**APPENDIX B:  
ARRA Financing by County**

**Table 18: ARRA Financing by County**

Region	County	CCRR	CEBFP	DGS	ECAA	Total
1	Alameda	111,692	0	288,795	3,060,998	4,256,260
7	Amador	558,459	0	0	0	69,414
7	Butte	223,384	0	131,265	562,992	726,922
7	Calaveras	446,768	0	0	0	48,998
7	Colusa	37,231	0	0	0	4,083
1	Contra Costa	111,692	0	0	0	820,720
7	Del Norte	\$0	0	0	298,819	298,819
2	El Dorado	2,494,452	0	0	0	342,987
3	Fresno	1,116,919	0	718,716	2,416,591	3,461,962
7	Glenn	0	0	0	89,582	89,582
7	Humboldt	0	0	0	145,695	145,695
6	Imperial	0	0	0	0	0
7	Inyo	0	0	0	0	0
3	Kern	0	0	997,601	0	1,001,684
3	Kings	0	0	3,150,861	0	3,163,110
7	Lake	260,614	0	0	0	32,665
7	Lassen	0	0	0	0	0
4	Los Angeles	37,231	0	746,434	193,125	9,297,832
3	Madera	37,231	0	44,989	0	65,405
1	Marin	0	0	0	1,293,383	1,468,959
7	Mariposa	0	0	0	0	0
7	Mendocino	297,845	0	0	0	73,498
3	Merced	260,614	0	508,249	0	544,998
7	Mono	0	0	0	0	0
7	Monterey	0	0	1,763,369	1,140,548	2,903,917
1	Napa	37,231	0	0	0	8,166
7	Nevada	930,766	0	0	0	102,080
4	Orange	0	0	1,629,447	0	1,641,697
2	Placer	6,068,593	0	0	0	816,636
7	Plumas	0	0	0	0	0
5	Riverside	148,923	0	832,479	319,945	1,168,757
2	Sacramento	1,824,301	0	8,117,854	0	13,021,756
5	San Bernardino	148,923	0	474,094	0	498,594
1	San Benito	0	0	23,208	95,190	118,397
6	San Diego	0	0	1,468,580	3,064,393	5,500,687

Region	County	CCRR	CEBFP	DGS	ECAA	Total
1	San Francisco	0	0	0	0	502,231
3	San Joaquin	2,568,914	0	0	0	530,813
7	San Luis Obispo	37,231	0	911,631	412,254	1,344,302
1	San Mateo	37,231	0	160,996	1,351,542	2,280,176
7	Santa Barbara	0	0	0	0	12,249
1	Santa Clara	74,461	18,106,484	289,909	0	19,168,115
1	Santa Cruz	0	0	25,496	0	25,496
7	Shasta	297,845	0	0	0	32,665
7	Sierra	0	0	0	0	0
7	Siskiyou	0	0	0	0	0
1	Solano	223,384	0	0	2,717,458	2,888,952
1	Sonoma	74,461	0	2,871,763	391,614	3,830,939
3	Stanislaus	781,843	0	374,612	1,053,220	1,615,659
2	Sutter	707,382	0	307,154	0	388,818
7	Tehama	0	0	0	0	0
3	Tulare	37,231	0	948,945	539,480	1,541,507
7	Tuolumne	37,231	0	0	0	8,166
4	Ventura	0	0	0	343,382	347,464
2	Yolo	1,749,840	0	508,314	0	724,723
2	Yuba	297,845	0	0	0	32,665
<b>Total</b>		22,077,765	18,106,484	27,294,762	19,490,212	86,969,223

Source: DNV KEMA

**APPENDIX C:  
Annual Economic Results by Region (2010-2026)**

**Table 19: Table for Figure 9: Annual GSP (Millions of 2012 Dollars)**

Program	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	Sum
San Diego	5	7	6	2	2	2	3	3	3	4	4	4	4	4	4	4	4	65
Inland Empire	2	3	4	2	2	2	2	3	3	4	4	4	4	3	3	3	2	51
Los Angeles	17	21	20	7	7	7	8	9	10	11	11	12	11	11	10	11	8	190
San Joaquin	7	9	11	6	6	6	7	8	9	11	11	12	11	11	11	11	7	154
Greater Sacramento	12	5	11	7	4	5	5	7	9	11	11	12	12	11	11	12	7	151
Bay Area	60	100	126	62	59	59	60	65	70	74	76	80	82	82	84	86	85	1,310
Rest of California	6	9	9	5	5	5	6	6	7	8	9	9	9	8	8	8	5	123
Total	110	154	187	90	86	87	91	99	111	121	126	132	133	131	132	135	117	2,043

Source: Economic Development Research Group, REMI model result

**Table 20: Table for Figure 11: Estimated Cumulative State Revenue by Program and Region (Millions of 2012 Dollars)**

Program	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	Sum
San Diego	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
Inland Empire	0	0	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	8
Los Angeles	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	35
San Joaquin	1	1	1	1	1	1	1	1	1	2	2	2	2	1	1	1	1	23
Greater Sacramento	3	1	2	3	3	3	3	3	3	3	4	4	4	4	4	4	3	51
Bay Area	5	8	10	5	5	5	5	5	5	6	6	6	6	6	6	5	5	99
Rest of California	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	19
Total	14	14	18	13	12	12	13	13	14	15	15	16	16	15	15	15	14	243

Source: Economic Development Research Group, REMI model result

## **APPENDIX D: Private-Sector Employment by Industry by Region**

Tables in this appendix provide detailed annual incremental full- or part-time job creation above the no-ARRA baseline. These tables are for private non-farm industry categories and therefore exclude government employees. Government employees are included in the occupation tables in Appendix E.

**Table 21: Industry Employment Changes for All Regions**

Incremental Employment by Industry (private non-farm only – excludes government employees)																	
All Programs																	
Region = All Regions																	
Years (2010-2026)																	
Industry Category	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Forestry, Fishing, and Related Activities	3	5	6	2	2	2	2	2	2	2	2	2	2	1	1	1	1
Mining	2	4	5	3	2	2	2	2	2	2	2	2	2	2	2	2	2
Utilities	2	3	4	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Construction	452	1,005	498	78	61	50	45	47	54	60	62	62	61	56	53	51	32
Manufacturing	107	172	233	115	112	109	109	110	112	114	114	113	112	110	110	109	107
Wholesale Trade	55	103	75	25	25	24	26	27	30	32	32	32	33	31	30	31	26
Retail Trade	91	89	101	49	45	43	48	52	61	64	64	66	63	53	53	51	39
Transportation and Warehousing	15	20	25	11	11	12	12	13	14	15	16	16	16	14	14	14	11
Information	12	13	15	7	6	6	7	7	8	9	9	9	9	8	7	7	6
Finance and Insurance	40	42	49	20	18	17	19	21	23	25	25	26	24	21	21	20	15
Real Estate and Rental and Leasing	32	36	45	24	24	25	27	30	34	37	38	40	39	36	34	35	29
Professional, Scientific, and Technical Services	302	334	252	58	41	42	45	48	56	63	65	70	67	63	63	62	52
Management of Companies and Enterprises	9	13	17	8	7	7	8	8	8	9	9	9	9	8	8	8	8
Administrative and Waste Management Services	67	86	98	44	41	41	43	45	54	57	60	61	61	57	54	56	46
Educational Services	38	122	154	9	10	10	12	13	14	16	16	18	19	18	18	18	17
Health Care and Social Assistance	79	75	88	43	41	45	47	54	63	70	73	79	77	67	70	74	56
Arts, Entertainment, and Recreation	24	27	31	16	15	15	16	17	18	20	20	21	20	19	19	19	16
Accommodation and Food Services	45	50	62	34	34	36	40	43	47	51	53	55	54	50	48	48	40
Other Services, except Public Administration	49	52	63	30	29	30	31	35	40	43	44	47	46	41	41	42	34
Annual Incremental Employment	1,425	2,251	1,820	579	526	519	540	576	642	690	707	732	716	658	649	650	538

Source: Economic Development Research Group

**Table 22: Industry Employment Changes for San Diego Region**

Incremental Employment by Industry (private non-farm only – excludes government employees)																	
All Programs																	
Region = San Diego																	
Years (2010-2026)																	
Industry Category	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Forestry, Fishing, and Related Activities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mining	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utilities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Construction	44	67	41	2	2	1	1	1	1	2	2	2	2	2	2	2	1
Manufacturing	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Wholesale Trade	3	4	3	0	0	0	1	1	1	1	1	1	1	1	1	1	1
Retail Trade	5	6	4	2	2	2	3	2	3	3	3	4	3	3	3	3	2
Transportation and Warehousing	0	1	1	0	0	0	0	0	1	1	1	1	1	1	1	1	1
Information	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Finance and Insurance	2	2	2	1	1	1	1	1	1	2	2	2	2	1	1	1	1
Real Estate and Rental and Leasing	2	2	2	1	1	1	1	1	2	2	2	2	2	2	2	2	2
Professional, Scientific, and Technical Services	23	24	16	1	1	1	2	2	2	3	3	3	3	3	3	3	3
Management of Companies and Enterprises	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Administrative and Waste Management Services	3	4	4	1	1	1	2	2	2	2	2	2	3	2	2	2	2
Educational Services	3	9	11	0	0	0	0	1	1	1	1	1	1	1	1	1	1
Health Care and Social Assistance	3	5	4	1	1	2	2	2	3	3	3	4	3	4	4	4	3
Arts, Entertainment, and Recreation	1	2	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1
Accommodation and Food Services	3	3	3	1	2	2	2	2	3	3	3	3	3	3	3	3	2
Other Services, except Public Administration	2	3	3	1	1	1	1	2	2	2	2	2	2	2	2	2	2
Annual Incremental Employment	97	136	97	13	14	15	19	19	24	25	26	30	28	26	27	27	23

Source: Economic Development Research Group

**Table 23: Industry Employment Changes for Inland Empire Region**

Incremental Employment by Industry (private non-farm only – excludes government employees)																	
All Programs																	
Region = Inland Empire																	
Years (2010-2026)																	
Industry Category	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Forestry, Fishing, and Related Activities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mining	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utilities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Construction	14	33	14	4	3	2	3	3	3	3	4	4	4	3	3	3	1
Manufacturing	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
Wholesale Trade	2	4	2	1	1	1	1	1	1	1	1	1	1	1	1	1	0
Retail Trade	4	5	5	2	2	2	3	3	4	4	4	4	4	2	3	3	2
Transportation and Warehousing	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	0
Information	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Finance and Insurance	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Real Estate and Rental and Leasing	1	1	2	1	1	1	1	1	1	2	2	2	2	2	1	1	1
Professional, Scientific, and Technical Services	7	8	6	1	1	1	1	2	2	2	2	2	2	2	1	1	1
Management of Companies and Enterprises	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Administrative and Waste Management Services	3	4	5	2	2	2	3	3	3	4	4	4	4	3	3	3	2
Educational Services	2	7	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Health Care and Social Assistance	3	3	3	2	2	2	2	3	3	3	4	3	3	2	2	3	1
Arts, Entertainment, and Recreation	1	1	1	0	0	0	0	1	1	1	1	1	1	1	0	1	0
Accommodation and Food Services	1	2	2	1	1	2	2	2	2	2	2	2	2	2	1	2	1
Other Services, except Public Administration	2	2	2	1	1	1	2	2	2	2	2	2	2	2	1	2	1
Annual Incremental Employment	44	76	56	19	19	18	20	22	26	29	30	30	28	23	20	22	12

Source: Economic Development Research Group

**Table 24: Industry Employment Changes for Los Angeles Region**

Incremental Employment by Industry (private non-farm only – excludes government employees)																	
All Programs																	
Region = Los Angeles																	
Years (2010-2026)																	
Industry Category	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Forestry, Fishing, and Related Activities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mining	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utilities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Construction	53	160	73	7	6	5	4	4	5	4	5	5	4	4	4	4	2
Manufacturing	7	9	10	4	4	3	4	4	4	5	5	4	4	3	3	3	2
Wholesale Trade	9	17	11	2	2	2	3	4	4	4	4	4	5	4	4	4	3
Retail Trade	12	12	11	3	4	3	7	6	6	5	5	7	5	3	4	3	3
Transportation and Warehousing	3	4	4	2	2	2	2	2	2	2	3	3	3	2	3	2	2
Information	3	3	3	1	1	1	2	2	2	2	2	2	2	2	2	1	1
Finance and Insurance	10	9	10	3	3	3	4	4	4	5	5	5	4	4	4	4	2
Real Estate and Rental and Leasing	7	7	8	3	3	3	4	4	5	5	5	5	5	5	5	6	5
Professional, Scientific, and Technical Services	76	70	41	5	5	5	5	5	7	8	7	8	6	7	7	7	5
Management of Companies and Enterprises	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Administrative and Waste Management Services	14	16	14	5	6	5	5	5	7	7	8	8	9	7	6	7	6
Educational Services	8	27	33	1	1	1	2	2	2	2	2	3	3	3	3	3	2
Health Care and Social Assistance	11	11	10	3	3	5	5	5	5	8	8	9	9	5	7	8	4
Arts, Entertainment, and Recreation	6	7	7	3	3	3	4	4	4	5	5	5	5	4	4	4	3
Accommodation and Food Services	6	7	6	2	2	3	4	4	4	5	5	5	5	5	4	5	3
Other Services, except Public Administration	8	8	9	3	3	4	4	5	5	5	5	6	6	5	5	6	4
Annual Incremental Employment	236	372	254	47	49	50	59	61	66	74	75	82	75	63	66	68	50

Source: Economic Development Research Group

**Table 25: Industry Employment Changes for All Regions**

Incremental Employment by Industry (private non-farm only – excludes government employees)																	
All Programs																	
Region = All Regions																	
Years (2010-2026)																	
Industry Category	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Forestry, Fishing, and Related Activities	3	5	6	2	2	2	2	2	2	2	2	2	2	1	1	1	1
Mining	2	4	5	3	2	2	2	2	2	2	2	2	2	2	2	2	2
Utilities	2	3	4	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Construction	452	1,005	498	78	61	50	45	47	54	60	62	62	61	56	53	51	32
Manufacturing	107	172	233	115	112	109	109	110	112	114	114	113	112	110	110	109	107
Wholesale Trade	55	103	75	25	25	24	26	27	30	32	32	32	33	31	30	31	26
Retail Trade	91	89	101	49	45	43	48	52	61	64	64	66	63	53	53	51	39
Transportation and Warehousing	15	20	25	11	11	12	12	13	14	15	16	16	16	14	14	14	11
Information	12	13	15	7	6	6	7	7	8	9	9	9	9	8	7	7	6
Finance and Insurance	40	42	49	20	18	17	19	21	23	25	25	26	24	21	21	20	15
Real Estate and Rental and Leasing	32	36	45	24	24	25	27	30	34	37	38	40	39	36	34	35	29
Professional, Scientific, and Technical Services	302	334	252	58	41	42	45	48	56	63	65	70	67	63	63	62	52
Management of Companies and Enterprises	9	13	17	8	7	7	8	8	8	9	9	9	9	8	8	8	8
Administrative and Waste Management Services	67	86	98	44	41	41	43	45	54	57	60	61	61	57	54	56	46
Educational Services	38	122	154	9	10	10	12	13	14	16	16	18	19	18	18	18	17
Health Care and Social Assistance	79	75	88	43	41	45	47	54	63	70	73	79	77	67	70	74	56
Arts, Entertainment, and Recreation	24	27	31	16	15	15	16	17	18	20	20	21	20	19	19	19	16
Accommodation and Food Services	45	50	62	34	34	36	40	43	47	51	53	55	54	50	48	48	40
Other Services, except Public Administration	49	52	63	30	29	30	31	35	40	43	44	47	46	41	41	42	34
Annual Incremental Employment	1,425	2,251	1,820	579	526	519	540	576	642	690	707	732	716	658	649	650	538

Source: Economic Development Research Group

**Table 26: Industry Employment Changes for San Diego Region**

Incremental Employment by Industry (private non-farm only – excludes government employees)																	
All Programs																	
Region = San Diego																	
Years (2010-2026)																	
Industry Category	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Forestry, Fishing, and Related Activities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mining	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utilities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Construction	44	67	41	2	2	1	1	1	1	2	2	2	2	2	2	2	1
Manufacturing	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Wholesale Trade	3	4	3	0	0	0	1	1	1	1	1	1	1	1	1	1	1
Retail Trade	5	6	4	2	2	2	3	2	3	3	3	4	3	3	3	3	2
Transportation and Warehousing	0	1	1	0	0	0	0	0	1	1	1	1	1	1	1	1	1
Information	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Finance and Insurance	2	2	2	1	1	1	1	1	1	2	2	2	2	1	1	1	1
Real Estate and Rental and Leasing	2	2	2	1	1	1	1	1	2	2	2	2	2	2	2	2	2
Professional, Scientific, and Technical Services	23	24	16	1	1	1	2	2	2	3	3	3	3	3	3	3	3
Management of Companies and Enterprises	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Administrative and Waste Management Services	3	4	4	1	1	1	2	2	2	2	2	2	3	2	2	2	2
Educational Services	3	9	11	0	0	0	0	1	1	1	1	1	1	1	1	1	1
Health Care and Social Assistance	3	5	4	1	1	2	2	2	3	3	3	4	3	4	4	4	3
Arts, Entertainment, and Recreation	1	2	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1

Incremental Employment by Industry (private non-farm only – excludes government employees)																	
All Programs																	
Region = San Diego																	
Years (2010-2026)																	
Industry Category	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Accommodation and Food Services	3	3	3	1	2	2	2	2	3	3	3	3	3	3	3	3	2
Other Services, except Public Administration	2	3	3	1	1	1	1	2	2	2	2	2	2	2	2	2	2
Annual Incremental Employment	97	136	97	13	14	15	19	19	24	25	26	30	28	26	27	27	23

Source: Economic Development Research Group

**Table 27: Industry Employment Changes for Inland Empire Region**

Incremental Employment by Industry (private non-farm only – excludes government employees)																	
All Programs																	
Region = Inland Empire																	
Years (2010-2026)																	
Industry Category	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Forestry, Fishing, and Related Activities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mining	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utilities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Construction	14	33	14	4	3	2	3	3	3	3	4	4	4	3	3	3	1
Manufacturing	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
Wholesale Trade	2	4	2	1	1	1	1	1	1	1	1	1	1	1	1	1	0
Retail Trade	4	5	5	2	2	2	3	3	4	4	4	4	4	2	3	3	2
Transportation and Warehousing	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	0
Information	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Finance and Insurance	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Real Estate and Rental and Leasing	1	1	2	1	1	1	1	1	1	2	2	2	2	2	1	1	1
Professional, Scientific, and Technical Services	7	8	6	1	1	1	1	2	2	2	2	2	2	2	1	1	1
Management of Companies and Enterprises	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Administrative and Waste Management Services	3	4	5	2	2	2	3	3	3	4	4	4	4	3	3	3	2
Educational Services	2	7	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Health Care and Social Assistance	3	3	3	2	2	2	2	3	3	3	4	3	3	2	2	3	1
Annual Incremental Employment	49	79	62	29	29	29	33	36	38	41	44	44	45	41	41	43	35

Source: Economic Development Research Group

**Table 28: Industry Employment Changes for San Joaquin Region**

Incremental Employment by Industry (private non-farm only – excludes government employees)																	
All Programs																	
Region = San Joaquin																	
Years (2010-2026)																	
Industry Category	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Forestry, Fishing, and Related Activities	1	1	2	1	0	0	0	0	1	0	0	0	0	0	0	0	0
Mining	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utilities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Construction	76	173	72	9	7	7	6	6	8	9	9	9	9	8	7	7	3
Manufacturing	3	4	5	2	2	2	2	2	2	3	3	3	2	2	2	2	2
Wholesale Trade	7	15	7	2	2	2	2	2	3	3	3	3	3	3	2	2	2
Retail Trade	11	14	13	7	7	7	8	9	10	11	10	11	10	9	8	8	5
Transportation and Warehousing	2	2	3	1	1	2	2	2	2	2	2	2	2	2	2	2	1
Information	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0
Finance and Insurance	2	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	1
Real Estate and Rental and Leasing	2	2	3	2	2	2	3	3	4	4	4	4	4	3	3	3	2
Professional, Scientific, and Technical Services	30	30	18	2	3	3	3	4	4	5	5	5	5	4	4	3	2
Management of Companies and Enterprises	0	1	1	0	0	0	0	1	1	1	1	1	1	0	0	0	0
Administrative and Waste Management Services	6	7	8	4	4	4	5	5	6	7	8	8	7	7	6	6	4
Educational Services	2	8	9	0	0	1	1	1	1	1	1	1	1	1	1	1	1
Health Care and Social Assistance	10	11	11	6	6	7	8	8	10	11	12	12	12	10	10	11	8
Arts, Entertainment, and Recreation	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Accommodation and Food Services	4	5	5	3	3	4	4	5	5	6	7	7	6	6	5	5	4

Incremental Employment by Industry (private non-farm only – excludes government employees)																	
All Programs																	
Region = San Joaquin																	
Years (2010-2026)																	
Industry Category	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Other Services, except Public Administration	5	6	6	4	4	4	4	5	5	6	6	6	6	5	5	5	3
Annual Incremental Employment	164	283	169	48	47	48	52	57	65	73	76	77	73	64	61	59	40

Source: Economic Development Research Group

**Table 29: Industry Employment Changes for Greater Sacramento Region**

Incremental Employment by Industry (private non-farm only – excludes government employees)																	
All Programs																	
Region = Greater Sacramento																	
Years (2010-2026)																	
Industry Category	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Forestry, Fishing, and Related Activities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mining	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utilities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Construction	62	62	57	6	5	5	5	6	8	10	10	10	10	10	9	9	4
Manufacturing	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Wholesale Trade	5	4	4	1	1	1	1	1	2	2	2	2	2	2	2	2	1
Retail Trade	11	-15	0	6	4	4	5	5	7	8	9	9	8	8	7	7	3
Transportation and Warehousing	1	1	2	1	1	1	1	1	1	1	2	2	2	2	1	1	1
Information	1	0	1	1	0	0	1	1	1	1	1	1	1	1	1	1	0
Finance and Insurance	4	0	3	2	2	2	2	2	3	3	3	3	3	3	3	2	1
Real Estate and Rental and Leasing	3	-3	0	2	1	2	2	3	3	4	4	5	5	4	4	4	3
Professional, Scientific, and Technical Services	44	53	41	12	3	3	3	4	5	6	7	7	7	7	7	7	5
Management of Companies and Enterprises	1	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1
Administrative and Waste Management Services	8	3	7	5	3	3	3	4	5	6	7	7	7	6	6	6	4
Educational Services	4	10	14	0	0	0	1	1	1	1	1	1	1	1	1	1	1
Health Care and Social Assistance	10	-14	-1	6	4	4	4	5	8	8	9	9	9	8	8	9	4
Arts, Entertainment, and Recreation	2	-2	1	1	1	1	1	1	1	2	2	2	2	2	2	2	1
Accommodation and Food Services	5	-5	1	2	2	2	3	3	4	5	5	6	6	5	5	5	3

Incremental Employment by Industry (private non-farm only – excludes government employees)																	
All Programs																	
Region = Greater Sacramento																	
Years (2010-2026)																	
Industry Category	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Other Services, except Public Administration	6	-4	2	3	2	2	3	3	4	5	5	5	5	5	5	5	3
Annual Incremental Employment	169	92	135	50	30	33	36	43	56	64	68	70	69	65	64	64	37

Source: Economic Development Research Group

**Table 30: Industry Employment Changes for Bay Area Region**

Incremental Employment by Industry (private non-farm only – excludes government employees)																	
All Programs																	
Region = Bay Area																	
Years (2010-2026)																	
Industry Category	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Forestry, Fishing, and Related Activities	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Mining	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Utilities	1	2	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Construction	136	368	191	40	30	24	20	20	23	24	24	24	24	24	22	22	18
Manufacturing	91	154	212	106	103	101	100	100	102	103	103	103	103	102	102	102	101
Wholesale Trade	22	46	43	17	17	17	17	17	19	19	19	20	20	19	19	19	19
Retail Trade	37	57	58	23	19	17	16	19	22	23	22	23	23	20	20	20	18
Transportation and Warehousing	6	10	12	5	5	5	5	5	6	6	6	6	6	6	6	6	6
Information	6	9	10	4	4	4	3	4	4	4	4	4	4	4	4	4	3
Finance and Insurance	18	25	27	10	9	8	8	9	10	10	10	11	11	9	9	9	8
Real Estate and Rental and Leasing	15	23	27	13	12	12	11	13	14	15	15	15	16	15	14	14	13
Professional, Scientific, and Technical Services	100	126	112	34	26	26	26	27	30	33	35	37	38	36	36	36	34
Management of Companies and Enterprises	6	10	13	6	5	5	5	5	6	6	6	6	6	6	5	6	5
Administrative and Waste Management Services	29	46	54	24	21	21	21	22	24	26	25	27	26	26	26	27	26
Educational Services	12	34	42	7	7	7	8	9	9	10	10	11	11	11	11	10	10
Health Care and Social Assistance	33	50	53	20	19	18	19	23	25	27	27	30	30	28	29	30	29
Arts, Entertainment, and Recreation	10	16	17	8	7	7	7	8	8	9	9	9	9	9	9	8	8
Accommodation and Food Services	20	32	38	20	18	18	19	20	22	22	23	23	24	22	22	21	20

<b>Incremental Employment by Industry (private non-farm only – excludes government employees)</b>																	
<b>All Programs</b>																	
<b>Region = Bay Area</b>																	
<b>Years (2010-2026)</b>																	
<b>Industry Category</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>13</b>	<b>14</b>	<b>15</b>	<b>16</b>	<b>17</b>	<b>18</b>	<b>19</b>	<b>20</b>	<b>21</b>	<b>22</b>	<b>23</b>	<b>24</b>	<b>25</b>	<b>26</b>
Other Services, except Public Administration	21	32	36	15	14	14	14	15	16	17	18	18	18	18	17	17	17
Annual Incremental Employment	567	1,038	951	356	321	307	303	320	343	357	360	371	372	358	354	355	338

Source: Economic Development Research Group

**Table 31: Industry Employment Changes for Rest of State Region**

Incremental Employment by Industry (private non-farm only – excludes government employees)																	
All Programs																	
Region = Rest of State																	
Years (2010-2026)																	
Industry Category	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Forestry, Fishing, and Related Activities	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Mining	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utilities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Construction	67	142	50	10	8	7	6	6	7	7	8	8	8	6	6	6	2
Manufacturing	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	0
Wholesale Trade	6	12	5	1	1	1	1	1	2	2	2	2	2	2	2	2	1
Retail Trade	10	11	10	6	6	7	7	8	9	9	10	10	9	8	7	7	5
Transportation and Warehousing	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1
Information	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Finance and Insurance	2	2	2	1	1	1	1	1	2	2	2	2	2	2	1	1	1
Real Estate and Rental and Leasing	3	3	4	3	3	4	4	4	5	6	6	6	6	5	4	4	3
Professional, Scientific, and Technical Services	21	24	16	2	3	3	4	5	5	6	6	6	6	5	5	4	3
Management of Companies and Enterprises	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Administrative and Waste Management Services	5	6	7	3	3	4	4	4	5	5	6	6	6	5	5	5	3
Educational Services	7	29	36	0	0	0	0	1	1	1	1	1	1	1	1	1	1
Health Care and Social Assistance	9	8	8	5	5	6	7	8	9	10	10	10	11	9	9	9	7
Arts, Entertainment, and Recreation	2	2	2	1	1	1	2	2	2	2	2	2	2	2	2	2	1
Accommodation and Food Services	5	6	7	5	5	6	6	7	8	8	9	9	8	7	7	7	6

Incremental Employment by Industry (private non-farm only – excludes government employees)																	
All Programs																	
Region = Rest of State																	
Years (2010-2026)																	
Industry Category	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Other Services, except Public Administration	5	5	6	4	4	4	4	5	6	6	6	7	6	5	5	5	4
Annual Incremental Employment	147	254	158	44	45	47	51	54	63	67	71	72	70	60	57	55	39

Source: Economic Development Research Group

**APPENDIX E:  
Employment by Occupation by Region**

These occupational estimates include jobs created in the government sector. Any differences in totals from other tables in this report (with the exception of Appendix D tables that exclude government employment) are due to rounding.

**Table 32: Occupational Changes for San Diego Region**

Incremental Employment by Occupation (includes government employees)																	
All Programs																	
Region = San Diego region																	
Years (2010-2026)																	
Occupation Category	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Management, business, and financial	8	17	12	2	2	2	3	3	3	4	4	4	4	4	4	4	3
Computer, mathematical, architecture, and engineering	10	17	11	1	1	1	1	1	1	2	2	2	2	2	2	2	1
Life, physical, and social science	1	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Community and social service	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Legal	2	4	2	0	0	0	0	0	0	0	0	1	1	0	0	1	0
Education, training, and library	2	6	7	0	0	0	1	1	1	1	1	1	1	1	1	1	1
Arts, design, entertainment, sports, and media	1	3	2	0	0	0	0	0	0	0	1	1	1	0	1	1	0
Healthcare	3	7	5	1	1	1	2	2	2	3	2	3	3	3	3	3	2
Protective service	2	4	4	1	2	2	2	2	2	3	3	3	3	3	3	3	2
Food preparation, serving and related	3	6	5	1	1	2	2	2	3	3	3	3	3	3	3	3	2
Building/grounds cleaning, maintenance, personal care and service	3	7	5	1	2	2	2	2	3	3	3	3	3	3	3	3	2
Sales and related, office and administrative support	17	35	25	5	5	6	7	8	9	10	10	11	10	10	10	11	8
Farming, fishing, and forestry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Construction and extraction	43	66	41	2	2	1	1	1	2	2	2	2	2	2	2	2	1
Installation, maintenance, and repair	2	4	3	1	1	1	1	1	2	2	2	2	2	2	2	2	1
Production	2	4	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Transportation and material moving	3	5	4	1	1	1	1	2	2	2	2	2	2	2	2	2	2

Incremental Employment by Occupation (includes government employees)																	
All Programs																	
Region = San Diego region																	
Years (2010-2026)																	
Occupation Category	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Annual Incremental Employment	104	189	133	19	20	21	26	27	32	36	37	40	38	37	37	38	30

Source: Economic Development Research Group

**Table 33: Occupational Changes for Inland Empire Region**

Incremental Employment by Occupation (includes government employees)																	
All Programs																	
Region = Inland Empire																	
Occupation Category	Years (2010-2026)																
	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Management, business, and financial	3	5	5	3	3	3	3	3	4	4	4	4	4	4	3	4	2
Computer, mathematical, architecture, and engineering	4	4	4	1	1	1	1	1	1	2	2	2	2	1	1	1	1
Life, physical, and social science	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Community and social service	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Legal	1	1	1	0	0	0	0	0	0	1	1	1	1	0	0	0	0
Education, training, and library	1	4	6	0	0	0	1	1	1	1	1	1	1	1	1	1	0
Arts, design, entertainment, sports, and media	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Healthcare	2	3	3	2	2	2	2	2	3	3	3	3	3	2	2	2	1
Protective service	1	2	3	2	2	2	3	3	3	4	4	4	4	4	3	4	2
Food preparation, serving and related	2	2	3	2	1	2	2	2	2	2	3	2	2	2	2	2	1
Building/grounds cleaning, maintenance, personal care and service	2	3	4	2	2	2	2	2	3	3	3	3	3	3	3	3	2
Sales and related, office and administrative support	10	13	14	7	7	7	8	9	11	11	12	12	11	9	9	9	4
Farming, fishing, and forestry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Construction and extraction	12	29	11	3	3	2	2	2	3	3	4	4	4	3	3	3	1
Installation, maintenance, and repair	1	2	2	1	1	1	1	2	2	2	2	2	2	2	2	2	1
Production	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	0
Transportation and material moving	2	3	4	2	2	2	2	2	3	3	3	3	3	2	2	2	1
Annual Incremental Employment	45	75	64	27	27	27	30	32	39	43	45	44	42	37	34	36	18

Source: Economic Development Research Group

**Table 34: Occupational Changes for Los Angeles Region**

Incremental Employment by Occupation (includes government employees)																	
All Programs																	
Region = Los Angeles region																	
Occupation Category	Years (2010-2026)																
	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Management, business, and financial	21	50	38	6	7	7	7	9	10	11	11	11	11	9	9	10	7
Computer, mathematical, architecture, and engineering	23	47	34	3	3	3	3	4	4	5	5	5	4	4	4	4	3
Life, physical, and social science	2	6	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Community and social service	3	4	4	1	1	2	2	2	2	2	2	3	2	2	2	3	1
Legal	4	11	7	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Education, training, and library	6	18	21	1	1	2	2	2	2	2	2	3	3	3	3	3	2
Arts, design, entertainment, sports, and media	4	8	6	1	1	1	1	1	1	2	2	2	2	2	2	2	1
Healthcare	9	15	12	3	3	4	4	4	5	7	6	7	7	5	6	6	3
Protective service	5	11	10	4	4	4	4	5	5	6	6	6	6	6	6	6	3
Food preparation, serving and related	8	13	10	2	3	3	5	5	4	6	5	6	5	6	5	5	4
Building/grounds cleaning, maintenance, personal care and service	12	19	16	5	5	6	6	6	7	8	8	9	9	7	7	8	6
Sales and related, office and administrative support	50	101	76	15	18	16	19	20	23	25	24	28	24	20	24	25	15
Farming, fishing, and forestry	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Construction and extraction	53	109	49	6	5	4	4	4	5	4	6	5	4	4	4	4	2
Installation, maintenance, and repair	6	12	10	3	3	3	4	4	4	5	4	5	5	4	4	4	3
Production	8	14	11	3	3	3	3	4	4	4	5	4	4	3	3	3	2
Transportation and material moving	10	19	15	4	4	4	4	5	5	6	6	7	7	6	6	6	4
Annual Incremental Employment	224	458	325	59	63	64	71	75	83	94	95	103	96	83	88	92	60

Source: Economic Development Research Group

**Table 35: Occupational Changes for San Joaquin Region**

Incremental Employment by Occupation (includes government employees)																	
All Programs																	
Region = San Joaquin region																	
Occupation Category	Years (2010-2026)																
	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Management, business, and financial	13	17	17	7	7	8	8	9	11	12	13	13	12	12	11	11	7
Computer, mathematical, architecture, and engineering	13	17	13	3	3	3	3	3	4	5	5	5	5	4	4	4	3
Life, physical, and social science	2	2	2	1	1	1	1	1	1	1	2	2	1	1	1	1	1
Community and social service	2	2	4	2	2	3	3	3	4	5	5	5	5	4	4	5	3
Legal	2	3	3	1	1	1	1	1	1	2	2	2	2	2	2	2	1
Education, training, and library	2	5	7	1	1	1	2	2	2	2	3	3	3	2	2	2	2
Arts, design, entertainment, sports, and media	2	3	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Healthcare	8	9	10	5	5	6	6	7	8	10	10	11	10	9	9	9	6
Protective service	4	5	10	7	7	7	8	9	11	13	13	13	13	13	13	13	8
Food preparation, serving and related	5	6	7	4	4	4	5	5	6	7	7	7	7	6	6	6	4
Building/grounds cleaning, maintenance, personal care and service	6	7	9	5	5	5	6	6	8	9	10	10	9	9	8	8	5
Sales and related, office and administrative support	33	43	43	19	19	20	22	23	28	32	32	33	32	28	27	27	18
Farming, fishing, and forestry	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Construction and extraction	77	151	60	8	7	6	6	7	8	9	10	10	9	9	8	8	4
Installation, maintenance, and repair	4	6	7	4	4	4	4	4	5	6	6	6	6	5	5	5	3
Production	4	5	6	3	3	3	3	3	4	4	4	4	4	3	4	3	2
Transportation and material moving	6	9	9	5	5	5	5	6	7	8	8	8	8	7	7	7	4
Annual Incremental Employment	184	293	210	74	74	77	82	90	110	126	130	132	127	117	113	113	71

Source: Economic Development Research Group

**Table 36: Occupational Changes for Greater Sacramento Region**

Incremental Employment by Occupation (includes government employees)																	
All Programs																	
Region = Greater Sacramento region																	
Occupation Category	Years (2010-2026)																
	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Management, business, and financial	24	13	18	9	5	5	6	7	9	11	11	12	12	11	11	11	7
Computer, mathematical, architecture, and engineering	23	14	14	5	2	2	2	3	4	5	5	5	5	5	5	5	3
Life, physical, and social science	3	2	2	1	0	1	1	1	1	1	1	1	1	1	1	1	1
Community and social service	4	2	4	2	1	2	2	2	3	4	4	4	4	4	4	4	2
Legal	6	3	3	2	1	1	1	1	1	2	2	2	2	2	2	2	1
Education, training, and library	4	7	10	1	1	1	1	1	2	2	2	2	2	2	2	2	1
Arts, design, entertainment, sports, and media	4	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Healthcare	11	2	7	5	3	4	4	5	7	7	8	8	8	8	8	8	4
Protective service	10	6	11	7	4	4	5	6	9	10	11	11	11	11	11	11	6
Food preparation, serving and related	8	1	5	3	2	2	3	4	5	5	6	6	6	6	6	6	4
Building/grounds cleaning, maintenance, personal care and service	10	4	9	5	3	4	4	5	7	8	8	8	8	8	8	8	5
Sales and related, office and administrative support	51	22	38	21	12	14	15	17	23	27	29	29	29	27	26	27	15
Farming, fishing, and forestry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Construction and extraction	64	68	61	6	4	4	4	5	7	9	9	10	9	9	9	8	4
Installation, maintenance, and repair	6	3	6	3	2	2	3	3	4	5	5	5	5	5	5	5	3
Production	5	2	4	2	1	2	2	2	2	3	3	3	3	3	3	3	2
Transportation and material moving	8	5	8	4	3	3	3	4	5	6	6	6	6	6	6	6	4
Annual Incremental Employment	240	156	203	78	46	51	55	66	90	107	111	114	113	108	107	109	63

Source: Economic Development Research Group

**Table 37: Occupational Changes for Bay Area Region**

Incremental Employment by Occupation (includes government employees)																	
All Programs																	
Region = Bay Area region																	
Occupation Category	Years (2010-2026)																
	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Management, business, and financial	55	93	103	43	38	37	37	39	43	44	45	47	47	45	45	44	42
Computer, mathematical, architecture, and engineering	52	80	76	25	22	22	22	23	24	25	26	27	27	26	26	26	25
Life, physical, and social science	6	10	10	4	4	4	4	4	4	4	5	5	5	5	5	5	4
Community and social service	7	12	14	6	6	6	6	7	8	8	8	9	9	8	8	9	8
Legal	8	13	12	4	4	4	4	4	4	4	5	5	5	5	5	5	4
Education, training, and library	11	25	31	7	7	7	7	8	9	9	10	10	10	10	10	10	10
Arts, design, entertainment, sports, and media	8	14	14	5	5	5	5	5	5	6	6	6	6	6	6	6	5
Healthcare	26	42	45	17	16	16	16	19	20	22	22	24	24	23	23	24	23
Protective service	15	24	31	16	15	15	15	18	19	20	20	21	21	21	21	21	19
Food preparation, serving and related	23	38	43	20	19	19	19	21	22	23	24	24	25	23	23	22	21
Building/grounds cleaning, maintenance, personal care and service	27	45	50	22	20	19	20	22	24	25	26	27	27	26	26	26	25
Sales and related, office and administrative support	132	224	237	97	87	83	81	90	98	101	98	106	105	100	99	100	94
Farming, fishing, and forestry	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Construction and extraction	136	265	136	32	26	22	19	20	22	23	23	24	24	23	22	22	19
Installation, maintenance, and repair	21	36	42	20	18	18	17	18	20	21	21	21	21	21	21	21	19
Production	55	94	125	61	60	58	58	58	60	61	61	61	61	60	61	60	59

Incremental Employment by Occupation (includes government employees)																	
All Programs																	
Region = Bay Area region																	
Occupation Category	Years (2010-2026)																
	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Transportation and material moving	30	53	61	27	26	25	25	27	28	29	30	30	30	29	29	29	28
Annual Incremental Employment	610	1,070	1,034	410	373	359	356	383	413	427	430	448	447	431	431	431	408

Source: Economic Development Research Group

**Table 38: Occupational Changes for Rest of State**

Incremental Employment by Occupation (includes government employees)																	
All Programs																	
Region = Rest of State																	
Occupation Category	Years (2010-2026)																
	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Management, business, and financial	11	10	11	2	1	1	1	2	3	3	3	3	4	4	4	4	3
Computer, mathematical, architecture, and engineering	13	12	9	1	0	0	1	1	1	1	1	1	1	1	1	1	1
Life, physical, and social science	2	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Community and social service	2	2	2	0	0	0	0	1	1	1	1	1	1	1	1	1	1
Legal	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Education, training, and library	5	17	21	0	0	0	0	0	0	1	1	1	1	1	1	1	1
Arts, design, entertainment, sports, and media	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Healthcare	5	3	4	1	1	1	1	1	2	2	2	2	3	3	3	3	3
Protective service	3	3	4	1	1	1	1	2	3	3	3	3	4	4	4	4	3
Food preparation, serving and related	5	4	5	1	1	1	1	1	2	2	3	3	3	3	3	3	3
Building/grounds cleaning, maintenance, personal care and service	5	5	7	1	1	1	1	1	2	3	3	3	3	3	3	3	3
Sales and related, office and administrative support	23	21	23	4	3	4	3	4	7	8	8	8	9	9	9	9	8
Farming, fishing, and forestry	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Construction and extraction	65	116	32	3	2	1	1	1	2	2	2	2	3	2	3	3	2
Installation, maintenance, and repair	3	3	4	1	1	1	1	1	1	2	2	2	2	2	2	2	1
Production	2	2	2	1	1	0	0	0	1	1	1	1	1	1	1	1	1
Transportation and material moving	4	4	5	1	1	1	1	1	2	2	2	2	2	2	2	2	2
Annual Incremental Employment	152	206	136	19	15	14	15	17	27	32	34	35	37	37	38	40	32

Source: Economic Development Research Group